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# I. Telephone Numbers

## Telephone Numbers

Area Code 406. If dialing from an on-campus phone, "994" should be excluded.

<table>
<thead>
<tr>
<th>Department</th>
<th>Address</th>
<th>Phone</th>
</tr>
</thead>
<tbody>
<tr>
<td>Academic Affairs</td>
<td>212 Montana Hall</td>
<td>994-4371</td>
</tr>
<tr>
<td>Administration and Finance</td>
<td>201 Montana Hall</td>
<td>994-4361</td>
</tr>
<tr>
<td>Admissions</td>
<td>201 Strand Union Building</td>
<td>994-2452</td>
</tr>
<tr>
<td>Agricultural Experiment station</td>
<td>202 Linfield Hall</td>
<td>994-3681</td>
</tr>
<tr>
<td>Agriculture, College of</td>
<td>202 Linfield Hall</td>
<td>994-3681</td>
</tr>
<tr>
<td>Alumni Relations</td>
<td>Foundation/Alumni Center, 11th Ave. and Lincoln St.</td>
<td>994-2401</td>
</tr>
<tr>
<td>Arts and Architecture, College of</td>
<td>217 Cheever Hall</td>
<td>994-4405</td>
</tr>
<tr>
<td>ASK US Information Center</td>
<td>280A Strand Union Building</td>
<td>994-4636</td>
</tr>
<tr>
<td>Allen Yarnell Center for Student Success</td>
<td>177 Strand Union Building</td>
<td>994-7627</td>
</tr>
<tr>
<td>ASMSU</td>
<td>221 Strand Union Building</td>
<td>994-2933</td>
</tr>
<tr>
<td>ASMSU Day Care Center</td>
<td>1295 W. Garfield St.</td>
<td>994-4370</td>
</tr>
<tr>
<td>Athletics</td>
<td>145 Fieldhouse</td>
<td>994-4221</td>
</tr>
<tr>
<td>Bookstore</td>
<td>125 Strand Union Building</td>
<td>994-2811</td>
</tr>
<tr>
<td>Business, College of</td>
<td>412 Reid Hall</td>
<td>994-4423</td>
</tr>
<tr>
<td>Career, Internship &amp; Student Employment Services</td>
<td>177 Strand Union Building</td>
<td>994-4353</td>
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<tr>
<td>University Communications</td>
<td>437 Culbertson Hall</td>
<td>994-4571</td>
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<tr>
<td>Conference Services</td>
<td>211 Strand Union Building</td>
<td>994-3081</td>
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<tr>
<td>Counseling and Psychological Services</td>
<td>211 Swingle Health Center</td>
<td>994-4531</td>
</tr>
<tr>
<td>Dean of Students</td>
<td>174 Swingle Health Center</td>
<td>994-2826</td>
</tr>
<tr>
<td>Disability, Re-entry, and Veteran’s Services</td>
<td>180 Strand Union Building</td>
<td>994-2824</td>
</tr>
<tr>
<td>Education, Health and Human Development, College of</td>
<td>250 Reid Hall</td>
<td>994-4133</td>
</tr>
<tr>
<td>Engineering, College of</td>
<td>212 Roberts Hall</td>
<td>994-2272</td>
</tr>
<tr>
<td>Extended University</td>
<td>128 EPS Building</td>
<td>994-6550</td>
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<tr>
<td>Extension Service</td>
<td>203 Culbertson Hall</td>
<td>994-1750</td>
</tr>
<tr>
<td>Facilities Services</td>
<td>Physical Plant, S. 6th Ave. and Grant St.</td>
<td>994-2001</td>
</tr>
<tr>
<td>Family Housing</td>
<td>1502 W. Garfield St.</td>
<td>994-3730</td>
</tr>
<tr>
<td>Financial Aid Services</td>
<td>183 Strand Union Building</td>
<td>994-2845</td>
</tr>
</tbody>
</table>

Foundation, MSU | Foundation/Alumni Center, 11th Ave. and Lincoln St. | 994-2053 |
Fraternity/Sorority Life | 174 Strand Union Building | 994-2826 |
Gallatin College | 101 Hamilton Hall | 994-5536 |
Graduate School | 9 and 108 Montana Hall | 994-4145 |
Health Service | 121 Swingle Health Center | 994-2311 |
Honors College | 104 Quad F | 994-4110 |
Human Resources | 920 Technology Boulevard Suite A | 994-3651 |
Information Technology Center | 49 Renne Library | 994-3042 |
International Programs | 400 Culbertson Hall | 994-7150 |
KGLT Radio | 376 Strand Union Building | 994-3001 |
KUSM Television | 183 Strand Union Building | 994-3437 |
Letters and Science, College of | 2-205 Wilson Hall | 994-4288 |
Library, Renne | P.O. Box 173320, Centennial Mall | 994-3119 |
Museum of the Rockies | 600 W. Kagy Blvd. | 994-2251 |
Native American Studies | 2-179 Wilson Hall | 994-3881 |
Nursing, College of | 115 Sherrick Hall | 994-3783 |
Office of Activities and Engagement | 222 Strand Union Building | 994-6902 |
Office of Financial Education | 177 Strand Union Building | 994-4388 |
Office of Institutional Equity | 118 Hamilton Hall | 994-2042 |
Orientation Office | 103 Strand Union Building | 994-2827 |
Outdoor Recreation Center | 1401 W. Lincoln St | 994-3621 |
Parent/Family Association | 174 Strand Union Building | 994-7359 |
Police, Campus | Huffman Building | 994-2121 |
Post Office, Campus | Culbertson Hall | 994-2672 |
President’s Office | 211 Montana Hall | 994-2341 |
Provost | 212 Montana Hall | 994-4371 |
Recreational Sports and Fitness | 120 Hosaeus Fitness Center | 994-5000 |
Registrar | 101 Montana Hall | 994-6650 |
Research, Creativity and Technology Transfer | 207 Montana Hall | 994-2891 |
Residence Life and Food Services | 31 Hedges Complex | 994-2661 |
Strand Union Building Administration | 223 Strand Union Building | 994-3082 |
Summer Session | 318 Montana Hall | 994-7136 |
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<th>Service</th>
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<tbody>
<tr>
<td>University Business Services</td>
<td>102 Montana Hall</td>
<td>994-1991</td>
</tr>
<tr>
<td>University Police</td>
<td>Huffman Building, 7th Avenue and Kagy Blvd.</td>
<td>994-2121</td>
</tr>
<tr>
<td>University Studies</td>
<td>418 Reid Hall</td>
<td>994-3532</td>
</tr>
<tr>
<td>Vice President for Student Success</td>
<td>174 Strand Union Building</td>
<td>994-2828</td>
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<tr>
<td>Women’s Center</td>
<td>372 Strand Union Building</td>
<td>994-3836</td>
</tr>
<tr>
<td>WWAMI/Division of Health Services</td>
<td>308 Leon Johnson Hall</td>
<td>994-4411</td>
</tr>
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</table>

**MSU - Billings**

<table>
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<tr>
<th>Service</th>
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<tbody>
<tr>
<td>Toll free</td>
<td>800-565-6782</td>
</tr>
<tr>
<td>Admissions and Records</td>
<td>657-2158</td>
</tr>
<tr>
<td>Business Services</td>
<td>657-2301</td>
</tr>
<tr>
<td>Extended Campus</td>
<td>896-5890</td>
</tr>
<tr>
<td>Financial Aid</td>
<td>657-2188</td>
</tr>
<tr>
<td>Graduate Studies and Research</td>
<td>657-2238</td>
</tr>
<tr>
<td>Registrar</td>
<td>657-2158</td>
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**Great Falls College - MSU**

<table>
<thead>
<tr>
<th>Service</th>
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<tbody>
<tr>
<td>Toll Free</td>
<td>800-446-2698</td>
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<tr>
<td>Admissions</td>
<td>771-4420</td>
</tr>
<tr>
<td>Business and Finance</td>
<td>771-4321</td>
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<tr>
<td>Community and Continuing Education</td>
<td>771-4303</td>
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<tr>
<td>Distance Education Coordinator</td>
<td>771-4444</td>
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<tr>
<td>Financial Aid</td>
<td>771-4334</td>
</tr>
<tr>
<td>Registrar</td>
<td>771-5128</td>
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</table>

**MSU - Northern (Havre)**

<table>
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<th>Service</th>
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<tr>
<td>Toll Free</td>
<td>800-662-6132</td>
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<tr>
<td>Admissions</td>
<td>265-3704</td>
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<tr>
<td>Business Services</td>
<td>265-3733</td>
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<tr>
<td>Extended University</td>
<td>265-3730</td>
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<tr>
<td>Financial Aid</td>
<td>265-3787</td>
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<tr>
<td>Graduate Studies</td>
<td>265-3758</td>
</tr>
<tr>
<td>Registrar</td>
<td>265-3703</td>
</tr>
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</table>
II. Directory

Board of Regents of Higher Education
Governor, Steve Bullock, ex officio member
Superintendent of Public Instruction, Denise Juneau, ex officio member
Commissioner of Higher Education, Clayton Christian, ex officio member
Fran M. Albrecht, Vice Chair
Asa Hohman, Student Regent
William Johnstone
Casey Lenz
Robert A. Nystuen
Martha Sheehy
Paul Tuss, Chair

Director
Governor, Steve Bullock, ex officio member
Superintendent of Public Instruction, Denise Juneau, ex officio member
Commissioner of Higher Education, Clayton Christian, ex officio member
Fran M. Albrecht, Vice Chair
Asa Hohman, Student Regent
William Johnstone
Casey Lenz
Robert A. Nystuen
Martha Sheehy
Paul Tuss, Chair

Central Administration
President’s Office
Waded Cruzado, Ph.D., President of Montana State University

Academic Affairs
Martha A. Potvin, Ph.D., Executive Vice President for Academic Affairs and Provost
David Singel, Ph. D., Associate Provost
Ronald Larsen, Ph. D., Associate Provost
David L. Di Maria, Associate Provost of International Programs

Student Success
Chris Kearns, Ph.D., Vice President for Student Success
Matthew Caires, Ed.D., Dean of Students
Ronda Russell, Me.D, Director of Admissions
Tony Campeau, M.S., Registrar
Carina Beck, Ed.D, Director of the Office of Student Success Programs
Brandi Payne, B.S., Director of Financial Aid
Brenda York, M.D., Director of Disability, Re-entry & Veterans’ Services
Jim Mitchell, M.B.A., Director of Student Health Service
Pat Donahoe, Ed.D., Director of Counseling & Psychological Services

Research and Creative Activities
Renee Reijo Pera, Ph.D., Vice President for Research and Economic Development
Leslie Schmidt, B.S., Assistant Vice President for Research, Creativity and Technology Transfer

Administration and Finance
Terry Leist, M.B.A., C.P.A., Vice President for Administration and Finance
Robert Lashaway, B.A., Associate Vice President for University Services
Laura Humberger, B.S., C.P.A., Assistant Vice President for Financial Services

Colleges
Agriculture
Charles Boyer, Ph.D, Vice President and Dean of Agriculture
Nora Smith, Ph.D., Assistant Dean

Arts and Architecture
William Shields, Ph.D., Interim Dean
JoDee Palin, Interim Assistant Dean

Jake Jabs College of Business & Entrepreneurship
Kregg Aytes, Ph.D., Dean
Susan Dana, J.D., Associate Dean

Brenda Truman, M.P.A., Director of Student Services

Education, Health and Human Development
Alison Harmon, Ph.D., RD, LN Interim Dean
Denise Malloy, M.Ed, JD, Assistant Dean
Suzanne Held, Ph.D., Assistant Dean of Student Affairs

Engineering
Brett Gunnick, Ph.D., Dean
Anne Camper, Ph.D., Associate Dean
Christine Forman, Ph.D., Associate Dean

Nursing
Helen Melland, Ph. D., Dean
Teresa Seright, Ph.D., RN, CCRN, Associate Dean
Donna Williams, Ph.D., Associate Dean

Graduate School
Karlene A. Hoo, Ph.D., Dean

Letters and Science
Nicol Rae, Ph.D., Dean
David Cherry, Ph.D., Associate Dean
Bridget Kevane, Ph.D., Associate Dean

Administrative Offices
Admissions
Ronda Russell, M.Ed., Director

Alumni Relations
Kerry Hanson, Vice President of Alumni Relations

Athletics
Peter Fields, M.S., Director

Career Services
Carina Beck, Ed.D., Director

University Communications
Tracy Ellig, B.A., Executive Director

Counseling and Psychological Services
Patrick Donahoe, Ed.D., Director

Extended University
Kimberly Obbink, Ed.D., Executive Director

Facilities Services
Jeff Butler, CET, Director, Facilities Services

Foundation
Chris Murray, MBA, President and CEO

Institutional Equity/Title IX Coordinator
Jyl Shaffer, M.A., Director

University Studies
Diane Donnelly, M.Ed., Director
Human Resources
Cathy Hasenpflug, B.S., Chief Human Resources Officer

Information Technology Center
Jerry Sheehan, M.S., Chief Information Officer

International Programs
David DiMaria, Ed.D., Associate Provost

Legal Counsel
Kellie Peterson, J.D.

Library
Kenning Arlitsch, Dean
Brian Rossman, M.L.S., Associate Dean

Mail Services
Wanda DeMay, Manager

Museum of the Rockies
Sheldon McKamey, B.S., Dean and Director

Native American Studies
Walter Fleming, Ph.D., Director

Office of Planning & Analysis
Chris Fastnow, Ph.D., Director

Registrar
Tony Campeau, M.S., Registrar

Residence Life and Food Services
Thomas Stump, C.P.A., Director of Auxiliary Services
Jeff Bondy, M.P.A., Director of Residence Life
Todd Jutila, Director of University Food Service

Safety and Risk Management
Chris Catlett, M.S., CRM, Director

Strand Union
Frank Damberger, B.S., Director

Student Accounts
Bonnie Holden, B.S., Director

Student Health Service
James Mitchell, M.B.A., Director
Ita Killeen, M.D., Associate Director

University Police
Robert Putzke, B.S., Director and Chief

WWAMI/Division of Health Sciences
Martin Teintze, Ph.D., Director

Women's Center
Betsy Danforth, B.A., Director
III. Academic Programs

Academic Programs

A
- Accountancy (Professional) - M (p. 405)
- Accounting - BS option in Business; minor (p. 276)
- Adult & Higher Education - option in MEd; option in EdD (p. 300)
- Aerospace - minor (p. 170)
- Agribusiness Management - concentration (p. 72)
- Agricultural Business - BS; minor (p. 71)
- Agricultural Education - BS; MS (p. 75)
- Agricultural Relations - BS option in Agricultural Education (p. 75)
- Agroecology - BS option in Sustainable Food and Bioenergy Systems (p. 101)
- American Studies - Graduate - MA; PhD (p. 355)
- American Studies - Undergraduate - BA (p. 179)
- Animal & Range Sciences - MS; PhD (p. 284)
- Animal Science - BS; minor (p. 78)
- Animal Systems - BS option in Biotechnology (p. 83)
- Anthropology - BS; minor (p. 184)
- Applied Economics - MS (p. 284)
- Applied Mechanics - PhD option in Engineering (p. 352)
- Architecture - Graduate - M.Arch (p. 297)
- Architecture - Undergraduate - BA option in Environmental Design (p. 115)
- Art - BA; BFA; MFA; teaching option; teaching minor, Art History minor (p. 105)
- Art History - BA option in Art; minor (p. 105)
- Asian Studies - BA (p. 182)
- Asian Studies - minor (p. 183)
- Associate of Arts - AA (p. 260)
- Associate of Science - AS (p. 260)
- Aviation - AAS (p. 261)

B
- Bio-Resources Engineering - BS option in Civil Engineering (p. 157)
- Biochemistry - Graduate - MS; PhD (p. 334)
- Biochemistry - Undergraduate - BS option in Chemistry; minor (p. 187)
- Biological Engineering - BS (p. 154)
- Biological Sciences - BS; MS; PhD (p. 81)
- Biology - teaching option; teaching minor (p. 199)
- Biomedical Sciences - BS option in Cell Biology and Neuroscience (p. 185)
- Biotechnology - BS (p. 82)
- Bookkeeping - CAS (p. 262)
- Botany - refer to Organismal Biology (p. 203)
- Building Energy Systems Minor - minor (p. 171)
- Business - BS (p. 269)
- Business Administration - minor (p. 277)

C
- CNC Machine Welding - CAS (p. 262)
- Cell Biology and Neuroscience - BS; option in Cell Biology and Neuroscience (p. 185)
- Chemical Engineering - Graduate - MS; PhD option in Engineering (p. 334)
- Chemical Engineering - Undergraduate - BS (p. 154)
- Chemistry - Graduate - MS; PhD (p. 358)
- Chemistry - Undergraduate - BS; professional option; teaching option; teaching minor (p. 187)
- China Studies - minor (p. 234)
- Civil Engineering - Graduate - MS; PhD option in Engineering (p. 358)
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- Clinical Nurse Specialist - Adults with Complex Acute and Chronic Health Problems (p. 381)
- Coaching - minor (p. 138)
- Community Health - BS (p. 139)
- Computer Engineering - Graduate - MS (p. 348)
- Computer Engineering - Undergraduate - BS, minor (p. 164)
- Computer Science - Graduate - MS; PhD (p. 348)
- Computer Science - Undergraduate - BS, minor (p. 161)
- Construction Engineering Technology - BS (p. 160)
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- Crop Science - BS option in Plant Sciences (p. 97)
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- Curriculum & Instruction MEd - option in MEd (p. 308)

D
- Design Drafting - AAS (p. 263)
- Dietetics - BS option in Food and Nutrition (p. 142)
- Directed Interdisciplinary Studies - BA; BS (p. 266)

E
- Early Childhood Education - BS option in Elementary Education (p. 126)
- Early Childhood Education and Child Services - BS (p. 140)
- Earth Sciences - Graduate - MS; PhD (p. 361)
- Earth Sciences - Undergraduate - BS; teaching minor (p. 191)
- Ecology & Environmental Sciences - PhD (p. 293)
- Economics - BS; teaching minor; minor (p. 204)
- Economics (Applied) - MS (p. 284)
- Education - MEd with options in Adult and Higher Education, Curriculum and Instruction, Education Leadership, and School Counseling; EdD with options in Adult and Higher Education, Curriculum and Instruction, and Education Administration (p. 300)
- Education Specialist - EdS with option in Education Administration (p. 300)
- Educational Leadership - option in MEd; option in EdS; option in EdD (p. 300)
- Electrical & Computer Engineering - PhD option in Engineering (p. 348)
• Electrical Engineering - Graduate - MS (p. 348)
• Electrical Engineering - Undergraduate - BS, minor (p. 166)
• Elementary Education - BS (p. 126)
• Engineering - PhD with options in Applied Mechanics, Chemical Engineering, Civil Engineering, Electrical & Computer Engineering, Environmental Engineering, Industrial Engineering, and Mechanical Engineering (p. 343)
• Engineering Management - MS (p. 341)
• Engineering Management - minor (p. 171)
• English - Graduate - MA (p. 365)
• English - Undergraduate - BA; writing option; literature option; teaching option (p. 205)
• Entomology - Graduate - MS (p. 291)
• Entomology - Undergraduate - minor (p. 85)
• Entrepreneurship & Small Business Management - minor (p. 278)
• Environmental Biology - BS option in Environmental Sciences (p. 91)
• Environmental Design - BA (p. 117)
• Environmental Engineering - MS; PhD option in Engineering (p. 356)
• Environmental Health - BS option in Microbiology (p. 229)
• Environmental Horticulture - BS (p. 86)
• Environmental Horticulture Science - BS option in Environmental Horticulture (p. 86)
• Environmental Sciences - BS (p. 90)
• Environmental Studies - BA option in Liberal Studies (p. 216)
• Equine Science - BS option in Animal Science (p. 78)
• Exercise Science - BS option in Health & Human Performance (p. 145)

 Family & Consumer Science Education - teaching minor (p. 133)
 Family & Consumer Sciences - Graduate - MS option in Health & Human Development (p. 331)
 Family & Consumer Sciences - Undergraduate - BS teaching or non-teaching options (p. 142)
 Family Financial Planning - MS option in Health & Human Development (p. 331)
 Family Nurse Practitioner - M option in Nursing (p. 381)
 Family Nurse Practitioner Certificate, Post-Master's - Post Master's FNP (p. 379)
 Farm & Ranch Management - concentration (p. 72)
 Film & Photography - BA options in Film or Photography; minor in Photography (p. 117)
 Finance - BS option in Business (p. 273)
 Financial Engineering - BS; minor (p. 73)
 Fish & Wildlife Biology - PhD (p. 365)
 Fish & Wildlife Management - Graduate - MS (p. 364)
 Fish & Wildlife Management - Undergraduate - BS option in Biological Sciences (p. 202)
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 French - BA option in Modern Languages & Literatures; teaching option; teaching minor; minor (p. 233)

 General Science - BS option in Secondary Education (p. 128)
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 Geographic Information Science (GIS) - minor (p. 193)
 Geographic Information Science (GIS)/Planning - option (p. 192)
 Geography - BS option in Earth Sciences (p. 193)
 Geology - BS option in Earth Sciences (p. 194)
 Geospatial and Environmental Analysis - BS option in Environmental Sciences (p. 91)
 German - BA option in Modern Languages & Literatures; teaching option; teaching minor; minor (p. 233)
 Gerontology - Certificate (p. 144)
 Global Studies Minor - minor (p. 220)
 Global/Multicultural Studies - BA option in Liberal Studies (p. 216)
 Government - teaching minor (p. 134)
 Graphic Design - option in BFA Art (p. 109)

 Health & Human Development - MS with options in Counseling, Family and Consumer Sciences, Family Financial Planning, Exercise and Nutrition Sciences, and Health Promotion and Education (p. 300)
 Health Information Coding - CAS (p. 263)
 Health Promotion and Education - MS option in Health & Human Development (p. 327)
 Health and Human Performance - BS option in Exercise Science; Kinesiology Health Enhancement K-12 (Health and Physical Education) - BS (p. 145)
 Hispanic Studies - BA option in Modern Languages and Literatures; minor (p. 233)
 History - Graduate - MA; PhD (p. 366)
 History - Undergraduate - BA; teaching option; teaching minor; minor (p. 208)
 Honors - courses (p. 266)

 Immunology and Infectious Diseases - MS, PhD (p. 287)
 Industrial & Management Engineering - MS (p. 352)
 Industrial Engineering - Graduate - PhD option in Engineering (p. 343)
 Industrial Technology - BS option in Technology Education (p. 135)
 Industrial and Management Systems Engineering - Undergraduate - BS (p. 172)
 International Business - minor (p. 278)
 International Relations - BS option in Political Science (p. 247)

 Japan Studies - BA in option History; minor (p. 233)

 Kinesiology - BS option in Health and Human Performance (p. 145)

 Land Rehabilitation - BS option in Environmental Sciences (p. 92)
 Land Rehabilitation - Graduate - MS (p. 286)
 Land Resources and Environmental Sciences - MS (p. 292)
 Landscape Design - BS option in Horticulture (p. 87)
 Latin American and Latino Studies - minor (p. 237)
 Liberal Studies - BA (p. 216)
• Library Media - BS option in Elementary Education; teaching minor (p. 126)
• Livestock Management and Industries - BS option in Animal Science (p. 79)

M
• Management - BS option in Business (p. 274)
• Marketing - BS option in Business (p. 275)
• Mathematics - Graduate - MS; PhD; Education option (p. 367)
• Mathematics - Undergraduate - BS; applied option; teaching option; teaching minor; minor (p. 222)
• Mechanical Engineering - Graduate - MS; PhD option in Engineering (p. 353)
• Mechanical Engineering - Undergraduate - BS (p. 174)
• Mechanical Engineering Technology - BS (p. 175)
• Mechanics (Applied) - PhD option in Engineering (p. 343)
• Medical Assistant - CAS (p. 265)
• Medical Laboratory Science - BS option in Microbiology (p. 226)
• Microbial Systems - BS option in Biotechnology (p. 84)
• Microbiology - Graduate - MS; PhD (p. 371)
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Welcome to MSU

Montana State University inspires big ideas and bold adventures. At MSU, we believe in transforming lives through education and empowerment. Students learn through hands-on research and creative experiences, engage with community and service learning projects, and discover new knowledge with the guidance of expert professors.

As Montana’s land-grant institution, Montana State University is dedicated to providing high quality education in a broad range of subjects from technical to liberal arts. In fulfilling its land-grant mission, the Bozeman campus provides educational opportunities to nearly 16,000 students from associate degrees and certificate programs to doctoral degrees.

MSU is Montana’s premier university with seven academic colleges and more than 225 academic options.

**MSU Mission**
Montana State University, the state’s land-grant institution, educates students, creates knowledge and art, and serves communities by integrating learning, discovery and engagement.

**MSU Vision**
Montana State University is as remarkable as its setting. Created as a land-grant institution, it is a welcoming, adventurous community of students, faculty and staff distinguished by its commitment to address the world’s greatest challenges. The university energizes individuals to discover and pursue their aspirations. It inspires people to engage with the university to improve the human prospect through excellence in education, research, creativity and civic responsibility.

**MSU At-A-Glance**
- Degrees offered: Associate, Bachelor’s, Master’s, and Doctoral
- Accreditation: Regionally accredited by Northwest Commission on Colleges and Universities (NWCCU); professional schools and departments approved by specialized accrediting organizations
- Student/Faculty ratio: 19:1
- Established: 1893
- Location: Bozeman, Montana
- Academic year: fall and spring semesters, summer sessions
- Average High School GPA: 3.43; Average ACT: 25.3; Average SAT: 1720
- Athletic conference: Big Sky Conference, NCAA Division I (Football Championship Subdivision–FCS)
- Varsity sports:
  - Men: football, basketball, NIRA rodeo, track, cross-country, Alpine and Nordic skiing, tennis and Spirit Squad
  - Women: volleyball, basketball, track, cross-country, tennis, NIRA rodeo, golf, Alpine and Nordic skiing and Spirit Squad
- Mascot: Bobcat
- School colors: Blue & Gold
- Geographic surroundings: 90 miles from Yellowstone National Park; 2.1 million acres of national forest and wilderness areas in the Gallatin National Forest
- Classroom to chairlift: 20 minutes to Bridger Bowl; 55 minutes to Big Sky; Campus to camping: 25 minutes to Hyalite Canyon

**Brief MSU History**
- February 16, 1893: Montana State University was established as the Agricultural College of the State of Montana at Bozeman by an act of the State Legislature. The first term of instruction began on April 17 of that year.
- 1913: the name of the institution was changed to the State College of Agriculture and Mechanic Arts.
- 1920: the name was changed to Montana State College
- July 1, 1965: name became Montana State University

**Learning**
MSU prepares students to graduate equipped for careers and further education. MSU’s low student to faculty ratio means accessible professors and hands-on learning opportunities. Working alongside world-class faculty mentors, students discover new knowledge that helps to improve quality of life around the globe. This supportive and collaborative learning environment helps students succeed in competing for national and international scholarships and awards. In the past year alone, MSU students have received prestigious awards including:

- Goldwater scholarships (math, science & engineering)
- Rhodes Scholarship (to study at Oxford University)
- Marshall Scholarship (grad school in the United Kingdom)
- Udall Scholarship (to pursue careers in the environment)
- Newman Civic Fellow (public leadership)

**Discovery**
MSU is recognized nationally for its prominence in research among leading public research universities. MSU is among the top 3 percent of colleges and universities in the nation for research expenditures. This prolific research has led to many significant discoveries that are changing the world. MSU holds more than 250 active technology licenses. In addition, 91 patents and 31 plant variety certificates have been issued for MSU discoveries with many more pending.

Research expenditures at MSU typically exceed $100 million annually and top research departments include microbiology and immunology, chemistry and biochemistry, transportation, physics, and land resources and environmental sciences; while much of the research funding from the National Institutes of Health, Departments of Energy, Defense and Agriculture, and private sources. MSU is Montana’s largest research enterprise.

**Engagement**
Students, professors and staff at MSU work together with community partners to exchange and apply knowledge and resources that improve the world. MSU recently earned The Carnegie Foundation for the Advancement of Teaching’s engagement classification. The designation recognizes commitment to teaching that encourages volunteer service in communities and spreading of knowledge that benefits the public. In addition, through courses, clubs and organized events, students participate in many local, national and international service-learning projects that enable them to apply their education while strengthening communities. By integrating learning, discovery and engagement, and by working across disciplines, MSU is making great strides to improve the world.

**Undergraduate Excellence**
The Carnegie Foundation classifies MSU as an institution with a high undergraduate profile. Its high undergraduate profile combined with its status as one of the top research universities in the nation gives MSU’s undergraduate students opportunities to do research of national importance on a variety of topics, opportunities that would typically be reserved for graduate students at other universities. That’s one reason why MSU is a national leader in producing winners of the Goldwater Scholarship, the nation’s premier award for undergraduates in math and science fields. MSU
A Unique Learning Environment

MSU is the only university with easy access to Yellowstone National Park. For MSU students, Yellowstone is a 20 million acre classroom, lab and adventure hub featuring hot springs, rivers, peaks and wildlife. Known as The University of the Yellowstone™, MSU is located just 90 miles from the park. MSU students help research the ecology of our stunning natural environment, plus the microbes of the Park’s hot pools and the science behind avalanches. Our setting makes it possible to study things that would be impossible to examine anywhere else in the world.

Bozeman, MT - MSU's Backyard

Bozeman is a small town with big energy. Perhaps best known for outdoor recreation, Bozeman also has the cultural amenities of a much larger city include a symphony, opera, and ballet companies, as well as many locally-owned shops, restaurants and galleries that make Downtown vibrant. Skiing, hiking, camping, biking, climbing, and fishing options are endless because Bozeman is surrounded by five mountain ranges including the Bridger, Tobacco Root, Big Belt, Gallatin and Madison ranges; and the Gallatin, Madison and Yellowstone Rivers are all within a half hour of campus. There is plenty of National Forest land to explore, and Yellowstone National Park is just 90 miles away.

Connect with MSU

Connect with Montana State University online to keep up on the latest news. Our MSU social media guide (http://www.montana.edu/web/socialmedia) has a general list of all things MSU so tune in with the Bobcat Bulletin, Facebook, Twitter, and MSUTube.

- Montana State University Class of 2021 Facebook group (https://www.facebook.com/groups/1278807518799874/) - Meet and connect with other future MSU students.
- Montana State University Admissions (https://www.facebook.com/MontanaStateAdmissions) - Stay in the know with Facebook about events, deadlines, scholarships and items of interest for future MSU students.
- Montana State University (https://www.facebook.com/montanastate) - Keep informed about projects, events, speakers and achievements at MSU with this Facebook page.
- Montana State University Athletics (http://www.msubobcats.com) - Find out about upcoming games and see the latest scores with this Facebook page. Go Cats!
- @AdmissionsMSU (https://twitter.com/AdmissionsMSU) - Get tweets from the Admissions crew.
- @montanastate (https://twitter.com/montanastate) - MSU news, events, and updates tweeted
- Check out the #MontanaState hashtag on Twitter to see what people are saying about MSU.
- MSUTube (https://www.youtube.com/montanastate) - Subscribe to MSU’s YouTube Channel to see recently uploaded videos.
- Subscribe to the Bobcat Bulletin (http://www.montana.edu/bobcatbulletin), a weekly e-newsletter with upcoming events and news from campus.

MSU Parent Family Association

www.montana.edu/pfa

All parents and family members of MSU students are given automatic membership in the MSU Parent/Family Association. No dues are charged. The PFA offers several notable programs and events designed to encourage a strong relationship between families and the university. They include Parent/Family Fall Weekend, Parent Handbook, Parents Funder and an Advisory Board.

Statewide Research, Educational Outreach and Service

As a land-grant institution, MSU is committed to state-focused activities with global impacts, while sharing its research discoveries with Montanans through educational outreach and service. These discoveries enhance communities and enterprises throughout Montana. Learn about several of our programs.

Agricultural Experiment Station

http://ag.montana.edu/maes.htm

The Montana Agricultural Experiment Station (MAES) conducts research in agricultural and natural resource systems addressing state, regional and national needs from multiple Montana locations: the main station (Bozeman), 7 research centers (Conrad, Corvallis, Creston, Havre, Huntley, Moccasin, Sidney), allied properties and on farms/ranches. The Agricultural Experiment Station is funded cooperatively through a legal partnership between federal and state governments. The Montana Agricultural Experiment Station is a unit of the Montana University System and is administered by the MSU campus.

Engineering Experiment Station

www.coе.montana.edu/eng_exp_station.html

The Engineering Experiment Station at Montana State University was created by the State Board of Education in 1924 to improve the economy, efficiency, and safety of engineering activity in Montana; to promote the conservation and utilization of Montana resources; and to encourage the development of new business activities in Montana.

Extension

http://www.msuextension.org/

Montana State University Extension provides research-based knowledge to strengthen the economic, social, and environmental well-being of Montana families, communities, and agricultural enterprises. Educational programs of MSU Extension are conducted on an informal, non-credit basis.

The focal point for MSU Extension programs is the local Extension office. In Montana, these offices serve 56 counties and seven tribal reservations. Local county and reservation agents are backed by a staff of campus-based faculty who provide direct linkage with current research and a close working relationship with the Montana Agricultural Experiment Station. One of the functions of Extension is to provide input to the University on current Montana problems that are in need of research for their resolution.

Programs of MSU Extension address societal needs in the general areas of agriculture, family living, community and economic development, and youth development. One of Extension’s best known programs is the 4-H youth development program. Another unit of MSU Extension is the Montana Fire Services Training School, which provides training for paid and volunteer fire fighters throughout the state.

MSU Extension is a unit of the Montana University System and is administered by the MSU campus.
Extended University
http://eu.montana.edu

Extended University administers and coordinates on- and off-campus instruction in the form of distance-delivered and face-to-face courses, programs, institutes, and conferences that supplement the formal academic curriculum at MSU. Extended University services are organized into three main categories: Montana State Online, Office of Continuing Education, and Burns Technology Center.

Montana Public Television - KUSM
www.montanapbs.org

Montana Public Television is the primary public television provider for the state of Montana. PBS services, instructional and outreach activities are provided to viewers throughout Montana through over-the-air broadcast and cable distribution. Montana Public TV is a service of Montana State University and the University of Montana.

Museum of the Rockies
www.museumoftherockies.org

The Museum of the Rockies is home to one of the largest collections of dinosaur fossils in the world. The museum’s primary objective is to understand, preserve and interpret the natural and cultural history of the Northern Rocky Mountain region. It accomplishes its mission through research, collections, exhibits and programs for the education and entertainment of people of all ages.

Accreditation

Montana State University has been accredited by the Northwest Commission on Colleges and Universities (NWCCU) (http://www.nwccu.org), an institutional accrediting body recognized by the Council for Higher Education Accreditation and the U.S. Department of Education, since 1932. Eligible professional academic and service programs within the University are accredited by the following agencies:

- Accreditation Association for Ambulatory Health Care (for Student Health Service)
- Accreditation Board for Engineering and Technology (ABET)
- Accreditation Council for Education in Nutrition and Dietetics (ACEND)
- American Psychological Association (for PhD level Internships in Counseling and Psychological Services) (APA)
- Association to Advance Collegiate Schools of Business (AACSB)
- Commission on Collegiate Nursing Education (CCNE)
- Council for Accreditation of Counseling and Related Educational Programs (CACREP)
- National Architectural Accrediting Board (NAAB)
- National Association of Schools of Art and Design (NASAD)
- National Association of Schools of Music (NASM)
- National Collegiate Athletic Association (for Intercollegiate Athletics) (NCAA)
- Northwest Association of Secondary and Higher Schools
- Society of Range Management (SRM)
- Teacher Education Accreditation Council (TEAC)

Important Notice to All Students

The following information pertains to student and institutional rights and responsibilities under this catalog:
## Academic Calendar

### Summer 2016

<table>
<thead>
<tr>
<th>Event</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Classes Begin</td>
<td>May 16</td>
</tr>
<tr>
<td>Memorial Day Holiday</td>
<td>May 30</td>
</tr>
<tr>
<td>Second 6-week Session Begins</td>
<td>June 27</td>
</tr>
<tr>
<td>Independence Day Holiday</td>
<td>July 4</td>
</tr>
<tr>
<td>Semester Ends</td>
<td>Aug 5</td>
</tr>
</tbody>
</table>

### Fall 2016

<table>
<thead>
<tr>
<th>Event</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Orientation &amp; Registration</td>
<td>Aug 24-26</td>
</tr>
<tr>
<td>Classes Begin</td>
<td>Aug 29</td>
</tr>
<tr>
<td>Labor Day Holiday</td>
<td>Sept 5</td>
</tr>
<tr>
<td>Election Day</td>
<td>Nov 8</td>
</tr>
<tr>
<td>Veterans’ Day Holiday</td>
<td>Nov 11</td>
</tr>
<tr>
<td>Thanksgiving Day Holiday</td>
<td>Nov 23-25</td>
</tr>
<tr>
<td>Classes End</td>
<td>Dec 9</td>
</tr>
<tr>
<td>Final Exams</td>
<td>Dec 11-16</td>
</tr>
<tr>
<td>Semester Ends</td>
<td>Dec 16</td>
</tr>
<tr>
<td>Commencement</td>
<td>Dec 17</td>
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### Spring 2017

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<tr>
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</thead>
<tbody>
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<td>Orientation &amp; Registration</td>
<td>Jan 9-10</td>
</tr>
<tr>
<td>Classes Begin</td>
<td>Jan 11</td>
</tr>
<tr>
<td>Martin Luther Kind Holiday</td>
<td>Jan 16</td>
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<tr>
<td>President’s Day</td>
<td>Feb 20</td>
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<tr>
<td>Spring Break</td>
<td>Mar 13-17</td>
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<tr>
<td>University Day</td>
<td>Apr 14</td>
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<td>Classes End</td>
<td>Apr 28</td>
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<tr>
<td>Final Exams</td>
<td>May 1-5</td>
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<tr>
<td>Semester Ends</td>
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<tr>
<td>Commencement</td>
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### Summer 2017

<table>
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<tbody>
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<td>Classes Begin</td>
<td>May 15</td>
</tr>
<tr>
<td>Memorial Day Holiday</td>
<td>May 29</td>
</tr>
<tr>
<td>Second 6-week Session Begins</td>
<td>June 26</td>
</tr>
<tr>
<td>Independence Day Holiday</td>
<td>July 4</td>
</tr>
<tr>
<td>Semester Ends</td>
<td>Aug 4</td>
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</tbody>
</table>

### Fall 2017

<table>
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<tr>
<th>Event</th>
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<td>Aug 28</td>
</tr>
<tr>
<td>Labor Day Holiday</td>
<td>Sept 4</td>
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<tr>
<td>Election Day</td>
<td>Nov 7</td>
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<tr>
<td>Veterans’ Day Holiday</td>
<td>Nov 10</td>
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<tr>
<td>Thanksgiving Day Holiday</td>
<td>Nov 22-24</td>
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<tr>
<td>Classes End</td>
<td>Dec 8</td>
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<tr>
<td>Final Exams</td>
<td>Dec 11-15</td>
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<tr>
<td>Semester Ends</td>
<td>Dec 15</td>
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<tr>
<td>Commencement</td>
<td>Dec 16</td>
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Undergraduate Admissions

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- Obtaining Undergraduate Admission Forms (p. 14)
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- Freshmen (first-time undergraduates) (p. 15)
- Transfer Students (p. 16)
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- Evaluation of Transfer Credits (p. 18)
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- Dual Enrollment (p. 22)
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Admission as an Undergraduate Student

Undergraduate students are first-time college students, or those who have attempted college level credits during high school, or have attempted college level credits after graduating high school, and have not been awarded a bachelor’s degree.

Applications for admission to undergraduate programs are processed by the Office of Admissions. The requirements for admission are described in the following sections. There are several options for obtaining MSU application (http://www.montana.edu/admissions/apply.html) forms.

Applications are accepted from resident, non-resident, and international students. Eligible undergraduate students may attend full-time or part-time. Montana State University retains the right to establish requirements which will ensure successful scholastic performance.

General Admission Information

Applicants are responsible for submitting applications and all other required credentials necessary for admission, financial aid, and housing, must provide verification of immunizations, must complete a tuberculosis screening form, and must register for a New Student Orientation session. Applicants should be aware of the following:

1. Applicants are requested to voluntarily provide their social security number which allows the school to distinguish between individuals with the same or similar names.

2. Students intending to apply for financial aid may obtain appropriate forms from their high school guidance office, online at www.fafsa.ed.gov (http://www.fafsa.ed.gov), or by contacting Financial Aid Services (finaid@montana.edu) via email or by calling 406-994-2845. MSU’s FAFSA school code is 002532.

3. Students with fewer than 30 credits of college level coursework completed after high school graduation are required to live in the residence halls. Additional information about residence life and family housing policies may be obtained by calling the Residence Life Office, 406-994-2661, or by visiting the Residence Life (http://www.montana.edu/reslife) website.

4. Students must submit required immunization records and a tuberculosis screening form. This is done by logging onto the Student Health Services (https://shs103.msu.montana.edu) website and using the “On-line Student Health” link, or students may download and complete the immunization and tuberculosis screening forms and mail, fax or email them to Student Health Services (immune@montana.edu). Students must submit proof of required immunizations and a tuberculosis screening form prior to class registration. Questions should be referred to MSU’s Student Health Services, 406-994-2311.

5. Students with a health condition or a disability which should be brought to MSU’s attention may submit a confidential letter of need to Disability/Re-Entry & Veterans Services. Contact the Office of Disability, Re-Entry & Veterans Services (dvrs@montana.edu) via email or by calling 406-994-2824; they will also answer any questions about services for disabled students.

6. All admitted students must attend a New Student Orientation session prior to the beginning of the semester. Information about Orientation dates will be sent from the Office of Admissions after admission has been determined. Additional information can be obtained by visiting the Orientation (http://www.montana.edu/admissions/orientation) website or by calling 406-994-2827.

When to Apply

Applicants are encouraged to apply at least six to eight months prior to the first semester of attendance. Early application will allow adequate time for the student to request any academic credentials needed to complete the application file, make housing arrangements, process financial aid materials, and participate in a New Student Orientation session.

Applications should be on file in the Office of Admissions according to the following recommended priority dates:

- Fall semester - July 1
- Spring semester - December 1
- Summer session - May 1

Applicants will be notified as soon as possible after all credentials necessary to determine a student’s application status have been received by the Office of Admissions.

- All applications are kept on file at MSU for one full academic year from the original application term (e.g. an application for Fall 2016 may be updated through Fall 2017).
- An applicant may defer their term or update their application file during this one year period without having to re-apply. After the one year time period has passed, a new application, application fee, and any/all required academic documents must be re-submitted by the student.
- It is the applicant’s responsibility to inform the Office of Admissions of any changes to their original application.
- To defer or update an application within a year from the original application term, contact the Office of Admissions at 406-994-2452 or 1-888-MSU-CATS or email the Office of Admissions (admissions@montana.edu).

Obtaining Undergraduate Application Forms

Several application alternatives are available to students interested in applying for undergraduate admission to MSU-Bozeman.

- Online Application Form: Freshmen, transfer, international, non-degree, and second-degree (post-baccalaureate) students may complete the online application form which is electronically submitted directly to MSU.
- Undergraduate Application Form: This is a large pdf file (1.45 MB) which can be downloaded and printed. A pdf file of instructions for completing the form is also available.
Campus Visit Opportunities

Individual Campus Visits
A personal visit to the MSU campus will provide an opportunity to meet faculty, staff and students, and to explore campus life. Because selecting a college is such an important decision, families are welcome and encouraged to participate. As part of a campus visit, the Admissions staff can schedule any or all of the following for you: a campus tour, a residence hall information session, an appointment with an MSU Admissions Counselor, a visit with a faculty member, and a classroom visit (during the school year).

To schedule a visit, please call or complete the registration form (http://www.montana.edu/admissions/visit/schedule) at least two weeks in advance. Please contact the Campus Visit Coordinator (campusvisit@montana.edu) in the Office of Admissions at 406-994-2452 or toll free at 1-888-MSU-CATS. "Drop-in" visits are also welcome.

MSU Fridays
MSU Friday, a comprehensive campus preview day held four times a year, gives prospective students and their families a chance to meet with faculty and students, explore academic facilities, tour the campus, and investigate possibilities and scholarships. It’s a great time to explore MSU! For more details, go to the MSU Friday website (http://www.montana.edu/msufriday).

New Student Orientation
All new students are required to attend New Student Orientation in order to register for classes. Summer Orientation Programs are offered to new freshmen and transfer students who enter in the fall semester. Additional orientation sessions for freshman, transfer, veteran, and international students are offered prior to each semester.

At Orientation students receive assistance with course selection, course registration, and become familiar with the location and use of campus facilities and services. New Student Orientation also highlights MSU’s academic assistance and other special services, as well as recreational and social programs. New Student Orientation assists all new students in their transition to MSU and increases students’ chances for academic success.

Contact the Orientation Office at 406-994-2827 or visit the Orientation website (http://www.montana.edu/admissions/orientation) for more information. International students should contact the Office of International Programs at 406-994-4031.

Freshman (First-Time Undergraduates)
Freshmen students are those who have completed high school or its equivalent. Students who have attempted fewer than 12 quarter or semester college-level credits at another regionally accredited college or university after high school graduation are considered incoming freshmen. Students who have earned college-level course credit, Advanced Placement or International Baccalaureate credits before graduating from high school are also considered incoming freshmen.

Academic Eligibility
Students who do not meet the freshman admission requirements, listed below, are still encouraged to apply for admissions and submit the necessary credentials. MSU is allowed a number of exemptions to the stated requirements and will examine each student’s credentials on an individual basis for admissibility. Some students who do not meet the requirements may be admitted as Pre-University Studies students. In Pre-University Studies, students may take up to 7 credits at MSU and up to an additional 7 credits through a partnership with Gallatin College MSU. Students who take a combination of at least 12 credits will qualify for federal financial aid as a full-time student. Once a Pre-University Studies student has earned 7 MSU credits with a minimum cumulative grade-point average of 2.0, he/she will be admitted as a full-time MSU student.

Admission requirements (Resident and Non-Resident)

- Graduation from a high school accredited by the state accrediting agency or a passing score on an approved high school equivalency exam such as HiSET or GED. Students who complete their secondary education through home schooling or at an accredited secondary school may be admitted as long as they have satisfactorily performed on the ACT or SAT test.
- MSU Academic Requirements:
  - A 2.5 cumulative grade-point average (on a 4.0 scale), OR
  - ACT Composite score of 22, OR
  - SAT Combined Critical Reading/Mathematics/Writing score of 1540, OR
  - Rank in the upper half of the graduating class
  - AND
- Successful completion of a College Preparatory Curriculum. Non-resident applicants who have not completed the college preparatory requirements stated below may satisfy the requirements by providing evidence that they have completed a similar college preparatory program required by their home state:
  - Four years of English: courses should emphasize the development of written and oral communication skills and literature.
  - Three years of Mathematics: courses should include algebra I, geometry, and algebra II (or the sequential content equivalent of these courses). Students are encouraged to take a math course in their senior year.
  - Three years of Social Studies: courses should include one year of global studies (such as world history or world geography), American history, government, economics, Indian history, psychology, sociology, or other third-year courses.
  - Two years of Laboratory Science: one year should be earth science, biology, chemistry, or physics, and the other year can be one of the above sciences or another approved college preparatory science.
• Two years of elective courses: foreign language (preferably two years), computer science, visual and performing arts, or approved vocational education units.

• The following categories of students are exempt from the admissions requirements above:
  • Non-Traditional age students (out of high school more than 3 years from graduation date or expected graduation date)
  • Non-Degree undergraduate students

In order to begin a University Academic Plan at Montana State University, students must demonstrate readiness in areas of mathematics and writing. Typically, students demonstrate their readiness through scores earned on standardized examinations:

  Math: ACT Math of 22+ or SAT Math of 520+.

  Writing: ACT English/Writing or ELA of 18+ or minimum score of 7 on the Writing Subscore (prior to September 2015) or 19+ on the Writing Subject Score (effective September 2015). SAT Writing of 440+ or 7 on the Essay Subscore.

If a student does not demonstrate full readiness prior to his/her New Student Orientation, academic advisors will help the student register during orientation for the appropriate courses needed to move forward in his/her degree path.

Note: The ACT/SAT test score requirements reflect the score parameters as of March 2016. Due to significant changes in both ACT and SAT tests, students are encouraged to refer to our online catalog for the most up-to-date information.

Application Procedure

Receipt of the following credentials in the Office of Admissions constitutes a complete application for admission. Requests to have final credentials sent to MSU must be initiated by the applicant. Requests should be made by contacting the high school, the registrar’s office at the college/university, or agency. Credentials must be sent directly from the school to the Office of Admissions. Credentials received from the student that have been opened or are in an unsealed envelope are considered unofficial copies and will not be accepted as official documents.

Application materials and fees will be retained for one year from the original application term. To apply for a semester other than the one originally intended, notify the Office of Admissions as soon as possible.

Be sure to submit the following items (if applicable):

1. Admission Application: An application for admission (https://www.msuadmissions.org/application/index.cfm?&isndsl) may be submitted online or downloaded and printed; if completing the paper application, please return the completed and signed application form to the Office of Admissions. The application may also be obtained from a high school counselor or directly from the Office of Admissions.

2. Application Fee (non-refundable): $38 online application or $30 paper application. Checks should be made payable to Montana State University. The application fee will not be waived or refunded. The fee must be paid before the application for admission will be processed.

3. Student Self-Report Form (included in the Admissions Application): This form, required of all first-time applicants who have been out of high school less than three years, will be used to determine admission status prior to the receipt of the final, post-graduation high school transcript.

4. High School Transcript: After graduation, a complete and official transcript must be sent directly from the high school to the Office of Admissions. Courses completed, GPA (on a 4.0 scale), and official date of graduation must be posted.

5. Approved High School Equivalency Exam: If an approved high school equivalency exam was taken in lieu of high school graduation, an official score report/transcript must be sent directly to the Office of Admissions from the Department of Education from the state in which the exam was given.

6. ACT/SAT Scores: All first-time incoming freshmen are required to take either the American College Test “ACT” (MSU School code is 2420) or the SAT Test (MSU School code is 4488). MSU does not accept the SAT Subject Tests (formally SAT II Subject Test) for admissions purposes. Test scores are used in determining admission status, awarding certain scholarships, and in assisting with academic planning. Non-traditional applicants who graduated three or more years prior to the semester in which they intend to enroll are not required to submit ACT/SAT test results. Arrangements to take the ACT test on campus may be made by contacting MSU Testing Services at 406-994-6984.

7. College/University Transcripts: Applicants who have attended another college or university, whether credit was earned or not, must have an official transcript sent directly from each institution to the Office of Admissions after all final grades have been posted. If the college or university participates in secure electronic transmission of official transcripts, the transcripts should be sent to: MSUadmissionstranscript@sympa.montana.edu. For more information on how college/university courses will transfer to MSU, refer to the “Evaluation of Transfer Credit” section.

8. Advanced Placement (AP): Applicants who have completed an Advanced Placement Examination should request that the official scores be sent directly to the Office of Admissions. Scores of 3 or higher on most AP Exams will be granted college credit with a Pass grade for the equivalent courses. For more information on how AP courses will transfer to MSU, refer to the AP Course Equivalencies website (http://www.montana.edu/admissions/ap/ap.pdf).

9. International Baccalaureate (IB): Applicants who have completed an International Baccalaureate Examination should request that the official scores be sent directly to the Office of Admissions. IB Exams with scores of 4 or higher (Higher Level only) will be granted college credit with a Pass grade for equivalent courses. For more information on how IB courses will transfer to MSU, refer to the IB Course Equivalencies website (http://www.montana.edu/admissions/ib/ib.pdf).

Freshman Students Denied Admission

Students interested in appealing the admission decision should refer to the “Appeal of Admission Decisions” section.

Transfer Students

A transfer student has graduated high school or its equivalent and attempted 12 or more quarter or semester credits of college-level courses at a regionally accredited institution after high school graduation. Students who have previously been awarded a baccalaureate degree who wish to apply as a Second Bachelor’s Degree student (Post-Baccalaureate) are also considered a transfer student. College-level work is defined as those courses that are applicable towards at least an associate degree. It does not include remedial, certificate or developmental courses.

Students who previously attended Montana State University and who are returning after attending another institution should refer to the "Former MSU Students" section.

Academic Eligibility

Applicants will be considered for admission based on transferrable credits from all regionally accredited colleges or universities previously attended.
As determined by the Office of Admissions, a 2.0 (or C) cumulative transferable GPA (on a 4.0 scale) is required in order to be accepted for admission in good academic standing. Transfer students start with a new GPA upon enrolling at MSU.

Students who do not meet the 2.0 cumulative transferable GPA are still encouraged to apply for admissions and submit the necessary credentials. Montana State University will examine each student’s credentials on an individual case for admissibility. Some students who do not meet the requirements may be admitted on University Probation and will need to earn a 2.0 or higher GPA upon completing the first term attended at MSU to be placed in good academic standing.

**Application Procedure**

Receipt of the following credentials in the Office of Admissions constitutes a complete application for admission. Requests to have final credentials sent to MSU must be initiated by the applicant. Requests should be made by contacting the registrar’s office at the college/university previously attended. Credentials must be sent directly from each institution or agency to the Office of Admissions. Credentials received from the student that have been opened or are in an unsealed envelope are considered unofficial working copies and will not be accepted as official documents.

Application materials and fees will be retained for one year from the original application term. To apply for a semester other than the one originally intended, notify the Office of Admissions as soon as possible.

Be sure to submit the following items (if applicable):

1. **Admissions Application**: An application for admission (https://www.msuadmissions.org/application/index.cfm?&isndsl) may be submitted online or downloaded and printed; if completing the paper application, please return the completed and signed application form to the Office of Admissions. The application may also be obtained from the Office of Admissions.

2. **Application Fee (non-refundable)**: $38 online application or $30 paper application. Checks should be made payable to Montana State University. The application fee will not be waived or refunded. The fee must be paid before the application for admission will be processed.

3. **Official College/University Transcripts**: An official transcript must be sent directly to the Office of Admissions from each regionally accredited college or university attended. This academic information will be used to determine admission status as well as transfer credit. Applicants who are enrolled at a transfer school while applying to MSU will be considered for admission based on an incomplete official transcript showing all academic work completed and posted to date. A final official transcript must be received in the Office of Admissions by the 15th class day of the first term of attendance. If the college or university participates in secure electronic transmission of official transcripts, the transcripts should be sent to: MSUadmissionstranscript@sympa.montana.edu. Academic eligibility will be reviewed again upon receipt of that final transcript. For more information on how college/university courses will transfer to MSU, refer to the Evaluation of Transfer Credit section.

4. **Advanced Placement (AP)**: Applicants who have completed an Advanced Placement Examination should request that the official scores be sent directly to the Office of Admissions. Scores of 3 or higher on an AP Exam will be granted college credit with a Pass grade for the equivalent courses. For more information on how AP courses will transfer to MSU, refer to the AP Course Equivalencies website (http://www.montana.edu/admissions/ap/ap.pdf).

5. **International Baccalaureate (IB)**: Applicants who have completed an International Baccalaureate Examination should request that the official scores be sent directly to the Office of Admissions. IB Exams with scores of 4 or higher (Higher Level only) will be granted college credit with a Pass grade for equivalent courses. For more information on how IB courses will transfer to MSU, refer to the IB Course Equivalencies website (http://www.montana.edu/admissions/ib/ib.pdf).

Transfer students follow the Undergraduate Catalog in effect at the time of initial enrollment at MSU. Transfer students from community colleges and four year colleges in Montana may elect to follow the MSU catalog that was in effect when they began their freshman year at the above mentioned institution.

**Second Bachelor's Degree (Post-Baccalaureate) Students**

Students who have earned one undergraduate bachelor’s degree and who would like to pursue a second undergraduate bachelor’s degree are also considered transfer students.

Students who previously attended Montana State University and who are returning after attending another institution should refer to the “Former MSU Students” section.

**Academic Eligibility**

Applicants will be considered for admission based on transferable credits from all regionally accredited colleges or universities previously attended. As determined by the Office of Admissions, a 2.0 (or C) cumulative transferable GPA (on a 4.0 scale) is required in order to be accepted for admission in good academic standing. Transfer students start with a new GPA upon enrolling at MSU.

Students who do not meet the 2.0 cumulative transferable GPA are still encouraged to apply for admissions and submit the necessary credentials. Montana State University will examine each student’s credentials on an individual basis for admission eligibility. Some students who do not meet the requirements may be admitted on University Probation and will need to earn a 2.0 or higher GPA during the first term attended at MSU to be placed in good academic standing.

**Application Procedure**

Receipt of the following credentials in the Office of Admissions constitutes a complete application for admission. Requests to have final credentials sent to MSU must be initiated by the applicant. Requests should be made by contacting the registrar’s office at the college/university previously attended. Credentials must be sent directly from each institution or agency to the Office of Admissions. Credentials received from the student that have been opened or are in an unsealed envelope are considered unofficial working copies and will not be accepted as official documents.

Application materials and fees will be retained for one year from the original application term. To apply for a semester other than the one originally intended, notify the Office of Admissions as soon as possible.

Be sure to submit the following items (if applicable):

1. **Admissions Application**: An application for admission (https://www.msuadmissions.org/application/index.cfm?&isndsl) may be submitted online or downloaded and printed; if completing the paper application, please return the completed and signed application form to the Office of Admissions. The application may also be obtained from the Office of Admissions.

2. **Application Fee (non-refundable)**: $38 online application or $30 paper application. Checks should be made payable to Montana State University. The application fee will not be waived or refunded. The fee must be paid before the application for admission will be processed.

3. **Official College/University Transcripts**: An official transcript must be sent directly to the Office of Admissions from each regionally accredited college or university attended. This academic information will be used to determine admission status as well as transfer credit. Applicants who are enrolled at a transfer school while applying to MSU will be considered for admission based on an incomplete official transcript showing all academic work completed and posted to date. A final official transcript must be received in the Office of Admissions by the 15th class day of the first term of attendance. If the college or university participates in secure electronic transmission of official transcripts, the transcripts should be sent to: MSUadmissionstranscript@sympa.montana.edu. Academic eligibility will be reviewed again upon receipt of that final transcript. For more information on how college/university courses will transfer to MSU, refer to the Evaluation of Transfer Credit section.

4. **Advanced Placement (AP)**: Applicants who have completed an Advanced Placement Examination should request that the official scores be sent directly to the Office of Admissions. Scores of 3 or higher on an AP Exam will be granted college credit with a Pass grade for the equivalent courses. For more information on how AP courses will transfer to MSU, refer to the AP Course Equivalencies website (http://www.montana.edu/admissions/ap/ap.pdf).

5. **International Baccalaureate (IB)**: Applicants who have completed an International Baccalaureate Examination should request that the official scores be sent directly to the Office of Admissions. IB Exams with scores of 4 or higher (Higher Level only) will be granted college credit with a Pass grade for equivalent courses. For more information on how IB courses will transfer to MSU, refer to the IB Course Equivalencies website (http://www.montana.edu/admissions/ib/ib.pdf).


3. **Official College/University Transcripts**: An official transcript must be sent directly to the Office of Admissions from each regionally accredited college or university attended. The first bachelor’s degree must be posted on the official transcript. If the college or university participates in electronic transmission of official transcripts, the transcripts should be sent to MSUadmissionstranscript@sympa.montana.edu (MSUadmissionstranscript@sympa.montana.edu). This academic information will be used to determine admission status as well as transfer credit.

Transfer credit of Second-Degree students is not evaluated on a course-by-course basis through the Admissions Office; total credits earned are posted to their student record. Second-Degree students should make an appointment with their departmental advisor to prepare an academic plan for their second bachelor’s degree; students should bring copies of their college transcripts to their appointment.

Second Degree students follow the Undergraduate Catalog in effect at the time of initial enrollment at MSU.

**Evaluation of Transfer Credit**

(Freshman and transfer students)

Requests to have final credentials sent to MSU must be initiated by the applicant. Requests should be made by contacting the registrar’s office at the college, university or agency previously attended. Credentials must be sent directly from each institution to the Office of Admissions. If the college or university participates in secure electronic transmission of official transcripts, the transcripts should be sent to: MSUadmissionstranscript@sympa.montana.edu. Credentials received from the student that have been opened or are in an unsealed envelope are considered unofficial copies and will not be accepted as official documents. To see how courses may transfer, please visit our Transfer Course Equivalencies website (https://atlas.montana.edu:9000) and click on “Transfer Equivalencies.” If a course or institution is not listed it does not necessarily mean the course will not transfer; rather the information is not yet in our database.

- An official evaluation of transfer credits will be completed after final transcripts from each institution have been received. Upon completion, a copy of the credit evaluation will be mailed to the student.
- All college-level courses from colleges or universities in candidacy status or accredited by any of the six regional accrediting agencies at the time the courses were taken will be accepted for transfer. Courses from non-accredited schools will not be accepted for transfer.
- The Office of Admissions determines whether or not the transfer work is college-level, the appropriate grading and credit conversions on transfer work, and the applicability of transfer credit toward the MSU CORE 2.0 requirements. The academic department has the authority to substitute transfer courses for curriculum requirements. Transfer credit and CORE, if applicable, will be given for courses in which passing grades were received.
- College level courses which do not have an equivalent at MSU will be accepted as an elective or as an elective with CORE credit. The academic department will determine if the transfer electives satisfy specific curriculum requirements.
- Freshman/sophomore level courses taken at another college or university will generally not be evaluated as equivalent to junior/senior level courses at MSU. Also, junior/senior level courses will generally not be evaluated as equivalent to freshman/ sophomore courses at MSU. Elective credit will be granted in these cases. If a lower-level elective is substituted for an upper-level course by an academic department, that credit may not be used to fulfill the University upper-level credit requirement.
- Transfer credit is accepted from vocational technical institutions if the institution is regionally accredited, if the courses taken apply toward an associate degree at the institution, and if the courses are transferable to a 4-year institution. MSU does not accept courses that apply solely to a certificate degree.
- Credit is not granted for continuing education, correspondence, or extension courses.
- Applicants who have taken Advanced Placement (AP) Exams or International Baccalaureate (IB) Exams should request that the official scores be sent directly to the Office of Admissions. AP scores of 3 or higher and IB Exams with scores of 4 or higher (Higher Level only) will be granted college credit with a Pass grade for the equivalent courses. For more information on how AP and IB courses will transfer, refer to the AP Course Equivalencies website (http://www.montana.edu/admissions/ap/ap.pdf) or the IB Course Equivalencies website (http://www.montana.edu/admissions/ib/ib.pdf).
- College Level Examination Program (CLEP) credit may be awarded by the academic department for successful performance in certain subject exams. Credit awarded for the CLEP Exams will not count toward University Core requirements. Official results must be sent directly from the CLEP testing center to MSU Testing Services (http://www.montana.edu/ehhd/centers/testing).
- Military experience will be considered for credit upon receipt of official military transcripts and, based on ACE recommendations, will be evaluated as elective credit only.
- International coursework (except from institutions where English is the language of instruction) may require evaluation by a foreign credential evaluation company. Contact the Office of International Programs (globalstudy@montana.edu) or visit the Office of International Programs website (http://www.montana.edu/international) for further information.
- Applicants are encouraged to bring personal copies of their transcripts for advising purposes during Orientation. Catalogs and course syllabi describing previous coursework may also be of assistance to the academic advisor when determining appropriate course placement.

Students who wish to appeal a decision regarding acceptance of transfer credit should address their concern to the Graduation and Admissions Requirements Committee (http://www.montana.edu/registrar/CERCanGARC.html) (GARC). Students who wish to appeal the assignment of transfer credit to the University Core requirements should address their concern to the Core Equivalency Review Committee (http://www.montana.edu/registrar/CERCanGARC.html) (CERC).

**International Undergraduate Students**

Students from countries other than the United States are encouraged to apply to Montana State University as first-time freshmen or transfer students. Those who have attempted secondary school are considered freshmen; those who have completed university-level coursework equivalent to 12 credits or more (a semester of study) beyond secondary school are considered transfer students.

**Academic Eligibility**

**Freshman (First Time Undergraduates)**

Freshmen will be considered for admission on the basis of their secondary school record and their English proficiency. Applicants who can prove their English language proficiency and have a minimum cumulative grade-point average of 2.5/4.0 on a U.S. scale will qualify for admission.
Transfer Students

Transfer students will be considered on the basis of their post-secondary education record and their English proficiency. Applicants who can prove their English proficiency and have a minimum cumulative transferable grade-point average of 2.0/4.0 on a U.S. scale will qualify for admission.

All application materials must bear the official school seal and signature, and be sent directly from the institution or agency to the Office of International Programs. Transcripts and test scores received from students are unofficial and not acceptable. To provide time for evaluation and for notice of acceptance to reach the applicant in a timely manner, the application and required credentials must be received by the Office of Admissions according to the following dates:

- Fall Semester - July 1
- Spring Semester - November 15
- Summer Session - March 15

Application Procedure

Receipt of the following credentials in the Office of International Programs constitutes a complete application for admission:

1. **International Undergraduate Application for Admission:**
   An International undergraduate application (https://www.msuadmissions.org/application/index.cfm?&isndsl) may be submitted online or a paper application form (http://www.montana.edu/international/admissions/docs/InternationalApplication.pdf) may be downloaded and printed. A paper application may also be obtained by contacting the Office of International Programs. Contact the Office of International Programs via mail: Office of International Programs, Montana State University, P.O. Box 172260, Bozeman, MT 59717-2260, or by phone: +1-406-994-4031, or by Fax: +1-406-994-1619, or contact the Office of International Programs (globalstudy@montana.edu) via email. If completing the paper application, please return the completed and signed application form to the Office of International Programs.

2. **Application Fee (non-refundable):** $38 online application or $30 paper application. The fee must be in U.S. currency. The online application fee must be paid by credit card. Checks submitted with paper applications should be made payable to Montana State University and must indicate the U.S. banking codes. The application fee will not be waived, deferred, or refunded. The fee must be paid before the application will be processed.

3. **Official Proof of English Language Proficiency:**
   Obtain official scores online for TOEFL (http://www.toefl.org) or IELTS (http://www.ielts.org). Proof of completion of A.C.E. Language Institute Level 6, upon completion of the program, may be submitted in lieu of a standardized test score. A list of options to prove English proficiency (http://www.montana.edu/international/admissions/englishproficiency.htm) can be found online. Students who are citizens of countries where English is an official language do not need to submit proof of English proficiency, if English is the student’s native language and if secondary level education was undertaken in English.

4. **Evidence of Financial Support:**
   Montana State University requires certification of financial support from students with non-immigrant visas. A financial documentation form is included on the international application. A Form I-20 for VISA purposes will not be issued until the student’s file, official transcripts from each international and U.S. college/university attended are required. The transcript must be sent directly from each institution to the Office of International Programs and must list all courses taken and grades/marks earned. Alternatively, the student may obtain an official copy from the school, leave it in the school’s sealed envelope and mail or carry it to MSU. Additional official certificates may be required to show completion of secondary school.

5. **Secondary School Academic Records:**
   For admission purposes, scanned or photocopies of academic records are acceptable. To complete the student’s file, a comprehensive and official secondary school record listing all courses and grades/marks earned is required of all students applying for admission. The transcript must be sent directly from the secondary school to the Office of International Programs. Alternatively, the student may obtain an official copy from the school, leave it in the school’s sealed envelope and mail or carry it to MSU. Additional official certificates may be required to show completion of secondary school.

6. **College/University Transcripts:**
   For admission purposes, scanned or photocopies of academic records are acceptable. To complete the student’s file, official transcripts from each international and U.S. college/university attended are required. The transcript must be sent directly from each institution to the Office of International Programs and must list all courses taken and grades/marks earned. Alternatively, the student may obtain an official copy from the school, leave it in the school’s sealed envelope, and mail or carry it to MSU.

7. **Translation of Academic Records:**
   An English translation is required for all non-English academic credentials.

8. **Evaluation of Foreign Credentials:**
   The MSU Office of International Programs requires final, official academic records and course descriptions in order to evaluate courses for transfer credit. MSU reserves the right to require a professional evaluation of non-U.S. academic credentials from applicants who have attended colleges/universities outside the United States and Canada (where English is not the language of instruction) unless MSU has a formal agreement with the post-secondary institution.

The Office of International Programs will issue the Form I-20 (necessary for obtaining an F-1 student visa) to international applicants who are accepted for admission and whose admission files are complete.

The request to have credentials sent to Montana State University must be initiated by the applicant. Requests should be made in writing directly to the registrar at the former secondary school, college, university, or agency. Credentials must be sent directly to the Office of International Programs.

Students must submit completed immunization records and a tuberculosis screening form to Student Health Services by logging on the Student Health Service (http://www.montana.edu/health/immunization.php) website. From there, students may submit their immunization records online using the “On-line Student Health” link or download and complete the immunization and tuberculosis screening forms and mail or email to the Student Health Service (immune@montana.edu), Montana State University, PO Box 173260, Bozeman, MT 59717-3260. Students must submit proof of required immunizations and a tuberculosis screening form prior to registration of classes. Questions should be referred to the MSU Student Health Service, +1-406-994-2311.

Application materials and the application fee will be retained for one year from the original applied term. To defer admission to a later semester, the Office of International Programs must be notified well in advance of the intended semester of entry.

**Application Procedure for International Undergraduate Non-Degree-Seeking Students**

Students interested in taking a limited number of courses at MSU without pursuing a degree may apply for non-degree-seeking status by submitting the following:

1. **International Undergraduate Application Form:**
   An International undergraduate application (https://www.msuadmissions.org/application/index.cfm?&isndsl) may be submitted online or a paper
application form (http://www.montana.edu/international/admissions/docs/International/Application.pdf) may be downloaded and printed. A paper application may also be obtained by contacting the Office of International Programs. Contact the Office of International Programs via mail: Office of International Programs, Montana State University, P.O. Box 172260, Bozeman, MT 59717-2260, or by phone: +1-406-994-4031, or by Fax: +1-406-994-1619, or contact the Office of International Programs (globalstudy@montana.edu) via email. If completing the paper application, please return the completed and signed application form to the Office of International Programs.

2. Application Fee (non-refundable): $38 online application or $30 paper application. The fee must be in U.S. currency. The online application fee must be paid by credit card. Checks submitted with paper applications should be made payable to Montana State University and must indicate the U.S. banking codes. The application fee will not be waived, deferred, or refunded. The fee must be paid before the application will be processed.

3. Official Proof of English Language Proficiency: Obtain official scores online for TOEFL (http://www.toefl.org) or IELTS (http://www.iels.org). Proof of completion of A.C.E. Language Institute Level 6, upon completion of the program, may be submitted in lieu of a standardized test score. A list of options to prove English proficiency (http://www.montana.edu/international/admissions/englishproficiency.htm) can be found online. Students who are citizens of countries where English is an official language do not need to submit a proof of English proficiency, if English is the student’s native language and if secondary level education was undertaken in English.

4. Letter of Intent: Students must submit a letter of intent outlining educational objectives, purpose of study, and specific terms and dates of anticipated attendance at MSU.

5. Evidence of Financial Support: Montana State University requires certification of financial support from students with non-immigrant visas. A financial documentation form is included on the international application. A Form I-20 for VISA purposes will not be issued until an International Student Financial Certificate, complete with a signed statement of support is submitted and on file in the Office of International Programs. The Financial Certificate guarantees that the required minimum amount of money, in U.S. dollars, will be available to the student during the academic year. A bank statement is also required.

The Office of International Programs will issue the Form I-20 (necessary for obtaining an F-1 student visa) to international applicants who are accepted for admission and whose admission files are complete.

Students must submit completed immunization records and a tuberculosis screening form to Student Health Services by logging on to the Student Health Service (http://www.montana.edu/health/immunization.php) website. From there, students may submit their immunization records online using the “On-line Student Health” link or download and complete the immunization and tuberculosis screening forms and mail or email to the Student Health Service (immune@montana.edu), Montana State University, PO Box 173260, Bozeman, MT 59717-3260. Students must submit proof of required immunizations and a tuberculosis screening form prior to registration of classes. Questions should be referred to the MSU Student Health Service, +1-406-994-2311.

Canadian Undergraduates

Students from Canada who have completed grade twelve in secondary school are considered freshmen; those who have completed an equivalent of 12 credits or more of post-secondary university-level course work after secondary graduation are considered transfer students.

Academic Eligibility

Freshmen students will be considered for admission on the basis of their secondary school record and scores taken from the ACT or SAT tests. Applicants who have a minimum cumulative grade-point average (GPA) of a 2.5/4.0 on a U.S. scale, or have an ACT score of 22, or have an SAT score of 1540, will qualify for admission. If the applicant’s native language is not English, a proof of English language proficiency is required. A list of options to prove English proficiency (http://www.montana.edu/international/admissions/englishproficiency.htm) can be found online.

Transfer students will be considered on the basis of their post-secondary education record. A minimum cumulative transferable grade-point average (GPA) of 2.0 or C on a 4.0 scale is required of all Canadian transfer students. If the applicant’s native language is not English, a proof of English language proficiency is required. A list of options to prove English proficiency (http://www.montana.edu/international/admissions/englishproficiency.htm) can be found online.

All application materials must bear the official school seal and signature and be sent directly from the institution or agency to the Office of International Programs. Transcripts and test scores received from students are unofficial and not acceptable. To provide time for evaluation and for notice of acceptance to reach the applicant in a timely manner, the application and required credentials must be received by the Office of International Programs according to the following dates:

- Fall Semester - July 1
- Spring Semester - November 15
- Summer Session - March 15

Receipt of the following credentials in the Office of International Programs constitutes a complete application for admission. Requests to have final credentials sent to MSU must be initiated by the applicant. To apply for a semester other than the one originally intended, notify the Office of International Programs as soon as possible.

Application Procedure

Be sure to submit the following items:

1. International Undergraduate Application for Admissions: An International undergraduate application (https://www.msuadmissions.org/application/index.cfm?isndsl) may be submitted online or a paper application form (http://www.montana.edu/international/admissions/docs/International/Application.pdf) may be downloaded and printed. A paper application may also be obtained by contacting the Office of International Programs. You may contact the Office of International Programs via mail: Office of International Programs, Montana State University, P.O. Box 172260, Bozeman, MT 59717-2260 or by phone: +1-406-994-4031, or by Fax: +1-406-994-1619, or contact the Office of International Programs (globalstudy@montana.edu) via email. If completing the paper application, please return the completed and signed application form to the Office of International Programs.

2. Application Fee (non-refundable): $38 online application or $30 paper application. The fee must be in U.S. currency. The online application fee must be paid by credit card. Checks submitted with paper applications should be made payable to Montana State University and must indicate the U.S. banking codes. The application fee will not be waived, deferred, or refunded. The fee must be paid before the application will be processed.

3. Evidence of Financial Support: Montana State University requires certification of financial support from students with non-immigrant visas. A financial documentation form is included on the international application. A Form I-20 for VISA purposes will not be issued until an International Student Financial Certificate, complete with a signed statement of support is submitted and on file in the Office of International Programs. Transcripts and test scores received from students are unofficial and not acceptable. To provide time for evaluation and for notice of acceptance to reach the applicant in a timely manner, the application and required credentials must be received by the Office of International Programs according to the following dates:

- Fall Semester - July 1
- Spring Semester - November 15
- Summer Session - March 15

Receipt of the following credentials in the Office of International Programs constitutes a complete application for admission. Requests to have final credentials sent to MSU must be initiated by the applicant. To apply for a semester other than the one originally intended, notify the Office of International Programs as soon as possible.
signed statement of support is submitted and on file in the Office of International Programs. The Financial Certificate guarantees that the required minimum amount of money, in U.S. dollars, will be available to the student during the academic year. A bank statement is also required.

4. **Secondary School Academic Records:** For admission purposes, scanned or photocopies of academic records are acceptable. To complete the student’s file, comprehensive and official secondary school transcripts listing all courses and grades/marks earned are required of all students applying as first-time freshmen or those who have attended fewer than 12 college/university credits (a semester of study). The record must be sent directly from the secondary school to the Office of International Programs. Additional official certificates may be required to show completion of secondary school.

5. **ACT/SAT Scores:** All first-time incoming freshmen are required to take either the American College Test "ACT" (MSU School code is 2420) or SAT Test (MSU School code is 4488). MSU does not accept the SAT Subject Tests (formally SAT II Subject Test) for admissions purposes. The test results are used in determining admission status, awarding certain scholarships, and in assisting with academic planning. Applicants who graduated three or more years prior to the semester in which they intend to enroll are not required to submit ACT/SAT test results. Arrangements to take the ACT test on campus may be made by contacting MSU Testing Services. +1-406-994-6984. Note: The ACT/SAT test score requirements reflect the score parameters as of March 2016. Due to significant changes in both ACT and SAT tests, students are encouraged to refer to our online catalog for the most up-to-date information.

6. **College/University Transcripts:** For admission purposes, scanned or photocopies of academic records are acceptable. To complete the student’s file, official transcripts from each international and U.S. college/university attended are required and must list all courses taken and grades/marks earned. The transcript must be sent from each institution to the Office of International Programs.

7. **Translation of Academic Records:** An English translation is required for all non-English academic credentials.

8. **Evaluation of Foreign Credentials:** MSU reserves the right to require a professional evaluation of non-U.S. academic credentials from applicants who have attended colleges/universities outside the United States and Canada (where English is not the official language of instruction) unless MSU has a formal agreement with the post-secondary institution.

9. **Official Proof of English Language Proficiency:** You may obtain official scores online for TOEFL (http://www.toefl.org) or IELTS (http://www.ielts.org). Proof of completion of A.C.E. Language Institute Level 6, upon completion of the program, may be submitted in lieu of a standardized test score. A list of other alternatives to prove English proficiency (http://www.montana.edu/international/admissions/englishproficiency.htm) can be found online. Students who are citizens of countries where English is an official language do not need to submit a proof of English proficiency, if English is the student’s native language and if secondary level education was undertaken in English.

Students must submit completed immunization records and a tuberculosis screening form to Student Health Services by logging on the Student Health Service (http://www.montana.edu/health/immunization.php) website. From there, students may submit their immunization records online using the "On-line Student Health" link or download and complete the immunization and tuberculosis screening forms and mail or email to Student Health Service (immune@montana.edu), Montana State University, PO Box 173260, Bozeman, MT 59717-3260. Students must submit proof of required immunizations and a tuberculosis screening form prior to registration of classes. Questions should be referred to MSU Student Health Service, +1-406-994-2311.

**Notification of Admission**

Applicants are reviewed for admission when all required final and official credentials have been received at the Office of International Programs. Successful candidates will promptly be issued a letter of acceptance and an I-20 form necessary for obtaining an F-1 student visa. A packet of information regarding orientation, the registration process and other important information will follow directly in a separate mailing.

**Early Admission**

Early Admission (concurrent high school/university attendance) allows a high-ability student who has not completed high school to take courses for university credit.

**Academic Eligibility**

- Demonstrate ability to do university-level work in at least one academic area.
- Demonstrate a strong likelihood of success at university-level work in that area.
- Meet the course requirements for Early Admission set by the departments offering the courses to be attended.
- Normally such students will have completed the sophomore year in high school and will have a grade-point average of at least 3.25, documented on an official high school transcript.

**Application Procedure**

Receipt of the following credentials in the Office of Admissions constitutes a complete application for admission. Requests to have final credentials sent to MSU must be initiated by the applicant. Requests should be made by contacting the high school, the registrar’s office at the college/university or testing agency.

1. **Admissions Application:** An application for admission (https://axiomw.msu.montana.edu/AxiomWebprod/Login.aspx?SourceID=13) may be submitted online or downloaded and printed; if completing the paper application, please return the completed and signed application form to the Office of Admissions. The application may also be obtained from a high school counselor or from the Office of Admissions.

2. **Application Fee:** An application fee is not required.

3. **High School Transcript:** An official transcript must be sent directly from the high school to the Office of Admissions. The transcript must post all courses completed and a minimum grade point average (GPA) of 3.25 or test scores listed below.

4. **ACT/SAT Scores:** An ACT Composite score of 27 or an SAT Composite score of 1820. Official ACT/SAT scores should be sent electronically directly to the Office of Admissions from the testing agency. The MSU school code for ACT is 2420; the MSU school code for SAT is 4488.

5. **Coursework:** Must have completed the majority of the College Preparatory coursework outlined under Freshmen Admission Requirements.

6. **Letters of Recommendation:** A letter must be submitted from the high school principal and/or guidance counselor recommending the student for Early Admission.

7. **University Professor Recommendation:** A letter from a faculty member in the university department in which the course is to be taken must state that the student is prepared to take the course in question and is granted permission to do so.
8. **Interview:** The MSU Early Admissions Committee must recommend acceptance in the Early Admission program. Applicants and their parents may be interviewed by the committee. Contact the Assistant Director of Admissions (406-994-2452) to schedule an interview.

### Dual Enrollment

Dual enrollment is designed to provide Montana high school students with the opportunity to earn college credit through Gallatin College. MSU’s Gallatin College and local high schools work together to provide these opportunities to their students, as dual credit (high school and college credit simultaneously) or college credit only. Check with your high school counselor to see if your school offers dual enrollment with Gallatin College.

### Application Procedure

Receipt of the following credentials in the Office of Admissions constitutes a complete application for admission:

1. **Admissions Application:** Three forms are required for admission to the Dual Enrollment Program. An application for admission (https://axiomw.msu.montana.edu/AxiomWebprod/Login.aspx?SourceID=13) can be submitted online. The other required Dual Enrollment forms, the registration form and the student release form (http://gallatin.montana.edu/programs.dual.php), can be found online. Click the link called “Dual Enrollment Application”. These forms should be submitted to Gallatin College MSU, c/o Dual Enrollment Coordinator, PO Box 170515, Bozeman, MT 59717-0515, or call 406-994-2646.

2. **Application Fee:** An application fee is not required.

3. **ACT/SAT Scores:** ACT/SAT scores may be required for placement or to fulfill prerequisite requirements for particular courses. Contact the Dual Enrollment Coordinator at 406-994-2646 to see if any tests are required for the course. Official ACT/SAT scores should be sent electronically to the Office of Admissions from the testing agency. The MSU school code for ACT is 2420; the MSU school code for SAT is 4488.

### Non-Degree Undergraduate Level

Non-degree undergraduate students are those who have not earned a baccalaureate degree and are wishing to take college courses, but who are not interested in pursuing a baccalaureate degree at Montana State University.

#### Academic Eligibility

- Students must have at least a high school diploma or equivalent and have not earned a baccalaureate degree.
- Students must be in good academic standing at previous or current institution (including current students at MSU).
- Non-degree students are not eligible for financial aid, family housing, or intercollegiate athletic competition.
- Credit earned in non-degree status may apply to a future undergraduate degree program. Academic departments determine how or if the credit will meet graduation requirements.

#### Application Procedure

Receipt of the following constitutes a complete application for admission:

1. **Admissions Application:** An application for admission (https://www.msuadmissions.org/application/index.cfm?csntid=4) may be submitted online or downloaded and printed; if completing the paper application, please return the completed and signed application form to the Office of Admissions. The application may also be obtained from the Office of Admissions.

2. **Application Fee (non-refundable):** $38 online application or $30 paper application. Checks should be made payable to Montana State University. The application fee will not be waived or refunded. The fee must be paid before the application for admission will be processed.

### Former MSU Students

Students are considered former/returning students when they have attended MSU, but not during the immediately preceding term. The Intent to Register Form (http://www.montana.edu/registrar/pdfs/Intent_to_Register.pdf) should be completed and returned to the Registrar’s Office a minimum of 30 days prior to the registration period for the term desired.

Students who have earned a bachelor’s degree at MSU, but are interested in taking additional work not applicable toward an advanced degree, should complete and file a Non-Degree Graduate Application with The Graduate School.

Students who have completed a bachelor’s degree at another institution since last attending MSU and are interested in pursuing another bachelor’s degree should file an Intent to Register form to declare a Second Bachelor’s Degree.

The following items are required of each former/returning student:

1. A completed **Intent to Register Form.**
2. An **official transcript** from each college or university attended since last attending Montana State University. After registration is complete, an evaluation of transfer credit will be provided.
3. Students submitting an intent should file it with the Registrar’s Office by the following dates:
   - Fall Semester - July 15
   - Spring Semester - December 15
   - Summer Session - May 1

Returning international students must contact the Office of International Programs to determine if a new Form I-20 must be obtained to renew a student visa.

For questions or to request the Intent to Register Form, contact the Office of the Registrar at 406-994-6650.

### Appeal of Admission Decisions

Applicants who wish to appeal the decision(s) made in the Office of Admissions relating to admission status, acceptance of transfer credit, granting of University Core designation, or Montana residency status are encouraged to contact the appropriate campus resource. Initial questions regarding admission decisions and transfer credit evaluations should be directed to the Office of Admissions. If an appeal is appropriate, information about the appeal process can be obtained from the Office of Admissions.

### Graduation and Admissions Requirements Committee (GARC)

The Graduation and Admissions Requirements Committee (GARC) considers appeals and petitions from students seeking waivers of established admission and graduation requirements. For admission appeals, the Committee is composed of the Associate Provost (chairperson), the Registrar, the Director of Admissions, and the Assistant Dean of the College in which the student is enrolled.
Core Equivalency Review Committee
The Core Equivalency Review Committee (CERC (http://www.montana.edu/registrar/CERCandGARC.html)) considers appeals and petitions from students seeking re-evaluation of the assignment of transfer credit to meet University CORE requirements.

Residency Appeals Committee
The Residency Appeals Committee considers appeals from students seeking reconsideration of Montana residency status for fee purposes based upon the Montana Board of Regents Policy. All incoming students should contact the Office of Admissions regarding the appeal process and submission of required documentation. Continuing or returning students who wish to appeal the initial residency classification should contact the Registrar’s Office and request a Student Guide to Montana’s Residency Policy brochure.
Special Academic Opportunities

Montana State University offers numerous opportunities for unique and special academic opportunities through classroom learning, research experiences, study abroad, internships, interdisciplinary programs, and community engagement opportunities.

MSU students learn in the classroom, lab, studio and field through a hands-on student centered curriculum that integrates learning, discovery and engagement in and out of the classroom.

Innovative and significant research and creative activities are a recognized hallmark of MSU, where faculty, students, and staff all participate in the creation of knowledge and art.

Engagement is the collaboration between MSU and its local, state, national, and global communities for the mutually beneficial exchange of knowledge and resources in a context of partnership and reciprocity (Carnegie Foundation, 2006). Engagement, a form of scholarship that bridges teaching, research, and service brings the university intellectual resources to bear on societal needs. (Association of Public and Land Grant University’s Council on Engagement and Outreach, APLU CEO).

Learning

MSU students learn in the classroom, lab, studio and field through a hands-on student centered curriculum that integrates learning, discovery and engagement in and out of the classroom.

A.C.E. Language Institute
http://www.montana.edu/international/admissions/language_instruction.htm

American Cultural Exchange (A.C.E.) Language Institute is the on-campus provider of English language preparation programs for students whose native language is not English. The program offers numerous levels of English instruction designed to meet students’ needs. Students who complete the appropriate level and receive a full recommendation from the Language Institute can apply to Montana State University without taking the TOEFL exam.

Acoustic Atlas
http://www.acousticatlas.org

The Montana State University Library’s Acoustic Atlas is a free online archive of natural sounds of Montana and the American West. The Acoustic Atlas documents natural soundscapes that are increasingly impeded by human activity and connects people with the sounds of regional ecosystems and biodiversity. The collection and study of animal sounds informs research in the media arts, human health, education, engineering, philosophy, and the social sciences. Hear the rumbling snorts of bison, the murmur of a Yellowstone mudpot, the eerie booming of a sage grouse and other amazing sounds.

Bob Miller Pavilion
http://animalrange.montana.edu/facilities/equestrian.html

The Bob Miller Pavilion provides indoor and outdoor equestrian facilities for MSU’s Equine program. The Pavilion is also home to the MSU Youth Horsemanship School each summer.

Bozeman Agricultural Research and Teaching Farm (BART Farm)
http://animalrange.montana.edu/facilities/

The Bozeman Agricultural Research and Teaching Farm is located west of the MSU campus, comprises 474 acres and includes: Towne’s Harvest Garden, The Oscar Thomas Nutrition Center, Miller Pavilion, Horseshoeing School and the MSU Horticulture Farm. BART also has a research feedlot, the Calan gate facility, a GrowSafe system, feedmill and an artificial insemination building. Surrounding pastures and hayfields help support the animals (beef cattle, sheep, horses) housed there. The farm is dedicated to the service and support of research, teaching and extension activities relating mainly to animals and animal management.

Bracken Center for Undergraduate Excellence
http://www.montana.edu/business/bracken/

The Bracken Center, in the Jake Jabs College of Business & Entrepreneurship (JJCBE) houses numerous programs that enable students to get the assistance they need to excel academically and professionally. The Center hosts many events focused on recruiting, networking and professional development such as:

- **Student Organization Events** - The Bracken Center supports six student clubs and organizations (Beta Alpha Psi/Accounting Club, Finance Club, International Business Club, LaunchCats - jointly with Blackstone LaunchPad, Management Club, and a new chapter of American Marketing Association at MSU). These groups host guest speakers, recruiting, and networking events.

- **Bracken Business Communications Clinic (BBCC)** - The clinic provides one-on-one written and oral communication support to students enrolled in any business course. Assistance includes basic grammar, punctuation, sentence structure, business themes, content and organization of material. These skills can be applied to writing resumes, executive summaries, memos, articles, papers and more.

- **Meet the Recruiters/Meet the Accounting Recruiters Fairs** - JJCEB hosts two recruiting fairs in the fall for all business students. These events provide a place to network with future employers and to secure interviews. Students dress professionally, network, and share resumes and business cards with prospective employers. More than 70 local and national companies, accounting firms and non-profit organizations are represented each year.

Cereal Quality Laboratory
http://scientist.montana.edu/cqlab/

The Montana State University Cereal Quality Laboratory (CQL) researches the end-use properties of cereal grains. Emphasis is on flour milling and bread-baking traits of hard red and hard white wheats. The CQL cooperates with wheat breeders, field technicians, research center scientists, and others to ensure that high quality wheats are released and recommended by the Montana Agricultural Experiment Station.

The EMPower Minority Program
http://www.montana.edu/empower/

The Engineering Minority Program (EMPower) encourages the involvement of women and minorities in the field of engineering. EMPower provides services to groups underrepresented in engineering, including scholarships, tutoring, mentoring and seminars.

Extended University
http://eu.montana.edu/

Extended University administers and coordinates on-and off-campus instruction in the form of distance-delivered and face-to-face courses, programs, institutes, and conferences that supplement the formal academic curriculum at MSU. Extended University services are organized into three main categories:
• **Montana State Online** offers several graduate degrees and select undergraduate courses online and via video conferencing. Non-traditional programs are offered in partnership with Extended University and MSU academic departments. Program offerings include a variety, certificate, degree and professional development programs.

• **Office of Continuing Education** courses extend the educational resources of the University to the citizens of Montana and beyond. Credit and non-credit courses are offered at various locations across the state. Increasingly, instruction is provided through the use of distance learning technologies, such as video conferencing and web-based online courses.

• **Burns Technology Center** supports a variety of instructional technology classrooms and tools at Montana State University. The BTC provides training and support services for faculty, students, and private organizations on a contract basis. In addition, the BTC participates in pilot and demonstration programs that explore and enhance information and communication technologies to benefit education and society.

**International Programs**
http://www.montana.edu/international/

Responding to fundamental trends that further integrate the United States and Montana into the global marketplace and increase daily contact with other nations, Montana State University seeks to embed international education into the core of the university’s academic and cultural life. The Office of International Programs (OIP) offers a full range of programs and services for MSU students, faculty, and staff.

OIP is responsible for developing and maintaining a network of international partnerships that align with and advance MSU’s academic, research and outreach priorities. At present, MSU maintains active partnerships with over 100 universities throughout the world. These partnerships provide opportunities for study abroad and exchanges, collaborative research, and outreach and service learning opportunities around the globe. OIP provides high quality educational opportunities abroad for MSU students at 325 universities in more than 50 countries.

OIP facilitates programs and services that support the recruitment and retention of talented students from around the world. MSU encourages qualified students from other nations to enroll in its academic programs on a degree-seeking, non-degree, or exchange basis. International students enrich our campus by exposing MSU students, faculty and staff to the diverse cultures, traditions and ways of knowing of other nations. In order to enable international students to succeed at MSU, OIP offers advising on their academic discipline. OIP provides information and assistance to OIP assists faculty to engage in the international and global dimensions of Montana into the global marketplace. OIP serves to build and maintain long-lasting, cross-cultural partnerships that provide opportunities for study abroad and exchanges, collaborative research, and outreach and service learning opportunities around the globe. OIP provides high quality educational opportunities abroad for MSU students at 325 universities in more than 50 countries.

OIP reports to the Office of the Provost and works closely with the MSU International Programs Committee.

**Montana Dietetics Internship**
http://www.montana.edu/hhd/nondegree/mdi.html

Food and Nutrition students who want to pursue a career in dietetics have the opportunity to complete a post-baccalaureate level dietetic internship in Montana, the only program of its kind in the state.

**MSU Library**
http://www.lib.montana.edu

The MSU library is a hub for knowledge and resources including:

• **Library Workshops** - The library offers online and in-person workshops on library research, citation management, library databases, Microsoft Office, cloud computing, research impact and many other topics.

• **Tech Checkouts at the MSU Library** http://guides.lib.montana.edu/techcheckouts - The MSU Library offers a variety of technologies available for checkout to support your academic and adventurous needs, from laptops and digital recorders to video cameras and tripods.

• **Library Research Assistance** - The library offers the Research Assistance Program (RAP) for research consultations with your subject librarian. Work with an expert reference librarian to talk about ideas, search options, strategies, databases, citations, search terms and any other research questions you have.

• **IT Services in the Library** - The IT Services Desk in the Library Commons offers a one-stop resource for help connecting to all campus network resources: secure wireless network, student email, printing, file shares, as well as general software support. IT Services also offers hardware repair (Apple and Dell certified) for laptops.

• **ScholarWorks** http://scholarworks.montana.edu/enius/ - ScholarWorks is an open access institutional repository for the capture of the intellectual work of Montana State University in support of its teaching, research and service missions. MSU ScholarWorks is a central point of discovery for accessing, collecting, sharing, preserving, and distributing knowledge to the MSU community and the world.

**Indian Leadership Education and Development (I LEAD) Project**
http://www.montana.edu/education/ilead/

The I LEAD project recruits, educates, certifies and place American Indian educators into administrative positions in schools with high populations of Native American students. The program culminates with a Master’s degree in Educational Leadership and certification as a school principal. The curriculum focuses on local school improvement initiatives through problem-based learning assignments. Each candidate will be assigned a mentor who is an experienced administrator in schools with high populations of Native American students. Classes will be delivered during the school year using computer-based instruction and summer classes held on the MSU campus at Bozeman, Montana. All participants must agree to serve as administrators in schools serving Native American children for a period of time equal to the length of their education and training.

**Math Learning Center**
http://www.math.montana.edu/undergrad/mle.html

The Math Learning Center, a tutoring center for students taking some 100 and 200 level classes, employs qualified undergraduates as math tutors. The department also maintains a computer lab for student to use and employ undergraduates as staff for the lab.

**National Student Exchange**
http://www.montana.edu/universitystudies/nse/
American Indian Research Opportunities (AIRO)

http://www.montana.edu/wwwail/

AIRO is a consortium of Montana’s seven tribal colleges and Montana State University dedicated to increasing the number of Native Americans entering higher education and career fields where they are significantly underrepresented. AIRO provides Native students the opportunity to excel and serve as role models for their peers through two summer research experiences:

• The Bridges program builds a seamless educational experience between Montana’s seven reservation-based colleges and MSU and seeks to increase the number of Native American students successfully transferring from two-year tribal colleges to MSU and pursuing academic studies in biomedical and other health related sciences.

• The Montana Apprenticeship Program (MAP) is a six-week summer immersion for underrepresented minority high school students that provides rising sophomores, juniors and seniors their first taste of college life and hands-on science research experience with MSU faculty mentors. The goal of MAP is to inspire young people to pursue college degrees and increase the number of Native American and other underrepresented high school students entering the fields of science, technology, engineering, and math (STEM).

Architecture Fabrication Laboratory
http://arch.montana.edu/students/facilities.html

The School of Architecture has a wide array of digital fabrication equipment including two computer numerically controlled (CNC) milling machines, laser cutting machines, 3D printers, large format scanner and plotter as well as a fully equipped wood lab, welding space, glass kiln and plasma cutter.

The Center for Biofilm Engineering
http://www.biofilm.montana.edu/

The Center for Biofilm Engineering (CBE) has been a world leader in biofilm research for more than 20 years. The center’s emphasis on research, education, and industry continues to produce results and provides exciting opportunities for students, staff, and faculty—as well as industrial partners. Multidisciplinary research teams develop beneficial uses for microbial biofilms and find solutions to industrial problems—think dental plaque or gunk in pipes. In the CBE, students get a head start on their careers by working on research teams led by world-recognized biofilm experts.

The Experimental Program to Stimulate Competitive Research (EPSCoR)
http://mntepscor.org/index.php

EPSCoR is a federally-funded program to promote the development of science and technology capacity in the United States. Funded by the National Science Foundation (NSF), Montana NSF EPSCoR supports capacity building by investing in researchers and institutions to better position them to compete for federal research funds. Students and faculty work together to build infrastructure and capacity for research programs that enhance learning and build the economy.

Health and Human Development
http://www.montana.edu/wwwhhd/

Health and Human Development has numerous unique equipment and facilities for student research projects:

• Exercise Science students work with professors to conduct ski research at Bridger Bowl Ski Resort and also help conduct fitness testing for alpine and cross-country ski teams.

• The Bod Pod, a piece of equipment that looks like a giant egg, is enabling professors and students in nutrition and exercise science to
gather body composition data that may help people fight chronic diseases such as heart disease and diabetes.

• The Movement Science Human Performance Lab houses a giant treadmill, the largest in the northwest, capable of measuring Nordic ski performance.

Image and Chemical Analysis Lab - iCAL
http://www.physics.montana.edu/ical/

iCAL is a user oriented facility that supports basic and applied research and education in all science and engineering disciplines at MSU. The laboratory provides access to state of the art equipment, professional expertise and individual training to government and academic institutions and the private sector. Laboratory instrumentation is dedicated to the characterization of materials through high resolution imaging and spectroscopy. iCAL promotes interdisciplinary collaboration between the research, educational and industrial fields.

Montana INBRE (IDeA Network for Biomedical Research Excellence)
http://brin.montana.edu

Montana INBRE is funded by the National Institutes of Health (NIH) and supports students’ biomedical research and student success through a statewide network. Montana INBRE focuses on increasing the biomedical research capacity of Montana by building research infrastructure, supporting faculty and student research, and fostering a state-wide collaboration.

Montana Institute on Ecosystems
http://www.montanaitive.org/

The Institute on Ecosystems (IoE) is a multi-institutional community dedicated to understanding complex ecosystems and the interconnectedness of people and nature. IoE researchers study the vulnerability of landscapes and livelihoods to the effects of climate change, and the IoE supports students who explore the effects of climate change in sustaining healthy ecosystems and economic growth. The IoE has hubs at MSU and the University of Montana and collaborates with other Montana institutions and partners.

Montana Space Grant Consortium (MSGC)
http://ispacgrant.montana.edu/

The Montana Space Grant Consortium (MSGC) was established in 1991 as a component of NASA’s National Space Grant College and Fellowship Program. The Montana program is one of a national network of 52 consortia, working to strengthen aerospace research and education in the United States. Montana State University is the lead Institution of MSGC, which has eighteen additional academic affiliates across Montana, as well as other educational and industrial members. MSGC offers a variety of programs to support students and faculty wanting to pursue activities consistent with NASA’s interests.

Museum of the Rockies
http://www.museumoftherockies.org/

The Museum of the Rockies seeks to understand, preserve and interpret the natural and cultural history of the Northern Rocky Mountain Region. Known for its vast collection of dinosaur fossils, the Museum houses some of the most famous dinosaur specimens in the world including Tyrannosaurus rex and Triceratops. The Museum of the Rockies is both a college-level division of Montana State University (http://www.montana.edu) and an independent 501(c)(3) nonprofit institution. Accredited by the American Association of Museums (http://www.aam-us.org), MOR is one of just 776 museums to hold this distinction from the more than 17,500 museums nationwide. The Museum is a Smithsonian Affiliate and a Federal Repository for fossils.

Robotics Lab
http://www.coe.montana.edu/ee/maher/ee101/eeobot/

Students interested in robotics have many exciting opportunities, whether they major in computer science or engineering. MSU students have won top awards in various competitions including, NASA’s Lunabotics competition and the Robo Olympics.

The Space Science and Engineering Laboratory (SSEL)
http://ssel.montana.edu/

The Space Science and Engineering Laboratory (SSEL) enables students and faculty to design and build equipment that NASA has launched into space. Data has been collected from an MSU satellite in orbit since 2011 and from two launched in 2013. SSEL strengthens MSU’s solar-terrestrial physics, microelectronics, optics, composite and ultra-light structures, biofilms and remote sensing programs.

The Spectrum Lab
http://www.spectrum.montana.edu/

The Spectrum Lab advances the opto-electronic technologies emerging from the research laboratories of Montana State University and fosters their transition to Montana companies and in the process provides enhanced educational opportunities for undergraduate and graduate students. The Spectrum lab:

• Performs advanced research and development on MSU grown photonic technologies.
• Establishes and maintains university-corporate partnerships to effect the transfer of these technologies into Montana companies.
• Provides enhanced educational and employment opportunities for Montana undergraduate and graduate students, enabling students to perform team-oriented, goal-driven, time-critical research and development.

The Subzero Science and Engineering Research Facility
http://www.coe.montana.edu/ce/subzero/

The Subzero Science and Engineering Research Facility is a unique, state-of-the-art suite of labs used to study the effects of the cold on projects across many scientific disciplines. MSU is known worldwide for avalanche research, and this lab expands the study of how cold affects athletes, agriculture, transportation and rare life forms.

Thermal Biology Institute (TBI)
http://tbi.montana.edu/

Thermal Biology Institute (TBI) is comprised of a multidisciplinary team of scientists and students focused on scientific discoveries in the unique thermal environments within Yellowstone National Park. Committed to furthering scientific understandings of the extreme limits of life on our planet, TBI works to ensure a sustainable future for research and outreach focused on the geothermal features of Yellowstone National Park.

Discoveries in extreme environments have led to significant advances that affect our daily lives in areas of genetics, medicine, bioremediation and alternative energy.

The Western Transportation Institute (WTI)
http://www.wti.montana.edu/

The Western Transportation Institute (WTI) is the country’s largest National University Transportation Center focused on rural transportation issues. The institute studies the critical roles that rural transportation
plays in the lives of people, the environment and the economy. Integrated research groups create solutions for clients, sponsors and rural transportation research partners.

WTI studies ways to deploy advanced Intelligent Transportation Systems on rural roads, reduce wildlife-vehicle collisions and maintain roads in cold regions. Undergraduates benefit from research projects, field trips, student chapters of professional transportation associations and travel to national conferences.

**Engagement**

Engagement is the collaboration between MSU and its local, state, national and global communities for the mutually beneficial exchange of knowledge and resource in a context of partnership and reciprocity (Carnegie Foundation, 2006). Engagement, a form of scholarship that bridges teaching, research and service brings the university intellectual resources to bear on societal needs. (Association of Public and Land Grant University’s Council on Engagement and Outreach, APLU CEO).

**Activity Classes for Credit**

<http://www.montana.edu/geefit>

Activity Classes for Credit (ACT) held in the Recreational Sports & Fitness Center count for one academic credit for the student/faculty/staff participant. These classes are a way for students to learn new skills, get exercise, reduce stress, and meet new people. A variety of activity classes are offered such as racquetball, volleyball, yoga, soccer, cycling, tennis, weight lifting and others.

**Blackstone Launchpad**

<http://www.montana.edu/launchpad/>

The Blackstone Launchpad fosters connections between the university campus, business community and local entrepreneurs to create an environment that nurtures young entrepreneurs and provides them the skills and network necessary to succeed. The Launchpad introduces entrepreneurship as a viable career option and provides students with a network of venture coaches and entrepreneurial support to transform new ideas into sustainable companies.

**Community Design Center**

<http://www.arch.montana.edu/cde/>

The Community Design Center (CDC) fosters a collaborative interdisciplinary community/university partnership approach to research and design of the built environment. The goals are to assist community groups and non-profit organizations representing underserved areas or under-funded projects and to work with state agencies, city departments and other regional governmental entities.

**Carnegie Engagement Classification**

<http://www.montana.edu/news/9336/carnegie-recognizes-msu-excellence>

MSU was awarded The Carnegie Foundation for the Advancement of Teaching’s community engagement classification. This designation recognizes MSU’s commitment to teaching that encourages volunteer service in communities and spreading of knowledge that benefits the public. Service and outreach projects are embedded in MSU’s coursework, research and extracurricular activities to enhance learning and improve lives around the world.

**Education Students**

Students in the education program have numerous opportunities to engage such as:

- **Travel** – Elementary and secondary education majors may choose to compete their student teaching experience in one of fifty countries. In addition, through Educators without Borders, there are opportunities to study in England, France, Mexico and Thailand as well as research opportunities in Russia.
- **Lab Classroom** – In partnership with Hyalite Elementary School, students spend the semester in engaging in the design and delivery of technology-rich instruction in a laboratory classroom environment. This innovative collaboration provides students invaluable opportunities to gain relevant experience in digital learning through working with expert practicing teachers and participating K-5 students.
- **Community**- In partnership with Hyalite Elementary School in Bozeman, students engage in the design and delivery of technology-rich instruction in a laboratory classroom environment. This innovative collaboration provides students invaluable opportunities to gain relevant experience in digital learning through working with expert practicing teachers and K-5 students.

**Humanities and Modern Languages and Literatures International Experiences**

Departments regularly offer study abroad trips to enhance learning. Recent trips have included a Shakespeare course in England, a philosophy course in Greece, a community service course in the Atlas mountains of Morocco and Modern language training in France and Mali.

**International Engineering Certificate**

<http://www.cs.montana.edu/paxton/global/certificate.html>

Computer science and engineering majors who earn the International Engineering Certificate gain an appreciation of the global environment into which he or she will graduate. Students with the certificate should be more marketable upon graduation, as well as a better global citizen — someone who can live, work and perform anywhere.

**The Jake Jabs College of Business and Entrepreneurship**

<http://www.montana.edu/cob/>

The Jake Jabs College of Business and Entrepreneurship offers additional hands on learning programs and professional development opportunities such as:

- **Student Clubs** - Students can join a variety of student clubs where they can build their professional skills and learn from experts in their fields, perform community service, collaborate on projects and compete at regional competitions. The Student Entrepreneurs in Action club gives back by helping link students with internship opportunities.
- **Service Learning Courses** – Students are paired with local businesses and community to gain real world experience. Courses such as Volunteer Income Tax Assistance (VITA) program enable students to become trained to assist lower income individuals file their tax returns.
- **Seminars** - Engage with local business experts and entrepreneurs through one-of-a-kind mentoring and face-to-face interactions with veteran business people and entrepreneurs.
- **Speaker Series** – Experts in business present at the Orser lecture each year.

**Music Concert Tours**

<http://www.montana.edu/music/ensembles/>

The School of Music offers concert tours, both foreign and domestic where students can perform music and see the world. The School of Music offers numerous opportunities for students interested in music such as choral performances in Venice, performing in a jazz band in Prague, or doing a half-time show with the Spirit of the West Marching Band in front of 20,000 fans.
Nursing Students have a variety of engagement opportunities such as:

- **International Opportunities**: Nursing students have the opportunity to travel nearly every semester to places like the Dominican Republic, Ecuador and Honduras. The College of Nursing partners with Timmy Global Health to provide global opportunities designed specifically for nursing students. Student nurses typically see up to 120 patients each day and provide basic health assessments, HIV screenings, wound care, dental screenings, health education and pre-natal care. [http://www.montana.edu/nursing/undergraduate/international.html](http://www.montana.edu/nursing/undergraduate/international.html)

- **Research and Creative Opportunities** - Students are able to join their professors in research and service projects across Montana and in partnership with Montana’s seven tribal nations. Some of the research interests within the college include end-of-life decision-making, health disparities, environmental health, oral health, and gerontology.

**Service Learning**

Students learn best when they engage with not only the material but also the broader community.

- **Domestic** - Students actively enhance their class and field experiences by getting involved in a variety of community organizations. Service learning opportunities exist with a number of local organizations including: Arts Without Boundaries, Big Brothers/Big Sisters, Heart of the Valley Animal Shelter, Gallatin Valley Food Bank, Montana Outdoor Science School and Cancer Support Community.

- **International Opportunities** - Service learning opportunities abound and many include international travel. Whether it is through a student organization, part of a class or a customized experience that meets your interests, service learning entails applying information from a class in authentic settings while addressing real community-identified needs.
  - Nursing Students provide basic health screenings in remote areas of South America
  - Engineering students construct wells for clean drinking water in Kenya
  - Architecture students build straw bale houses in Morocco.

**Study Abroad**

MSU encourages students to study abroad, both to build the international skills that are increasingly needed in all professions, and for the intrinsic educational value of studying outside one’s home country.

In addition to hundreds of study abroad options for individual students, numerous special programs are developed by MSU faculty members which allow groups of MSU students to travel and study abroad. Students earn full credit while participating in MSU-sponsored study abroad programs, and in most cases can maintain regular progress toward their MSU degree while studying abroad. Some MSU-approved study abroad experiences also satisfy the University Core Curriculum Multicultural/Global or Diversity requirement. These decisions will be made on a case-by-case basis.

Fees for many study abroad programs are based on MSU tuition rates, enabling students to study abroad for little additional cost than remaining on the Bozeman campus. In addition, students eligible for financial assistance may apply their aid package to meet study abroad costs.

**Towne’s Harvest Garden**

[http://townesharvest.montana.edu/](http://townesharvest.montana.edu/)

Students in sustainable food and bioenergy systems and food and nutrition gain hands-on experience at Towne’s Harvest Garden, the university’s teaching and research garden, growing local and sustainable produce for the community, the local food bank, and the community food truck.

**Women in Engineering**

[Montana State University](http://www.montana.edu)
**Academic Support & Student Life**

Make new friends in the residence halls, explore Bozeman’s backyard with the Outdoor Recreation Program, link up with like-minded people through one of the 300 plus student clubs and organizations, cheer the Cats to victory, or get résumé help at the Career, Internship & Student Employment Services Office. MSU has a vast array of programs and support services to make for an easy transition into college and to facilitate successful progression throughout your academic career. Explore all that MSU has to offer.

- Activities & Engagement at MSU (p. 30)
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- The Arts (p. 38)
- Student Government (ASMSU) (p. 32)
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**Activities & Engagement at MSU**

The Office of Activities & Engagement’s (OAE) mission is to provide the campus community with resources and to connect students to engagement opportunities, within and beyond the academic classroom, as they develop the skills of future leaders and active citizens. We are a one-stop shop for students interested in connecting with peers on campus through student organizations, or engaging in service to the Bozeman area community.

**Campus Engagement with Student Organizations**

On average, there are over 250 Registered Student Organizations at MSU which reflect a myriad of interests and passions among the student body. The OAE serves as a resource to campus student organizations providing student leader and faculty/staff advisor training and support.

**Community Engagement with Area Non-Profit Organizations**

Montana State University is designated by the Carnegie Foundation for Teaching and Learning as a Community Engaged Campus. This is a big deal and means that we take our role as a partner with our communities very seriously. Each year the OAE helps to connect thousands of MSU students with volunteer, internship and work-study opportunities in the Bozeman area non-profit community, across the state of Montana, and the nation. In addition, the Office of Activities & Engagement:

- Coordinates the MSU America Reads*America Counts tutoring program in pre-K through 8th grade classrooms in Bozeman working with and supporting area youth to achieve and succeed academically.
- Hosts monthly Service Saturday projects for students to serve 2-4 hours with local non-profit groups.
- Manages MSU BreaksAway, a spring break service trip program, which sends MSU student groups across the U.S. to volunteer during their spring break to meet community needs.

**Other Activities & Events**

- **Can the Griz Food Drive** competition between MSU and University of Montana to see who can collect the most food for their local food bank in conjunction with the Cat/Griz football game.
- **Fall Kick-Off Trails Project** over the fall opening weekend engages students in local trail maintenance work in partnership with the Gallatin Valley Land Trust.
- **The ”M” Restoration** on Mount Baldy the weekend before Homecoming each year involves 100 students in a hike and painting project on our beloved “M”.
- **Day of Student Recognition** is a campus-wide awards ceremony held each spring recognizing students for their outstanding achievements in both service and leadership.

For more information about anything here please contact us in the MSU Office of Activities & Engagement by calling (406) 994-6902, email us at engagement@montana.edu, come by our office in room 222 of the Strand Union Building (SUB), or check us out on the web at www.montana.edu/engagement.

**Computer Resources**

MSU places high priority on the use of information technology to enhance the educational experience, with a wide variety of technology resources available to students and faculty.

**MSU IT Services Desk and the Information Technology Center**

The MSU IT Service Desk, housed in the Renne Library Commons, provides IT support to campus by assisting with ID and Password questions, account setup, IT security concerns, software installations, Wi-Fi and more. Contact the Service Desk at 994-1777 or helpdesk@montana.edu with your IT questions!

The MSU Information Technology Center (ITC) is comprised of IT staff dedicated to providing the MSU campus with the technology and support needed for students, faculty and staff to be successful. ITC builds and maintains the technological infrastructure at MSU, from computing devices in campus labs and the telephone systems to campus email and classroom technology and the online learning platform, Brightspace. To learn more, visit MSU ITC (http://www.montana.edu/itcenter).

**Student Email**

MSU students receive a student email account to use while registered at MSU. Students must check it regularly for targeted announcements and email communication from the university at a minimum of twice per week. See Student Electronic Communication Policy (http://www.montana.edu/policy/student_electronic_communications) for details.

**Classroom Technology**

Numerous classrooms are technology-enhanced with equipment to support instruction, enhance student learning and engagement and collaborative learning. Three Technology Enhanced Active Learning (TEAL) Classrooms are designed for active engagement with class content and student collaboration. Informal spaces with a flat screen and connections for laptops are also provided in public areas for impromptu study and work sessions.
On-Campus Student Computer Labs

Students have access to over 600 computers in collaborative workspaces and labs in residence halls, academic halls, and the Renne Library. Lab computers offer specialized and industry-standard software packages for technology-specific assignments, including Microsoft Office, Adobe products, AutoCAD, SAS, SPSS, and MCAD. Visit studentlabs.montana.edu/ for more information.

Residence Hall Internet and Technical Assistance

ResNet (http://www.montana.edu/resnet) connects more than 2700 residence hall rooms and family and graduate-student housing units with internet access. The on-campus service desk for students is open six days/week and provides virus removal, software installs and computer support for resident students.

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Intercollegiate Athletics

Montana State University Department of Intercollegiate Athletics strives to foster excellence in academic and athletic performance while providing excitement and pride on-campus and among all who support the University.

MSU sponsors 15 sports and is a NCAA Division I member institution, with football competing in the Football Championship Sub-Division (FCS). The department offers a variety of ways for all students to enhance the college experience through supporting the Bobcats, either as a participant or a fan.

Montana State University is committed to promoting student-athlete well-being, ethical conduct, sportsmanship, equal opportunity, and financial responsibility while striving to be the best in the Big Sky Conference. Traditionally, MSU hosts the largest home crowds within the conference supported by both the student body and the Bozeman and statewide communities and annually finishes near the top of the Big Sky Conference’s All Sports Trophy which acknowledges the best overall athletic program in the Big Sky by measuring athletic and academic success.

In pursuit of athletic excellence, the Montana State Bobcats have claimed eleven national championships and 45 conference titles in its history; most recently Big Sky Conference crowns in women’s basketball 2015-16, men’s tennis 2013, and football 2010, 2011 and 2012. The Bobcat ski team is a nationally renowned program and placed fourth in the country at the 2016 NCAA Championships, paced by national champion Anika Miller in Nordic racing. In addition, MSU is traditionally ranked among the Big Sky Conference’s best in numbers of academic all-conference selections.

Student-Athletes and the entire department are strongly committed to giving back to the community. Student-athletes can often be found in the local schools and at community organizations and events promoting local causes.

Bobcat Athletics strives to develop campus leaders and engaged student-athletes. The department provides support programs designed to enhance the student-athlete experience by supporting the academic, athletic, and personal growth of all student-athletes. The department has an Athletic Academic Center, Strength and Conditioning program, and Sports Medicine Program designed to assist student-athletes in these areas.

To learn more about Bobcat Athletics, please visit www.msubobcats.com (http://www.msubobcats.com). Students may attend Bobcat Athletic home events for free by presenting a valid Cat Card. GO CATS!

Library and Information Resources

Dean
Kenning Arlitsch
Library Administration, Renne 124
406-994-3119
Research Assistance

The Research Desk is located in the Renne Library Commons
406-994-3171
Email or Chat (http://www.lib.montana.edu/research/referenceservices.php)

www.lib.montana.edu

The Library’s mission is to facilitate student and faculty success by
providing access to information and knowledge. It supports the
University’s commitment to teaching and research through its information
resources (most of which are electronic), research assistance to students and
faculty, and by providing technology-rich learning and study spaces.

Students in need of help locating information resources for assignments
or research projects may drop by the Research Desk or schedule an
appointment with a librarian (http://www.lib.montana.edu/forms/rapreq.php). Knowledgeable and friendly faculty librarians and staff
provide assistance using the collections, accessing online information
resources, and delivering instruction to individuals and groups.

Each discipline on campus has its own subject librarian (http://

The Renne Library is one of the busiest buildings on campus receiving
approximately 30,000 visits in a typical mid-semester week. It offers a
variety of study options for students, including group study rooms that can
be reserved, group collaboration areas, and quiet spaces. Wi-Fi is available
throughout and computer workstations are plentiful. Laptops and other
technology are available for check-out.

The Library maintains the University’s open access institutional repository –
ScholarWorks (http://scholarworks.montana.edu/xmlui) – which
takes the intellectual work of the Institution. It offers data management
and curation services to researchers, and provides access to local digital
collections (http://www.lib.montana.edu/digital), including historical
papers, MSU theses and dissertations, and photographs.

Special Collections and Archives (http://www.lib.montana.edu/archives)
holds unique primary source and original materials in the areas of Montana
agriculture and ranching, Yellowstone National Park and its ecosystem,
Montana history, Native Americans, trout and salmonid fish, and author
Ivan Doig’s archives.

Additionally, the Library is home to the Information Technology Help
Center (http://www.montana.edu/itcenter), a satellite location of the
Writing Center (http://www.montana.edu/writingcenter), and Testing
Services (http://www.montana.edu/ehhd/centers/testing).

The Brewed Awakening coffee shop offers a variety of beverages and snacks
for sale.

Courses Offered

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>LSCI 121</td>
<td>Library Research Skills</td>
<td>2</td>
</tr>
<tr>
<td>LSCI 290R</td>
<td>Undergraduate Research</td>
<td>1-6</td>
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<tr>
<td>LSCI 316</td>
<td>Bus Info Research Skills</td>
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<tr>
<td>LSCI 490R</td>
<td>Undergraduate Research</td>
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<tr>
<td>LSCI 492</td>
<td>Independent Study</td>
<td>1-3</td>
</tr>
<tr>
<td>LSCI 498</td>
<td>Internship</td>
<td>1-12</td>
</tr>
</tbody>
</table>

Additionally, Research Librarians and Library staff provide research
assistance, deliver many course-specific instruction sessions, and teach
workshops on a wide range of topics.

Student Government (ASMSU)

About ASMSU

www.montana.edu/asmu

The Associated Students of Montana State University (ASMSU) provides
numerous services to its student members, who pay the student activity fee.
ASMSU is the voice for student concerns to the MSU Administration, the
Montana University System, the Board of Regents, the Montana Governor
and Legislature.

The Senate, the legislative governing body, consists of twenty-one students.
The Senate annually allocates the student activity fee moneys to twenty
programs. The programs are administered by an elected student body
president and vice-president, and a business manager, who is appointed.
ASMSU hires approximately 250 students a year. An educational experience
in responsible management of student funds, knowledgeable decision
making, and representation of student concerns, as well as experience in
working with people, may be acquired through involvement in ASMSU.

The ASMSU Office is located in Room 221 Strand Union Building (SUB)
and provides a variety of services to students such as notaries,
various pamphlets, and information about our programs. For more
information about all the programs, call 406-994-2933 or visit our website
at www.montana.edu/asmu.

MSU Office of Sustainability

www.montana.edu/sustainability

The student government office for sustainability at MSU engages students
in the process of making the university more environmentally and socially
responsible. The Center offers student employment and internship
opportunities developing outreach programs, events, and strategic initiatives
in addition to ongoing services, such as recycling.

Streamline Transit

www.streamlinebus.com

A public bus system provided through a student bus fee. Commuter route
buses arrive throughout the day in front of the Strand Union Building.
Shuttle route buses also provide transportation to the downtown business
area and the Main Mall. Schedules are available at the ASK-US Desk and
the ASMSU Office. For further information, call 406-587-2434 or visit

Streamline Latenight

This program coordinates with Streamline Transit to provide late night
transportation Thursday, Friday and Saturday from 8 P.M. to 3 A.M. For
further information call 406-994-5800 or visit www.streamlinebus.com
(http://www.streamlinebus.com).

ASMSU Day Care Center

www.montana.edu/asmu/daycare.html

The Day Care Preschool is supported by ASMSU and the University. It
is located in the Family and Graduate Housing Louise Shunk Daycare
Community Center. Children aged 2½ until entrance into kindergarten, of
MSU students, staff and faculty are eligible, with priority given to students.
Applications are available in SUB 221, on the ASMSU website or call the
Day Care Center at 406-994-4370 for more detailed information.

ASMSU Exponent

http://msuexponent.com/
The ASMSU Exponent, an independently student run newspaper, is published weekly during the academic year. The ASMSU Exponent and is produced by and for the students of Montana State University. Student positions offer experience in publication design, professional editing, journalistic writing, ad campaign creation, and professional management. Call 406-994-2224 or email the editor at editor@exponent.montana.edu (editor@exponent.montana.edu) for more information.

**ASMSU KGLT**
KGLT FM is a non-commercial, alternative public radio station broadcasting from the campus of Montana State University since 1968. KGLT offers diverse, music-based programming with a staff of 80+ volunteer DJs comprised of students, staff and community members and provides DJ opportunities by offering an apprentice class three times per year. KGLT produces 2,000 public service announcements yearly and is the Emergency Alert System for Gallatin County. The station is supported by ASMSU, Federal and Private Grants, listeners and local businesses. More information on the web at www.kglt.net (http://www.kglt.net).

**Spirit**
The Spirit chair helps organize the Homecoming celebration and Cat/Griz events. Homecoming and Cat/Griz events include the student barbeque, the bonfire, the Saturday morning parade and king-queen competition as well as several other events. Spirit also works with Service Saturdays, helps with the Red Cross and United Blood Services blood drives to provide service opportunities on campus.

**Homecoming**
A highlight each autumn is the Homecoming celebration. The ASMSU Homecoming committee, advised by the Office of Student Activities, organizes the student barbeque, morning parade and king-queen competition as well as several other events.

**Recreational Sports and Fitness**
www.montana.edu/wwwimrec

The ASMSU Intramurals and Recreation office is located in 202 Shroyer Gym. Objectives of the program are to provide activities which promote physical fitness, social contact, improved self-esteem, and foster a permanent interest in wellness through organized recreation. The program provides opportunities for participation in both team and individual sports, offering about seventy different activities throughout the academic year. Currently over eighty percent of the student body takes advantage of this program! Call 406-994-5000 for more information or check out our Web page at www.montana.edu/wwwimrec.

The ASMSU Recreational Sports and Fitness program is located in room 120 in the newly remodeled Hosaeus Fitness Center (HFC). Students taking 7 credits or more may access the HFC and participate in the Intramural and Open Recreation Programs with no additional fees. Other programs include Personal Training, Group Fitness (75 classes per week), and the Instructional Program. The HFC features 6 gymnasiums, 9 racquetball courts, 4 Group Fitness rooms, a combatives room, a 14,000 sq. ft. fitness area with 70+ cardio machines, a running track, a bouldering gym and more. For more information, please call 994-5000.

**ASMSU Outdoor Recreation Program**
www.montana.edu/outdoorrecreation

The ASMSU Outdoor Recreation Program offers a variety of services including equipment rental, group outings, resource area, bicycle & ski workshop, non-credit instructional classes and other activities. The Outdoor Recreation Center is located on West Lincoln Street, adjacent to the Rookie Hall parking lot and the Intramural Fields. Further information may be obtained at 994-3621 or www.montana.edu/outdoorrecreation.

**ASMSU Campus Entertainment**
Campus Entertainment (CE) is located in Room 282B SUB (406-994-4839). The mission of ASMSU Campus Entertainment is to enhance the social, cultural, and educational opportunities for students and the University community through innovative and entertaining activities and programs. Serving as a programming resource for the University, Campus Entertainment often partners with campus organizations and departments to sponsor a variety of events and activities. Committed to the development of leadership and citizenship among students, Campus Entertainment strives to promote excellence in student activities programming.

ASMSU Campus Entertainment offers the following services:

- **ASMSU Concerts**: is a committee designed to provide MSU students, staff, and faculty with a wide range of professional music and entertainment, including major recording artists and local talent. Phone 406-994-5821 for more information.
- **ASMSU Comedy Spotlight**: is responsible for laughter! Shows range from stand-up comedy routines and big-name comedians to FUN interactive events that have been successful in the past. Take a break from studying and come join us for a few laughs! Phone 406-994-1829 for more information.
- **ASMSU Lively Arts/Lectures**: provides culturally oriented entertainment ranging from solo classical instrumentalists to modern theater and dance companies. Local, regional, and national acts with a variety of performance styles are showcased. Several nationally and regionally known speakers are sponsored each year. Activities may range from forums on controversial issues to educational and fun lectures. This committee’s purpose is to broaden the horizons of the students of MSU. Phone 406-994-5828 for more information.

Other ASMSU Programs include:

- **ASMSU Arts and Exhibits**: displays paintings, photographs, and sculptures of locally, regionally, and nationally known artists in the Exit Gallery (student run and funded) in the North West entrance at the base of the steps in the SUB. In addition, the committee also provides workshops and lectures by visiting artists and Upheaval; the student art show and sale during the spring semester. For more information contact exhibits@montana.edu or 406-994-1828.
- **ASMSU Films**: The Procrastinator Theater is MSU’s student-run second run theatre located in SUB 287. The Procrastinator shows movies six night a week (closed Wednesdays for student and community groups to use the theatre) during the academic year, with two films nightly. All movies are $2. For more information on theater rental, contact MSU Conference Services in room 280F of the Strand Union Building or by phone at 406-994-3081. Or you can contact the Procrastinator Theatre director at: films@montana.edu. The “Movie Hotline” number is 406-994-3312.
- **ASMSU Technical Services**: provides lighting and sound reinforcement equipment and a technical workforce to ASMSU programs, university functions, and to anyone else affiliated with the University who may need such equipment or expertise. Phone 406-994-5823.

**ASMSU Public Relations**
ASMSU Public Relations has the purpose of increasing the communication between ASMSU, the community and the students we serve. PR provides informational advertising for ASMSU on the pack page of the Exponent, promoting ASMSU at MSU Fridays during the school year. The committee’s main purpose is to convey ASMSU awareness and inform the student body of the operations of ASMSU. The PR Committee is located in 325 SUB, 406-994-5824.
ASMSU Student Political Action Committee
ASMSU ensures that student voices and concerns are heard and acted upon by the MSU administration, the local community, the Board of Regents, and the State of Montana. The ASMSU Student Political Action Committee exists primarily to lobby the state legislature. Student input is always welcomed, particularly during state legislative sessions. Students interested in serving on this committee should contact the ASMSU Senate Office in 281 SUB, 406-994-2933.

ASMSU Leadership Institute
www.montana.edu/leadership

The Leadership Institute is charged with providing leadership opportunities and inspirations to MSU students. The Institute works towards developing leaders and problem solvers who effectively empower both self and others. Our objective is to work on a system wide basis providing, coordinating, planning and organizing leadership opportunities for students, faculty, staff and community members throughout MSU and Montana. For more information call 406-994-7275 or visit www.montana.edu/leadership.

Student Health Service and Psychological Services

• Swingle Student Health Center (p. 34)
• The VOICE Center (p. 34)
• Counseling and Psychological Services (p. 34)

Swingle Student Health Center

The Swingle Student Health Center is located at the east end of the Strand Union Building. The Student Health Service provides a wide range of outpatient medical care and health promotion services for MSU students and spouses. In addition to routine health care, the Student Health Service has a clinical laboratory, x-ray, pharmacy, and nutrition services. The Student Health Service is accredited by the Accreditation Association for Ambulatory Health Care and is a member of the American College Health Association. All MSU students who carry seven or more credits are charged the health fee each semester and are eligible for care at the Student Health Service. Students carrying fewer than seven credits and non-student spouses may also receive care at the Student Health Service if they pay the health fee. For more information call 406-994-2311.

Immunizations

All MSU students are required to show proof of current immunizations against the following vaccine-preventable diseases: measles, mumps, and rubella (two doses of each unless born before 1957). New students must also complete the Student Health Service’s tuberculosis screening form. Students identified by the screening process as high risks for tuberculosis must be tested. Students will not be permitted to register for classes until the Student Health Services receives verification of immunizations, screening, and (if required) tuberculosis testing.

Medical Insurance Plan

Montana State University students who carry six or more credits are required to carry health insurance. Health insurance is available for all MSU students through a university-sponsored health insurance program. Students who have adequate health insurance may waive participation in the University plan.

Dental Clinic

The Dental Clinic is located at the south end of the Swingle Student Health Center. The Dental Clinic is a preventive and urgent care facility. Services include: check-ups, cleaning, emergency treatment, consultations, and referrals. Some limited routine services can be provided as time permits. Treatment is by appointment only, except for emergencies which can be seen on a walk-in basis. Students who have paid the Health Service fee are eligible to utilize the clinic. Part time students taking fewer than seven credits may pay this fee optionally. For appointments or more information, phone 406-994-2314.

Health Advancement

Health Advancement Educates, Empowers and Energizes the MSU community to thrive through a balanced lifestyle. We employ the public health approach which works to create an environment that supports making healthy choices. Health Advancement uses evidence-informed programs, activities and educational campaigns designed to allow students to be successful academically and personally. We take a harm reduction approach to alcohol, tobacco and drug use, promote safe sexual practices, positive body image, healthy nutrition, the development of resiliency, positive stress management and healthy sleep hygiene habits among other wellness related topics. The Office of Health Advancement offers paid internships to allow students the opportunity to apply theory to practice while in school and works collaboratively with other campus and community partners. For more information, please call 406-994-4380 or visit our website at montana.edu/oha.

The VOICE Center

www.montana.edu/voice

This program is part of MSU Health Promotion with the goal of providing free confidential support, advocacy, and referral services to survivors of rape, sexual assault, relationship violence, and stalking. Trained student advocates and professional staff work with faculty, other campus professionals, and the Bozeman community to provide campus-wide advocacy and education. Services include walk-in hours as well as a 24-hour crisis line. Students of any age or gender are invited to stop in or call for information: 406-994-7069.

Counseling and Psychological Services

www.montana.edu/wwwcc

Counseling & Psychological Service (CPS) provides free, confidential counseling to eligible MSU students. CPS sees approximately 900 students each year for a variety of concerns, including adjustment difficulties, academic struggles, depression, anxiety, relationships, substance use, eating disorders, current/past trauma or abuse, problematic behaviors, identity concerns or sexual health/sexuality issues and couples/relationship counseling.

In addition to counseling services, CPS staff is available to speak on an array of topics of general interest to the college population, such as time/stress management, wellness, healthy relationships, and awareness/prevention of depression, anxiety, substance use and suicide. They also provide consultation and training to student organizations, faculty and staff.

CPS is staffed by licensed psychologists and counselors, as well as advanced graduate students. On campus for over 20 years, the agency is accredited by the International Association of Counseling Centers and the training program is accredited by the American Psychological Association. For more information, see their website at www.montana.edu/wwwcc.

Student Services

• Office of the Dean of Students (p. 35)
• Allen Yarnell Center for Student Success (p. 35)
• Office of Financial Education (p. 36)
• Career, Internship & Student Employment Services (p. 36)
Office of the Dean of Students
www.montana.edu/success

The Dean of Students office acts as an advocate for students, consults and works with individual students and student groups, and works with other campus offices in creating a sense of community at MSU. Assistance is available on a “drop-in” basis or by appointment. Services offered by the office include:

- Consulting with students to help mitigate conflicts on campus
- Supporting MSU’s fraternities and sororities
- Supporting MSU’s parent and family relationship program
- Coordinating conduct hearings
- Providing general information or assistance
- Administering and interpreting the Student Conduct Code

The Office of the Dean of Students is located in Student Union Building (SUB) room 174. Call 406-994-2826 for more information.

Allen Yarnell Center for Student Success
www.montana.edu/success

Programs

The Allen Yarnell Center for Student Success believes in students and their potential. Students who visit the office learn to take an active role in owning and directing their education and future. The Allen Yarnell Center for Student Success offers several programs and services aimed at helping students succeed at MSU. These programs and services include:

First Year Initiative (FYI) - Through the FYI program, the Office of Student Success strives to make contact with all first year students through orientation information sessions, one-on-one advising meetings with student success advisors, workshops, a free or $2 tutoring program (SmartyCats Tutoring), and several grand scale campus events such as Adventures MSU and the ChampChange auctions. For more information visit www.montana.edu/success/fyi.php.

Second Year Initiative (2YI) - Some students may have experienced a few bumps in the road during their first year at MSU. 2YI is here to help second year students navigate past any new or continuing rough spots. 2YI shows students how to “dial-in” to the numerous campus resources available to support their academic careers. For more information visit www.montana.edu/success/2yi.php.

Beginning College Survey of Student Engagement (BCSSE) - Every entering freshman takes this survey, administered by the Office of Student Success, at their orientation session. We strongly suggest that students set up an appointment with a student success advisor to interpret the results of this survey. The survey results teach students how they can maximize their academic performance. Student success advisors help students learn what it takes to be a successful MSU student.

Student Success Advisors & Learning Strategist - Student success advisors are expert learning strategists who meet one-on-one with students to teach them tools they can use to improve their academic performance. Topics covered in meetings include:

- organization
- time management
- how to improve grades
- prioritization and meeting deadlines
- other techniques to help keep students on the path to graduation

Students who meet with our student success advisors are more aware of how they learn and how they can better themselves to ensure a successful academic career. Our student success advisors are committed to assisting students and helping them get connected to the campus resources they need to utilize to be successful MSU students.

Student Early Alert System - Students are referred to our office in a number of different ways, but most often through the Early Alert System. When faculty members are concerned about an individual student’s classroom performance, attendance, or course progress, they can submit the student’s name to our office through the Early Alert System. The Office of Student Success personally connects referred students with student success advisors who provide them with tools to improve their performance and help them formulate a success plan for the remainder of the semester. Advisors can also answer questions about how academic performance may affect financial aid, living arrangements, and academic standing and point students towards the right resources to address those concerns and achieve greater success at MSU.

Workshops - The Office of Student Success offers free workshops that help students become organized, learn the ins and outs of MSU, and connect with other students. These workshops include:

- The Five Keys to College Success
- Developing Your Study Skills
- Managing Your Time
- Effective Test Preparation
- How to Manage Fear of Tests
- How to Think Like a College Student
- And many more!

ChampChange - ChampChange rewards undergraduate students for engaging in events and programs at MSU and in the Bozeman community. Students earn points by attending special lectures, attending Residence Hall programs, meeting with a student success advisor, financial coach, or student success advisor, voting in ASMSU elections, volunteering for service projects sponsored by the Office of Community Involvement, playing intramural sports, or meeting with a SmartyCats tutor.

Students can also swipe their CatCards and receive ChampChange points any time they visit one of these permanent reader locations:

- Student Athletic Events
- Writing Center
- Fitness Center
- BBCC Writing Center
- Gallatin College Programs
Students use acquired ChampChange to bid on great prizes online, or save their ChampChange to bid on great prizes online, or save their ChampChange until the end of each semester and participate in the Final ChampChange Auction. Prizes available at the final auction include TVs, laptops, bikes, coffee makers, gaming consoles, cameras, and many other great items, as well as the grand prize: a $1,000 tuition scholarship donated by the Office of Financial Aid. For more information, visit www.champchange.com (http://www.champchange.com).

SmartyCats Tutoring - The Office of Student Success offers one-on-one and small-group online and in-person tutoring for hundreds of courses through the SmartyCats Tutoring Program. SmartyCats tutors are an invaluable resource for students who need extra help or who seek to maximize their learning as required for their programs and career goals. SmartyCats tutors help students clarify points from lectures, labs, discussions, and assigned readings. Free drop-in tutoring and common hour exam study sessions are also available. To learn about the tutoring program, please visit www.MSUSmartyCats.com (http://www.MSUSmartyCats.com).

Return to Learn - Return to Learn helps returning students navigate the re-enrollment process, understand the value of their return to school, and successfully reach their educational goals. A Return to Learn specialist is assigned to each student to check in periodically to ensure that returning to MSU is simple and seamless. Return to Learn staff and student success advisors help students arrange financial aid, connect with an academic advisor, register for classes, find tutoring, and much more. For more information visit http://www.montana.edu/returntolearn.

MSU 101 – Designed for students who seek an intensive learning experience to maximize their academic potential and create a personalized college experience, MSU 101 offers valuable insights into study strategies, note taking, critical thinking, and time management. This two-hour workshop is offered at the beginning of each semester, with the purpose of providing students with the tools they need to succeed at MSU. Workshop facilitators share their tips on how to reach goals—both inside and outside the classroom. Students learn what is necessary to get back on track and are encouraged to take an active role in achieving their goals. To find out more, visit www.montana.edu/mus101.

We encourage students to stop by our office to learn more about all of the ways we can help them make the most of their time here at MSU. The Office of Student Success is located at 177 Strand Union Building. We can also be reached by calling 406-994-ROAR (7627), or by emailing us at success@montana.edu. We are a dedicated and knowledgeable resource, ready and willing to support students at all points in their academic careers.

Office of Financial Education
www.montana.edu/financialeducation

The Office of Financial Education provides resources to MSU students and MSU alumni to help them gain financial independence and learn techniques to achieve their life goals. We educate and support our students to ensure that they can manage debt and develop sound budgeting skills. We offer students opportunities to improve their financial management skills through: one-on-one financial coaching, workshops and events, and informational materials.

Career, Internship & Student Employment Services
www.montana.edu/careers

The Career, Internship, & Student Employment Services (CISES) office, located in the lower level of the Strand Union Building (177 SUB), offers a full range of career planning and employment services to students, alumni, the campus community, and employers. A primary goal of the office is to help students identify purposeful and fulfilling career paths and to gain experience and career skills which will clarify goals and facilitate entry into the job market. Students concerned about choice of major or career, who have questions on career options or graduate school, or who need help searching for jobs should visit the office. To learn more about CISES, visit www.montana.edu/careers or call 406-994-4353. Our primary services are listed below.

Career Fairs - Annually, we host at least four career fair events on campus. These include Student Employment Job Fairs, the Fall Career Fair, the “Almost” Spring Job and Internship Fair, and the Teach Montana Educators Fair. These career fairs offer opportunities for students and alumni to network and build relationships with employers and organizations.

Workshops and Events - The office offers a range of events and workshops preparing students for the world of work by identifying their interests and matching them with exciting opportunities and career choices. Workshops and events include:

- Margaret Alderson Etiquette Dinner
- Executive Closet
- Meet the Employers Networking Event
- Career Fair Preparation Clinic
- Careers in Demand Workshops
- Resume Critiques
- Resumes for Government Jobs
- Diversity Coffee
- Veterans Social
- What Can I DO with a Major in…?
- What Can I DO with a Career in…?
- Help! I’m Still Undecided! Finding a Career That Matches Your Skills and Interests

Career Coaching - Our experienced professional career coaches assist individuals with choice of major, career opportunities, job search preparation, and career changes. The coaches work with students to use career assessment tools such as career interest inventories, computerized guidance systems, and personality indicators in order to prepare them for the world of work. Additionally, coaches assist with career preparation through job and internship searches, resume critiques, and practice job interviews.

HireABobcat.com - This free job and internship portal is exclusively for MSU students and alumni to search for full- or part-time employment, internships, and other interesting opportunities. Employers can access HireABobcat.com (http://www.montana.edu/careers/hireabobcat) to post job openings and opportunities for students and alumni.

Professional Skills Studio - MSU’s Professional Skills Studio was developed in response to our employer partners’ identified need for interns
and employees trained in the “soft skills” necessary to succeed and perform at a high level in the workplace. Completing the professional skills studio signals to employers that you recognize the importance of these skills and are taking steps to acquire them and positions you for success from day one in your first job, helping you to advance in your career.

**Bobcat Mentoring** - The MSU Alumni Foundation and MSU Career, Internship & Student Employment Services are proud to host the MSU Bobcat Mentoring Program, designed specifically to connect students with outstanding MSU alumni ready to share their stories, networks, and experiences in order to help students navigate their future possibilities. Mentors and mentees are matched for a year but build relationships that will last indefinitely. These alumni are willing to share their stories so students can build theirs. [http://www.montana.edu/mentor](http://www.montana.edu/mentor)

**Internships** – Utilizing [www.HireABobcat.com](http://www.HireABobcat.com), students are able to view and apply for internships in a variety of fields. It is recommended that students complete at least one, preferably two, internships before graduation. Surveys conducted through our office indicate that the number one reason why a graduate gets a job is because of the valuable experiences they earned while interning in their area of interest.

**On-Campus Interviews** - The office also hosts on-campus interviews for summer opportunities, internships, and career positions with a variety of employers in business, industry, government, and education.

**Credential Files** - Teachers and graduate school candidates may set up credential files which contain personal, educational, and employment data as well as letters of recommendation. They may access and update this information for future employment and educational opportunities. [http://www.montana.edu/careers/students/credential_files.html](http://www.montana.edu/careers/students/credential_files.html)

**Disabled Student Services**
[www.montana.edu/wwwwomen/disability](http://www.montana.edu/wwwwomen/disability)

Disabled Student Services personnel determine eligibility for specific disability accommodations, assure the provision of approved accommodations, and provide direction, advice, and referral services for persons with verified disabilities. Students seeking accommodations for a disability must request services through Disabled Student Services, 180 Strand Union Building. Students may also contact the office by phone, 406-994-2824, by TDD, 406-994-6701, by fax, 406-994-3943, or by email, DRV@montana.edu or byork@montana.edu.

**Re-entry Student Services**
[www.montana.edu/ldrv](http://www.montana.edu/ldrv)

Non-traditional-age students (25 and over) can find direction, support, and assistance in this office. Consumer information is available. Re-entry Student Services is located in 180 Strand Union. Students may also contact the office by phone, 406-994-2824, by TDD, 406-994-6701, by fax, 406-994-3943, or by email, DRV@montana.edu or byork@montana.edu.

**The Veteran Support Center**
[www.montana.edu/veteran](http://www.montana.edu/veteran)

The Veteran Support Center provides service and assistance for veterans, dependents, and members of the guard and selected reserve who receive educational benefits from the U.S. Department of Veterans’ Affairs (DVA). DVA educational benefits recipients must have school enrollment certified each term by the MSU certifying official. Applications for the MUS Honorable Discharged Veteran Fee Waiver (see Special Exemptions for full fee waiver information) are also reviewed by the certifying official for approval. The Veteran Support Center is located in 185 Strand Union Building. Students may also contact the office by phone, 406-994-2824, by TDD, 406-994-6701, by fax, 406-994-3943, or by email, vets@montana.edu or byork@montana.edu.

**Women’s Center**
[www.montana.edu/wwwwomen](http://www.montana.edu/wwwwomen)

The Women’s Center is open to all students, faculty, staff, and community members considering returning to school, and facilitates student and academic success at MSU through involvement with educational co-curricular programs and services. Located in room 372 of the Strand Union Building, the Center is open 9 a.m. to 4 p.m., Monday through Friday, when school is in session. Services and resources include: weekly Sack Lunch Seminars, events celebrating National Women’s History Month, the Women and Their Futures film series, the Shannon Weatherly Memorial Lecture Series, a quarterly newsletter, a lending library with resources addressing women’s and gender concerns, career and scholarship information, and various other resources and programs. The Women’s Center also offers volunteer and internship opportunities.

**Diversity Awareness Office**
[www.montana.edu/diversity](http://www.montana.edu/diversity)

The Diversity Awareness Office (DAO) provides information and support to the university community in the areas of multicultural awareness and community building, prejudice education, and practical resources relating to diversity issues. The DAO sponsors, produces and promotes events that encourage and foster diversity awareness around issues of gender, class, religion, sexual orientation, and ethnicity. Awareness of diversity is examined through lectures, movies, discussion groups and social events. The DAO provides a safe supportive environment in which students can begin to understand the diversity they experience on campus as well as the larger global community.

Part of the vision of the DAO is to also foster and support the growth of understanding and tolerance of difference throughout the university and in the surrounding community. We see the existing diversity as a valuable resource towards this goal, and seek to involve students in all steps of the process. From this, we hope to add to the leadership skills of those students interested in the processes of raising visibility and understanding of difference and multiple perspectives.

The Diversity Awareness Office manages programs such as Expanding Horizons, Sustained Dialogue, and Safe Zone. The DAO collaborates with student groups, departments, and community organizations to deliver lectures, activities and events that address issues of diversity on campus, within the state, and in the world at large. For more information, please visit [www.montana.edu/diversity](http://www.montana.edu/diversity) or visit us in Strand Union Building room 368.

**Cat Card**
[www.montana.edu/catcard](http://www.montana.edu/catcard)

The Cat Card is your MSU Student ID, an optional on-campus debit card, and after hour access card to the residence halls. The Cat Card also serves as a meal pass card and is used to gain entrance to Marga Hosaeus H&PE Center and student functions such as athletic events.

The magnetic strip on the back of the Cat Card contains information about the student’s current status. When swiped at various locations on campus, this information determines, if the student is permitted to participate in the services or activities at a specific location.

Deposits can be made at the Cat Card and Meal Pass Offices to use the card as an on-campus debit card. You can also manage your account and make deposits online at [www.montana.edu/catcard](http://www.montana.edu/catcard). The Cat Card can then be used to make purchases in all food areas, MSU Bookstore, Health Service,
Dental Service, Strand Union retail areas, copy machines, laundry machines in the residence halls, parking areas, and other areas on campus that accept Cat Cards.

Your Cat Card is your “key” to the campus. For more information about the Cat Card visit the Cat Card Office in the lower level of the Strand Union Building or call 994-CARD. You may also visit our Website at www.montana.edu/catcard.

**Strand Union (SUB)**  
www.montana.edu/sub

The Strand Union Building (SUB) is truly the center of campus activity at MSU. The SUB provides daily services, amenities and out-of-the-classroom opportunities for informal interaction among members of the MSU community. The Strand Union strives to provide students with a space for personal development and fulfillment through opportunities in student government, community service groups, and employment as well as recreational events and activities. The SUB also fills the role of conferencing center for hundreds of meetings and conferences every year.

Focused on serving the needs of students, faculty, staff and guests to the university, the SUB offers two student managed, student staffed service centers: the Ask Us Desk and the Rec Center. The Ask Us Desk is the information center for the building, connecting people to campus information, handling lost and found, stamps sales, affordable fax services, and is a Tickets West ticket sales outlet. Visit www.montana.edu/askus for MSU events and schedules, and other information.

The Recreation Center provides a social gathering place and stress relief with bowling, billiards, foosball, shuffleboard, big screen TVs, special late night events, Wii and PlayStation 2, and of course, snacks! A limited number of lockers in the SUB are available for rental through the Rec Center. Each semester, bowling and billiard classes are offered and can be registered for through the Health and Human Development Department. For more information and hours, visit www.montana.edu/subrec.

The SUB Building offers meeting rooms (seating from 10-1,350) through Conference Services, and houses the MSU Bookstore, full-service banking, student lounges and a variety of ATMs. There are also copy and postal services and a FedEx drop box in the building. Strand Union Food Services include sandwiches and wraps at Avogadro’s Number, burgers and pizza from the Bobcat Court, delicious espresso drinks from S.R.O., treats and smoothies from The Sweet Shop and Freshens, a variety of other meal choices from The Union Market, and University Catering for special events.

The SUB is also home to the Associated Students of Montana State University (ASMSU Student Government, Campus Entertainment, the Exit Gallery, Student Legal Services, the Leadership Institute, KGLT Community Radio), Admissions, the MSU Veteran’s Center, the Office of Community Involvement, the Cat Card Office, Financial Aid, Copy Cats, the VOICE Center and the Procrastinator Theater. The Division of Student Success has the following offices and departments located in the SUB: The Vice President for Student Success, Dean of Students Office, Office of Students Success/Career Internship Services, First Year Initiative, Disability, Re-entry and Veteran Services, the Office of Student Activities, The Women’s Center and the Diversity Awareness Office.

The Strand Union Administration Office, located in room 223 (directly behind the Ask Us desk), houses the offices of the Director, the Marketing Manager and the SUB Administration Office Manager. Visit www.montana.edu/sub or call 406-994-3082 for more information.

**Computer Services**

The Information Technology Center operates microcomputer facilities for student use in Reid, Roberts, and Cheever Halls. A wide variety of software packages are available, including word processing, spreadsheets, database managers, and drawing and design packages.

**University Printing Services**  
www.montana.edu/printshop

Located in the basement of Culbertson Hall, University Printing Services provides copying and a large variety of specialized printing services for all university departments, faculty, staff, students, and university organizations. University Printing Services strives to provide the highest quality printing and copying in a timely fashion at a price below on- or off-campus services. See www.montana.edu/cpa/printshop for more information.

**Copying Service**

The Renne Library has a copy service in the basement and coin-operated copiers in lobby areas. Copy Cats (http://www.montana.edu/copycats) and University Printing Services (http://www.montana.edu/printshop) also offer complete copy services. Links: www.montana.edu/copycats and www.montana.edu/cpa/printshop.

**Graphic Services**

Complete professional graphic design, typesetting, print production, photography, and darkroom services are available from MSU Creative Services, 427 Culbertson Hall, a branch of University Communications. Graphics and web design, scanning, and color output services are also available from Strand Union Graphics.

**Audio Video Listening and Viewing**

The Renne Library has facilities for listening to audio cassettes, phonograph records, and compact discs, as well as viewing video cassettes and slides.

**Campus Post Office**  
www.montana.edu/wwwmail

A full-service post office is located in Culbertson Hall on Harrison Street. All services are available Monday through Friday from 8:30 a.m. to 4:00 p.m. Stamp sales and a letter drop-off are available at the Ask-Us desk in Strand Union; weekday pickup is at 8:45 a.m. and 2:00 p.m. A USPS mailbox with 3:00 p.m. Monday - Saturday pickup is located outside the Strand Union south entrance. Priority Mail, stamp sales, and a letter drop are also available at Cards ‘N’ Copies, which has a 2:00 p.m. weekday pickup.

**Testing Services**  
www.montana.edu/ehbd/testing

The Testing Service coordinates the scheduling and administration of national testing programs such as the College-Level Examination Program (CLEP), the ACT, the Proficiency Examination Program (PEP), the General Educational Development Program (GED), the Graduate Record Examination (GRE), Law School Admission Test (LSAT), Medical College Admission Test (MCAT), and the Graduate Management Admission Test (GMAT). The Testing Service proctors the High School Days scholarship test, correspondence course exams, and exams for professors and resource students with disabilities who qualify for special test considerations. Contact Testing Services at (406) 994-6984.

**The Arts**

**Music**  
www.montana.edu/wwwmusic

Opportunities exist for all interested students to participate in a variety of ensembles and classroom activities in the Department of Music. Many
music courses are specifically designed for non-majors and several satisfy University Core requirements.

Department of Music concert ensembles are open to all university students, some through audition. Three choral ensembles—The Montanans, Chorale, and University Chorus—provide performance opportunities for vocalists. Instrumentalists may choose from five performing bands—Wind Ensemble, Symphonic Band, Marching Band, Jazz Lab I, and Jazz Ensemble II; two orchestras—Chamber Orchestra and the Bozeman Symphony Orchestra; a percussion ensemble; and numerous faculty-coached chamber music groups. Many students also enroll in private or class instruction with teachers in piano, voice, guitar, and all band and orchestral instruments.

Howard Hall, home of the Department of Music, is equipped with a number of private teaching studios, classroom facilities, and an electronic piano laboratory. In addition to a 265-seat recital hall, Howard Hall contains a large ensemble rehearsal room and several acoustically-efficient practice rooms.

On-campus performances occur frequently. Recitals by faculty and guest artists, and concerts by musical organizations are scheduled throughout the year. Informal musical entertainment, special musical events, appearances by musical organizations at athletic events, statewide tours, and performances for professional conferences are other features of the music program.

Students seeking additional information should contact the Department of Music, Howard Hall, 406-994-3562 or visit www.montana.edu/wwwmusic.

Theatre Arts

Generally two mainstage productions and two student-produced Underground Theatre productions are presented each academic year through the theatre arts production program. In addition, MSU provides the home base for Montana Shakespeare in the Parks during the summer months.

Theatre Arts is under the direction of an academically and professionally qualified faculty. Any enrolled student is eligible to participate in theatre arts productions regardless of major, providing the student has the interest, ability, and sufficient time. For students who are interested in pursuing theatre arts on an academic basis, a Bachelor of Arts in Film and Photography is offered. Information regarding the theatre arts production and academic programs can be obtained from the department office in the Visual Communication Building, 406-994-2484 or visit www.montana.edu/art.

Visual Arts

The School of Art is home to the Helen E. Copeland Gallery, the University’s professional fine arts gallery. The Copeland Gallery offers a dynamic exhibition schedule that includes exhibitions of student and faculty work, original exhibitions curated by the School of Art, and national touring exhibitions. All exhibits in the Copeland Gallery are free and open to the public. All MSU students, regardless of major, are also welcome to submit work for exhibition in the annual undergraduate juried art show.

The School of Art is also home to the Waller-Yoblonsky Gallery, located in the Melvin Graduate Art Studios. Committed to the encouragement of artistic experimentation in a diverse variety of mediums, the Waller-Yoblonsky Gallery is overseen by the School of Art’s MFA students.
Housing

University Housing is made up of smaller departments including Residence Life and Family & Graduate Housing. These two departments work collaboratively with University Food Services and Residential Networking departments to provide a comfortable and safe environment for those students and families living on-campus at Montana State University. We encourage you to look at the additional tabs for more information pertaining to these various departments and entities.

Residence Life
www.montana.edu/reslife

Residence Halls
Montana State University offers convenient and affordable on-campus housing for students. The Residence Life Department is committed to providing an environment which is socially stimulating while enhancing the academic experience of the students who live on campus. Students with fewer than 30 earned credit hours (while in a residence hall setting) are required to live in the residence halls. Prospective students are urged to submit an application at the earliest possible date since assignments are made in the order they are received. A limited number of single rooms are available.

Living Options
There are many living options available that encompass academic and social enrichment for our residents; however, living options do change from year to year, based on student need, academic interest areas, and national trends. Our current living options are listed below.

1. All Male Hall (Langford)
2. All Female Halls (Hapner/Hannon)
3. Sophomore & Above and 21+ (Johnstone)
4. Co-Ed Halls: Co-ed living environments are comprised of both men and women living on either separate floors or separate wings of the same hall (Mullan, South and North Hedges, Roskie, Johnstone Center, Yellowstone Hall, Headswaters Complex, and Freshman Apartments).
5. Emerging Leaders: Currently housed in South Hedges, this co-ed option is open to students enrolled in the Leadership Fellows program. Members of this community have the unique opportunity to learn and practice their individual style of leadership.
6. Global Village: Located in Hapner and Langford, these floors offer the opportunity to make friends from around the world and to learn and share different cultures. This community is ideal for students planning to study abroad, international students, students studying foreign languages, and for any student interested in the world.
7. Living Learning Communities (LLCs): Dedicated to academic success, Residence Life offers floors designed to assist students with common majors. Currently, Business, Arts and Architecture, and Engineering floors are scattered throughout all seven halls.
8. Honors: Housed in The Quads and one floor in South Hedges, these co-ed options are for students enrolled in the Honors College. These spaces provide an ideal setting for the study sessions and spontaneous discussions that foster the growth of an Honors student.
9. Sophomore and Above Deluxe Floors: Roskie Hall is the home of two newly remodeled sophomore and above floors. These floors consist of single rooms with the same square footage as a double room in Roskie. This quiet, yet active, living option provides an opportunity for those students who want a change of pace from the traditional freshmen energy.
10. Sophomore and Above Halls: The Headswaters Complex and Johnstone Center are designed to meet the needs of all second year students by creating programs that deal directly with the issues they are currently facing.

Please visit the Residence Life website, www.montana.edu/reslife, contact the Residence Life Office at 406.994.2661, or email housing@montana.edu for the specific halls and floors which provide the living options outlined above.

Facilities
Room Equipment and Furnishings
All rooms have closets, extra-long twin beds, chests of drawers, study desks, waste baskets, chairs, and window coverings. A mattress pad and a pillow are provided for each student. Also, a linen service is available for residents, providing sheets and pillow cases. These items can be exchanged once a week for a clean set of linens. It is the responsibility of the residents to maintain order and cleanliness in their rooms.

Laundry
Laundry rooms are in every hall with the exception of the Headswaters Complex and are equipped with Cat Card-operated automatic washers and dryers. Ironing boards and a limited number of irons are available at the hall desks.

Residence Hall Association (RHA)
All students residing in the residence halls are members of the Residence Hall Association. Organized on floor, hall, and inter-hall levels with programming, judicial, and governmental committees, RHA strives to uphold and promote the interests of students residing in the residence halls and to provide an active voice in residence hall administrative policy and operating procedures.

Visitation Policy
Members of the opposite sex may visit in the privacy of individual rooms. Cohabitation is prohibited.

- Definition of a resident, as it pertains to this policy: A student who has contracted with the university to live in a specifically assigned hall and room for a designated period of time.
- Definition of visitor: Visitors are in the room for less than overnight periods. They may use the facilities in a manner in which they would not be considered regular hall residents. They do not sleep in the room. Visitors are subject to university regulation.
- Definition of guest: Guests are non-residents staying with a student resident for a period not to exceed three (3) days. Guests are to present a photo ID and be registered at the hall front desk and are subject to university policies and regulations.

In an effort to accommodate a variety of student lifestyles, the residence halls offer twenty-four hour visitation, in which residents may have visitors at their discretion and with the consent of their roommate.

Personal Funds and Property
Students are urged to help safeguard their personal funds by establishing local checking accounts. All other valuable personal property should be adequately protected. Montana State University is not insured nor responsible for the loss or destruction of any personal property of students. Students are encouraged to carry their own personal property insurance.
Montana State University has strict regulations regarding firearms on campus; contact the Office of Residence Life for details.

**Board Charges and Meal Plans**
All residence hall students are required to participate in a meal plan. Meals are not served in the residence halls during Thanksgiving Break, Winter Break, and Spring Break, which is reflected in the meal plan charges.

Student meal plans can be viewed on the UFS website at www.montana.edu/ufs/rdh/mealplanunlimited.

In addition to these meal plans, off-campus students (only) have the option to purchase a variety of commuter meal plans, which can be viewed at www.montana.edu/ufs/rdh/commutermeal.

**Semester Charges**
Prices for the current academic year/semester can be obtained through the Residence Life website www.montana.edu/reslife.

*Note: Charges listed are estimates for the academic year/semester and are subject to change without notice.*

**Payment of Charges**
Room and board fees, ResNet, and the RHA social fee are paid in full at the beginning of each semester during the fee payment period. Installment payments for room and board must be arranged in advance with the Office of Student Accounts. There are no deductions for room or board for late arrivals (at the beginning of the semester) or for early departures (at the end of the semester).

**Application for Housing**
Apply online at www.montana.edu/reslife.

**Prepayment**
A $200 prepayment is required when submitting a Residence Hall Application. The University will not process housing requests until the student has submitted a completed housing application and the $200 nonrefundable prepayment. The $200 will be applied to the total housing costs upon payment of fees.

**Prepayment Forfeiture**
Failure to occupy the room or cancellation of the contract before or during the contract period will result in the forfeiture of the $200 prepayment.

**Refunds of Room and Board Payments**
Students who terminate class registration during a semester will receive a prorated refund of their room and board payments unless they are suspended by the university.

There are no refunds for early departures at the end of the semester or late arrivals at the beginning of the semester. Rooms are held until the first hour of classes on the first class day of the semester.

A student who is absent from his/her residence hall for one or more weeks of consecutive meals due to his/her own illness or participation in University-sponsored activities will be refunded board at $2 per meal, provided the student notifies the University Food Services Meal Pass Office in advance of the University-sponsored activity. Requests for refunds based on absence due to illness must be submitted to the Residence Life Office, accompanied by a statement from the Director of Student Health Services, or the student’s own doctor, indicating required hospitalization or home care.

**Exemptions from On Campus Living**
All incoming freshmen with fewer than 30 credits earned in a university residential setting are required to live on campus for their first two academic semesters. However, there are some criteria that, if met, may qualify a student for an exemption from living on campus. Qualifications for exemption are as follows:

1. Marriage.
2. Physical custody of a dependent child.
3. Have completed one full academic year at another college/university while living in a residence hall.
4. Will be taking 5 or fewer credit hours.
5. Recent substantial financial change beyond the control of the student.
6. A medical or disability condition that precludes a student from living in the residence halls.
7. Will be living at home with an immediate family member (mother, father, brother, sister, grandmother, grandfather) or legal guardian.
8. Current active military or veteran’s status.
9. Have other extenuating circumstances.

To initiate the exemption process, you must submit the required written documentation. This must be received by the Residence Life Office prior to the academic period requested. Exemptions received after the start of any term will be considered, but rarely approved. The Request for Exemption form can be found online at http://www.montana.edu/reslife/documents/pdfs/exemption_form.pdf.

Part time students (3 - 11 credits) wishing to live on campus may be granted a waiver. Please contact the Residence Life Office at 406-994-2661 for more information.

The specific opening/closing dates for the residence halls will be sent to students with their room assignments. If this information is needed earlier, please contact the Residence Life Office at 406.994.2661, housing@montana.edu, or www.montana.edu/reslife.

The residence halls will be closed during Thanksgiving Break, Winter Break, and Spring Break. Students may request University housing during break periods for an additional fee. Rookie Hall, Johnstone Hall, the Freshman Apartments, and the Headwaters Complex will remain open to accommodate students requesting break housing. Students not currently living in one of the previously mentioned halls will be required to move to an unoccupied room in one of the breaking housing halls. Other halls will only remain open based on the discretion of the Residence Life Administration. Guests are not allowed during break periods.

**Work Opportunities**
For students needing to work while attending Montana State University, there are a number of employment opportunities available in residence halls, at front desks, and with the various food services on campus. Information regarding employment may be obtained by contacting the Residence Life Office and University Food Service. Work study/financial aid status is not necessary to qualify for student employment.

**Family and Graduate Housing**
www.montana.edu/fgh

The Family & Graduate Housing Office is pleased to offer convenient, affordable housing as a service to enable families, married couples, graduate students, second degree undergraduates, single parents, and those in a legally dependent relationship to continue their education.
Family & Graduate Housing consists of 587 units in one, two, and three bedroom apartment/house configurations in eight different communities, located both on campus and within walking distance to all campus buildings and amenities. While each apartment complex varies, available options include: washer/dryer hookups, free laundry (in apartment complexes without washer/dryer connections), ResNet connection, dishwashers (in several Julia Martin, Paisley, and Branegan units), storage areas, playground equipment, picnic tables, barbecues, and cable television.

Electric and gas utility costs are included in all units except McIntosh, Paisley, and the West Side Houses. Water, sewer, and garbage costs are included in the rental price of all units.

As a benefit to our residents, the Family & Graduate Housing Office offers a variety of services to assist with making the transition to campus-life: a newsletter is published monthly to inform residents of upcoming campus and community events; a staff of community assistants (CA’s) is available to answer questions; ASMSU Day Care Center is available for children 2-1/2 years through kindergarten; events and programs catered to adults, children, and families are conducted throughout the year; a staff of skilled craftsmen are available to assist with any maintenance problems; a 24-hour call-out service is available to assist with emergencies.

To receive a brochure, application, or to inquire about Family & Graduate Housing’s eligibility requirements, please contact:

Family & Graduate Housing Office
1502 West Garfield
Bozeman, MT 59715
406-994-3730
Email: fgho@montana.edu
www.montana.edu/fgh

MSU Family & Graduate Housing provides an equal housing opportunity. Discrimination based on race, color, national origin, religion, creed, physical or mental disability, gender, marital status, familial status, or age is prohibited.

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### University Food Service

[www.montana.edu/ufs](http://www.montana.edu/ufs)

### Meal Plan Options

Our meal plans offer students the flexibility and freedom to eat what, where, and when they want with the convenience of three locations across campus. Students living in the Residence Halls may choose between a 5-Day Meal Plan (Mon-Fri) or one of the 7-Day Meal Plans (Sun-Sat) options. All plans allow for unlimited entry and unlimited food at any of the three locations during hours of operations.

#### Residence Dining Commons Hours of Operation

**Miller Dining Commons**
- Monday - Friday 7am to Midnight
- Saturday - Sunday 7am - 7pm

**Harrison Dining Commons**
- Saturday - Thursday 7AM to Midnight
- Friday 7am - 7pm
- Saturday 7am - 7pm

**Hannon Dining Commons**
- Monday - Friday 7am to 7PM
- Saturday - Sunday Closed

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### Choosing A Meal Plan

#### Bobcat Anytime Platinum

This plan provides unlimited access to the all-you-care-to-eat residential dining venues seven (7) days per week during operating hours plus 12 guest meal passes and a $300 balance in Cuisine-N-Clean cash per semester.

#### Bobcat Anytime Gold

This plan provides unlimited access to the all-you-care-to-eat residential dining venues seven (7) days per week during operating hours plus 8 guest meal passes and a $150 balance in Cuisine-N-Clean cash per semester.

#### Bobcat Anytime Silver

This plan provides unlimited access to the all-you-care-to-eat residential dining venues seven (7) days per week during operating hours plus 4 guest meal passes per semester.

#### Bobcat Anytime Copper

This plan is designed for students who will not be on campus on the weekends. It provides unlimited access to the all-you-care-to-eat residential dining venues five (5) days per week (Monday-Friday) during operating hours plus 4 guest passes and a $200 balance in Cuisine-N-Clean cash per semester.

#### Bobcat Anytime Bronze

This plan is designed for students who will not be on campus on the weekends. It provides unlimited access to the all-you-care-to-eat residential dining venues five (5) days per week (Monday-Friday) during operating hours plus 4 guest passes and a $100 balance in Cuisine-N-Clean cash per semester.

#### Cuisine-N-Clean (CNC) cash can be used at:

- Any of the campus retail food operations
- Concessions
- Dining Commons
- All laundry facilities in the Residence Halls
- WEPA Print Kiosks

**CNC cash will be available for students to use while they have an active CatCard at MSU. All CNC cash left at the end of one year after their CatCard is no longer active will be lost.**

### Notes:

- Students will be able to reload money into their CNC Cash Accounts if they run out of money
- Students will NOT be able to convert their CNC money into CatCash
- Students will lose guest passes that are unused at the end of the fall and spring semester; passes do not roll over between semesters.
- A student who is absent from his/her residence hall for one or more weeks of consecutive meals due to his/her own illness will be refunded based on a pro-rated system. Requests for refunds based on absence due to illness must be submitted to the Residence Life Office, accompanied by a statement from the Director of Student Health Services, or the student’s own doctor, indicating required hospitalization or home care.

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### ResNet

[www.montana.edu/resnet](http://www.montana.edu/resnet)

The MSU Residential Network (ResNet) is a campus network that provides secure wired and wireless connections for students living in the Residence
Halls and in Family & Graduate Housing. ResNet is available as part of the room and board plan. If you own a computer, laptop, tablet or smart phone or plan to purchase one, you will be able to browse the Web from the comfort of your own room. For those residents not bringing a computer to school, ResNet also provides computing facilities with ResNet access, Microsoft Office software, and high speed printing in six computer labs located in the Residence Halls.

**Help Desk**

ResNet provides a full service help desk to those students living on campus. If you are experiencing any network related problems, general technical issues, or have questions about your service, ResNet’s technicians are available 6 days a week as part of your room and board plan.
## Expenses

- Estimated Expenses (p. 44)
- Fee Schedule and Other Charges (p. 45)
- Special Fees and Charges (p. 46)
- Special Exemptions (p. 46)
- Refund of Fees (p. 47)
- Financial Aid and Student Employment (p. 47)
- Fee Descriptions (p. 48)

The Board of Regents of Higher Education approves all student fee charges. Fees are subject to change at any time.

Student charges and refunds are posted under the student’s name, not the parent’s. Therefore, all fee statements and bill notifications are emailed to the student, not the parents. Student refunds are Direct Deposited or mailed to the student if the student has not signed up for Direct Deposit. (Exception: Refund checks generated as a result of a Parent PLUS loan are mailed to the parents unless the Financial Aid Office has written authorization to disburse the funds to the student.)

Students are personally responsible for meeting their financial obligations at the times stated in the term calendar. A student’s registration is not complete until all fees are paid.

All students are urged to safeguard their personal funds by establishing checking accounts. It is most helpful for a student to be able to write checks for exact amounts for fees, room and board, and other necessary expenses. A local bank account is also good identification while on campus.

A check presented to MSU which is subsequently returned by the bank for insufficient funds or other reasons may cause the cancellation of a student’s registration, reporting to federal agencies, and/or a request to terminate room and board. A returned check service charge of $25 is assessed for all returned checks.

### Estimated Expenses

#### 2016/2017 Montana State University Undergraduate Cost of Attendance

The expenses shown below reflect estimated costs for a student carrying a full-time load (12 or more credits) for fall and spring semesters, 2016/2017. These expenses include fees and other charges. Actual fees may vary based on specific program fees or the number of credits carried each semester. These figures are subject to change at any time and should be regarded as estimates only.

#### Undergraduate Resident Students

<table>
<thead>
<tr>
<th>Category</th>
<th>Semester</th>
<th>Academic Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tuition/Fees(^1)</td>
<td>$3,445</td>
<td>$6,890</td>
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<tr>
<td>Room/Board(^2)</td>
<td>$4,450</td>
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<tr>
<td>Books/Supplies(^3)</td>
<td>$650</td>
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<td>Personal/Transportation(^4)</td>
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<td></td>
</tr>
<tr>
<td>Total</td>
<td>$8,545</td>
<td>$17,090</td>
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#### Undergraduate Non-Resident Students

<table>
<thead>
<tr>
<th>Category</th>
<th>Semester</th>
<th>Academic Year</th>
</tr>
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<tr>
<td>Tuition/Fees(^1)</td>
<td>$11,595</td>
<td>$23,190</td>
</tr>
<tr>
<td>Room/Board(^2)</td>
<td>$4,450</td>
<td>$8,900</td>
</tr>
</tbody>
</table>

\(^1\) MSU’s undergraduate tuition rate applies to undergraduate students at all class levels (Freshmen, Sophomore, Junior, and Senior). There is not a higher rate for Junior and Senior students. These figures do not include the health insurance fee which is required of students who do not have their own health insurance coverage.

\(^2\) For on campus residents, these costs include in-room high speed internet service, unlimited entry into residence hall dining areas, cable TV and unlimited local phone service. Room and Board above is based on a double room, 7 day meal plan. This figure also represents an amount reasonably incurred for off-campus housing and food costs. Food and housing costs will vary depending on a student’s living arrangements and lifestyle.

\(^3\) The actual cost of books and supplies will vary depending upon curriculum.

\(^4\) Financial Aid budgets include a personal/transportation/miscellaneous figure of $1,690 per semester ($3,380 per year). Personal/miscellaneous expenses will vary depending on individual circumstances.

### Undergraduate Resident Students: Gallatin College

<table>
<thead>
<tr>
<th>Category</th>
<th>Semester</th>
<th>Academic Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tuition/Fees</td>
<td>$1,580</td>
<td>$3,160</td>
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<tr>
<td>Room/Board(^1)</td>
<td>$4,450</td>
<td>$8,900</td>
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<td>Books/Supplies(^2)</td>
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<td>Personal/Transportation(^3)</td>
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<td></td>
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<tr>
<td>Total</td>
<td>$6,680</td>
<td>$13,360</td>
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### Undergraduate Non-Resident Students: Gallatin College

<table>
<thead>
<tr>
<th>Category</th>
<th>Semester</th>
<th>Academic Year</th>
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</thead>
<tbody>
<tr>
<td>Tuition/Fees</td>
<td>$5,485</td>
<td>$10,970</td>
</tr>
<tr>
<td>Room/Board(^1)</td>
<td>$4,450</td>
<td>$8,900</td>
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<tr>
<td>Books/Supplies(^2)</td>
<td>$650</td>
<td>$1,300</td>
</tr>
<tr>
<td>Personal/Transportation(^3)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>$10,585</td>
<td>$21,170</td>
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</table>

\(^1\) For on campus residents, these costs include in-room high speed internet service, unlimited entry into residence hall dining areas, cable TV and unlimited local phone service. Room and Board above is based on a double room, 7 day meal plan. This figure also represents an amount reasonably incurred for off-campus housing and food costs. Food and housing costs will vary depending on a student’s living arrangements and lifestyle.

\(^2\) The actual cost of books and supplies will vary depending upon curriculum.
Financial Aid budgets include a personal/transportation/miscellaneous figure of $1,690 per semester ($3,380 per year). Personal/miscellaneous expenses will vary depending on individual circumstances.

2016/2017 Montana State University Graduate Cost of Attendance
The expenses shown below reflect estimated average costs for a graduate student enrolled in 6 or more credits for both fall and spring semesters, 2016-2017. These expenses include fees and other charges. Actual fees may vary based on specific program or course fees or the number of credits carried each semester. These figures are subject to change at any time and should be regarded as estimates only.

Graduate Resident Students

<table>
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<tr>
<th>Category</th>
<th>Semester</th>
<th>Academic Year</th>
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</thead>
<tbody>
<tr>
<td>Tuition/Fees¹</td>
<td>$2,600</td>
<td>$5,200</td>
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<tr>
<td>Room/Board²</td>
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<tr>
<td>Books/Supplies³</td>
<td>$500</td>
<td>$1,000</td>
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<tr>
<td>Personal/Transportation⁴</td>
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<td></td>
</tr>
<tr>
<td>Total</td>
<td>$7,550</td>
<td>$15,100</td>
</tr>
</tbody>
</table>

Graduate Non-Resident Students

<table>
<thead>
<tr>
<th>Category</th>
<th>Semester</th>
<th>Academic Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tuition/Fees¹</td>
<td>$8,100</td>
<td>$16,200</td>
</tr>
<tr>
<td>Room/Board²</td>
<td>$4,450</td>
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<tr>
<td>Books/Supplies³</td>
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<td>$1,000</td>
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<td>Personal/Transportation⁴</td>
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</tr>
<tr>
<td>Total</td>
<td>$13,050</td>
<td>$26,100</td>
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</tbody>
</table>

¹ These figures do not include a supplemental health insurance fee required of students who do not have proof of insurance coverage.
² For on campus residents, these costs include in-room high speed internet service, unlimited entry into residence hall dining areas, cable TV and unlimited local phone service. Room and Board above is based on a double room, 7 day meal plan. This figure also represents an amount reasonably incurred for off-campus housing and food costs. Food and housing costs will vary depending on a student’s living arrangements and lifestyle.
³ The actual cost of books and supplies will vary depending upon curriculum.
⁴ Financial Aid budgets include a personal/transportation/miscellaneous figure of $1,690 per semester ($3,380 per year). Personal/miscellaneous expenses will vary depending on individual circumstances.

Course fees: FY17_Course_Fees.pdf (http://catalog.montana.edu/expenses/FY17_Course_Fees.pdf)

Fee descriptions

Exemptions from Payment of Certain Fees

- Tuition: Undergraduate students holding high school honor, American Indian scholarships, and Montana citizens sixty-five years of age or older are exempt from tuition. Undergraduate students with merit scholarships may be exempted from the tuition, in amounts to be determined by the scholarship committee depending upon funds available for this purpose.
- Permanent staff employed at least three-quarter time are exempt from tuition for six credits only.
- Dependents of employees with five or more years of service employed at least three-quarter time are exempt from 50% of their tuition when seeking a first undergraduate degree.
- Student Activity and Health Service Fees: Students who are required by the university to complete their entire semester’s work off campus and more than fifty miles from Bozeman are exempt from Student Activity and Health Service Fees as are professional staff and non-professional staff employed at least three-quarter time.
- In Absentia: Students registered in absentia pay only the registration fee.

Other Charges

The following fees are in addition to those listed in the fee schedule. Fees are subject to change at any time. Non-matriculated students pay the same fees as regularly enrolled students. See also Course Fees.

- Residence Hall Social Fee, per semester, to defray costs of activities and projects $10.00
- Late Payment assessed the first day after regular payment $40.00
- Additional late fee after 15th day of class $40.00
- Nursing Students
  - Uniforms and shoes (estimate) $200.00
  - Upper division petition deposit $200.00
- Doctoral Dissertation, for microfilming and publication of abstract in “Dissertation Abstracts” $55.00
- Exams given by special request (May include Graduate Record, College Entrance and Placement, GED, Miller Analogy, Doppelt, and Minnesota Engineering exams.) $2.50 to $55.00
- Course Materials Fee
  - Consult the department
  - (For materials furnished in some courses offered by Departments of Animal and Range Science, Health and Human Development, Medical Science, Earth Sciences, Nursing, Physics, Education, Biology, Architecture, Microbiology, and Music.)
- Field Trip Fee
  - Consult the department
- Program Fees
  - Consult the department or college
Regularly enrolled students who register for courses without credit pay the **Auditor's Fee** to the Registrar, who will provide a form for approval by the instructor. Applications for non-matriculated enrollment should be made through the Office of Admissions. An adult not regularly enrolled at Montana State University may, with permission of the instructor, register for a non-laboratory class upon the payment of the same fees as students enrolled for credit. The person so registered may not participate in class discussion or take examinations.

### Non-matriculated Fees

Residency Requirements for Fee Purposes. Students of legal age and minors whose parents have not established residence for fee purposes are required to pay the non-resident fees. See statutes and regulations of the Board of Regents. A copy of these regulations may be obtained by visiting or writing the Office of Admissions.

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### Special Fees and Charges

#### Application Fee
A $30 application fee must accompany all applications for admission. This fee is not refundable nor is it applied toward the payment of any other fee. The application fee is honored for one year from the semester for which the student is applying.

#### Additional Fees Paid by Graduate Students
Graduate students will be charged fees at a higher rate than undergraduates. (Please see the Fee Schedule.)

#### Additional Fees Paid by Out-of-State Students
Resident or non-resident status for fee purposes is determined by Montana statutes and regulations of the Board of Regents. A copy of these regulations may be obtained by visiting or writing the Office of Admissions.

Students of legal age and minors whose parents have not established residence for fee purposes are required to pay the non-resident fees. See Residency Requirements for Fee Purposes.

#### Non-matriculated Fees
An adult not regularly enrolled at Montana State University may, with permission of the instructor, register for a non-laboratory class upon the payment of the same fees as students enrolled for credit. The person so registering may not participate in class discussion or take examinations. Applications for non-matriculated enrollment should be made through the Registrar, who will provide a form for approval by the instructor.

#### Auditor's Fee
Regularly enrolled students who register for courses without credit pay the same fees as students enrolled for credit.

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### Testing Fees
The Montana State University Testing Service administers certain testing and examination programs for which fees are charged. The fees are established by testing agencies (companies) other than MSU.

#### Nursing Students
Nursing students are charged a program fee each semester which covers such costs as mandatory liability insurance while taking clinical courses, pre-NCLEX testing fees, fingerprinting costs, specialized equipment, and distance delivery support.

Costs for board, room and transportation will vary in relation to the facilities available in the community where assigned for upper division. If a student does not have a car, she/he must make arrangements for transportation.

#### Health Insurance
Students carrying six or more credits are automatically enrolled in the student insurance plan each semester. Students carrying fewer than six credits must contact the Student Insurance Office if they desire coverage. Students wishing to apply for exemption from the insurance plan must do so online.

Complete information on student insurance may be obtained from the Student Insurance Office in the Swingle Student Health Center.

#### Special Fees and Charges for Foreign Students
An additional administrative fee will be charged to all foreign students who come to the University.

### Special Exemptions

#### Honorably Discharged Veteran Tuition Waiver
A veteran who meets all of the following conditions is eligible for a waiver of tuition:

1. “Honorable” discharge (“General Under Honorable Conditions” will not be accepted) from any branch of the U.S. Armed Forces for service on active duty for other than training purposes.
2. Bona fide resident of Montana for tuition and fee purposes.
3. At some time eligible for VA education benefits but benefits were exhausted or have expired (VEAP eligible veterans who withdrew a portion of their VEAP contribution before benefits expired are not eligible for the tuition waiver).
4. Qualifies under one of the following:
   a. Served any time prior to May 8, 1975. Waiver available to all otherwise qualified undergraduate and graduate students; or
   b. Working on initial undergraduate degree and has been awarded an Armed Forces Expeditionary Medal; or
   c. Working on initial undergraduate degree and received the Southwest Asia Service Medal for service in the Persian Gulf between August 2, 1990 and April 11, 1991; or
   d. Working on initial undergraduate degree and has been awarded the Kosovo Campaign Medal; or served in a combat theater in Afghanistan or Iraq after September 11, 2001, and received either the Global War on Terrorism Expeditionary Medal, the Afghanistan Campaign Medal, or the Iraq Campaign Medal.

Qualified recipients must maintain satisfactory academic progress.

Application for this waiver must be made through the MSU Office of Veterans' Services, Montana State University, P.O. Box 173960, Bozeman, MT 59717-3960 at least two weeks before fee payment for the semester in

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### Special Fees and Charges

#### Application Fee
A $30 application fee must accompany all applications for admission. This fee is not refundable nor is it applied toward the payment of any other fee. The application fee is honored for one year from the semester for which the student is applying.

#### Additional Fees Paid by Graduate Students
Graduate students will be charged fees at a higher rate than undergraduates. (Please see the Fee Schedule.)

#### Additional Fees Paid by Out-of-State Students
Resident or non-resident status for fee purposes is determined by Montana statutes and regulations of the Board of Regents. A copy of these regulations may be obtained by visiting or writing the Office of Admissions.

Students of legal age and minors whose parents have not established residence for fee purposes are required to pay the non-resident fees. See statutes and regulations of the Board of Regents. A copy of these regulations may be obtained by visiting or writing the Office of Admissions.

### Non-matriculated Fees
An adult not regularly enrolled at Montana State University may, with permission of the instructor, register for a non-laboratory class upon the payment of the same fees as students enrolled for credit. The person so registering may not participate in class discussion or take examinations. Applications for non-matriculated enrollment should be made through the Registrar, who will provide a form for approval by the instructor.

#### Auditor's Fee
Regularly enrolled students who register for courses without credit pay the same fees as students enrolled for credit.
which the recipient expects to qualify. Phone 406-994-3661 for additional information.

State Benefits
The tuition is waived at any of the units of the Montana University System for children of members of the United States armed forces who served on active duty during World War II, the Korean, Vietnam, Iraq or Afghanistan conflicts and who, at the time of entry into service, had legal residence in Montana and who were killed in action or who died as a result of injury, disease, or other disability incurred while in the service. Children who desire to study under the “War Orphans” educational law must enter any of the Montana University System institutions before the age of twenty-five to be eligible for waiver of tuition. Application for the waiver of tuition must be made, well in advance of the date of anticipated enrollment, to the Commissioner of Higher Education (2500 Broadway, Helena, Montana 59620-3101), who will determine eligibility and notify the student and the Office of Financial Aid Services of the institution.

American Indian Tuition Waiver
Montana Residents of one-fourth American Indian blood or more, or enrolled members of a state or federally recognized Indian Tribe which is located within the boundaries of the State of Montana, are eligible for a tuition waiver upon satisfaction of financial need. Contact Financial Aid Services for more information.

Senior Citizen Tuition Waiver
In state tuition may be waived for Montana citizens who are (65) sixty-five years of age or older. The application for Senior Citizen Tuition Waiver may be found at www.montana.edu/wwwfa/forms.html or at Financial Aid Services located in Room 183 Strand Union Building (SUB). Submit the completed application and supporting documentation to Financial Aid Services for processing. A completed application is required for each semester of attendance.

Faculty and Staff Tuition Waiver
Permanent staff employed at least three-quarter time for the entire term are eligible for a waiver of resident tuition for up to six credits. The Faculty & Staff Tuition Waiver Request form may be downloaded at www.montana.edu/wwwfa/forms.html. These forms are also available at Financial Aid Services. Once this form is completed and signed by the required parties, it can be submitted to Financial Aid Services for processing. A completed application is required for each semester of attendance and due by the 15th class day. This waiver does not apply to self-supporting courses offered by Extended University.

Dependent Partial Tuition Waiver
Dependents of employees with five or more years of service employed at least three-quarter time are exempt from 50% of their resident tuition. The tuition waiver does not apply to non-credit, continuing education or other self-supporting courses. Dependents may utilize the tuition waiver to take courses in any two-year or certificate program, and to obtain a first baccalaureate degree at any unit of the Montana University System. Employees who utilize the faculty and staff tuition waiver are not eligible for a dependent tuition waiver during the same academic term. Only one dependent may utilize the dependent tuition waiver in an academic term. Electronic application instructions can be found at http://www.montana.edu/wwwfa/dptw.html.

Refund of Fees
Drop/Add
Students dropping courses during the first fifteen class days are currently given a full refund for those courses. Fees for courses dropped after the fifteenth class day will not be refunded. The drop refund policy is subject to change. For summer term, please see the refund schedule located here.

The health, dental, and athletic activity fees will not be refunded to students dropping to a credit load of less than seven credits if services have been provided.

University Withdrawal
Fees except those listed below will be refunded based upon the following schedule, unless otherwise required by the Higher Education Act of 1965 as amended. The Office of Student Success records will establish the date used for refunding. Refunds will not be granted for withdrawals after the completion of the term.

Non-refundable fees are: registration fee, ID fee, orientation fee, late fee, tuition payment plan fees, social fees, foreign student fee, dorm deposit, new student fee, and transfer student fee.

If health and/or dental services have been provided, NO refunds of those fees will be given.

If health and/or dental services have NOT been provided, the refund amount will be based upon the following schedule:

<table>
<thead>
<tr>
<th>Days of Instruction</th>
<th>Percent Refunded</th>
</tr>
</thead>
<tbody>
<tr>
<td>Registration Day</td>
<td>100</td>
</tr>
<tr>
<td>1-5</td>
<td>90</td>
</tr>
<tr>
<td>6-10</td>
<td>75</td>
</tr>
<tr>
<td>11-15</td>
<td>50</td>
</tr>
<tr>
<td>16-on</td>
<td>0</td>
</tr>
</tbody>
</table>

Financial Aid and Student Employment
Office of Financial Aid Services
The Office of Financial Aid Services at Montana State University administers federal, state, and institutional aid programs designed to help eligible students pay for their educational expenses. Amounts of awards vary and depend upon the student’s financial need as well as the amount of funds available for distribution.

To apply for financial aid, students and parents of dependent students must file the Free Application for Federal Student Aid (FAFSA) each year. The FAFSA can be filed electronically at www.fafsa.gov (http://www.fafsa.gov).

To be eligible for financial aid, an individual must be a citizen or permanent resident of the United States and have applied for admission to the University as a degree-seeking student. Priority consideration is given to students who file the FAFSA by MSU’s financial aid priority filing date, which is March 1 of the preceding year (e.g., March 1, 2016 for the academic year beginning in Fall Semester 2016).

Students applying for financial assistance are considered for all aid programs for which they are eligible. Assistance is offered in the form of grants, scholarships, tuition waivers, student and parent loans, and work opportunities.

Publications describing the different programs, eligibility criteria, satisfactory progress, and application procedures are available via the Internet at www.montana.edu/wwwfa/, or at the Office of Financial Aid Services, 183 Strand Union, P.O. Box 174160, Bozeman, MT 59717-4160. Our telephone number is: (406) 994-2845.

Both undergraduate and graduate students may apply for aid. Assistance to graduate students is generally limited to long-term loans and work
opportunities. Information on graduate fellowships, scholarships, and assistantships may be obtained from The Graduate School.

Although student expenses will vary according to differences in courses of study, residency status, housing arrangements, transportation costs, and other factors, the table of estimated expenses may be used to determine the projected cost of education for a school year (two semesters). In estimating costs, between-semester expenses should not be overlooked.

Please remember that policies and procedures governing financial assistance at MSU are subject to change at any time, without prior notification or publication, due to changes in university, state, and/or federal guidelines and regulations.

The Office of Financial Aid Services is open Monday through Friday from 8:00 AM to 5:00 PM or as otherwise posted. The office is located in Room 183 in the Strand Union Building which is equipped with an elevator for disabled students.

### Fee Descriptions

**Registration Fee** is a flat non-refundable processing fee of $30.00 charged to each student.

**The Tuition and Fees** on the student bill is the total of the tuition fee, registration fee, building fees, information technology fee, computer fee, student equipment fee, health and dental fees, ASMSU fees, athletic fee, and SFEP fee. The Tuition and Fees for more than 12 (twelve) credits is the same as for 12 (twelve) credits.

**Tuition** is a mandatory per credit hour fee based on the number of credits selected and the status of the student (resident, non-resident, Western Undergraduate Exchange Program, or graduate). On the fee chart, the Non-Resident Tuition Fee consists of the Resident Fee (paid by resident students) plus the Non-Resident Fee, which is the portion of the Tuition Fee covered on behalf of resident students by Montana state taxes.

**Building Fees** are mandatory per credit hour fees and are used to repay bonds that financed the construction and/or remodeling of university buildings. Students have also voted to continue paying some building fees for major maintenance needs after the bonds have been repaid. The Building Fees for state resident students include: Student Building Fee; Academic Building Fee; PE Complex; Health Operations; Strand Union Operations; and PE Building Fee. The Building Fees for non-resident students include all of those for resident students plus the Non-Resident Building Fee. The Non-Resident Building Fee is that portion of bonds that are covered on behalf of resident students by Montana state taxes.

**Computer Fee** is a mandatory per credit hour fee used to provide and enhance student computer labs and access.

**Student Equipment Fee** is a mandatory per credit hour fee used to provide and enhance classroom and student lab equipment.

**Information Technology Fee** is a mandatory per student fee for partial funding of the student administrative software.

**Health and Dental Fees** are mandatory fees charged to all students registered for seven (7) credits or more. These fees are for maintaining the Student Health and Dental Clinic.

**The Associated Students of Montana State University (ASMSU) Fees** are mandatory fees charged to all students registered for seven (7) credits or more. ASMSU Fees are set by student vote.

ASMSU Activity Fee provides for the operation of the student government (ASMSU) and its committees.

ASMSU Intramural Fee contributes to the operational cost of the intramural facilities and programs.

**Payment of the ASMSU Activity Fee** and the ASMSU Intramural Fee entitles the student to participation in ASMSU student government and use of gym, swimming, weight room facilities, day care facilities, legal aid, tutoring, and other sponsored activities.

ASMSU Bus Fee funds a local bus system for students.

ASMSU Student Leadership Fee provides funding to the MSU Leadership Institute.

ASMSU Student Sustainability Fee contributes to the promotion and implementation of sustainable practices.

ASMSU Student Organization Fee supports registered student organizations.

ASMSU Student Press Fee funds the student newspaper, The Exponent.

ASMSU Outdoor Recreation Fee funds the Outdoor Recreation Program.

**Athletic Fee** is a mandatory fee charged to students registered for seven (7) credits or more that is used to support the Bobcat Athletic program.

**SFEP Fee** includes funds pledged for debt service on the Student Facilities Enhancement Project, as well as Operations & Maintenance fee for the Health & PE Complex.

**Student Medical Insurance Fee** is a mandatory medical insurance program (by ASMSU vote) for all students registered for six (6) credits or more. Students may waive the insurance if they have other medical insurance. Dependent coverage is available by contacting the Student Insurance Office at 104 Swingle or 994-3199.
Curriculum, Enrollment, & Graduation

- Catalog and Curriculum (p. 49)
- Registration (p. 49)
- Examinations (p. 51)
- Credits and Grades (p. 51)
- Dean’s List and President’s List (p. 53)
- Scholastic Probation and Suspension (p. 54)
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- Name Change (p. 56)
- Transcript of Record (p. 56)

Catalog and Curriculum

Catalog in Effect
MSU-Bozeman undergraduates may elect to follow the catalog in effect when they first enroll at MSU, or any subsequent catalog, if there has not been a break of more than one academic year in their attendance and if they fall within the six-year catalog limitation policy. Undergraduate students transferring from any regionally accredited United States college or university may follow the MSU catalog which was in effect when they first entered the institution from which they transferred, or any subsequent catalog in effect prior to graduation, provided there has been no break in attendance. The six-year catalog limitation policy applies to transfer students, also.

MSU undergraduates who change majors may follow the catalog in effect when they began their freshman year at MSU or any subsequent catalog in effect prior to their graduation, provided there has been no break in attendance of more than one academic year. In these instances, too, the six-year catalog limitation policy applies. In either case (transferring or changing majors), it may be necessary to make course substitutions within the department curricular requirements, due to changes in tabulations from year to year; students should consult with their academic advisors about this. The curriculum advisor and department certifying officer make the official check on degree-specific requirements for graduation. The Registrar provides the final check on university requirements: CORE, total credits earned, grade point, cumulative grade point average earned at MSU, as well as university-wide requirements.

Six-Year Catalog Limitation Policy
Each MSU-Bozeman catalog covers a specific time period beginning fall semester of the first year and ending the following summer session. From the time a student enters Montana State University, he or she has six years to fulfill the curricular requirements stated in the catalog in effect when he or she entered. If a student does not complete the requirements in six years, he or she must select a subsequent catalog. This policy applies to all students, including undergraduates who change curriculum and transfer students.

Change of Major/Curriculum
A Curriculum & Catalog Changes form may be obtained from the Registrar’s Office, the college dean’s office, or online. A change of curriculum becomes official when the form is filed with the Registrar’s Office.

Second Major
A student may declare a second major by completing a Curriculum & Catalog Changes form. A student may earn a second major by fulfilling the curricular requirements of that major in addition to the requirements of the primary major. The student is not required to complete additional core requirements for the second major since these requirements will be fulfilled with the primary major.

The department of the second major will assign an advisor to assist the student in meeting all the second major’s requirements. The second major will be posted on the student’s transcript at the time of graduation and upon verification by the Registrar that all curricular and procedural requirements have been met.

Second Bachelor’s Degree
There are two distinct methods for obtaining more than one bachelor’s degree:

A student who has already completed requirements for one bachelor’s degree must complete a minimum of thirty additional credits (nine of which must be upper division), all curriculum requirements of the second degree, and two semesters in residence at Montana State University after receiving the first degree. All courses listed on the student’s transcript at the time the first degree is granted are considered as required for and/or applied toward the first degree. None of the credits on the student’s transcript at the time the first degree was awarded may count toward the 30 additionally required credits. A second degree student will not be required to complete additional University Core requirements, with the exception of students who have international degrees.

A student may work concurrently toward receipt of two bachelor’s degrees. These degrees may be awarded at the same time. In this case, the student must complete the courses required in both curricula and at least 30 credits beyond the larger number of credits required for the two degrees he or she is seeking. Fifty-one credits (forty-two credits for the first degree; nine for the second) of the total minimum number of credits required for both degrees must be upper division. A student working under this option must declare his or her intentions by submitting a completed Curriculum & Catalog Changes form.

Minors
A student must declare his or her intentions of seeking a minor(s), by submitting a completed Curriculum & Catalog Changes form prior to submitting a graduation application. A student must be currently enrolled in a baccalaureate degree program in order to declare a minor(s). The minimum number of credits required for a minor is twenty-one, with nine of those being upper-division credits. There are two categories of minors:

Teaching Minors
Teaching minors must be approved by the certifying officer in the Education Department.

Non-Teaching Minors
Non-teaching minors must be approved by the certifying officer in the related department.

Registration

Dates for Registration
The dates for registration are published in the Registration Handbook, which is printed prior to registration and is available online, via MyInfo, or from the Registrar’s Office. See the Registration Handbook for detailed registration instructions and for fee payment dates.
A currently enrolled student in good standing will receive registration information, including alternate PIN, from his or her advisor. Before meeting with an advisor, all students should review their degree progress using DegreeWorks (through MyInfo), plan a schedule of classes by consulting the MyInfo Schedule of Classes, and make an appointment to meet with an advisor. Additionally, all outstanding fees and holds must be resolved before registration, and students must pay all new fees at the scheduled time.

**Academic Advisors**

Academic advisors are available to help students plan their programs of study and make informed choices about courses. Although students are fully responsible for their academic decisions, they should recognize the advantages of close cooperation and understanding between themselves and their advisors.

Because academic advisors are usually associated with a students’ major department or field, students should contact their major departmental offices or the offices of their college deans to determine the names and locations of their advisors. Some programs—University Studies, Native American Studies, University Honors, pre-health professions, WWAMI—offer additional advising assistance.

**Classification of Students**

- **Freshman:** an undergraduate student who has earned less than thirty credits.
- **Sophomore:** an undergraduate student who has earned thirty to fifty-nine credits.
- **Junior:** an undergraduate student who has earned sixty to eighty-nine credits.
- **Senior:** an undergraduate student who has earned ninety or more credits.
- **Post-Baccalaureate:** an undergraduate student who has already earned one or more baccalaureate degrees and is seeking another.
- **Non-Degree Undergraduate:** a student taking courses for special interest, but not planning on using the credit toward a degree.
- **Non-Degree Graduate:** a student with at least a baccalaureate degree but not seeking another degree.
- **Graduate:** a student who has at least a baccalaureate degree and has been accepted into The Graduate School.

**Drop/Add Regulations and Procedures**

**Add Procedure**

Students may add classes online using MyInfo through the 5th day of the semester. After the 5th semester day, all adds require the instructor’s and the advisor’s signatures on an Add/Drop form. After the 10th semester day, all adds require the additional signature of the Assistant Dean of the student’s major curriculum on an Add/Drop form.

**Drop Procedure**

Students may drop classes online using MyInfo through the 10th day of the semester. After the 10th semester day, all drops require the instructor’s and the advisor’s approval communicated through signatures on an Add/Drop form. Between the 15th and 60th semester days, students may continue to drop courses, with the approval of the instructor and of the advisor, though the student will receive a “W” (withdrawn) grade.

**Drop for Extraordinary Reasons**

From the 60th day of the semester through the 70th class day (generally Friday before finals), students may only drop for extraordinary reasons. To complete this process the student is required to document the extraordinary reasons submit that documentation along with an advisor and instructor approved (signed) Add/Drop form to the Dean of the College of their primary degree. Upon review, approval, and signature of the Dean the form must be submitted to the Office of the Registrar for processing.

Add/Drop forms are available online or through the Office of the Registrar. If the student has confirmed attendance or paid fees and wishes to drop all courses, a University Withdrawal must be obtained through the Office of Student Success. Graduate students seeking a complete withdrawal must contact The Graduate School. Each student is responsible for fees upon registration. Contact the Student Accounts Office for partial-refund dates.

**Taking Courses for Zero Credit**

**Auditing Course**

Registered students may, with the permission of the instructor, audit a course and earn zero credit. A student must submit a signed Add/Drop form, by the 10th semester day, indicating the course is for audit. Auditors pay the same fees as students enrolled for credit.

**Non-Matriculated ("Listener")**

Any adult not regularly enrolled may, with the permission of the instructor, register for a non-laboratory class. Application forms for non-matriculated enrollment are obtained from the Registrar’s Office, and the Registrar reviews the completed application for compliance. Payment is required upon approval at the rate charged a regularly enrolled in-state student. A listener may not participate in class discussions or take examinations.

**Absence from Classes**

When students enroll in a course, they enter a contractual agreement with the instructor for the duration of the course, and both the student and the instructor are expected to honor the specified terms of that agreement. It is important, therefore, for the student to understand the attendance requirements in each course. The instructor should communicate these requirements during the first or second class meeting in writing via the course syllabus.

Absences from classes are handled exclusively within the purview of the individual instructor. If a student has an accident, falls ill, or suffers some other emergency over which he or she has no control, the student should gather available documentation (e.g., copies of repair or tow bills, prescriptions, accident reports, or statements from physicians) to show to instructor. In some instances, the student may wish to petition the instructor for partial grades.

The provisions for making up missed class work may vary from one instructor to another. Most but not necessarily all instructors provide for some opportunity to make up missed work; for example, if a student is absent from campus to participate in a university-sponsored event. Students involved in such activities should advise their instructors of these events in advance and determine what arrangements are available to make up missed class work.

**Class Rolls**

During the third day of University instruction and thereafter, those students who have registered but have not attended class may be required by the instructor to drop the course when space and/or equipment is limited and other students have requested to add that class. Students are not automatically dropped; this action requires a student-initiated drop/add form.

**University Withdrawal**

If a student must withdraw from all classes after he or she has confirmed attendance or paid fees, he or she must initiate the withdrawal through the
Office of Student Success. Graduate students must initiate the withdrawal through the Graduate School.

Students who withdraw before the end of the fifteenth day of instruction will not receive grades for any registered courses. Thereafter through the last day of instruction a grade of W shall be assigned in all courses for which the student is registered unless the Dean of Students authorizes otherwise. The Dean of Students Office also indicates the official date of the university withdrawal.

Students who leave the campus without withdrawing through regular channels or who withdraw late without extraordinary reasons will receive F grades in all course work for that semester.

Retroactive University Withdrawal Policy

A retroactive university withdrawal may be an option for students who were unable to complete a standard university withdrawal during the semester of their departure from the university. A retroactive university withdrawal is an extraordinary remedy that is available only for the reasons set forth below. Students who are granted a retroactive university withdrawal receive W grades in all courses for the semester in which they apply for the retroactive withdrawal. Requests for retroactive withdrawals must be submitted no later than three years from the last day of the semester for which the withdrawal is sought.

Students who leave the campus without applying at the Dean of Students Office for a university withdrawal during the semester of departure or who fail to withdraw through regular channels or who fail to withdraw for extraordinary reasons may apply for a retroactive university withdrawal only if they can provide evidence of the following:

1. The student had a debilitating illness or injury that significantly limited his/her capacity to withdraw in a timely manner; or
2. The student was forced to leave the University abruptly due to health or safety emergency within his/her immediate family; or
3. The student has been recommended to apply for a retroactive university withdrawal by the University Scholastic Appeals Board and meets the other criteria for a retroactive university withdrawal.

To apply for a retroactive university withdrawal, students must submit a formal letter of request to the Dean of Students, no later than three years after the last day of the semester for which the withdrawal is sought. The student must include his/her name, and student identification number, dates for the requested retroactive withdrawal, and supporting documentation to verify claims of illness, injury or emergency which precluded the student from applying for a university withdrawal during the semester of departure. The Dean of Students Office will assign the official date of the retroactive university withdrawal.

An Appellate Board will convene to review the request for a retroactive withdrawal upon receipt of appropriate verification of potential eligibility. Requests for a retroactive withdrawal will be considered by the Appellate Board only if sufficient documentation is provided to support claims of extraordinary illness, injury, or emergency. The review process will be limited to a review of documents and student records. The Dean of Students, in his/her capacity as Chair of the Appellate Board, shall inform the student of the Board’s decision with ten working days of the Hearing. The decision of the Appellate Board is final.

Undergraduate Student Petitions for Registration and Reservation of Certain Courses

Generally, courses are applied to the student record associated with the academic level (undergraduate or graduate) of the student at the time the course was taken. Students may petition to reserve certain classes in certain situation to be applied to an academic level other than their current status.

For example: register for and reserve undergraduate or graduate credits for possible application to a graduate degree, register for a graduate course for use toward an undergraduate degree, register while a student graduate for use toward an undergraduate degree, register for a graduate class as a foreign exchange student with no intent to use the credit toward an MSU degree.

To reserve a course a student must complete the Petition to Reserve/ Register for Credits form available through the graduate school. A successful petition must meet all of the following criteria:

1. The student is of senior or post baccalaureate standing.
2. The student has a cumulative grade-point average of at least 3.25.
3. All prerequisites for the course(s) have been completed.
4. Credits reserved for graduate degree may not exceed nine (9) in total.
5. For reserved credits to be applied to the graduate transcript the student must earn a minimum grade of a B.
6. The petition may not include any internship or independent study courses for either registration or reservation.
7. The petition is filed prior to registering for the course.

Undergraduate senior students with financial aid should be aware that credits reserved for future application to a graduate program may affect their current financial aid eligibility.

Examinations

Common Hour Exams

Common hour exams are given during the semester for multi-section courses. Dates and times are posted online at www.montana.edu/registrar/Schedules. These exams take the place of one class meeting and are included in the student’s commitment to the course upon enrolling in it. For the complete Common Hour Exam Policy, please go to the Code of Conduct, Policies, Regulations, & Reports (p. 59) section of the catalog.

Final Exams

Final examinations in one-credit courses are given during regular class periods. Final examinations for all other courses are scheduled by the Registrar and published online, and may not be rescheduled or given prior to the start of the final examination period. According to University policy, the examination period is instructional time, and it is expected that some instructional use is made of this period if a final examination is not given. When a final examination is given it must be given at the time shown in the examination schedule. Exception: no formal laboratory classes are held during final examination days.

A student who has three or more final examinations on any one day should first contact the instructors of the courses to see if one exam can be rescheduled. If this rescheduling cannot be resolved, then the student should contact the assistant dean of his or her college at least one week before the beginning of final examination week to assist in resolving the conflict.

Credits and Grades

Definitions

• Course. A course is a unit of instruction in a subject-matter area offered in a single university semester. Resident courses (courses for which resident credit is granted) are those listed in the Schedule of
Classes. Continuing education courses are arranged through Extended University.

- **Credit.** A credit is the unit used in computing the amount of work required for graduation. One credit is equivalent to three hours of work each week for one semester. One lecture hour assumes two hours of work outside of class. In the case of laboratories, library work, or studio classes, the entire time may be spent under the supervision of the instructor.

- **Credit Load.** Undergraduate students who are enrolled for twelve or more credits and graduate students for nine or more credits, will be certified and reported as full-time students. Completion of a 120-credit undergraduate curriculum in four years requires students to complete an average of fifteen credits each semester.

- **Curriculum.** A curriculum is a combination of courses that constitutes a program of study leading to the completion of an academic program.

- **Semester.** Montana State University operates on a semester system consisting of two semesters and a summer session. The Term Calendar gives the dates of each semester.

- **Grades.** The quality of the student’s work in each course is denoted by a letter grade according to the following tabulation. In computing scholastic averages, each letter grade is assigned a specific number of grade points for each credit. Final grades are due within forty-eight hours after the final examination in each course and are generally posted to the student record by the end of the week following finals.

  No grade or credit will be given to students in courses for which they have not been enrolled and for which they have not been certified and reported as full-time students. Completion of a 120-credit undergraduate curriculum in four years requires students to complete an average of fifteen credits each semester.

### Minimum Competency Requirements

The Montana Board of Regents has established a common policy on minimum course grades across all campuses in the system. According to the policy, a grade of C- or better is required to satisfy requirements for pre-requisite and required courses in majors, minors, and certificate programs and for all core requirements. Further, a grade of C- or better is required in all courses that will be counted toward the upper-division requirements for reasons such as apparatus or equipment failure, death or illness in the immediate family, family emergencies, or military orders. The Dean of Students will verify personal hardship cases at the instructor’s request. The instructor may assign an I grade to a student for personal hardship, provided the student has completed three-fourths of the work of the course with a passing grade. If the student has not satisfactorily completed three-fourths of the course work the instructor must provide written justification for assigning an I grade.

For repeated courses, only the credits and grades received the last time the course was taken will be included in the cumulative grade-point average. GPA is used to determine academic standing including: University probation, suspend warning, or suspended. The grade-point average is computed by dividing the sum of grade points earned by the sum of credits carried, except that neither the credits nor the grade points shall be counted for courses passed on a pass/fail basis.

#### W Grade Eligibility

After the 15th day of the semester, students may drop courses and receive a grade of W (withdrawal) only if approved by the academic advisor and course instructor. Approval is not guaranteed, and no refund is given. Until one week past the last day of the official registration period for the following semester, students use a Drop/Add form to drop courses with a W. The W grade is non-punitive; it counts in credits attempted but not in earned credits or in quality points toward the GPA. If a student repeats the course in a subsequent semester, the new grade will count in the GPA but the original W grade will remain on the transcript.

#### I Grade (Incomplete)

Instructors may assign a grade of “I” (Incomplete) when students have been unable to complete their academic obligations because of circumstances beyond their control. The University takes the position that when students register, they commit themselves to completing their academic obligations as their primary responsibility. Therefore, the instructor may assign an I grade only in cases when students have suffered extreme personal hardship or unusual academic situations.

An instructor may assign an I grade in cases of personal hardship when students have been unable to fulfill their commitments because of illness, death or illness in the immediate family, family emergencies, or military orders. The Dean of Students will verify personal hardship cases at the instructor’s request. The instructor may assign an I grade to a student for personal hardship, provided the student has completed three-fourths of the work of the course with a passing grade. If the student has not satisfactorily completed three-fourths of the course work the instructor must provide written justification for assigning an I grade.

An instructor may also assign an I grade, subject to the department head’s approval, in cases when a student has been unable to complete course requirements for reasons such as apparatus or equipment failure, death or disease in experimental animals, delays in material shipments from
suppliers, or in other unusual academic circumstances which are clearly beyond the student’s control. In these situations, the student must have completed three-fourths of the work of the course with a passing grade. If the student has not satisfactorily completed three-fourths of the course work the instructor must provide written justification for assigning an I grade.

In each instance qualifying for an I grade, the instructor must prepare an I-Grade Authorization form. On this form, the instructor will list the makeup requirements and the date beyond which the I will revert to a F grade.

To change the I grade after the make-up work has been completed, the instructor will complete and submit the Grade Change available through the Registrar’s Office. Unless an alternate time is specified by the instructor, an I grade shall be made up no later than the end of the following semester (excluding summer session). An instructor may extend the specified completion time by submitting the required documentation to the Registrar’s Office before the reversion grade takes effect. An I grade may not be extended beyond one calendar year. An I grade not made up in the prescribed length of time or within one calendar year lapses to a failure (F).

Make-Up of I Grades
An I Grade make-up is reported to the Registrar on a Grade Change Form. No fee is charged. These grades are not included on the next semester grades.

During the time allowed for the completion of the unfinished work leading to the I grade, the student may have access to university resources (e.g., library) necessary to complete the work.

N Grade
An N grade may be assigned to students enrolled in specified continual or on-going courses only (for example 590 and 690 thesis courses). This grade indicates that, though students have made progress, they have not completed the course objectives successfully. These students must re-enroll in the course immediately in order to continue with the course work and complete the course objectives. The N grade does not affect the GPA.

Pass/Fail Grading
As a general policy, courses at Montana State University are graded by the letter grades, A, A-, B+, B, etc. However, in certain courses, pass/fail grading may be more appropriate. Courses may be offered on a pass/fail basis for all students registered in the course, with the approval of the department head and college dean. Courses offered on a pass/fail basis will be identified in the Schedule of Classes. Permission to offer a course on a pass/fail basis is limited to one academic year; if the permission is not renewed, the course reverts to a letter-grade basis.

In pass/fail grading, passing work will receive a P grade on the student’s transcript, but it will not count in the grade point average. However, the course credit will count toward the number of credits required for graduation. Failing work will receive an F grade and will count in the grade-point average.

Grade Changes
Once a grade has been reported by the instructor to the Registrar, it cannot be changed except in case of clerical error or unless it was fraudulently obtained. All grades and credits will stand as recorded in the Registrar’s official record if changes are not reported in writing to the Registrar within five years of the last day of the semester in which the course was taken.

A change of final grade does not mean allowing additional time to complete the work of a course or allowing the student to submit work or to take or to retake examinations after the conclusion of the semester. A change of grade is not a substitute for an I grade when an I grade cannot be justified.

A change of grade may be made only with the approval of the department head. If the grade being changed was given more than one academic year previously, the college dean must also approve the change.

Fresh Start Policy
A former Montana State University undergraduate who returns to the University after a minimum absence of five years will have the opportunity to petition to begin a new cumulative (or Fresh Start) GPA as follows:

1. After returning to Montana State University, a student must complete thirty credits of academic study with a minimum cumulative GPA of 2.5 for the new course work before petitioning for a Fresh Start GPA.
2. A student who is eligible for a Fresh Start GPA must petition for a new cumulative GPA during the semester following that in which he or she meets the requirements stated in #1.
3. A student may begin a Fresh Start GPA only once.
4. Student petitions will be considered on a case-by-case basis by the Admission and Graduation Requirements Board. The decisions of the Board will be final.
5. When the new GPA is started, all previous grades and credits earned at Montana State University are excluded; it is not possible to select some grades and credits to exclude while retaining others. Only Montana State University grades and credits will be excluded.
6. The new GPA begins the first semester the student is re-enrolled. The transcript will state that a new GPA has been started. The old grades will remain on the transcript. Although old credits will appear on the transcript, they may not be used to fulfill any University requirements.

Students wishing to petition for a Fresh Start GPA should contact the Registrar’s Office to initiate the process.

Dean’s List and President’s List
Any undergraduate student who passes twelve or more college-level credits and attains a 3.50 grade-point average or better for any one semester is placed on the Dean’s List. A student who receives a 4.00 grade-point average and is taking twelve college-level credits or more is placed on the President’s List. Developmental courses do not count towards the twelve
credits required. The names of the students making the Dean’s List and President’s List are announced by the Registrar at the end of each semester. These lists apply only to undergraduate students.

**Scholastic Probation and Suspension**

When a student’s semester or cumulative grade-point average falls below 2.0, the record of the student’s performance is reviewed by the University Scholastic Appeals Board, which is composed of the Senior Vice Provost for Academic Affairs, the Dean of Students, and the dean or assistant dean of the college concerned. The board meets between semesters and at other times as needed to act upon individual cases recommended for either suspension or transfer out of a curriculum. This board has the authority:

1. to suspend a student from the University for scholastic reasons,
2. to reinstate a student who has been suspended for scholastic reasons, and
3. to require a student to transfer out of a curriculum with the consent of both colleges involved.

The chairperson of this board will notify students in writing of the action. (The designation probocation, suspension warning, or suspension will be entered on the student’s permanent record.) Semester grade reports indicate the status of students, and it is the individual student’s responsibility to review his or her grade report each semester.

**Appeal of Suspension**

A student who has been suspended may appeal the suspension if he or she believes there were extraordinary circumstances beyond the student’s control of which the University Scholastic Appeals Board was unaware when it reached its decision. Appeal forms are available from the offices of academic deans.

**Reinstatement**

A student who was suspended for the first time may be reinstated after one semester has elapsed (exclusive of Summer Session). In order to enroll again at MSU, however, a suspended student must submit an Intent to Register form to the Registrar’s Office. After a second suspension, one academic year must elapse before the student will be reinstated, again with submission of an Intent to Register. Students may complete their intent to register online through their MyInfo account. Completed Intent to Register submissions must be received by the following approximate deadline dates (check with the Registrar’s Office for current deadline dates).

### For Reinstatement | Deadline
---|---
Fall Semester | August 1
Spring Semester | January 1
Summer Session | May 1

Students who have received more than two suspensions must petition for reinstatement through their academic dean to the University Scholastic Appeals Board. Petitions are available from the academic deans and must be submitted in accordance with the deadlines listed above.

Reinstated students will be on “probation” when they re-enroll. When students achieve a term and cumulative GPA of 2.00 and above, the “probation” designation is removed. Students must have a 2.00 term and cumulative GPA to graduate.

**Guidelines Used by the University Scholastic Appeals Board**

Grade Point Average (TGPA = Term GPA, CGPA = Cumulative GPA)

<table>
<thead>
<tr>
<th>Previous Status</th>
<th>Previous</th>
<th>Good Standing</th>
<th>College Probation</th>
<th>University Probation</th>
<th>Continuing</th>
<th>College Probation</th>
<th>Suspension Warning</th>
<th>College Probation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Good Standing</td>
<td>0 ≤ TGPA &lt; 1</td>
<td>1 ≤ TGPA &lt; 2</td>
<td>2 ≤ TGPA ≤ 4</td>
<td>2 ≤ TGPA ≤ 4</td>
<td>0 ≤ CGPA &lt; 2</td>
<td>0 ≤ CGPA &lt; 2</td>
<td>0 ≤ CGPA &lt; 2</td>
<td>0 ≤ CGPA &lt; 2</td>
</tr>
<tr>
<td>College Probation</td>
<td>Suspension</td>
<td>Warning</td>
<td>Suspended</td>
<td>Suspended</td>
<td>Suspended</td>
<td>Suspended</td>
<td>Suspended</td>
<td>Suspended</td>
</tr>
<tr>
<td>University Probation</td>
<td>Suspension</td>
<td>Warning</td>
<td>Suspended</td>
<td>Suspended</td>
<td>Suspended</td>
<td>Suspended</td>
<td>Suspended</td>
<td>Suspended</td>
</tr>
<tr>
<td>Continuing College Probation</td>
<td>Suspension</td>
<td>Warning</td>
<td>Suspended</td>
<td>Suspended</td>
<td>Suspended</td>
<td>Suspended</td>
<td>Suspended</td>
<td>Suspended</td>
</tr>
<tr>
<td>Suspended (Re-instated)</td>
<td>Suspension</td>
<td>Warning</td>
<td>Suspended</td>
<td>Suspended</td>
<td>Suspended</td>
<td>Suspended</td>
<td>Suspended</td>
<td>Suspended</td>
</tr>
</tbody>
</table>

* These academic actions appear on the student’s transcript.

**Good Standing**

A student has both a term GPA and cumulative GPA of at least 2.00 or better or is a new student (transfer students may be admitted on university probation).

**College Probation**

A student in “good” standing has received the first term GPA between 1.00 and 1.99.

**Continuing College Probation**

A student previously on College Probation has raised the term GPA above 2.00 but the cumulative GPA is not above 2.00.

**University Probation**

A student previously on University Probation has raised the term GPA above 2.00 but the cumulative GPA is not above 2.00, or has received a term GPA between 0.00 and 0.99 after being in “Good” standing.

**Suspension Warning**

A student has received a term GPA less than 2.00 for the past two terms. One more term with a GPA less than 2.00 will result in suspension.

**Suspension**

Students will be required to sit out one term on their first suspension and one year on their second suspension. Third suspensions will be handled on an appeal basis only.

All students in either College Probation, University Probation, or Suspension Warning status remain in some form of probationary status until both their most recent term GPA and their cumulative GPA are above 2.0.

**Credits for Degree Completion**

**Credits**

A candidate for the bachelor’s degree must complete the minimum number of credits required for the degree selected. The minimum number of credits must be composed of credits earned for graduation. The required number of credits varies among the four-year curricula leading to the bachelor’s degree.
Credits Earned for Graduation
Credits earned for graduation include the total number of credits for which passing grades (A through C-, and P) have been received in courses numbered 100 and above. If students repeat courses in which they have passing grades, the most recent grade will be the effective grade for graduation. A course taken by an undergraduate or a non-degree student may not later be repeated and applied toward requirements for a graduate degree. For further credit-use restrictions, see Special Topics and Individual Problems, or refer to the Course Descriptions for maximum allowable credit limits placed on certain courses.

Upper-Division Credit Requirement
A minimum of forty-two credits for the first degree and at least nine additional credits for the second degree must be earned in courses numbered 300 and above (upper-division courses). As required by the Minimum Competency Requirements, a grade of C- or better is required in all courses to be counted toward the upper division credits required in all degrees.

Note: The curricula for specific majors may have more stringent requirements.

Special Topics and Individual Problems Courses
No more than twelve credits of Special Topics 291 or 491 combined in each rubric will count toward graduation. No more than six credits of 492 Independent Study in each rubric will count toward graduation. Some departments have established lower limits than these, and students are responsible for checking course listings to ensure that they do not exceed the allowable number of credits in each category.

Transfer Student Credit Requirements at MSU-Bozeman
To graduate from Montana State University, transfer students must earn not less than thirty MSU credits and a minimum 2.0 cumulative GPA, as well as meet the curriculum requirements for a degree. Furthermore, twenty-three of the last thirty credits earned to meet graduation requirements must be MSU credits.

Correspondence Credits and Extension Courses
No more than thirty semester credits earned by correspondence, extension, or continuing education from accredited colleges or universities may be counted toward graduation. However, special circumstances may warrant consideration, and approval of such courses is on a case-by-case basis.

Advanced Standing
Under certain circumstances, if students can demonstrate mastery of course work not taken at the University, they may receive advanced standing and University credit for the course. Two mechanisms are available for obtaining advanced standing:

1. College Level Examination Program (CLEP). Montana State University awards credit toward graduation for successful performance in certain Subject Examinations of the College Level Examination Program conducted by the College Entrance Examination Board. Students may arrange to take these examinations on campus or at designated centers throughout the country. Passing grades are determined by Montana State University. These students receive credit and a P grade on the transcript for scores above the passing level; scores below the passing level are not entered on the transcript. CLEP examinations do not apply as a grade waiver for a course previously taken. University Core requirements cannot be satisfied by the CLEP procedures. In general, a department will not give a challenge examination if a CLEP examination is available for the same course.

2. Advanced Standing by Challenge. Challenge provides the opportunity to earn college credits and grade points without formal course enrollment. A student who has completed the work of a college course on his or her own initiatives and time, may, with the approval of the student’s academic advisor, the instructor, the department heads, and the college deans, take a comprehensive examination in the subject matter of the course. Performance in the examination will become the basis for a grade in the course, and the results will be recorded on the student’s permanent academic record at the end of the term which the challenge exam is taken. Official permission forms should be secured in advance from the Registrar’s Office. Students must be registered at MSU when they take the challenge examination, and they must have passed ten credits of regular course work at Montana State University before the challenge grade will be recorded on their permanent records.

The challenge examination for credit in a course which is a prerequisite to a second course must be taken before enrollment in the second course. Students who have enrolled in a regular or an extension course and received a grade (including that of W) or have taken a regular or an extension course for zero credit may not challenge that course. Challenges are not permitted in any 290, 291, 292, 490, 491, 492 and 498 courses.

A fee of $30 per credit is assessed and must be paid prior to taking the challenged exam.

The following list gives the names of the CLEP examinations and the course for which credit is given:

<table>
<thead>
<tr>
<th>Code</th>
<th>Course Description</th>
<th>Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>NRSM 101</td>
<td>Nat Resource Conservation</td>
<td>Natural Resource Conservation</td>
</tr>
<tr>
<td>BI0B 170IN</td>
<td>Principles of Biological Diversity</td>
<td>Gen Biology</td>
</tr>
<tr>
<td>BI0B 160</td>
<td>Principles of Living Systems</td>
<td>Gen Biology</td>
</tr>
<tr>
<td>ECNS 101IS</td>
<td>Econ Way of Thinking</td>
<td>Intro Microcon</td>
</tr>
<tr>
<td>ECNS 202</td>
<td>Prin of Macroeconomics</td>
<td>Intro Microcon</td>
</tr>
<tr>
<td>EDU 222IS</td>
<td>Educ Psych &amp; Child Development</td>
<td>Sch Age Educ Psych</td>
</tr>
<tr>
<td>LIT 110H</td>
<td>Intro to Lit</td>
<td>Analysis &amp; Interp of Lit</td>
</tr>
<tr>
<td>HSTR 101IH</td>
<td>Western Civilization I</td>
<td>Western Civilization I with essay</td>
</tr>
<tr>
<td>HSTR 102IH</td>
<td>Western Civilization II</td>
<td>Western Civilization II with essay</td>
</tr>
<tr>
<td>HSTA 101IH</td>
<td>American History I</td>
<td>Am Hist I with essay</td>
</tr>
<tr>
<td>HSTA 102IH</td>
<td>American History II</td>
<td>American History II with essay</td>
</tr>
<tr>
<td>M 151Q</td>
<td>Precalculus</td>
<td>Precalculus</td>
</tr>
<tr>
<td>M 171Q</td>
<td>Calculus I</td>
<td>Calc with Elem Fncts</td>
</tr>
<tr>
<td>FRCH 101</td>
<td>Elementary French I</td>
<td>Col French I</td>
</tr>
<tr>
<td>FRCH 102D</td>
<td>Elementary French II</td>
<td>Col French I &amp; II</td>
</tr>
<tr>
<td>FRCH 201D</td>
<td>Intermediate French I</td>
<td>Col French I &amp; II</td>
</tr>
<tr>
<td>GRMN 101</td>
<td>Elementary German I</td>
<td>Col German I</td>
</tr>
<tr>
<td>GRMN 102D</td>
<td>Elementary German II</td>
<td>Col German I &amp; II</td>
</tr>
<tr>
<td>GRMN 201D</td>
<td>Intermediate German I</td>
<td>Col German I &amp; II</td>
</tr>
<tr>
<td>SPNS 101</td>
<td>Elementary Spanish I</td>
<td>Col Spanish I</td>
</tr>
<tr>
<td>SPNS 102D</td>
<td>Elementary Spanish II</td>
<td>Col Spanish I &amp; II</td>
</tr>
<tr>
<td>SPNS 201D</td>
<td>Intermediate Spanish I</td>
<td>Col Spanish I &amp; II</td>
</tr>
<tr>
<td>PSCI 210IS</td>
<td>Intro to American Government</td>
<td>Am Govt</td>
</tr>
<tr>
<td>BI0B 110CS</td>
<td>Introduction to Plant Biology</td>
<td>Plant Science, Resource &amp; Environment</td>
</tr>
</tbody>
</table>
In general, a department will not give a challenge examination if a CLEP examination is available for the same course.

Deficiencies, I, and F Grades
All “I” grade completions, transfer work, advanced standing, and challenge examinations must be completed and transcripts filed in the Registrar’s Office at least one month before the end of the semester of expected graduation.

Graduation Registration Requirements for Baccalaureate Degrees
Graduation Registration Requirements
A student must be registered at Montana State University the semester of his or her graduation. If the student is not required to take any courses at Montana State University during the final semester, he or she must process an “in absentia” registration and pay a registration fee of $30 before the end of the third week of the semester he or she expects to earn a degree. Arrangements for this registration must be made by the student with the Registrar. Graduate students must have the written permission of the Graduate Dean to register in absentia.

Enrollment must coincide with the university’s offering of a specific credential. A student must enroll and complete at least one course for credit during the time a credential is offered in order to receive that credential. Retroactive awarding for a newly approved and offered credential when all credits earned preceded that offering is not permitted.

Except for certain pre-professional curricula (e.g., pre-medicine), twenty three of the last thirty credits earned to meet the graduation requirement must be MSU credits. Specific majors may have program-specific requirements for courses that must be taken from MSU to meet graduation requirements. Such requirements are clearly identified in the curriculum description for that department.

Graduation Procedures
Notification of Degree Eligibility
Students are expected to submit an Application for Baccalaureate Degree form by October 1st for spring semester graduation and March 1st for summer or fall semester graduation. A $30 degree application fee is assessed at the time the Application for Degree form is filed. Returning former students must file the application during the first week of university instruction of the semester of completion. Application for Degree forms can be moved from one semester to the next within one academic year. If it is necessary to delay graduation the student must file a new Application for Degree resulting in an additional $30 fee.

Satisfaction of Financial Obligation
All candidates for degrees must fully satisfy their financial obligations to the University (or make arrangements with Montana State University for doing so) as a condition for completing their degree programs. Candidates failing to comply with this requirement shall not be eligible for graduation, diplomas, degrees, or any transcripts of their records.

Graduation Grade Point Average
In order to graduate, students must earn a cumulative grade point average of 2.00. Further restrictions and graduation requirements may be imposed by the various curricula. To receive a graduate degree from MSU-Bozeman, students must earn a 3.00 grade point average.

Graduation with Honors
Graduation with honors or highest honors applies only to undergraduate degrees.

To receive honors, a student must earn a cumulative grade-point average between 3.25 and 3.69. To receive highest honors, a student must earn a minimum cumulative grade point average of 3.70. Cumulative grade point averages are computed at the end of the semester of graduation.

All MSU credits attempted and grades received will be used in computing graduation with honors or highest honors.

Transfer students receiving their first baccalaureate degree must meet the cumulative grade-point average requirements stated above and complete a minimum of sixty semester credits at MSU. The credits earned at MSU must compute to minimum grade point averages of 3.25 or 3.70 for graduating with honors or highest honors respectively.

For second degree or subsequent baccalaureate candidates, the grade point average of the first or subsequent degrees will be included in the determination of honors or highest honors.

Diplomas
Diplomas are dated the last day of the semester in which the requirements for the degree are completed. Diplomas are mailed to graduates the semester following degree completion after final degree verification is complete.

Appeals of Graduation Requirements
The Admission and Graduation Requirements Committee (GARC) is composed of the Assistant Vice Provost for Undergraduate Education (chairperson), the assistant dean of the college concerned, and the Registrar.

This board considers appeals and/or petitions from undergraduate and non-degree students seeking waivers of established requirements in special situations.

Instructions for submitting appeals and petitions are available through the Registrar’s Office.

These submissions should be forwarded by letter to the Registrar and should originate with the student in conjunction with the student’s adviser.

Student Records
Access to student records is restricted according to the Family Educational Rights & Privacy Act (FERPA). For more information see www2.montana.edu/policy/family_ed_privacy_act/. Questions regarding privacy of student records should be directed to the Registrar.

Name Change
Notice of legal change of name, resulting from marriage, divorce, or other reason, must be promptly filed with the Registrar. Name change forms are available from the Registrar’s Office and must be submitted with copies of a legal court document, driver’s license and Social Security card with new name before academic records can reflect any name change.

Transcript of Record
Transcripts are sent only at the signed request of the student. Transcripts may be requested online at www.montana.edu/registrar or may be requested in person at the Registrar’s Office, 101 Montana Hall, and for each transcript issued, a fee is charged. Transcript requests are generally processed
within four to six business days, though at the end of the semester, additional time is needed.

If the student requesting a transcript has an outstanding debt with the University, the request will not be processed until the bill has been paid.
Code of Conduct, Policies, Regulations, & Reports

Academic and Conduct Guidelines
Montana State University expects students to maintain acceptable standards of behavior on campus and in the community and to manifest a serious purpose by maintaining satisfactory scholastic standing in their coursework. Students who show persistent unwillingness or inability to comply with these requirements will not be permitted to continue his or her affiliation with the University.

A complete statement of the guidelines and procedures concerning academic integrity and student conduct is contained in the Student Code of Conduct (http://www2.montana.edu/policy/student_conduct).

The following identifies the responsibilities of all MSU students as defined by the Student Code of Conduct. The entire code of conduct can be found at www.montana.edu/knowyourcode/

Student Responsibilities

Academic Expectations
Students must:
1. be prompt and regular in attending classes;
2. be well-prepared for classes;
3. submit required assignments in a timely manner;
4. take exams when scheduled, unless rescheduled under 310.01;
5. act in a respectful manner toward other students and the instructor and in a way that does not detract from the learning experience; and
6. make and keep appointments when necessary to meet with the instructor. In addition to the above items, students are expected to meet any additional course and behavioral standards as defined by the instructor and listed in the syllabus.

A student officially representing MSU in athletic events, government, performance, or in similar official capacities, is entitled to the rescheduling of exams or important assignments due to required absences, only if a student has met the academic expectations outlined in section 310.00 of the Student Conduct Code. Students who do not meet the academic expectations, however, may not be entitled to special accommodations. Students are expected to provide course instructors with official notification of scheduled activity(ies) as early as possible, preferably at least ten (10) days in advance of the event.

Students participating in official MSU activities should not expect any special accommodation for attendance at regularly scheduled practice sessions or meetings (i.e., the routine activities required for performance, athletic pursuits, etc.).

Assistance
Students should seek assistance from the instructor and from the appropriate University support services (e.g., tutors, study skills counseling, career development, etc.), if the need for such services arises.

Evaluation
Students should follow fair and appropriate procedures when evaluating their courses and instructors. Factors such as race, ethnicity, color, religion, sex/gender, sexual orientation or preference, age, national origin, disability, marital status, political beliefs, veteran status or personal relationships may not be considered.

Academic Honesty
The integrity of the academic process requires that credit be given where credit is due. Accordingly, it is academic misconduct to present the ideas or works of another as one’s own work, or to permit another to present one’s work without customary and proper acknowledgment of authorship. Students may collaborate with other students only as expressly permitted by the instructor. Students are responsible for the honest completion and representation of their work, the appropriate citation of sources and the respect and recognition of others’ academic endeavors.

The Dean of Students’ Office reviews the MSU Conduct Code and Grievance Procedures for Students annually. As changes occur in the organizational, operational, educational, and legal environments, the guide is revised.

Alcohol, Drug, Tobacco Policy
Montana State University is tobacco free campus, to include e-cigarettes and an environment where inappropriate use of alcohol and unlawful possession, consumption, use or distribution of illicit drugs or alcohol is prohibited. The university requirements are found in the Tobacco Free Campus Policy (http://www2.montana.edu/policy/smoking_facilities) and the Campus Alcohol and Drug Policy (http://www2.montana.edu/policy/security_report/alcohol_drug_policies.html).

For more information on resources http://www.montana.edu/oha (http://www.montana.edu/oha)

Valuable personal property should be adequately protected. Montana State University is not responsible for the loss or destruction of any of the personal property of students.

Vehicles
All persons operating vehicles on the University campus should be familiar with MSU vehicle regulations, copies of which are available at the University Police Department, Roy Huffman Building, 7th and Kagy. Students, faculty, staff, and visitors must register any motor vehicles they park on the university campus for any reason.

The regulations are considered to be part of the terms and conditions of enrollment for students and of employment for staff members. Students must register their vehicles within one week after classes begin; faculty and staff must register within one week after beginning employment. A vehicle registration fee is payable at the time each vehicle is registered.

Registration is not considered complete until the registration decal is mounted on the left side of the rear bumper so that it is plainly visible from the rear. The registration decal designates areas in which the vehicle may be legally parked on campus.

All visitors are required to have a parking permit to park at Montana State University Monday through Friday, 6:00 a.m. to 6:00 p.m. Parking permits may be purchased at the Visitor Information Booth located at 7th and Grant or the University Police Department at 7th and Kagy.

Montana State University assumes no responsibility for the care or protection of any vehicle or its contents while operated or parked on the campus. The University reserves the right to revoke student use or possession of vehicles for conduct or scholastic reasons. The Board of Regents has authorized Montana State University to levy fines against students, faculty, and employees for violations of parking, traffic, or vehicle registration regulations. These fines and penalties are listed in the vehicle regulations.
Bicycles must be registered if they are used on campus. They should be operated in a prudent manner and parked only in racks provided, except in the campus family housing area. Violators are subject to fine. Bicycles must be walked, not ridden, though designated areas in the central campus.

All matters concerning parking and traffic should be referred to the University Police Department. The University Police are sworn peace officers of the State of Montana and have authority as vested in these officers by law.

**Campus Crime Report**

Crime is a reality at Montana State University. Preventing crime is everyone’s responsibility. Unreported crime is a criminal’s greatest ally. Suspicion that a criminal act has taken place is the only justification needed to call the University Police Department. Whether you are a victim, witness, or have information about a criminal offense or suspicious activity, contact the University Police:

On campus call 911
Off campus call 994-2121
24 hour emergency dispatch

Report a crime anonymously by email to: switness@montana.edu


**Common Hour Exam Policy**

**Introduction and Purpose**

Common hour exams are given during the semester for multi-section courses. Dates and times are posted online at www.montana.edu/registrar/Schedules. These exams take the place of one class meeting and are included in the student’s commitment to the course upon enrolling in it.

**Policy**

1. The nominal examination time may be from one to two hours.

2. For each Common Hour Examination, students will be excused from an equivalent period of instruction.

3. Requests regarding the date, duration, and room assignments for Common Hour Examinations must be submitted to the Registrar’s Office by the 20th class day of the prior semester.

4. Departments must provide for make-up/conflict examinations or other equivalent means of evaluating the student who are absent from the scheduled examination for legitimate reasons.

4.1 Make-up examinations for conflicts are to be given only to those students who, at the same hour:

a. Have another Common Hour Examination

b. Have a regularly scheduled class

c. Are engaged in an activity or event sanctioned in paragraph 310.01 of the Student Conduct Code (Official student representatives with a regularly scheduled practice or meeting that conflict with a Common Hour Exam see point 5 below.)

d. Sustained a personal emergency that prevented participation in the scheduled examination.

4.2. During the third week of classes, the Registrar’s Office will disseminate a list of the students who have conflicts among scheduled common hour examinations (cf 4.1.a.). This list will be updated regularly after that date and made available to all instructors. A priority list for resolving conflicts between common hour examinations (cf 4.4.) will also be published during the third week of classes.

4.3. Students are responsible for identifying all conflicts. Apart from unforeseeable, personal emergencies (4.1.d.), students are required to confirm the need for make-up examinations with the instructor as early as possible, but no later than ten (10) days before the scheduled examination.

4.4. In the event of a conflict between scheduled common hour examinations (cf 4.1.a.), the priority of scheduled versus make-up examination will be determined by the priority list published by the Registrar’s office. The order of priority will vary from semester to semester.

4.5. Dates for make-up examinations will be arranged by the instructor. The examinations are to be equivalent to the original examinations as a means of evaluating the student. These examinations and their scheduling are to be non-punitive.

5. Students who are official representatives of MSU who have regularly scheduled meetings or practices that conflict with a Common Hour exam may request of their instructor that they be allowed to arrive up to thirty (30) minutes late for a Common Hour Exam. The approval of such a request, however, is entirely at the discretion of the instructor. The instructor must be notified at least ten (10) days in advance. Students and instructors are encouraged to work with the Testing Center to assist with any accommodations if alternate testing possibilities cannot be arranged readily within the program or department.

6. All faculty should consider the Common Hour Examination schedule when planning ad-hoc evening examinations and other activities. Common Hour Examinations take precedence over all activities that occur outside of scheduled class hours except as provided for in this policy.

**Family Educational Rights and Privacy Act (FERPA)**

The Family Educational Rights and Privacy Act of 1974 (FERPA) affords students certain rights with respect to their education records.

**Student Rights**

1. The right to inspect and review the student’s education records within 45 days of the day the University receives a request for access. Students should submit to the Registrar, Dean, Head of the academic department, or other appropriate officials, a written request that identifies the record(s) the student wishes to inspect. The University official will make arrangements for access and notify the student of the time and place where the records may be inspected. If the records are not maintained by the University official to whom the request was submitted, that official shall advise the student of the correct official to whom the request should be addressed.
2. The right to request the amendment of the student’s education records that the student believes is inaccurate, misleading, or otherwise in violation of the student’s privacy rights under FERPA.

A student who wishes to ask the University to amend a record should write the University official responsible for the record, clearly identify the part of the record the student wants changed, and specify why it should be changed.

If the University decides not to amend the record as requested, the University will notify the student in writing of the decision and the student’s right to a hearing regarding the request for amendment. Additional information regarding the hearing procedures will be provided to the student when notified of the right to a hearing.

3. The right to provide written consent before [University] discloses personally identifiable information (PII) from the student’s education records, except to the extent that FERPA authorizes disclosure without consent. The University discloses education records without a student’s prior written consent under the FERPA exception for disclosure to University officials with legitimate educational interests. A University official typically includes a person employed by the university in an administrative, supervisory, academic, research, or support staff position (including law enforcement unit personnel and health staff); or a student serving on an official committee, such as a disciplinary or grievance committee.

A university official also may include a volunteer or contractor outside of the university who performs an institutional service or function for which the university would otherwise use its own employees and who is under the direct control of the University with respect to the use and maintenance of PII from education records, such as an attorney, auditor, or collection agent or a student volunteering to assist another University official in performing his or her tasks. A University official typically has a legitimate educational interest if the official needs to review an education record in order to fulfill his or her professional responsibilities for the University.

Upon request, the University discloses education records without a student’s consent to officials of another University in which a student seeks or intends to enroll.

Directory Information

The University has designated certain information as “directory information” which it may disclose without the student’s written consent. Montana State University has designated the following as directory information:

1. name, campus address, home address, telephone listing and campus email address.
2. state of residence
3. age, date, and place of birth
4. sex and marital status
5. name of advisor
6. name and address of parent(s)
7. major field of study, including the college, division, department, or program in which the student is enrolled
8. classification as a freshman, sophomore, junior, senior, or graduate student, or by number referring to such cases
9. participation in officially recognized activities and sports
10. weight and height of members of athletic teams
11. dates of attendance and graduation, and degrees received
12. the most recent educational institutional attended
13. honors and awards received, including selection to a Dean’s list or honorary organization, and the grade point average of students selected
14. photographic, video or electronic images of students taken and maintained by the University

Any student may refuse to permit the university from designating any or all of the personally identifiable information designated as directory information with regard to his or her records. Any student wishing to exercise this right must inform the University Registrar in writing no later than the 10th class day of the semester, of the categories of personally identifiable information which are not to be designated as directory information with respect to that student.

FERPA permits the disclosure of certain information from the students’ education records without the consent of the student if the disclosure meets certain conditions as outlined in the federal regulations (34 C.F.R. §99.31). The University will comply with the requirements of FERPA as outlined in 20 U.S.C. 1232G and 34 C.F.R., Part 99.

Complaints

Students who believe the university has failed to comply with the requirements of FERPA have the right to file a complaint with the U.S. Department of Education concerning alleged failures by MSU to comply with the requirements of FERPA. The name and address of the Office that administers FERPA is:

Family Policy Compliance Office
U.S. Department of Education
400 Maryland Avenue, SW
Washington, DC 20202

Discrimination, Harassment, Sexual Misconduct, Dating & Domestic Violence, Stalking and Retaliation

Discrimination, Harassment, Sexual Misconduct, Dating Violence, Domestic Violence, Stalking and Retaliation Policy and Grievance Procedures

Montana State University is committed to providing an environment that emphasizes the dignity and worth of every member of its community and that is free from harassment and discrimination based upon race, color, religion, national origin, creed, service in the uniformed services (as defined in state and federal law), veteran’s status, sex, age, political ideas, marital or family status, pregnancy, physical or mental disability, genetic information, gender identity, gender expression, or sexual orientation. Such an environment is necessary to a healthy learning, working, and living atmosphere because discrimination and harassment undermine human dignity and the positive connection among all people at our University. Acts of discrimination, harassment, sexual misconduct, dating violence, domestic violence, stalking, and retaliation will be addressed by the university under its Discrimination, Harassment, Sexual Misconduct, Dating Violence, Domestic Violence, Stalking and Retaliation Policy (http://www2.montana.edu/policy/discrimination) and Discrimination Grievance Procedures for Allegations of Violations of the Discrimination, Harassment, Sexual Misconduct, Dating Violence, Domestic Violence, Stalking and Retaliation Policy (http://www.montana.edu/policy/discrimination/ procedures).

Title IX of the Education Amendments of 1972

Title IX and its implementing regulation, at 34 C.F.R. § 106.31 (a), provide that no person shall, on the basis of sex, be excluded from participation in, or be denied the benefits of, or be subjected to discrimination
under any academic, extracurricular, research, occupational training, or other education program or activity operated by the university.

Discrimination based upon sex can include sexual harassment or sexual violence, such as sexual intercourse without consent, sexual assault, and sexual coercion. Title IX also prohibits gender-based harassment, which may include acts of verbal, nonverbal, or physical aggression, intimidation, or hostility based on sex or sex-stereotyping, even if those acts do not involve conduct of a sexual nature.

**Reporting, Filing a Complaint or Questions**

Montana State University affords any student, employee, applicant for employment or admissions, or person who believes he or she was discriminated against by the University, the right to file a grievance on grounds of discrimination.

Any student, faculty or staff member with questions or concerns about discrimination based on any of the protected classes listed above or who believes that he or she has been the victim of discrimination based on any of the protected classes should contact the Director & Title IX Coordinator in the Office of Institutional Equity (OIE) for assistance or to file a complaint. The OIE Director and Title IX Coordinator is available to discuss options, explain university policies and procedures, and provide education on relevant issues. Reports may also be reported securely online through the Sexual Misconduct Reporting Form (https://publicdocs.maxient.com/reportingform.php?MontanaStateUniv&layout_id=9). Additionally, the Discrimination Grievance Procedures for Allegations of Violations of the Discrimination, Harassment, Sexual Misconduct, Dating Violence, Domestic Violence, Stalking and Retaliation Policy is found here (http://www.montana.edu/policy/discrimination/procedures).

Jyl Shaffer, M.A.
Director & Title IX Coordinator
Office of Institutional Equity (http://www.montana.edu/equity)
PO Box 172430
Bozeman MT 59717-2430
Tel: (406) 994-5326
Email: jyl.shaffer@montana.edu
Location: Hamilton Hall Room 114

**Residency Requirements for Fee Purposes**

In-state admission and fee status is granted to those persons who have demonstrated over a period of time that their permanent residence is Montana, a state which they have supported through the payment of appropriate taxes. In general, a person must meet all seven requirements listed below to qualify for in-state status:

1. A person must be physically present in Montana for twelve or more consecutive months without an absence in excess of a total of thirty days. One must demonstrate by appropriate actions during the twelve month period the intent to make Montana one’s permanent home. The required twelve month period does not begin until specific actions are taken to change legal ties to Montana.

2. The twelve month period does not begin until one or more acts, that clearly indicate the intent to become a resident, are taken. Mere presence in Montana alone will not serve to start this period. The legal action date must occur in the preceding year, on or before the fifteenth day of class of the term for which reclassification is requested. Sufficient actions to begin the period are:
   a. Montana vehicle registration
   b. Montana driver’s license
   c. Montana voter registration
   d. Purchase of a principal residence where a Montana title is obtained
   e. Filing of a resident Montana income tax return
   f. If none of the above is applicable, an affidavit of intent may be filed with the Registrar’s Office.

3. An individual must be at least fifty-one percent financially self-sufficient during the entire twelve month period, and that person must not be claimed as an exemption under federal income tax regulations by someone filing an out-of-state federal tax return, commencing with the tax year in which the twelve month period begins.

4. A person must file a Montana income tax return.

5. If a person drives a motor vehicle in Montana or has a driver’s license from another state, he or she must obtain a Montana operator’s license within the required legal time limit.

6. If a person owns a motor vehicle in Montana, he or she must license the vehicle in Montana within the required legal time limit.

7. An individual must register to vote in Montana if he or she expects to exercise the right to vote.

An individual who is enrolled for more than half-time status during any semester that falls within the twelve month period is presumed to be present in the state primarily for educational purposes, and such periods may not generally be applied toward the physical presence requirement of the policy.

At Montana State University, six credits is considered half-time enrollment.

There are additional regulations concerning married persons and others with special circumstances. Persons interested in gaining residency should request the pamphlet “Montana University System Student Guide to Montana’s Residency Policy.” For more information, new students should contact the Office of Admissions. Currently enrolled students and former students can obtain petition forms and more information from the Registrar’s Office.

**Right of Appeal and Grievances**

Student grievances are handled by approved university procedures. Grievances may be of at least four types: 1) academic, 2) student conduct, 3) discrimination or sexual harassment, or 4) other non-academic grievances.

1. **Academic Grievances**: Academic grievances are grievances involving coursework, grades, etc. All such grievances are to be handled in accordance with approved university guidelines and procedures. Copies of the approved procedures are available from offices of department heads, college deans, the Provost’s Office, and the Dean of Students’ Office.

2. **Student Conduct Grievances**: Student conduct grievances are those which do not involve academics or alleged discrimination or sexual harassment. Copies of university conduct guidelines and appeals procedures for conduct grievances at the Dean of Students’ Office.

3. **Discrimination or Sexual Harassment**: Montana State University guarantees the right to file a grievance on grounds of discrimination to all students, employees, or applicants for admission or employment.

If you believe you may have experienced unlawful discrimination on account of race, color, religion, national origin, creed, service in the uniformed services, veteran’s status, sex, age, political ideas, marital or family status, pregnancy, physical or mental disability, genetic information, gender identity, gender expression, or sexual orientation should visit the Office of Institutional Equity to discuss your concerns and to initiate any formal grievance procedure. As part of that policy, Montana State University prohibits all forms of sexual harassment of employees by coworkers or superiors, or of students by peers, staff, faculty, or administrators. Students seeking advice on or wishing to file a grievance related to alleged sexual harassment should contact the Office of Institutional Equity. A copy of the university-
approved policy and procedures regarding sexual harassment is available from that office. For more information please visit their web page at http://www.montana.edu/policy/discrimination/ and http://www.montana.edu/policy/discrimination/procedures/

4. Other Non-Academic Grievances:
   a. Traffic Violation Appeals: The Traffic Appeals and Regulations Committee handles appeals of traffic violation citations. This committee is composed of four students, three faculty, three classified staff, and three professional non-faculty members. The University Police Director is an ex-officio non-voting member. The decision of the committee is final on all appeals. Contact the University Police Department for appeal forms and additional information.
   b. Student Financial Aid Appeals: Appeals of actions of the Financial Aid Services Office, which relate to financial aid awards, may be addressed to the Financial Aid Appellate Board. The student should first contact the Director of Financial Aid and, if the grievance cannot be resolved at that level, the director will refer the student to the chair of the Financial Aid Appellate Board. Appeals must be in writing.
   c. Appeals of Residency Status Classification for Fee Purposes: Residency status for fee purposes is initially determined for undergraduates by the Office of Admissions and for graduates by The Graduate School. Requests for reclassification are handled by the Registrar. Appeals of registry decisions made by these offices may be made to the Residency Appeals Board. Information about reclassification and appeals can be obtained from the Office of the Registrar.
   d. Student Athletic Grievances: Student athletes who have grievances should contact the Director of Athletics. Regulations and requirements are published by the Athletics Department as well as by the directors for each sport.
   e. Residence Life Grievances: Grievances related to living in the residence halls should contact the Director of Residence Life. Family housing residents should contact the Family Housing Office if they have grievances.

Appeal
The student should be aware that, in cases of disagreement with the decision of a staff member, an appeal for review of the decision may be made to the next higher official or body unless otherwise stated in the grievance policy. If the student is in doubt concerning the person to whom the appeal should be made, he or she should consult the Dean of Students’ Office.
Core 2.0 General Curricular Requirements

- Core 2.0 Foundation Courses (p. 63)
- Core 2.0 Ways of Knowing Courses (p. 65)
- Core 2.0 Credit Policies (p. 67)
- Core 2.0 Grading Standards (p. 67)
- Approved Core 2.0 Courses (http://www.montana.edu/newcore/approved_courses.html)
- Permitted Substitutions (p. 66)
- Appeals (p. 67)
- Accommodations for Students with Math Learning Disabilities (p. 67)

Purpose of Core 2.0

As a land grant university, MSU Bozeman is charged, through the Morrill Act of 1862, with providing “liberal and practical education...in the several pursuits and professions of life.” In addition, as a member of the Montana University System, MSU is charged with providing programs that “stimulate critical analysis, clear and effective communication, and the creative process.” Students should also “broaden their cultural horizons by contact with the creative arts, sciences and the humanities, and achieve an understanding of the political, social, economic and ethical problems of the contemporary world and the relation of their studies to these problems.”

To this end, the faculty of MSU have developed a common core curriculum, called Core 2.0, for all undergraduate students in an effort to enable students to reach their intellectual potential, to become contributing members of society, and to compete more successfully in our rapidly changing and increasingly complex world.

The purpose of the Core 2.0 curriculum is to ensure a wide-ranging general education of consistent and high quality to all Montana State University students regardless of their major or area of study. Core courses allow students to reaffirm their common experiences, redefine their common goals, and confront their common problems. Core courses emphasize communication and techniques of creative inquiry in a variety of disciplines.

One of the goals of Core is to provide students with the opportunity to develop their creative and intellectual potential. Therefore, Core courses will require students to do the following:

1. Think, speak, and write effectively, and evaluate the oral and written expression of others.
2. Develop learning objectives and the means to reach them, thus developing lifelong patterns of behavior which increase the potential to adapt to and create change.
3. Exercise and expand intellectual curiosity.
4. Think across areas of specialization and integrate ideas from a variety of academic disciplines and applied fields.
5. Use complex knowledge in making decisions and judgments.
6. Make discriminating moral and ethical choices with an awareness of the immediate and long-term effects on our world.
7. Develop a critical appreciation of the ways in which we gain and apply knowledge and understanding of the universe, of society, and of ourselves.
8. Understand the experimental methods of the sciences as well as the creative approaches of the arts.
9. Develop an appreciation of other cultures as well as an understanding of global issues.

Core 2.0 Overview

The Core 2.0 curriculum at Montana State University is designed to enhance students' intellectual experience in all realms of academia, with the express goal of providing students with a broad exposure to and knowledge of multiple and varied methods of scholarship. The Core curriculum consists of required classes that focus on clear verbal and written expression(s) of critical analysis and evaluation of academic fields of study at the heart of human intellectual and artistic inquiry and achievement. Completion of the Core curriculum requirements will introduce students to the theories, methods, and foundations of those academic fields, enable them to critically evaluate information in those subjects, and teach them to present their knowledge clearly in both verbal and written form.

Core 2.0 has two broad categories: Foundation Courses and Ways of Knowing (Inquiry and Research & Creative Experience) Courses. Courses that apply to specific areas in either of these categories are indicated with a "letter attribute" after the course number which corresponds to the specific Core area. For example, courses that fulfill the Core 2.0 writing requirement are indicated with a "W" (WRIT 101 W). A current list of Core 2.0 course offerings can be found in the schedule of Core 2.0 classes (https://atlas.montana.edu:9000/pl/bzagent/bzsxcore.pw_selterm).

Students must complete the equivalent of one course in each of the Foundation Course areas: University Seminar (US), College Writing (W), Quantitative Reasoning (Q), Diversity (D), and Contemporary Issues in Science (CS).

Students must complete at least one 3 credit course in each of the Ways of Knowing Course areas: Arts (IA or RA), Humanities (IH or RH), Natural Sciences (IN or RN), and Social Sciences (IS or RS). All students must take at least one 3 credit course in an approved Research & Creative Experience course. Students may take an approved Research & Creative Experience course in one of the four areas mentioned above (indicated with an R) or they may take a separate Research & Creative Experience course in any discipline, including Undergraduate Scholars Program (USP 490R).

Notes:

- Total number of credits: 27 if the Research and Creative Experience requirement is completed as part of the requirements in Arts, Humanities, Natural Sciences or Social Sciences; otherwise 30.
- A grade of C- or better is required in all Core 2.0 courses.
- Completion of at least two approved Natural Science courses with a grade of C- or better satisfies both the Contemporary Issues in Science and the Natural Science Inquiry requirements. Individual substitutions for one requirement of the other are not permissible.

Core 2.0 Foundation Courses

University Seminar (US)

Rationale

Courses with the University Seminar (US) core designation are primarily intended for first-year students throughout all curricula to provide a platform for collegiate level discourse. Activities that hone written and oral communication skills are universally incorporated, but the themes represented in individual US core courses vary considerably to reflect the department or program from which the course originates. All US core courses are small in size and rely heavily on seminar-style teaching where course content is delivered by discussion and interaction rather than by lecture. This learning environment promotes vibrant interactions between first-year students, a faculty member, and in many courses, a more experienced student fellow. US core courses provide a venue where students...

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can enjoy rigorous academic discussions that promote critical thinking, learning, and understanding in a supportive and truly collegiate manner.

Student Learning Outcomes
Through completion of the US Core students will:

- Demonstrate critical thinking abilities
- Prepare and deliver an effective oral presentation
- Demonstrate analytical, critical, and creative thinking in written communication.

College Writing (W)
Rationale
WRIT 101W is a multi-section, three-credit course with an enrollment cap of 25. Classes consist largely of first and second-year students. The course fulfills the written communication requirement of the current core and is taught by adjunct instructors, teaching assistants, and tenure-track faculty. The departmental course design focuses on expository (vs. creative or personal) writing, requires at least four graded paper assignments per term, and calls for sections to be organized around topics/themes of the instructor’s choosing. With some variation, typical sections of 101W incorporate a wide range of learning components in support of major paper assignments: reading of essays, study of writing instruction texts, short compositions in response to reading, in-class writing, small group workshops, peer review of writing, draft conferences, and class discussion.

Student Learning Outcomes
It is intended that students who complete WRIT 101W will have been significantly aided in their ability to:

- Use writing as a means to engage in critical inquiry through exploring ideas and challenging assumptions.
- Read texts thoughtfully, analytically, and critically in preparation for writing tasks.
- Compare and contrast the alternative perspectives of multiple texts and take a position in writing in response to them.
- Reflect on and strategically apply the individual writing process.
- Make meaningful use of source material, citing texts in ways that enhance writing content.
- Develop competence in the use of conventional structures and forms of expository discourse, including sentence mechanics, organization, and argument structure.
- Critique and receive feedback on writing and practice revision from the word- and sentence-level to that of overall reorganization and rewriting.
- Apply principles of expository composition to a variety of academic writing tasks, including writing in other courses.
- Accommodate the interests of readers through careful consideration of content and style.
- Collaborate with others in the writing process through discussion and feedback.

Students whose scores meet or exceed any one of the following are exempt from the College Writing requirement:

- ACT English score of 28
- SAT Critical Reading score of 650
- Montana University System Writing Assessment of 5.5
- ACT/SAT essay/ writing sub-score of 11

*The credits will have to be made up in other coursework in order to meet the minimum graduation requirements.

Quantitative Reasoning (Q)
Rationale
The ability to reason quantitatively is essential for citizenship in the 21st Century world. An understanding of data and quantity, and how they are presented and interpreted by the press and on the Internet, is invaluable. Mathematics and logic are used throughout the world as essential tools in many fields, including natural science, engineering, medicine, and the social sciences. In the words of John Allen Paulos, “… There are three reasons or, more accurately, three broad classes of reasons to study mathematics. Only the first and most basic class is practical. It pertains to job skills and the needs of science and technology. The second concerns the understandings that are essential to an informed and effective citizenry. The last class or reasons involves considerations of curiosity, beauty, playfulness, and perhaps even transcendence and wisdom.”

In a Q course, the student will be exposed to the methods employed in the mathematical sciences. This will include the application of mathematical or statistical models to complex problems which can then lead to potential solutions of these problems. There are two types of Q courses: foundation and terminal. The type of course taken is dependent on a student’s program of study.

Criteria

- A foundation Q course (e.g. calculus or introductory statistics) provides the mathematical foundation prerequisite for successful completion of courses contained in a student’s program of study. Thus, a core goal of the foundation course is to provide the quantitative and logical tools required in subsequent courses that demand a high level of mathematical sophistication and preparedness.
- A terminal Q course stresses mathematical and related foundational methods and concepts over a broad array of topics, and, in particular, mathematical and statistical foundational methods. Mathematical-foundation methods include the understanding of numerical or foundational concepts and the proper expression, proof, and refutation of arguments in the language of mathematics. Statistical-foundation methods include the understanding of quantitative and statistical concepts, the analysis of data, and the critical interpretation of statistical information.
- Mathematical and statistical foundational concepts include properties of numbers (integers, fractions, real numbers, complex numbers,...), problems in higher dimensions, shapes (classical geometric, topological equivalence,...), measures (distance, angles, area, volume, data-based statistics), random variables (distributions, expectations,...), functions of these concepts and their interplay, as well as methods of formal proof in the language of mathematics.
- Q courses enable students to develop those skills that lead to an understanding of quantitatively-based problems related to contemporary society. They provide practical applications that relate to their current daily and future professional lives as consumers of quantitative information. Ultimately, after having developed certain Q skills, they can apply them to make informed decisions in their personal and professional lives.

Student Learning Outcomes
Students completing a Core 2.0 Quantitative Reasoning (Q) course should demonstrate an ability to:

- Interpret and draw inferences from mathematical models such as formulas, graphs, diagrams or tables.
- Represent mathematical information numerically, symbolically and visually.
- Employ quantitative methods in symbolic systems such as, arithmetic, algebra, or geometry to solve problems.
Diversity (D)  
Rationale  
Graduates of Montana State University face an ever-changing and increasingly complex world. A carefully informed understanding of multiple identities and cultures, both within the United States and beyond, helps create a campus community that is committed to intellectual inquiry and prepares students to be members of a diverse global community. Diversity courses focus on identity (race, ethnicity, class, gender, sexuality, nationality, ability, etc.); the study of languages other than English; and/or traditionally marginalized or less frequently studied societies, nations, and/or cultures.

Criteria  
The course must focus in in-depth analytical and critical attention to difference and to historical, cultural, and/or social contexts, with an emphasis on class discussion and active student engagement. In addition to this primary criterion, the course will meet one of the following criteria listed below:

- The course examines identity in relation to race, ethnicity, gender, sexuality, class, nationality, ability, and/or other axes of difference.
- The course teaches a language other than English and includes the examination of the culture(s) that speak(s) the language.
- The course examines the historical, political, cultural, and/or social forces that foster systemic disparities based on difference, and critically examines concepts of difference within these systems.

Student Learning Outcomes  
Students who successfully complete a Diversity-designated course will demonstrate one or more of the following:

- An analytical and critical understanding of diversity within societies, nations, and cultures.
- Knowledge of a language other than English and the culture(s) that speak(s) that language.
- An analytical and critical understanding of particular, traditionally marginalized, or less frequently studied societies, nations, and/or cultures and an understanding of cultural difference in relation to those societies, nations, and/or cultures.

Contemporary Issues in Science (CS)  
Rationale  
Contemporary Issues in Science (CS) is a course focused on natural science or technology that examines the ways in which science contributes to the study of significant problems in the contemporary world, and can help individuals and society make informed decisions about these issues. CS courses explore how knowledge is created in the natural sciences. They have a central goal of providing an understanding of the methods used to discover and create factual and theoretical scientific knowledge. These courses will examine particular scientific or technological issues and at the same time explore the methodological and theoretical foundations of scientific inquiry. CS courses, for example, might devote some time to examining the history of particular contemporary scientific issues and the ways in which truths or assumptions about these issues have changed over time. They might examine the social and political consequences of scientific and technological discoveries, or ethical issues arising from their use, or how science and scientific methods can aid public, personal, and professional decision-making. CS, like Inquiry courses, will build on the critical thinking and communication skills developed in other core courses, particularly those of the University Seminar and College Writing courses. By enhancing students’ understanding of the process of scientific inquiry, they will enrich students’ experience of the core Research and Creative Experience and may incorporate non-traditional teaching methods, including small group learning activities and guided research projects.

Criteria  
To receive a CS designation, a course should:

- Have a clearly defined science and/or technology focus, and explore a contemporary science or technology issue.
- Examine ways in which science and/or technology can contribute to the study of a significant problem in the contemporary world, and can help individuals and society make informed decisions about such issues.
- Explore how knowledge is created in science and/or technology (at least one-third of the course should be devoted to this goal).
- Include at least one major, discovery-based learning activity.
- Emphasize critical thinking, writing and oral communication skills.
- Ask students to independently analyze information from multiple sources.
- Develop students’ abilities to work effectively in small groups.

Student Learning Outcomes  
After completing a Contemporary Issues in Science course, students will:

- Explain how science contributes to analyzing complex problems in the contemporary world.
- Describe the scientific method, the kinds of questions asked by scientists and the methods used to explore those questions.
- Demonstrate critical thinking, writing and oral communication skills.
- Work effectively in small groups.

Students may substitute courses for this requirement. See the Permitted Substitutions near the end of this section.

Core 2.0 Ways of Knowing Courses  
All Ways of Knowing Courses emphasize the methods used to discover and create the factual and theoretical knowledge of the discipline. Inquiry courses (indicated with an I) do this primarily through classroom instruction and require at least one major learning activity based on methods of inquiry appropriate to the discipline. Research courses (indicated with an R) require students to have autonomous experience in the research and creative process and to generate a scholarly product. Lower-division R courses are intended to introduce students to the discipline and thus also satisfy a Ways of Knowing area (RA, RI, RN, or RS). Upper-division R course are often intended for majors and do not have a Ways of Knowing designation. These courses are listed separately with an R following the number.

All students must take at least one (1) Inquiry or one (1) Research & Creative Experience course in each of the following areas:

Inquiry (I)  
Rationale  
The central goal of every Inquiry course is to provide students with an understanding of the methods used to discover and create the factual and theoretical knowledge of the discipline. Each course will examine particular issues in the discipline while exploring its methodological and theoretical foundations. Inquiry courses, for example, might devote some time to examining the history of the discipline and the ways in which its truths or assumptions have changed over time. They might focus on major paradigm shifts or on contested ethical and interpretive issues within the discipline. Inquiry courses will build on the critical thinking and communication skills developed in other core courses, particularly those of the University Seminar and College Writing courses. By enhancing students’ understanding of the process of scientific inquiry, they will enrich students’ experience of the core Research and Creative Experience and...
and College Writing courses. By enhancing students’ understanding of the process of academic inquiry, they will enrich students’ experience of the core Research and Creative Experience. Inquiry courses are encouraged to incorporate non-traditional teaching methods, including small group learning activities and guided research projects.

**Criteria**

- A substantial proportion of the course will be devoted to exploring ways in which the discipline (http://www.montana.edu/newcore/areadescriptions.html) creates knowledge.
- The course must include at least one major learning activity based on methods of inquiry appropriate to the discipline.

**Student Learning Outcomes**

Inquiry courses are intended to improve students’

- Understanding of disciplinary methods, including the kinds of questions asked in the discipline and the methods that practitioners use to explore those questions.
- Understanding of how ideas and methods in the discipline have developed or changed.
- Critical thinking and written or oral communication skills.
- Proficiency in analyzing information from different viewpoints.

All students must take at least three credits in each of the following areas:

- Arts (IA or RA)
- Humanities (IH or RH)
- Natural Sciences (IN or RN)
- Social Sciences (IS or RS)

All students must take at least one (1) approved Research & Creative Experience course. Students may take an approved Research & Creative Experience course in one of these four areas OR they may take a separate Research & Creative Experience course in any discipline, including the Undergraduate Scholars Program (USP 490R).

**Notes:**

- Total number of courses: 9, if the Research and Creative Experience requirement is completed as part of the requirements in Arts, Humanities, Natural Sciences or Social Sciences; otherwise 10.
- A grade of C- or better is required in all Core courses.
- Completion of at least two approved natural sciences courses with a grade of C- or better satisfies both the Contemporary Issues in Science and the Natural Science Inquiry requirements. Individual substitutions for one requirement or the other are not permissible.
- Completion of UH 202 with a grade of C- or better satisfies the Humanities Inquiry requirement.

**Research & Creative Experience (R)**

**Rationale**

The Research & Creative Experience builds on the competencies students have developed in the foundation courses. These experiences will not be limited to a student’s major field of study and will incorporate a range of authentic experiences from traditional one-on-one mentoring to group Research and Creative Experience courses. Because research and creative projects vary from one discipline to the next, some general guidelines have been developed to determine what constitutes a Research and Creative Experience.

**Criteria**

- Students experience the process of research and creative experience as a unique intellectual activity and generate a scholarly product.
- Student autonomy directs the research and creative experience, while faculty and staff provide the framing concepts and contexts.
- Research and Creative Experience courses provide frequent and early benchmarks for student progress to encourage early engagement in the research and creative process.
- The research and creative experience component done individually or in small groups constitutes at least 1/3 of the course. The remaining part of the course should provide sufficient information about the subject to enable the student to formulate a project as well as provide the student with the tools to do a research and creative project.
- Courses geared toward sophomore level students are particularly encouraged, but Research & Creative Experience courses can be at any level. Research & Creative Experience courses may have prerequisites.
- Course must address the responsible conduct of research.

**Student Learning Outcomes**

Through the Research and Creative Experience students will:

- Improve their ability to put concepts and facts into practice.
- Increase their understanding of the processes and dynamic nature of knowledge.
- Strengthen their habits of critical and creative thinking while seeking and synthesizing information from broad and diverse sources.
- Deepen their understanding of the importance of team work and collaboration.
- Develop responsibility, competency, and confidence.
- Expand intellectual curiosity and interest in the subject area.

**Permitted Substitutions**

Completion of at least two of the following courses with a grade of C- or better satisfies the Contemporary Issues in Science (CS) and the Inquiry Natural Science (IN) requirements. Individual substitutions for one requirement or the other are not permissible.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOB 105CS</td>
<td>Introduction to Biotechnology</td>
<td>3</td>
</tr>
<tr>
<td>BIOB 110CS</td>
<td>Introduction to Plant Biology</td>
<td>3</td>
</tr>
<tr>
<td>BIOB 160</td>
<td>Principles of Living Systems</td>
<td>4</td>
</tr>
<tr>
<td>BIOB 170IN</td>
<td>Principles of Biological Diversity</td>
<td>4</td>
</tr>
<tr>
<td>BIOB 260</td>
<td>Cellular and Molecular Biology</td>
<td>4</td>
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<tr>
<td>BIOH 201</td>
<td>Human Anatomy and Physiology I</td>
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</tr>
<tr>
<td>BIOH 211</td>
<td>Human Anatomy and Physiology II</td>
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<tr>
<td>BIOM 250</td>
<td>Microbiology for Health Sciences: Infectious Diseases</td>
<td>3</td>
</tr>
<tr>
<td>BIOC 220</td>
<td>General Botany</td>
<td>3</td>
</tr>
<tr>
<td>CHMY 121IN</td>
<td>Introduction of General Chemistry</td>
<td>4</td>
</tr>
<tr>
<td>CHMY 123</td>
<td>Introduction of Organic Chemistry and Biochemistry</td>
<td>4</td>
</tr>
<tr>
<td>CHMY 141</td>
<td>College Chemistry I</td>
<td>4</td>
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<tr>
<td>CHMY 143</td>
<td>College Chemistry II</td>
<td>4</td>
</tr>
<tr>
<td>CHMY 151</td>
<td>Honors College Chemistry I</td>
<td>4</td>
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<td>CHMY 153</td>
<td>Honors College Chemistry II</td>
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<td>CHMY 211</td>
<td>Elements of Organic Chemistry</td>
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<td>ENSC 245IN</td>
<td>Soils</td>
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<tr>
<td>GEO 103CS</td>
<td>Intro to Envrnmnt Geology</td>
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<tr>
<td>GEO 211</td>
<td>Earth History and Evolution</td>
<td>3</td>
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</tbody>
</table>
NRSM 240  Natural Resource Ecology  3
PHSX 205  College Physics I     4
PHSX 207  College Physics II    4
PHSX 220  Physics I (w/ calculus)  4
PHSX 222  Physics II (w/ calculus)  4
PHSX 224  Physics III          4
PHSX 240  Honors Gen & Mod Phys I  4
PHSX 242  Honors Gen & Mod Phys II  4

**Core 2.0 Credit Policies**

1. University Core requirements cannot be satisfied by the CLEP procedure.
2. Advanced Placement credits (AP), if equivalent to MSU Core courses, can be used to fulfill Core requirements.
3. Credit earned in repeatable Core courses may be applied only once to University Core requirements.
4. Some study abroad programs, upon approval, may satisfy the Diversity requirement.
5. Students in good standing in the University Honors Program may fulfill part of their University Core curriculum requirements with designated honors courses. Specific information is available in the Honors Program Office, Quad D.

**Core 2.0 Grading Standards**

1. College-level competence in all areas of the Core curriculum is necessary for adequate performance in the Core and beyond. A grade of C- or better is required in all University core courses.
2. No University Core course may be taken on a pass/fail basis.

**Appeals**

Unusual circumstances that warrant an appeal of the established policies and procedures must be initiated by the student and sent through his/her adviser to the Core Equivalency Review Committee (CERC) via the Registrar’s Office.

**Accommodation for Students with Math Learning Disabilities**

Accommodation to the Quantitative Reasoning (Q) Core Curriculum Requirement may be made for students with Math learning problems caused by disabilities. Accommodations, when permitted, apply only to the Core Curriculum Requirement; they do not change requirements in majors, minors, or certificates.

MSU recognizes that some students with specific learning disabilities may experience difficulty completing the Core Quantitative Reasoning requirement. Students with learning disabilities who believe that they need an accommodation to meet the Quantitative Reasoning requirement should contact the office of Disabled Student Services (DSS) to begin the process to certify the disability. Learning Disability documentation must meet established MSU requirements as developed by DSS. This documentation is available from:

Disabled Student Service
P.O. Box 173960
Strand Union, Room 155
Montana State University
Bozeman, MT 59717-3960
Undergraduate Programs

- College of Agriculture (p. 68)
- College of Arts and Architecture (p. 68)
- Jake Jabs College of Business & Entrepreneurship (p. 68)
- College of Education, Health and Human Development (p. 68)
- College of Engineering (p. 69)
- College of Letters and Science (p. 69)
- College of Nursing (p. 70)
- Gallatin College (p. 70)
- Honors College (p. 70)
- University Programs (p. 70)

MSU-Bozeman offers a wide range of programs through its nine academic colleges. Specific degrees, majors, and options are listed under each college. By their junior year, earlier if possible, students will need to select a major; the choice should be based on interests and on plans for the future. Careful consideration should also be given to the courses offered in the major and the requirements for completing the program of study.

College of Agriculture (p. 71)
- Bachelor of Science in Agricultural Business (p. 71)
  - Agribusiness Management Concentration
  - Farm and Ranch Management Concentration
- Bachelor of Science in Agricultural Education (p. 75)
  - Agricultural Education Broadfield Teaching Option
  - Agricultural Communication, Leadership, and Extension Option
- Bachelor of Science in Animal Science (p. 77)
  - Equine Science Option
  - Livestock Management and Industry Option
  - Science Option
- Bachelor of Science in Biotechnology (p. 82)
  - Animal Systems Option
  - Plant Systems Option
  - Microbial Systems Option
- Bachelor of Science in Environmental Horticulture (p. 86)
  - Environmental Horticulture Science Option
  - Landscape Design Option
- Bachelor of Science in Environmental Sciences (p. 88)
  - Environmental Biology Option
  - Geospatial and Environmental Analysis Option
  - Land Rehabilitation Option
  - Soil and Water Sciences Option
- Bachelor of Science in Financial Engineering (p. 73)
- Bachelor of Science in Natural Resources and Rangeland Ecology (p. 95)
  - Rangeland Ecology and Management Option
  - Wildlife Habitat Ecology and Management Option
- Bachelor of Science in Plant Science (p. 97)
  - Crop Science Option
  - Plant Biology Option
- Bachelor of Science in Sustainable Food & Bioenergy Systems (p. 100)
  - Agroecology Option
  - Sustainable Crop Production Option
  - Sustainable Livestock Production Option
  - Non-degree program
  - Pre-veterinary Medicine Program (p. 98)

College of Arts and Architecture (p. 104)
- Bachelor of Arts in Art (p. 105)
  - Art Education K-12 Broadfield Option
  - Art History Option
  - Liberal Arts Studio Option
- Bachelor of Fine Arts in Art (p. 105)
  - Graphic Design Option
  - Studio Arts Option
- Bachelor of Arts in Environmental Design (p. 115)
- Bachelor of Arts in Film and Photography (p. 117)
  - Film Option
  - Photography Option
- Bachelor of Arts in Music (p. 120)
- Bachelor of Music Education (p. 123)
- Bachelor of Arts in Music Technology (p. 121)

Jake Jabs College of Business & Entrepreneurship (p. 269)
- Bachelor of Science in Business (p. 269)
  - Accounting Option
  - Finance Option
  - Management Option
  - Marketing Option

College of Education, Health and Human Development (p. 124)
- Bachelor of Science in Community Health (p. 124)
- Bachelor of Science in Early Childhood Education and Child Services (p. 124)
- Bachelor of Science in Elementary Education K-8 (p. 124)
  - Early Childhood Education Option
  - Mathematics Option
  - Science Education Option
  - Special Education Option
- Bachelor of Science in Family and Consumer Sciences (p. 124)
  - Non-teaching Option
  - Teaching Option
- Bachelor of Science in Food and Nutrition (p. 124)
  - Dietetics Option
  - Nutrition Science Option
- Bachelor of Science in Secondary Education (p. 124)
  - General Science Broadfield Option
  - Social Studies Broadfield Option
  - (Departmental Teaching Options)
- Bachelor of Science in Health Enhancement K-12 (p. 124) (Health and Physical Education)
- Bachelor of Science in Health and Human Performance (p. 124)
• Exercise Science Option
• Kinesiology Option
• Bachelor of Science in Sustainable Food & Bioenergy Systems (p. 124)
  • Sustainable Food Systems Option
• Bachelor of Science in Technology Education (p. 124)
  • Industrial Technology Option
  • Technology Education Broadfield Teaching Option
• Certificate of Gerontology (p. 144)

**College of Engineering (p. 150)**
• Bachelor of Science in Biological Engineering (p. 153)
• Bachelor of Science in Chemical Engineering (p. 153)
• Bachelor of Science in Civil Engineering (p. 155)
  • Bio-Resources Option
• Bachelor of Science in Computer Engineering (p. 163)
• Bachelor of Science in Computer Science (p. 161)
  • Interdisciplinary Option
  • Professional Option
• Bachelor of Science in Construction Engineering Technology (p. 155)
• Bachelor of Science in Electrical Engineering (p. 163)
• Bachelor of Science in Financial Engineering (p. 169)
• Bachelor of Science in Industrial and Management Systems Engineering (p. 169)
• Bachelor of Science in Mechanical Engineering (p. 169)
• Bachelor of Science in Mechanical Engineering Technology (p. 169)
• Non-degree programs
  • Military Aerospace Studies (p. 177) - Air Force ROTC
  • Military Science (p. 178) - Army ROTC

**College of Letters and Science (p. 179)**
• Bachelor of Arts in American Studies (p. 179)
• Bachelor of Arts in Asian Studies (p. 182)
• Bachelor of Science in Anthropology (p. 184)
• Bachelor of Science in Biological Sciences (p. 198) (Department of Ecology)
  • Biology Teaching Option
  • Conservation Biology and Ecology Option
  • Fish and Wildlife Ecology and Management Option
  • Organismal Biology Option
• Bachelor of Science in Cell Biology and Neuroscience (p. 185)
  • Biomedical Sciences Option (includes Pre-medicine, Pre-dentistry, Pre-optometry)
• Bachelor of Science in Chemistry and Biochemistry (p. 187)
  • Biochemistry Option
  • Chemistry Option
  • Chemistry Teaching Option
• Bachelor of Science in Earth Sciences (p. 191)
  • Geography Option
  • Geology Option
  • GIS/Planning Option
  • Paleontology Option
  • Snow Science Option
• Bachelor of Science in Economics (p. 204)
• Bachelor of Arts in English (p. 205)
  • Writing Option
  • Teaching Option
  • Literature Option
• Bachelor of Arts in History (p. 208)
  • History Option
  • History Teaching Option
  • Japan Studies Option
  • Science, Environment, Technology and Society Option (SETS)
• Bachelor of Arts in Liberal Studies (p. 216)
  • Environmental Studies Option
  • Global and Multicultural Option
  • Quaternity Option
• Bachelor of Science in Mathematics (p. 222)
  • Applied Mathematics Option
  • Mathematics Option
  • Mathematics Teaching Option
  • Statistics Option
• Bachelor of Science in Microbiology (p. 226)
  • Environmental Health Option
  • Medical Laboratory Science Option
  • Microbiology Option
    • Environmental Microbiology Track
    • Microbiology Track
    • Pre-Medical Track
• Bachelor of Arts in Modern Languages and Literatures (p. 233)
  • French Teaching K-12 Option
  • French and Francophone Studies Option
  • German Teaching K-12 Option
  • German Studies Option
  • Hispanic Studies Option
  • Latin American and Latino/Latina Studies
  • Spanish Teaching K-12 Option
• Bachelor of Arts in Philosophy (p. 240)
• Bachelor of Science in Physics (p. 242)
  • Physics Professional Option
  • Physics Teaching Option
  • Physics Interdisciplinary Option
• Bachelor of Arts in Political Science (p. 245)
  • International Relations Option
  • Analysis and Policy Option
  • Political Institutions Option
  • Political Theory Option
• Bachelor of Science in Psychology (p. 249)
  • Applied Psychology Option
  • Psychological Science Option
• Bachelor of Arts in Religious Studies (p. 251)
• Bachelor of Science in Sociology (p. 252)
  • General Sociology Option
  • Criminology Option
• Non-degree program
  • Pre-Medical/Pre-Health Professions (p. 249)
College of Nursing (p. 254)
- Bachelor of Science in Nursing (p. 254)

Gallatin College (p. 259)
- Associate of Applied Science in Aviation (p. 261)
- Associate of Applied Science in Design Drafting Technology (p. 263)
- Associate of Applied Science in Interior Design (p. 264)
- Associate of Arts (p. 260)
- Associate of Science (p. 260)
- Certificate of Applied Science in Bookkeeping (p. 262)
- Certificate of Applied Science in CNC Machine Technology (p. 262)
- Certificate of Applied Science in Health Information Coding (p. 263)
- Certificate of Applied Science in Medical Assistant (p. 265)
- Certificate of Applied Science in Welding Technology (p. 265)
- Professional Certificate in Business Management (p. 262)

Honors College (p. 266)
- Honors College provides academically motivated students with unique opportunities to undertake interdisciplinary coursework and undergraduate research leading to an Honors baccalaureate degree.
- Directed Interdisciplinary Studies (p. 266)

University Programs (p. 267)
- University Programs offers several important academic programs to students including the Undergraduate Scholars Program and Leadership Fellows. University Programs also includes the MSU Advising Center and the National Student Exchange.

Undergraduate Minors

Teaching Minors
A number of teaching minors are available for students majoring in Secondary Education or Elementary Education.
- Art K-12 (p. 132)
- Biology (p. 132)
- Chemistry (p. 133)
- Earth Science (p. 133)
- Economics (p. 133)
- Family and Consumer Sciences (p. 133)
- French K-12 (p. 133)
- German K-12 (p. 134)
- Government (p. 134)
- History (p. 134)
- Mathematics (p. 134)
- Physics (p. 134)
- Reading K-12 (p. 134)
- Spanish K-12 (p. 135)
- Technology Education (p. 135)

Non-teaching Minors
In addition to a major field of study, many students are now declaring a non-teaching minor. This is a secondary area of academic specialization.

Some students use minors to expand their career opportunities, while others pursue minors in education. Students must submit an Application for a Minor to the Registrar’s Office two semesters prior to graduation. Below is a list of non-teaching minors currently available.
- Accounting (p. 276)
- Aerospace (p. 170)
- Agricultural Business (p. 75)
- Animal Science (p. 78)
- Anthropology (p. 184)
- Art History (p. 107)
- Asian Studies (p. 183)
- Astrobiology (p. 191)
- Biochemistry (p. 191)
- Building Energy Systems (p. 171)
- Business Administration (p. 277)
- China Studies (p. 234)
- Chemistry (p. 191)
- Coaching (p. 138)
- Computer Engineering (p. 166)
- Computer Science (p. 162)
- Economics (p. 205)
- Electrical Engineering (p. 168)
- English Literature (p. 208)
- English Writing (p. 208)
- Entrepreneurship and Small Business Management (p. 278)
- Entomology (p. 85)
- Environmental Horticulture (p. 86)
- Finance (p. 278)
- Financial Engineering (p. 74)
- French (p. 235)
- Genetics (p. 94)
- Geographic Information Science (GIS) (p. 193)
- German (p. 235)
- Global Studies (p. 220)
- Hispanic Studies (p. 236)
- History (p. 209)
- Human Development (p. 147)
- Industrial and Management Systems Engineering (p. 171)
- International Business (p. 278)
- Japan Studies (p. 236)
- Land Surveying (p. 161)
- Latin American and Latino Studies (p. 237)
- Materials (p. 173)
- Mathematics (p. 223)
- Mechatronics (p. 176)
- Microbiology (p. 229)
- Military Studies (p. 178)
- Museum Studies (p. 214)
- Music (p. 124)
- Native American Studies (p. 239)
- Natural Resources and Rangeland Ecology (p. 95)
- Optics (p. 169)
- Personal and Consumer Finance (p. 147)
- Philosophy (p. 240)
• Photography (p. 119)
• Physics (p. 244)
• Political Science (p. 245)
• Psychology (p. 250)
• Religious Studies (p. 252)
• Sociology (p. 253)
• Soil Science (p. 94)
• Hispanic Studies (p. 236)
• Spatial Analysis/GIS (p. 193)
• Statistics (p. 225)
• Water Resources (p. 197)
• Women’s, Gender and Sexuality Studies (p. 253)

MSU-Bozeman reserves the right to add or withdraw programs at any time subject to the concurrence of the Board of Regents of Higher Education.

College of Agriculture
Charles Boyer, VP of Agriculture, Dean and Director

Undergraduate Programs Available:
The College of Agriculture offers the Bachelor of Science degree in agricultural business, agricultural education, animal science, biotechnology, environmental horticulture, environmental sciences, natural resources and rangeland ecology, plant science, and sustainable food & bioenergy systems. In addition, a pre-veterinary program is available for students wishing to prepare for professional training in veterinary medicine.

• B.S. in Agricultural Business (p. 71)
• B.S. in Agricultural Education (p. 75)
• B.S. in Animal Science (p. 77)
• Biological Sciences at MSU (p. 81)
• B.S. in Biotechnology (p. 82)
• B.S. in Environmental Horticulture (p. 86)
• B.S. in Environmental Sciences (p. 88)
• B.S. in Financial Engineering (p. 73)
• B.S. in Natural Resources and Rangeland Ecology (p. 95)
• B.S. in Plant Science (p. 97)
• B.S. in Sustainable Food & Bioenergy Systems (p. 100)
• Pre-veterinary Medicine Curriculum (p. 98)

Minors:
Undergraduate minors are offered in agricultural business, animal science, entomology, environmental horticulture, natural resources and rangeland ecology, and soil science.

Agricultural Business Minor (p. 75)
The Agricultural Business minor is specifically designed for management training with emphasis on finance, accounting, and managerial economics in agriculture-related businesses and industries.

Animal Science Minor (p. 78)
The minor in animal science is designed to give students outside of agriculture a broad overview of the livestock industry.

Entomology Minor (p. 85)
The Entomology minor provides focused training in entomology for students majoring in agricultural and natural resource disciplines.

Natural Resources and Rangeland Ecology Minor (p. 95)
A Natural Resources and Rangeland Ecology minor provides students with the basics of managing rangeland ecosystems for wildlife habitat, livestock production, and soil and water conservation.

Soil Science Minor (p. 94)
The Soil Science minor is designed to provide non-majors with fundamental soils courses in preparation for natural resource careers.

Water Resources Minor (p. 197)
The Water Resources Minor is designed to encourage a student from any discipline to explore water resources beyond course work in their major.

Agricultural Business
Department of Agricultural Economics & Economics

Agribusiness is a dynamic industry with a high degree of global and technological sophistication. The agribusiness sector includes companies that are on the cutting edge in the use of biotechnology, strategy, information systems, risk management, logistics and international trade. The study of agricultural business involves the application of business and economic principles to farming and ranching and related sectors of the general economy. Training in agricultural business includes courses in agricultural firm management, marketing farm products, farm credit and finance, agricultural prices and outlook, agricultural policy, management science, agricultural law, technical agriculture and the business aspects of industries serving agriculture. Surveys indicate that employers seek out graduates with expertise in communication, critical thinking, business management and quantitative analyses. Our program specifically develops each of these skills.

Many employment possibilities are open to students with training in agricultural business. Positions are available with businesses which process and market agricultural products, and with the large number of businesses that sell products and services to farmers and ranchers, such as fertilizer companies, farm machinery companies, banks, and farm credit institutions. Also, opportunities exist to operate and manage farms and ranches. In addition, federal and state governments employ persons with training in agricultural business. Many of our graduates work for regional, national, and even international agribusiness firms that market, process, and transport agricultural products. Other graduates work for companies that service agriculture by supplying inputs to producers. Agricultural credit institutions employ many of our graduates. Some of our graduates continue their education by pursuing graduate degrees or attending law school.

Agribusiness Management Concentration
The agribusiness sector of the economy, which produces and sells goods and services to farmers and ranchers on one hand, and processes and markets agricultural commodities on the other, is growing rapidly. In the United States, for every job in agricultural production, there are approximately three jobs in agriculture-related businesses. The MSU agribusiness management curriculum has established an excellent reputation with employers and is specifically designed for management training with emphasis on finance, accounting, and managerial economics in agriculture-related businesses and industries.

Farm and Ranch Management Concentration
For a student who expects to work in agricultural production and eventually own and operate a farm or ranch, the farm and ranch management option provides a vital set of management skills for success in undertaking the investment and complicated business aspects of farming and ranching. The future farm or ranch manager needs to be familiar with marketing, finance, business management, and the global agribusiness system in which
production agriculture operates. Farm and ranch management is a strong academic program designed to provide marketing, management, and finance skills. This curriculum is supplemented with courses that emphasize technical agricultural issues.

**Undergraduate Programs**
- Agribusiness Management Concentration (p. 72)
- Farm and Ranch Management Concentration (p. 72)
- Financial Engineering (p. 73)
- Minor in Agricultural Business (p. 75)
- Minor in Financial Engineering (p. 74)

### Agribusiness Management Concentration

#### Freshman Year

<table>
<thead>
<tr>
<th>Course</th>
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<tbody>
<tr>
<td>ANSC 100 - Introduction to Animal Science</td>
<td>3</td>
</tr>
<tr>
<td>ECNS 101IS - Economic Way of Thinking*</td>
<td>3</td>
</tr>
<tr>
<td>ECNS 202 - Principles of Macroeconomics*</td>
<td>3</td>
</tr>
<tr>
<td>WRIT 101W - College Writing I</td>
<td>3</td>
</tr>
<tr>
<td>BIOB 110CS - Introduction to Plant Biology</td>
<td>3</td>
</tr>
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<td>Choose one of the following:</td>
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<tr>
<td>CHMY 121IN - Introduction to General Chemistry</td>
<td></td>
</tr>
<tr>
<td>BIOB 160 - Principles of Living Systems</td>
<td></td>
</tr>
<tr>
<td>BIOB 170IN - Principles of Biological Diversity</td>
<td></td>
</tr>
<tr>
<td>M 161Q - Survey of Calculus</td>
<td></td>
</tr>
<tr>
<td>or M 171Q - Calculus I</td>
<td></td>
</tr>
<tr>
<td>AGED 140US - Leadership Dev For Agriculture</td>
<td>3</td>
</tr>
<tr>
<td>or COMX 111US - Introduction to Public Speaking</td>
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<tr>
<td>University Core and Electives</td>
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<td><strong>Total</strong>:</td>
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#### Sophomore Year

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<th>Course</th>
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<tr>
<td>ECNS 204IS - Microeconomics*</td>
<td>3</td>
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<tr>
<td>ECNS 309 - Managerial Economics</td>
<td>3</td>
</tr>
<tr>
<td>AGBE 337 - Agricultural Law</td>
<td>3</td>
</tr>
<tr>
<td>AGED 105 - Microcomputers in Agricultural</td>
<td>3</td>
</tr>
<tr>
<td>ACTG 201 - Principles of Financial Acct</td>
<td>3</td>
</tr>
<tr>
<td>ACTG 202 - Principles of Manageral Acct</td>
<td>3</td>
</tr>
<tr>
<td>STAT 216Q - Introduction to Statistics</td>
<td>3</td>
</tr>
<tr>
<td>ENSC 245IN - Soils</td>
<td>3</td>
</tr>
<tr>
<td>Choose one of the following:</td>
<td>3</td>
</tr>
<tr>
<td>BMGT 205 - Prof Business Communication</td>
<td></td>
</tr>
<tr>
<td>WRIT 201 - College Writing II</td>
<td></td>
</tr>
<tr>
<td>WRIT 221 - Intermediate Tech Writing</td>
<td></td>
</tr>
<tr>
<td>University Core and Electives</td>
<td>3</td>
</tr>
<tr>
<td><strong>Total</strong>:</td>
<td><strong>30</strong></td>
</tr>
</tbody>
</table>

#### Junior and Senior Year

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>AGBE 321 - Economics of Ag Marketing</td>
<td>3</td>
</tr>
<tr>
<td>AGBE 345 - Ag Finance and Credit Analysis</td>
<td>3</td>
</tr>
<tr>
<td>AGBE 451RS - Economics of Ag Policy</td>
<td>3</td>
</tr>
<tr>
<td>ECNS 301 - Intermediate Macro with Calc</td>
<td>3</td>
</tr>
<tr>
<td>ECNS 303 - Intermediate Macro with Calc</td>
<td>3</td>
</tr>
<tr>
<td>ECNS 313 - Money and Banking</td>
<td>3</td>
</tr>
<tr>
<td>AGBE 341 - Farm and Ranch Management</td>
<td>3</td>
</tr>
<tr>
<td><strong>Total</strong>:</td>
<td><strong>30</strong></td>
</tr>
</tbody>
</table>

Electives Must Include

- Social Sciences (excluding AGBE/ECNS) 6 credits
- One additional course from Fine Arts, Humanities, or Social Sciences (excluding AGBE/ECNS) 3 credits

These nine elective credits must be over and above University Core Requirements.

### Graduation Requirements

Agricultural Business students must receive a grade of C or better in ECNS 101IS, ECNS 202, ECNS 204IS, ECNS 301, ECNS 303, and M 161Q or M 171Q (or their equivalents) to meet departmental graduation requirements. All other AGBE/ECNS and selective courses counting toward departmental graduation requirements must be graded C- or better.

Agricultural Business students seeking a second major in Economics must complete an additional 15 credits at the 300 level or above in AGBE/ECNS electives over and above all requirements for graduation with a major in Agricultural Business.

A minimum of 120 credits is required for graduation; 42 of these credits must be numbered 300 or above.

### Farm and Ranch Management Concentration

#### Freshman Year

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ANSC 100 - Introduction to Animal Science</td>
<td>3</td>
</tr>
<tr>
<td>ECNS 101IS - Economic Way of Thinking*</td>
<td>3</td>
</tr>
<tr>
<td>ECNS 202 - Principles of Macroeconomics*</td>
<td>3</td>
</tr>
<tr>
<td>WRIT 101W - College Writing I</td>
<td>3</td>
</tr>
<tr>
<td>BIOB 110CS - Introduction to Plant Biology</td>
<td>3</td>
</tr>
<tr>
<td>Choose one of the following:</td>
<td>4</td>
</tr>
<tr>
<td>AGBE 421 - Advanced Ag Marketing**</td>
<td></td>
</tr>
<tr>
<td>AGBE 445 - Agribusiness Management**</td>
<td></td>
</tr>
<tr>
<td>BMGT 335 - Management and Organization</td>
<td></td>
</tr>
<tr>
<td>BMIS 311 - Management Information Systems</td>
<td></td>
</tr>
<tr>
<td>BMKT 325 - Principles of Marketing</td>
<td></td>
</tr>
<tr>
<td><strong>Total Program Credits</strong>:</td>
<td><strong>120</strong></td>
</tr>
</tbody>
</table>

* ECNS 251IS (Honors Economics, 4 credits) may be substituted for the 3 course sequence ECNS 101IS, ECNS 202, and ECNS 204IS.

** Neither AGBE 445 nor AGBE 421 can be used to simultaneously satisfy the Major and Supporting Area Course requirements.

Electives Must Include

- Social Sciences (excluding AGBE/ECNS) 6 credits
- One additional course from Fine Arts, Humanities, or Social Sciences (excluding AGBE/ECNS) 3 credits

These nine elective credits must be over and above University Core Requirements.

### Graduation Requirements

Agricultural Business students must receive a grade of C or better in ECNS 101IS, ECNS 202, ECNS 204IS, ECNS 301, ECNS 303, and M 161Q or M 171Q (or their equivalents) to meet departmental graduation requirements. All other AGBE/ECNS and selective courses counting toward departmental graduation requirements must be graded C- or better.

Agricultural Business students seeking a second major in Economics must complete an additional 15 credits at the 300 level or above in AGBE/ECNS electives over and above all requirements for graduation with a major in Agricultural Business.

A minimum of 120 credits is required for graduation; 42 of these credits must be numbered 300 or above.
Graduation Requirements:

Agricultural Business students must receive a grade of C or better in ECNS 101IS, ECNS 202, ECNS 204IS, ECNS 301, ECNS 303, and M 161Q or M 171Q (or their equivalents) to meet departmental graduation requirements. All other selected courses counting toward departmental graduation requirements must be graded C- or better.

Agricultural Business students seeking a second major in Economics must complete an additional 15 credits at the 300 level or above in AGBE/ECNS electives over and above all requirements for graduation with a major in Agricultural Business.

Financial Engineering

The Bachelor of Science in Financial Engineering (FE) is a multidisciplinary major that emphasizes the creation of new financial economic instruments as well as the combining of existing instruments to manage risk, create strategic business opportunities, lower costs, and access new markets. Risk management is essential in today's highly leveraged domestic markets as well as the global business environment. Successful market, credit, and production risk management requires complex financial economic modeling and analysis.

The objective of the program is to provide students with the necessary tools to manage a business's financial risks. In keeping with this objective, financial engineering majors undertake rigorous training in financial economics, engineering mathematics, and actuarial methods:

- Mathematics similar to engineering but expanded to include more statistics and probability theory
- Financial economics with a solid background in classical economic theory and markets (capital, commodity, and derivative)
- Software engineering and modeling

Financial engineers are commonly employed in banking, corporate finance, securities, insurance, manufacturing, agricultural businesses, and other industries that require sophisticated financial management skills. To remain competitive, regional industries as well as national and international firms will employ financial engineers because of the increased complexity and sophistication of business risk management. Due to their rigorous training, the demand for financial engineering graduates is high with a forecasted growth rate of 18 to 20% annually over the next seven years, according to the Occupational Outlook Handbook. The financial engineering major is a joint program of the Department of Mechanical and Industrial Engineering and the Department of Agricultural Economics and Economics.

Freshman Year

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
<th>Fall</th>
<th>Spring</th>
</tr>
</thead>
<tbody>
<tr>
<td>CLS 101US - Knowledge and Community</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>COMX 111US - Introduction to Public Speaking (formerly COM 110US)</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>M 171Q - Calculus I</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>University Core Electives</td>
<td>6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CSCI 111 - Programming with Java I</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>M 172Q - Calculus II</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PHSX 220 - Physics I (w/ calculus)</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>EFIN 101 - Introduction to Financial Engineering</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ECNS 251IS - Honors Economics</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>WRIT 101W - College Writing I</td>
<td>3</td>
<td></td>
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<tr>
<td>Year Total:</td>
<td>17</td>
<td>16</td>
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</table>

Sophomore Year

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
<th>Fall</th>
<th>Spring</th>
</tr>
</thead>
<tbody>
<tr>
<td>CSCI 132 - Basic Data Structures and Algorithms</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Choose one of the following:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ECNS 345 - Econ Org, Fin, &amp; Credit</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>EGEN 325 - Engineering Economic Analysis</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>M 221 - Introduction to Linear Algebra</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>M 273Q - Multivariable Calculus</td>
<td>4</td>
<td></td>
<td></td>
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</tbody>
</table>
## Financial Engineering Minor

### Required Courses

<table>
<thead>
<tr>
<th>Course Number</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CSCI 232</td>
<td>Data Structures and Algorithms</td>
<td>4</td>
</tr>
<tr>
<td>CHMY 141</td>
<td>College Chemistry I</td>
<td>4</td>
</tr>
<tr>
<td>ECNS 301</td>
<td>Intermediate Micro with Calc</td>
<td>3</td>
</tr>
<tr>
<td>M 274</td>
<td>Introduction to Differential Equation</td>
<td>4</td>
</tr>
<tr>
<td><strong>Year Total:</strong></td>
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### Junior Year

<table>
<thead>
<tr>
<th>Course Number</th>
<th>Course Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>EIND 354</td>
<td>Engineering Probability and Statistics I</td>
<td>3</td>
</tr>
<tr>
<td>Professional Electives</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>ECNS 313</td>
<td>Money and Banking</td>
<td>3</td>
</tr>
<tr>
<td>EIND 300</td>
<td>Engineering Management &amp; Ethics</td>
<td>3</td>
</tr>
<tr>
<td>EIND 364</td>
<td>Principles of Operations Research I</td>
<td>3</td>
</tr>
<tr>
<td>EIND 464</td>
<td>Prin of Operations Research II</td>
<td>3</td>
</tr>
<tr>
<td>EIND 457</td>
<td>Regres &amp; Multivar Analysis</td>
<td>3</td>
</tr>
<tr>
<td>Professional Electives</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>EFIN 301</td>
<td>Engineering &amp; Economic Financial Management I</td>
<td>3</td>
</tr>
<tr>
<td>EIND 373</td>
<td>Production Inventory Cost Analysis</td>
<td>3</td>
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<tr>
<td><strong>Year Total:</strong></td>
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### Senior Year

<table>
<thead>
<tr>
<th>Course Number</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technical Electives</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>ECNS 406</td>
<td>Industrial Organization</td>
<td>3</td>
</tr>
<tr>
<td>EFIN 401</td>
<td>Engineering &amp; Economic Financial Management II</td>
<td>3</td>
</tr>
<tr>
<td>EIND 468</td>
<td>Managerial Forecasting &amp; Decision Analysis</td>
<td>3</td>
</tr>
<tr>
<td>ECNS 461</td>
<td>Financial Econometrics</td>
<td>3</td>
</tr>
<tr>
<td>University Core Elective</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>Technical Electives</td>
<td></td>
<td>6</td>
</tr>
<tr>
<td>Professional Electives</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>EFIN 499R</td>
<td>Financial Engineering Design</td>
<td>3</td>
</tr>
<tr>
<td>Capstone</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Year Total:</strong></td>
<td></td>
<td><strong>15</strong></td>
</tr>
<tr>
<td><strong>Total Program Credits:</strong></td>
<td></td>
<td>125</td>
</tr>
</tbody>
</table>

* May substitute ECNS 202 Principles of Macroeconomics and ECNS 204IS Microeconomics

** Students exempt from MSU writing requirement should substitute another writing course such as WRIT 201, WRIT 221, HONR 201US, HONR 202IH

### Technical Electives

<table>
<thead>
<tr>
<th>Course Number</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CSCI 440</td>
<td>Database Systems</td>
<td>3</td>
</tr>
<tr>
<td>CSCI 446</td>
<td>Artificial Intelligence</td>
<td>3</td>
</tr>
<tr>
<td>CSCI 447</td>
<td>Machine Learning: Soft Computing</td>
<td>3</td>
</tr>
<tr>
<td>ECNS 501</td>
<td>Microeconomic Theory</td>
<td>3</td>
</tr>
<tr>
<td>ECNS 502</td>
<td>Macroeconomic Theory</td>
<td>3</td>
</tr>
<tr>
<td>ECNS 562</td>
<td>Econometrics II</td>
<td>3</td>
</tr>
<tr>
<td>EIND 422</td>
<td>Introduction to Simulation</td>
<td>3</td>
</tr>
<tr>
<td>EIND 458</td>
<td>Production &amp; Engineering Mgmt</td>
<td>3</td>
</tr>
<tr>
<td>E Sof 322</td>
<td>Software Engineering</td>
<td>3</td>
</tr>
<tr>
<td>E Sof 422</td>
<td>Advanced Software Engineering</td>
<td>3</td>
</tr>
<tr>
<td>E Sof 522</td>
<td>Empirical Software Engr</td>
<td>3</td>
</tr>
<tr>
<td>M 441</td>
<td>Numerical Linear Algebra &amp; Optimization</td>
<td>3</td>
</tr>
<tr>
<td>STAT 408</td>
<td>Statistical Computing and Graphical Analysis</td>
<td>1-3</td>
</tr>
</tbody>
</table>

A minimum of 125 credits is required for graduation; 42 of these credits must be in courses numbered 300 or above.

### Financial Engineering Minor

**Required Courses**

<table>
<thead>
<tr>
<th>Course Number</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHMY 141</td>
<td>College Chemistry I</td>
<td>4</td>
</tr>
<tr>
<td>ECNS 251IS</td>
<td>Honors Economics</td>
<td>4</td>
</tr>
<tr>
<td>M 171Q</td>
<td>Calculus I</td>
<td>4</td>
</tr>
<tr>
<td>M 172Q</td>
<td>Calculus II</td>
<td>4</td>
</tr>
<tr>
<td>M 221</td>
<td>Introduction to Linear Algebra</td>
<td>3</td>
</tr>
<tr>
<td>PHSX 220</td>
<td>Physics I (w/ calculus)</td>
<td>4</td>
</tr>
</tbody>
</table>

* May substitute ECNS 202 Principles of Macroeconomics and ECNS 204IS Microeconomics

**Minor Courses**

<table>
<thead>
<tr>
<th>Course Number</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECNS 301</td>
<td>Intermediate Micro with Calc</td>
<td>3</td>
</tr>
<tr>
<td>ECNS 313</td>
<td>Money and Banking</td>
<td>3</td>
</tr>
<tr>
<td>EFIN 101</td>
<td>Introduction to Financial Engineering</td>
<td>1</td>
</tr>
<tr>
<td>EFIN 301</td>
<td>Engineering &amp; Economic Financial Management I</td>
<td>3</td>
</tr>
<tr>
<td>EFIN 401</td>
<td>Engineering &amp; Economic Financial Management II</td>
<td>3</td>
</tr>
<tr>
<td>EGEN 325</td>
<td>Engineering Economic Analysis</td>
<td>3</td>
</tr>
<tr>
<td>EIND 354</td>
<td>Engineering Probability and Statistics I</td>
<td>3</td>
</tr>
<tr>
<td>EIND 364</td>
<td>Principles of Operations Research I</td>
<td>3</td>
</tr>
<tr>
<td><strong>Choose one of the following:</strong></td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>ECNS 309</td>
<td>Managerial Economics</td>
<td>3</td>
</tr>
<tr>
<td>ECNS 406</td>
<td>Industrial Organization</td>
<td>3</td>
</tr>
<tr>
<td>ECNS 461</td>
<td>Financial Econometrics</td>
<td>3</td>
</tr>
<tr>
<td><strong>Choose one of the following:</strong></td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>EIND 457</td>
<td>Regres &amp; Multivar Analysis</td>
<td>3</td>
</tr>
<tr>
<td>EIND 464</td>
<td>Prin of Operations Research II</td>
<td>3</td>
</tr>
<tr>
<td>EIND 468</td>
<td>Managerial Forecasting &amp; Decision Analysis</td>
<td>3</td>
</tr>
</tbody>
</table>
Minor in Agricultural Business (Non-Teaching)

A student must receive a grade of C- or better in all courses required for the minor.

Departmental Course Requirements

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECNS 101IS</td>
<td>Economic Way of Thinking</td>
<td>3</td>
</tr>
<tr>
<td>ECNS 202</td>
<td>Principles of Macroeconomics</td>
<td>3</td>
</tr>
<tr>
<td>ECNS 204IS</td>
<td>Microeconomics</td>
<td>3</td>
</tr>
<tr>
<td>ECNS 301</td>
<td>Intermediate Micro with Calc</td>
<td>3</td>
</tr>
<tr>
<td>AGBE 321</td>
<td>Economics of Ag Marketing</td>
<td>3</td>
</tr>
<tr>
<td>AGBE 341</td>
<td>Farm and Ranch Management</td>
<td>3</td>
</tr>
<tr>
<td>AGBE 345</td>
<td>Ag Finance and Credit Analysis</td>
<td>3</td>
</tr>
</tbody>
</table>

Supporting Requirements

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACTG 201</td>
<td>Principles of Financial Acct</td>
<td>3</td>
</tr>
<tr>
<td>M 161Q</td>
<td>Survey of Calculus</td>
<td>4</td>
</tr>
<tr>
<td>or M 171Q</td>
<td>Calculus I</td>
<td></td>
</tr>
<tr>
<td>STAT 216Q</td>
<td>Introduction to Statistics</td>
<td>3</td>
</tr>
<tr>
<td>3 credits of 200+ (ACTG, BFIN, BGEN, BMGT, BMIS, BMKT) courses</td>
<td>3</td>
<td></td>
</tr>
</tbody>
</table>

Total Credits: 40

* Students cannot use either AGBE 337 or BGEN 361 to meet the requirements of the minor.

ECNS 251IS Honors Economics (4 credits) may be substituted for the three-course sequence: ECNS 101IS, ECNS 202, and ECNS 204IS.

“P” grades may be accepted at the discretion of the department only for coursework transferred from outside the Montana University System.

Agricultural Education

Agricultural Education majors may choose from two options: Teaching or Relations. Agricultural education graduates are employed by high schools, area vocational schools, community colleges, public agriculture sector, Extension Service, Natural Resource Conservation Service, and other federal and state and government agencies.

The agricultural education curriculum is designed to provide professional preparation for extension agents, middle school and secondary agricultural education teachers and persons in agriculture service areas where content knowledge, pedagogical and andragogical skills, and presentation experience are desirable attributes. Our graduates are prepared for a wide variety of jobs because they have a broad base of knowledge combined with excellent people skills.

Students in agricultural education gain leadership experience through the Collegiate 4-H, Collegiate FFA, MSU Agricultural Education Club and other College of Agriculture student organizations.

Teaching Option

The teaching option permits a student to choose a balanced program among agricultural economics, agricultural mechanics, animal & range sciences, and plant & soil sciences, while also gaining teaching and presentation skills. Students preparing to teach spend 14 weeks in an approved high school agriculture department as teaching candidates. Graduates are eligible to receive a Montana Class Two (standard) teaching license which permits them to teach in middle and high schools. This licensure is recognized in most other states throughout the U.S.

Students may pursue a teaching minor in a variety of disciplines that provides them with additional employment opportunities.

Communications, Leadership and Extension Tracks

The Agricultural Education Communications track emphasizes academic coursework to prepare students to communicate about emerging agricultural issues to diverse audiences. Students will develop professional verbal, written, and technological skills to advocate for the agricultural industry. Courses in this track include advanced writing, communications, interpersonal skills, marketing, and media development. All students will also enhance their degree with a “Leadership Fellows” certificate integrated into the program of study. Careers may include agricultural business and communication positions related to public relations, rural broadcasting and news, magazine editors and writers, communications specialists, and sales representatives. An approved internship with an agricultural agency is required.

The Agricultural Education Extension track emphasizes academic coursework to prepare students for careers in the Cooperative Extension Service and other non-formal settings. This track provides broad-based coursework that includes animal science, plant science, agricultural economics, non-formal teaching methods, adult and youth education, communications, and leadership development. All students will also enhance their degree with a “Leadership Fellows” certificate integrated into the program of study. Careers may include positions in extension education, community and nonprofit education, government and nongovernmental agencies, and other non-formal educational organizations. An approved internship in a local Extension office or with an agricultural organization is required.

The Agricultural Education Leadership track emphasizes academic coursework to develop knowledge and skills necessary to work with people in leadership and management positions. Students will develop fundamental abilities in interpersonal communication, teamwork, leadership, motivation, and management in the broad area of agriculture. All students will also enhance their degree with a “Leadership Fellows” certificate integrated into the program of study. An array of careers in private and public sectors may include sales, management, organizational training, community development, non-formal education, and consulting in agricultural and natural resource industries. An approved internship with an agricultural agency is required.

Undergraduate Programs

- Agricultural Education Teaching Option (p. 77)
- Agricultural Education Communications, Extension and Leadership Tracks (p. 75)

Graduate Programs

- M.S. in Agricultural Education (p. 384)

Agricultural Education Communications, Leadership, and Extension Track

<table>
<thead>
<tr>
<th>Freshman Year</th>
<th>Fall</th>
<th>Spring</th>
<th>Summer</th>
</tr>
</thead>
<tbody>
<tr>
<td>WRIT 101W - College Writing I</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ECNS 101IS - Economic Way of Thinking</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>NRSM 101 - Natural Resource Conservation</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>NRSM 102 - Montana Range Plants</td>
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</tr>
<tr>
<td>Course Code</td>
<td>Course Title</td>
<td>Credits</td>
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</tr>
<tr>
<td>CHMY 121IN</td>
<td>Introduction to General Chemistry</td>
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<td>AGSC 101</td>
<td>Introduction to Agricultural and Environmental Resources (1)</td>
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<td>AGED 140US</td>
<td>Leadership Dev For Agriculture</td>
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<td>AGED 105</td>
<td>Microcomputers in Agricultural</td>
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<td>M 105Q</td>
<td>Contemporary Mathematics (formerly M 145Q, Math for Liberal Arts)</td>
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<td>BIOB 160</td>
<td>Principles of Living Systems</td>
<td>4</td>
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<td>ANSC 100</td>
<td>Introduction to Animal Science</td>
<td>3</td>
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<td>BIOB 318</td>
<td>Biometry</td>
<td>3</td>
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<tr>
<td>UC 202</td>
<td>Leadership Foundations</td>
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<td>AGBE 210IS</td>
<td>Economics of Ag Business</td>
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<tr>
<td>BIO 265</td>
<td>Principles of Digital Photography</td>
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<td>AGED 309</td>
<td>Philosophy and Programs in Extension</td>
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<tr>
<td>BMKT 325</td>
<td>Principles of Marketing (3)</td>
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<td>Leadership Capstone</td>
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<td>H Core</td>
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<td>AGED 494</td>
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<td>AGED 401</td>
<td>Agricultural Relations Issues and Research</td>
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**Total Program Credits:** 125

### Ag Electives (Lower Level)

<table>
<thead>
<tr>
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<th>Course Title</th>
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<tbody>
<tr>
<td>ANSC 205</td>
<td>Intro to Meat Evaluation</td>
<td>2</td>
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<tr>
<td>ANSC 222</td>
<td>Livestock in Sustain Systems</td>
<td>3</td>
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<tr>
<td>HORT 105</td>
<td>Miracle Growing</td>
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<td>HORT 245</td>
<td>Plant Propagation</td>
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<td>NRSM 240</td>
<td>Natural Resource Ecology</td>
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<td>ANSC 215</td>
<td>Calving Management</td>
<td>2</td>
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<tr>
<td>SFBS 146</td>
<td>Introduction to Sustainable Food and Bioenergy Systems</td>
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### Ag Electives (Upper Level)

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>AGSC 341</td>
<td>Field Crop Prod</td>
<td>3</td>
</tr>
<tr>
<td>AGSC 342</td>
<td>Forages</td>
<td>3</td>
</tr>
<tr>
<td>ANSC 316</td>
<td>Meat Science</td>
<td>4</td>
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<tr>
<td>ANSC 321</td>
<td>Physiology of Animal Reproduction</td>
<td>4</td>
</tr>
<tr>
<td>ANSC 337</td>
<td>Disease of Domestic Livestock</td>
<td>3</td>
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<tr>
<td>NRSN 421</td>
<td>Holistic Thought/Mgmt</td>
<td>4</td>
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<tr>
<td>WILD 325</td>
<td>Wildlife-Livestock Nutrition</td>
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### Communications Electives

<table>
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<tr>
<td>BMKT 240</td>
<td>Advertising</td>
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<td>CS 204</td>
<td>Multimedia Dev Methods</td>
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<tr>
<td>WRIT 326</td>
<td>Advanced Writing</td>
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<tr>
<td>WRIT 371</td>
<td>Digital Rhetorics and Multimodal Writing</td>
<td>3</td>
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<tr>
<td>WRIT 372</td>
<td>Science Writing for Popular Non-Fiction</td>
<td>3</td>
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<tr>
<td>WRIT 374</td>
<td>Magazine Editing</td>
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<td>WRIT 429</td>
<td>Professional Writing</td>
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### Leadership Electives

<table>
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<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>AGSC 465R</td>
<td>Health, Agriculture, Poverty</td>
<td>4</td>
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<tr>
<td>BGEN 242D</td>
<td>Intro to Int'l Business</td>
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<tr>
<td>BMGT 366</td>
<td>Supervisory Management Skills</td>
<td>3</td>
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<tr>
<td>BMGT 406</td>
<td>Negotiation/Dispute Resolution</td>
<td>3</td>
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<tr>
<td>BMKT 337</td>
<td>Consumer Behavior</td>
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<tr>
<td>BMKT 343</td>
<td>Integrated Marketing Communication</td>
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<td>BMKT 436</td>
<td>Sales and Sales Management</td>
<td>3</td>
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<tr>
<td>SOCI 345</td>
<td>Sociology of Organizations</td>
<td>3</td>
</tr>
<tr>
<td>WRIT 373</td>
<td>News and Pub Relations Writing</td>
<td>3</td>
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</table>

A minimum of 125 credits is required for graduation; 42 of these credits must be in courses numbered 300 and above. All tracks will earn a Leadership Fellows Certificate as a part of their program.

### Agricultural Education Teaching Option

#### Freshman Year

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>AGED 140US</td>
<td>Leadership Dev For Agriculture</td>
<td>3</td>
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<tr>
<td>CHMY 121IN</td>
<td>Introduction to General Chemistry</td>
<td>4</td>
</tr>
<tr>
<td>M 105Q</td>
<td>Contemporary Mathematics (formerly M 145Q, Math for Liberal Arts)</td>
<td>3</td>
</tr>
<tr>
<td>NRSN 101</td>
<td>Natural Resource Conservation</td>
<td>3</td>
</tr>
<tr>
<td>NRSN 102</td>
<td>Montana Range Plants</td>
<td>1</td>
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<tr>
<td>WRIT 101W</td>
<td>College Writing</td>
<td>3</td>
</tr>
<tr>
<td>AGED 105</td>
<td>Microcomputers in Agricultural</td>
<td>3</td>
</tr>
<tr>
<td>ANSC 100</td>
<td>Introduction to Animal Science</td>
<td>3</td>
</tr>
<tr>
<td>BIOB 110CS</td>
<td>Introduction to Plant Biology</td>
<td>3</td>
</tr>
<tr>
<td>ECNS 101IS</td>
<td>Economic Way of Thinking</td>
<td>3</td>
</tr>
<tr>
<td>EDU 202</td>
<td>Early Field Experience</td>
<td>1</td>
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<tr>
<td>FCS 101IS</td>
<td>Indiv and Fam Dev: Lifespan</td>
<td>3</td>
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#### Year Total: 17 16

#### Sophomore Year

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>BIOB 160</td>
<td>Principles of Living Systems</td>
<td>4</td>
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</tbody>
</table>

#### Total Program Credits: 128

A minimum of 128 credits is required for graduation; 42 of these credits must be in courses numbered 300 and above.

### Animal Science

**Note:** MSU's programs in the biological sciences are distributed across multiple departments; MSU does not have a single Department of Biology. For additional options see Biological Sciences at MSU, Department of Animal and Range Sciences.

The animal science curricula are administered by the Department of Animal and Range Sciences. The curricula in animal science provide students with a firm foundation in the biological and natural sciences, animal breeding, reproductive physiology, nutrition and livestock production and...
management. Applications to production environments of the western United States are emphasized, including the close relationships among livestock, rangeland and natural resources. Three options are offered leading to a B.S. in Animal Science. Proper use of restricted electives allows students to tailor curricula to meet their individual needs.

Equine Science Option
The Equine Science Option emphasizes science and technology combined with practical aspects of management, horsemanship and training. Graduates of this program will have a firm foundation to meet the growing needs of the equine industry. This program is designed to prepare students for employment in breeding, nutrition, and management of facilities and land, as well as in the allied industries such as sales, feed, tack, and equipment. Students can tailor their program for more emphasis in biotechnology, business, or range management.

Livestock Management & Industry Option
The Livestock Management & Industry Option stresses the application of science to livestock production, incorporating courses in agricultural economics and business. Emphasis is placed on the application of the principles of economics, range science, genetics, physiology and nutrition in sustainable livestock production systems and business and management skills as they relate to livestock enterprises and service industries closely allied to livestock production. It is designed to allow flexible course work choices to prepare graduates to manage livestock enterprises or for employment with companies producing and marketing livestock, animal feeds and health products, as well as employment with a variety of communication and service organizations such as breed associations, commodity groups, livestock publications and government agencies.

Science Option
The Science Option emphasizes greater depth in the basic sciences and is designed for highly motivated students who have a strong interest in graduate training or professional school. Individual curricula can be tailored to provide excellent preparation for veterinary school, medical school, or graduate studies in animal biotechnology, physiology, nutrition or genetics.

Undergraduate Programs
- Equine Science Option (p. 78)
- Livestock Management & Industry Option (p. 79)
- Science Option (p. 80)

Undergraduate Minors
- Animal Science Minor (Non-Teaching) (p. 78)
- Genetics Minor (Non-Teaching) (p. 94)

Graduate Programs
- M.S. in Animal and Range Sciences (p. 285)
- M.S. in Land Rehabilitation (interdisciplinary) (p. 286)
- Ph.D. in Animal and Range Sciences (p. 286)

Animal Science Minor (Non-Teaching)

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>ANSC 100</td>
<td>Introduction to Animal Science</td>
<td>3</td>
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<tr>
<td>NRSM 101</td>
<td>Natural Resource Conservation</td>
<td>3</td>
</tr>
<tr>
<td>NRSM 102</td>
<td>Montana Range Plants</td>
<td>1</td>
</tr>
<tr>
<td>ANSC 222</td>
<td>Livestock in Sustain Systems</td>
<td>3</td>
</tr>
<tr>
<td>CHMY 123</td>
<td>Introduction of Organic Chemistry and Biochemistry</td>
<td>4</td>
</tr>
<tr>
<td>ANSC 265</td>
<td>Anatomy and Physiology of Domestic Animals - Lecture</td>
<td>3</td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>ANSC 266</td>
<td>Anatomy and Physiology of Domestic Animals - Lab</td>
<td>1</td>
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<tr>
<td>ANSC 320</td>
<td>Animal Nutrition</td>
<td>4</td>
</tr>
<tr>
<td>ANSC 321</td>
<td>Physiology of Animal Reproduction</td>
<td>4</td>
</tr>
<tr>
<td>ANSC 322</td>
<td>Principles of Animal Breeding and Genetics</td>
<td>3</td>
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</table>

Choose one of the following: 1-2
- ANSC 205 : Intro to Meat Evaluation
- ANSC 215 : Calving Management
- ANSC 232 : Livestock Management - Sheep I
- EQUUS 233 : Horse Science and Mgt Lab
- ANSC 234 : Livestock Management - Beef I
- NRSM 236 : Small Pasture Management
- ANSC 308 : Livestock Evaluation

Choose one of the following: 3-4
- ANSC 316 : Meat Science
- EQUUS 430 : Horse Management
- ANSC 434R : Beef Cattle Management
- ANSC 432R : Sheep Management

Total Credits: 33-35

All students are responsible for meeting prerequisites for upper division courses.

Equine Science Option

<table>
<thead>
<tr>
<th>Freshman Year</th>
<th>Credits</th>
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<tbody>
<tr>
<td>NRSM 101 - Natural Resource Conservation</td>
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<td>NRSM 102 - Montana Range Plants</td>
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<tr>
<td>CHMY 121N - Introduction to General Chemistry</td>
<td>4</td>
</tr>
<tr>
<td>University Core and Electives</td>
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<tr>
<td>ANSC 100 - Introduction to Animal Science</td>
<td>3</td>
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<tr>
<td>BIOL 160 - Principles of Living Systems</td>
<td>4</td>
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<tr>
<td>ECNS 101S - Economic Way of Thinking</td>
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<td>Applied Courses</td>
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<tr>
<td>BIOL 318 - Biometry or STAT 216Q - Introduction to Statistics</td>
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<tr>
<td>EQUUS 206 - Equine Ethology: Understanding Horse Behavior</td>
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<tr>
<td>NRSM 240 - Natural Resource Ecology</td>
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<tr>
<td>Applied Courses</td>
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<td>University Core and Electives</td>
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<tr>
<td>ANSC 222 - Livestock in Sustain Systems</td>
<td>3</td>
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<tr>
<td>ANSC 265 - Anatomy and Physiology of Domestic Animals - Lecture</td>
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<tr>
<td>ANSC 266 - Anatomy and Physiology of Domestic Animals - Lab</td>
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<tr>
<td>NRSM 236 - Small Pasture Management</td>
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<td>CHMY 123 - Introduction of Organic Chemistry and Biochemistry</td>
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<tr>
<td>BMGT 205 - Prof Business Communication or WRIT 221 - Intermediate Tech Writing</td>
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Year Total: 14 15

**Junior Year**

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<tbody>
<tr>
<td>ANSC 320 - Animal Nutrition</td>
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<tr>
<td>ANSC 321 - Physiology of Animal Reproduction</td>
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<tr>
<td>ANSC 498 - Internship</td>
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<td>Applied Courses</td>
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<tr>
<td>Econ and Business Electives</td>
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<tr>
<td>AGBE 210IS - Economics of Ag Business</td>
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<td>ANSC 322 - Principles of Animal Breeding and Genetics</td>
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<td>EQUH 347 - Equine Form to Function</td>
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**Senior Year**

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<td>Equine Science Elective</td>
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<td>Electives</td>
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<tr>
<td>Mgmt &amp; Industry Electives</td>
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<td>Mgmt &amp; Industry Electives</td>
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**Total Program Credits:** 120

**Applied Courses**

Select 6 credits

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<tr>
<td>EQUH 110 - Western Equitation</td>
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<td>EQUH 114 - Beginning English Equitation</td>
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<tr>
<td>EQUH 207 - Intermed English Equitation</td>
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<tr>
<td>EQUH 210 - Intermed Western Equitation</td>
</tr>
<tr>
<td>EQUH 253 - Starting Colts</td>
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<tr>
<td>EQUH 256 - Developing The Young Horse</td>
</tr>
<tr>
<td>EQUH 314 - Equestrian Instruction Methods</td>
</tr>
<tr>
<td>EQUES 233 - Horse Science and Mgt Lab</td>
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<tr>
<td>NRSM 235 - Range and Pasture Monitoring</td>
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**Equine Science Electives**

Take 2 courses

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<tbody>
<tr>
<td>ANSC 410 - Veterinary Entomology and Parasitology</td>
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<td>EQUH 352 - Equine Lameness</td>
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<td>EQUH 346 - Equine Reproductive Management</td>
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<td>EQUH 424 - Equine Exercise Physiology</td>
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**Econ & Business Electives**

Select 9 credits

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<td>ACTG 201 - Principles of Financial Acct</td>
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<td>ACTG 202 - Principles of Managerial Acct</td>
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<tr>
<td>ACTG 220 - Survey of Accounting</td>
</tr>
<tr>
<td>AGBE 321 - Economics of Ag Marketing</td>
</tr>
<tr>
<td>AGBE 337 - Agricultural Law</td>
</tr>
<tr>
<td>AGBE 341 - Farm and Ranch Management</td>
</tr>
<tr>
<td>AGBE 345 - Ag Finance and Credit Analysis</td>
</tr>
<tr>
<td>AGBE 353 - Co-operative Business Principles and Practice</td>
</tr>
<tr>
<td>BGEN 204 - Business &amp; Entrepreneurship Fundamentals</td>
</tr>
<tr>
<td>BGEN 242D - Intro to Int’l Business</td>
</tr>
<tr>
<td>BGEN 361 - Principles of Business Law</td>
</tr>
<tr>
<td>BMGT 335 - Management and Organization</td>
</tr>
<tr>
<td>BMGT 337 - Consumer Behavior</td>
</tr>
<tr>
<td>BMGT 436 - Sales and Sales Management</td>
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**Management & Industry Electives**

Select 9 credits

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<tr>
<td>AGSC 341 - Field Crop Prod</td>
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<td>AGSC 342 - Forages</td>
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<td>ANSC 232 - Livestock Management - Sheep I</td>
</tr>
<tr>
<td>ANSC 234 - Livestock Management - Beef I</td>
</tr>
<tr>
<td>ANSC 418 - Topics in Beef Nutrition</td>
</tr>
<tr>
<td>or EQUH 423 - Equine Nutrition</td>
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<tr>
<td>ANSC 432R - Sheep Management</td>
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<tr>
<td>ANSC 434R - Beef Cattle Management</td>
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<tr>
<td>BIOM 405 - Host-Associated Microbiomes</td>
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<td>ENSC 245IN - Soils</td>
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<tr>
<td>EQUH 430 - Horse Management</td>
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<tr>
<td>NRSM 353 - Grazing Ecology and Management</td>
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<tr>
<td>NRSM 453 - Habitat Inventory and Analysis</td>
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<tr>
<td>NRSM 455 - Riparian Ecology &amp; Management</td>
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</table>

A minimum of 120 credits is required for graduation; 42 of these credits must be in courses numbered 300 and above. University core requirements must be completed.

**Livestock Management & Industry Option**

**Freshman Year**

<table>
<thead>
<tr>
<th>Credits</th>
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<tbody>
<tr>
<td>NRSM 101 - Natural Resource Conservation</td>
</tr>
<tr>
<td>NRSM 102 - Montana Range Plants</td>
</tr>
<tr>
<td>CHMY 121IN - Introduction to General Chemistry</td>
</tr>
<tr>
<td>University Core and Electives</td>
</tr>
<tr>
<td>ANSC 100 - Introduction to Animal Science</td>
</tr>
<tr>
<td>CHMY 123 - Introduction of Organic Chemistry and Biochemistry</td>
</tr>
<tr>
<td>BIOL 160 - Principles of Living Systems</td>
</tr>
<tr>
<td>ECNS 101IS - Economic Way of Thinking</td>
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<tr>
<td>Year Total:</td>
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**Sophomore Year**

<table>
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<tr>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>NRSM 240 - Natural Resource Ecology</td>
</tr>
<tr>
<td>STAT 216Q - Introduction to Statistics</td>
</tr>
<tr>
<td>University Core and Elective</td>
</tr>
<tr>
<td>Econ &amp; Business Elective</td>
</tr>
<tr>
<td>Practicum Electives</td>
</tr>
<tr>
<td>ANSC 222 - Livestock in Sustain Systems</td>
</tr>
<tr>
<td>ANSC 265 - Anatomy and Physiology of Domestic Animals - Lecture</td>
</tr>
<tr>
<td>Course Code</td>
</tr>
<tr>
<td>-------------</td>
</tr>
<tr>
<td>ANSC 266</td>
</tr>
<tr>
<td>BMGT 205</td>
</tr>
<tr>
<td>or WRIT 221</td>
</tr>
<tr>
<td>University Core and Electives</td>
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<tr>
<td>Year Total</td>
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</table>

### Junior Year

<table>
<thead>
<tr>
<th>Credits</th>
<th>Fall</th>
<th>Spring</th>
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<tbody>
<tr>
<td>ANSC 320</td>
<td>Animal Nutrition</td>
<td>4</td>
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<tr>
<td>ANSC 321</td>
<td>Physiology of Animal Reproduction</td>
<td>4</td>
</tr>
<tr>
<td>Econ &amp; Business Elective</td>
<td>3</td>
<td></td>
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<tr>
<td>University Core and Electives</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>AGBE 210IS</td>
<td>Economics of Ag Business</td>
<td>3</td>
</tr>
<tr>
<td>AGBE 316</td>
<td>Meat Science</td>
<td>4</td>
</tr>
<tr>
<td>AGBE 322</td>
<td>Principles of Animal Breeding and Genetics</td>
<td>3</td>
</tr>
<tr>
<td>AGBE 337</td>
<td>Disease of Domestic Livestock</td>
<td>3</td>
</tr>
<tr>
<td>ANSC 498</td>
<td>Internship</td>
<td>3</td>
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</table>

| Year Total | | 14 |

### Senior Year

<table>
<thead>
<tr>
<th>Credits</th>
<th>Fall</th>
<th>Spring</th>
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<tbody>
<tr>
<td>Econ &amp; Business Elective</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Mgmt &amp; Industry Elective</td>
<td>6</td>
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<tr>
<td>University Core and Electives</td>
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<tr>
<td>Livestock Management Elective</td>
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<tr>
<td>Mgmt &amp; Industry Elective</td>
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<tr>
<td>University Core and Electives</td>
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</table>

| Year Total | | 15-16 |

### Total Program Credits

| Credits | 120 |

### Livestock and Range Practicum Electives

Choose two of the following:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ANSC 205</td>
<td>Intro to Meat Evaluation</td>
<td>2</td>
</tr>
<tr>
<td>or ANSC 308</td>
<td>Livestock Evaluation</td>
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<tr>
<td>ANSC 232</td>
<td>Livestock Management - Sheep I</td>
<td>1</td>
</tr>
<tr>
<td>ANSC 234</td>
<td>Livestock Management - Beef I</td>
<td>1</td>
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<tr>
<td>EQUUS 233</td>
<td>Horse Science and Mgt Lab</td>
<td>2</td>
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<tr>
<td>NRSM 235</td>
<td>Range and Pasture Monitoring</td>
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</table>

### Livestock Management Electives

Select 6 credits

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>Credits</th>
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<tbody>
<tr>
<td>ANSC 416R</td>
<td>Meat Processing</td>
<td>3</td>
</tr>
<tr>
<td>ANSC 432R</td>
<td>Sheep Management</td>
<td>3</td>
</tr>
<tr>
<td>ANSC 434R</td>
<td>Beef Cattle Management</td>
<td>4</td>
</tr>
<tr>
<td>EQUUS 430</td>
<td>Horse Management</td>
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### Econ & Business Electives

Select 9 credits

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>ACTG 201</td>
<td>Principles of Financial Acct</td>
<td>3</td>
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<tr>
<td>ACTG 202</td>
<td>Principles of Managerial Acct</td>
<td>3</td>
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<tr>
<td>ACTG 220</td>
<td>Survey of Accounting</td>
<td>3</td>
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<tr>
<td>AGBE 321</td>
<td>Economics of Ag Marketing</td>
<td>3</td>
</tr>
<tr>
<td>AGBE 337</td>
<td>Agricultural Law</td>
<td>3</td>
</tr>
<tr>
<td>AGBE 341</td>
<td>Farm and Ranch Management</td>
<td>3</td>
</tr>
<tr>
<td>AGBE 345</td>
<td>Ag Finance and Credit Analysis</td>
<td>3</td>
</tr>
<tr>
<td>AGBE 353</td>
<td>Co-operative Business Principles and Practice</td>
<td>3</td>
</tr>
<tr>
<td>AGBE 421</td>
<td>Advanced Ag Marketing</td>
<td>3</td>
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<tr>
<td>BFIN 205</td>
<td>Personal Finance</td>
<td>3</td>
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<tr>
<td>BGEN 204</td>
<td>Business &amp; Entrepreneurship Fundamentals</td>
<td>3</td>
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<tr>
<td>BGEN 242D</td>
<td>Intro to Int'l Business</td>
<td>3</td>
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<tr>
<td>BGEN 361</td>
<td>Principles of Business Law</td>
<td>3</td>
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<tr>
<td>BMGT 335</td>
<td>Management and Organization</td>
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<tr>
<td>BMKT 325</td>
<td>Principles of Marketing</td>
<td>3</td>
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<tr>
<td>BMKT 337</td>
<td>Consumer Behavior</td>
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</tr>
<tr>
<td>BMKT 436</td>
<td>Sales and Sales Management</td>
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### Management & Industry Electives

Select 12 credits

<table>
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<tr>
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<th>Course Name</th>
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<tbody>
<tr>
<td>AGSC 341</td>
<td>Field Crop Prod</td>
<td>3</td>
</tr>
<tr>
<td>AGSC 342</td>
<td>Forages</td>
<td>3</td>
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<tr>
<td>ANSC 310</td>
<td>Veterinary Entomology and Parasitology</td>
<td>3</td>
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<tr>
<td>ANSC 418</td>
<td>Topics in Beef Nutrition</td>
<td>2</td>
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<tr>
<td>ANSC 421</td>
<td>Assisted Reproduction Technologies w/ Lab</td>
<td>4</td>
</tr>
<tr>
<td>BIOM 405</td>
<td>Host-Associated Microbiomes</td>
<td>4</td>
</tr>
<tr>
<td>EQUUS 327</td>
<td>Equine Lameness</td>
<td>3</td>
</tr>
<tr>
<td>EQUUS 423</td>
<td>Equine Nutrition</td>
<td>2</td>
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<tr>
<td>ENSC 245IN</td>
<td>Soils</td>
<td>3</td>
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<tr>
<td>NRSM 353</td>
<td>Grazing Ecology and Management</td>
<td>3</td>
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<tr>
<td>NRSM 453</td>
<td>Habitat Inventory and Analysis</td>
<td>3</td>
</tr>
<tr>
<td>NRSM 455</td>
<td>Riparian Ecology &amp; Management</td>
<td>3</td>
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</tbody>
</table>

A minimum of 120 credits is required for graduation; 42 of these credits must be in courses numbered 300 and above. University core requirements must be completed.

### Science Option

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>Credits</th>
<th>Fall</th>
<th>Spring</th>
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</thead>
<tbody>
<tr>
<td>NRSM 101</td>
<td>Natural Resource Conservation</td>
<td>3</td>
<td></td>
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<tr>
<td>NRSM 102</td>
<td>Montana Range Plants</td>
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<tr>
<td>BIOB 170IN</td>
<td>Principles of Biological Diversity</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CHMY 141</td>
<td>College Chemistry I</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>University Core and Electives</td>
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<td></td>
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<tr>
<td>ANSC 100</td>
<td>Introduction to Animal Science</td>
<td>3</td>
<td></td>
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<td>ANSC 241</td>
<td>Livestock in Sustain Systems</td>
<td>3</td>
<td></td>
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<tr>
<td>AGBE 318</td>
<td>Assisted Reproduction Technologies w/ Lab</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>University Core and Electives</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AGBE 337</td>
<td>Agricultural Law</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AGBE 341</td>
<td>Farm and Ranch Management</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AGBE 345</td>
<td>Ag Finance and Credit Analysis</td>
<td>3</td>
<td></td>
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</tbody>
</table>

A minimum of 120 credits is required for graduation; 42 of these credits must be in courses numbered 300 and above. University core requirements must be completed.
A minimum of 120 credits is required for graduation; 42 of these credits must be in courses numbered 300 and above. University core requirements must be completed.

### Livestock Management Electives

**Take two**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>ANSC 316</td>
<td>Meat Science</td>
<td>4</td>
</tr>
<tr>
<td>ANSC 432R</td>
<td>Sheep Management</td>
<td>3</td>
</tr>
<tr>
<td>ANSC 434R</td>
<td>Beef Cattle Management</td>
<td>4</td>
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<tr>
<td>EQUS 430</td>
<td>Horse Management</td>
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### Restricted Electives

**Select 12 credits**

<table>
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<th>Course Code</th>
<th>Course Title</th>
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<tbody>
<tr>
<td>ANSC 337</td>
<td>Disease of Domestic Livestock</td>
<td>3</td>
</tr>
<tr>
<td>ANSC 410</td>
<td>Veterinary Entomology and Parasitology</td>
<td>3</td>
</tr>
<tr>
<td>ANSC 421</td>
<td>Assisted Reproduction Technologies w/ Lab</td>
<td>4</td>
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<tr>
<td>BIOB 375</td>
<td>General Genetics</td>
<td>3</td>
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<tr>
<td>BIOH 323</td>
<td>Human Developmental Biology</td>
<td>4</td>
</tr>
<tr>
<td>BIOH 454</td>
<td>Microanatomy (Histology)</td>
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</tr>
<tr>
<td>BIOM 360</td>
<td>General Microbiology</td>
<td>5</td>
</tr>
<tr>
<td>BIOM 405</td>
<td>Host-Associated Microbiomes</td>
<td>4</td>
</tr>
<tr>
<td>BIVO 310</td>
<td>Comparative Vertebrate Anatomy</td>
<td>4</td>
</tr>
<tr>
<td>BIVO 412</td>
<td>Animal Physiology</td>
<td>3</td>
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<tr>
<td>PHSX 205</td>
<td>College Physics I</td>
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<tr>
<td>PHSX 207</td>
<td>College Physics II</td>
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</table>

### Total Program Credits:

- **Fall:** 15
- **Spring:** 18

### University Core and Electives

**Senior Year**

<table>
<thead>
<tr>
<th>Course Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>University Core and Electives</td>
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</tr>
<tr>
<td>Livestock Management Electives</td>
<td>3</td>
</tr>
<tr>
<td>ANSC 498 - Internship</td>
<td>3</td>
</tr>
<tr>
<td>or ANSC 490R - Undergraduate Research</td>
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<td>Year Total:</td>
<td>16</td>
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<tr>
<td><strong>Fall:</strong></td>
<td></td>
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<tr>
<td><strong>Spring:</strong></td>
<td></td>
</tr>
<tr>
<td>Total Program Credits:</td>
<td>120</td>
</tr>
</tbody>
</table>

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### Biological Sciences

**Animal Science** (p. 77) - Animal and Range Sciences Department; College of Agriculture

*Equine Science*: emphasizes science and technology combined with practical aspects of management, horsemanship and training.

*Livestock Management and Industry*: stresses the application of science to livestock production, incorporating courses in agriculture economics and business. This program focuses on sustainable livestock systems, business, and management skills as they relate to livestock enterprises and production service industries.

*Science Option*: emphasizes greater depth in the basic sciences and is designed for highly motivated students who have a strong interest in graduate training or professional school.

**Biological Sciences** - Ecology Department; College of Letters and Science

*Conservation Biology and Ecology*: gives students a clear understanding of the ways that natural and human-related processes affect species, communities and ecosystems, and relate this knowledge to its broad societal context.

*Fish and Wildlife Ecology and Management*: provides a professional degree program for those students who have an interest in employment in these fields. Study leading toward a bachelor's degree emphasizes basic principles of animal ecology, with considerable work in related fields.

*Organismal Biology*: provides a rigorous program of study in plant or animal biology at the whole-organism, species, population, and community levels, while allowing students flexibility in selecting those biology courses that best meet their interests and objectives.

*Biological Teaching*: certifies graduates to be qualified to teach secondary school biology and provides a solid education in biology and basic sciences with professional preparation courses required for state teacher certification.

**Biotechnology** - Veterinary Molecular Biology Dept; Microbiology Dept; Plant Sciences and Plant Pathology Department

Modern research in cellular and molecular biology, in areas focused on *Animal Systems*, *Plant Systems*, and *Microbial Systems*, and its resultant technology offers unparalleled opportunities to provide solutions to our society’s most urgent problems in human and animal health, agriculture, and environmental quality.

**Cell Biology and Neuroscience** - Cell Biology and Neuroscience Department; College of Letters and Science

*Biomedical Sciences*: The biomedical science options curriculum provides a strong background for students who are (1) interested in biomedical sciences career in research or teaching, or (2) plan on a career in medicine or other health professions.

*Cell Biology and Neuroscience*: The curriculum in the cell biology and neuroscience option provides a strong background for students who are interested in a career in research or teaching in cell biology, molecular biology, developmental biology, or neuroscience.

**Chemistry, Biochemistry option** - Chemistry and Biochemistry Department; College of Letters and Science

This course of study includes a core of Chemistry, Biochemistry, and biology courses for the student interested in the molecular nature of biological materials and life processes.

**Environmental Horticulture** - Plant Sciences and Plant Pathology Department; College of Agriculture
**Biotechnology**

*Note: MSU’s programs in the biological sciences are distributed across multiple departments. MSU does not have a single Department of Biology. For additional options see Biological Sciences at MSU.*

**Biotechnology**

Modern research in cellular and molecular biology and its resultant technology offers unparalleled opportunities to provide solutions to our society’s most urgent problems in human and animal health, agriculture, and environmental quality. The emerging biotechnology industries are involved in developing products to maintain biodiversity, restore soil and water quality, develop new pharmaceuticals to combat disease, decrease our dependence on nonrenewable resources, and improve food and fiber production. Students interested in microbiology, animal or plant science, biochemistry, and animal or human medicine will find challenging careers in the diverse areas of biotechnology in either an academic or industrial setting. Students successfully completing a biotechnology curriculum will also be prepared to enter graduate or medical professional schools for further study.

The Bachelor of Science in Biotechnology is an interdisciplinary degree offered by the College of Agriculture. Students will pursue a basic science curriculum the first two years and then choose an area of emphasis in plant, animal or microbial systems for the junior/senior years. Depending on the option chosen, students will be advised by participating faculty in the Colleges of Agriculture and Letters and Science.

### Undergraduate Programs

- All Biotechnology Options (p. 82)
- Animal Systems Option (p. 83)
- Microbial Systems Option (p. 84)
- Plant Systems Option (p. 84)

### All Biotechnology Options

#### Freshman Year

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
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<tbody>
<tr>
<td>WRIT 101W - College Writing I</td>
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</tr>
<tr>
<td>BIOB 105CS - Introduction to Biotechnology</td>
<td>3</td>
</tr>
<tr>
<td>BIOB 170IN - Principles of Biological Diversity</td>
<td>4</td>
</tr>
<tr>
<td>CHMY 141 - College Chemistry I</td>
<td>4</td>
</tr>
<tr>
<td>BIOB 160 - Principles of Living Systems or BIOB 260 - Cellular and Molecular Biology</td>
<td>4</td>
</tr>
<tr>
<td>CHMY 143 - College Chemistry II</td>
<td>4</td>
</tr>
<tr>
<td>Select one of the following:</td>
<td>3</td>
</tr>
<tr>
<td>BIOB 318 - Biometry</td>
<td></td>
</tr>
<tr>
<td>STAT 216Q - Introduction to Statistics</td>
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</tr>
<tr>
<td>M 165Q - Calculus for Technology I</td>
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<tr>
<td>Select one of the following:</td>
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<tr>
<td>M 161Q - Survey of Calculus</td>
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<tr>
<td>M 166Q - Calculus for Technology II</td>
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</table>

| University Core and Electives | 11 |

| Year Total | 39-40 |

#### Sophomore Year

<table>
<thead>
<tr>
<th>Course</th>
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<tbody>
<tr>
<td>BIOB 375 - General Genetics</td>
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<tr>
<td>CHMY 321 - Organic Chemistry I or CHMY 211 - Elements of Organic Chemistry</td>
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<tr>
<td>CHMY 323 - Organic Chemistry II</td>
<td>4</td>
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<tr>
<td>BIOM 360 - General Microbiology</td>
<td>5</td>
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<tr>
<td>ECNS 101IS - Economic Way of Thinking</td>
<td>3</td>
</tr>
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</table>
University Core and Electives 8-12
Year Total: 27-31
Total Program Credits: 66-71

* If a student takes BIOB 318 Biometry or STAT 216Q Introduction to Statistics, then the student must take M 161Q Survey of Calculus. If a student takes M 165Q Calculus for Technology I, then the student must take M 166Q Calculus for Technology II.

** If a student takes CHMY 321 Organic Chemistry I, the student must take CHMY 323 Organic Chemistry II.

---

**Animal Systems Option**

All Biotechnology Options have the same Freshman and Sophomore year requirements.

**Freshman Year**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>WRIT 101W - College Writing I</td>
<td>3</td>
</tr>
<tr>
<td>BIOB 105CS - Introduction to Biotechnology</td>
<td>3</td>
</tr>
<tr>
<td>BIOB 170IN - Principles of Biological Diversity</td>
<td>4</td>
</tr>
<tr>
<td>CHMY 141 - College Chemistry I</td>
<td>4</td>
</tr>
<tr>
<td>Select one of the following:</td>
<td>3-4</td>
</tr>
<tr>
<td>BIOB 318 - Biometry</td>
<td></td>
</tr>
<tr>
<td>STAT 216Q - Introduction to Statistics</td>
<td></td>
</tr>
<tr>
<td>M 165Q - Calculus for Technology I</td>
<td></td>
</tr>
<tr>
<td>BIOB 160 - Principles of Living Systems</td>
<td>4</td>
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<tr>
<td>or BIOB 260 - Cellular and Molecular Biology</td>
<td></td>
</tr>
<tr>
<td>CHMY 143 - College Chemistry II</td>
<td>4</td>
</tr>
<tr>
<td>Select one of the following:</td>
<td>3-4</td>
</tr>
<tr>
<td>M 161Q - Survey of Calculus</td>
<td></td>
</tr>
<tr>
<td>M 166Q - Calculus for Technology II</td>
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University Core and Electives 11
Year Total: 39-40

**Sophomore Year**

<table>
<thead>
<tr>
<th>Course</th>
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<tbody>
<tr>
<td>BIOB 375 - General Genetics</td>
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<tr>
<td>CHMY 321 - Organic Chemistry I</td>
<td>4</td>
</tr>
<tr>
<td>or CHMY 211 - Elements of Organic Chemistry</td>
<td></td>
</tr>
<tr>
<td>BIOM 360 - General Microbiology</td>
<td>5</td>
</tr>
<tr>
<td>CHMY 323 - Organic Chemistry II</td>
<td>4</td>
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<tr>
<td>ECNS 101IS - Economic Way of Thinking</td>
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<tr>
<td>University Core and Electives</td>
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</table>

Year Total: 27-31
Total Program Credits: 66-71

* If a student takes BIOB 318 Biometry or STAT 216Q Introduction to Statistics, then the student must take M 161Q Survey of Calculus. If a student takes M 165Q Calculus for Technology I, then the student must take M 166Q Calculus for Technology II.

** If a student takes CHMY 321 Organic Chemistry I, the student must take CHMY 323 Organic Chemistry II.

**Junior Year**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
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<tbody>
<tr>
<td>BCH 380 - Biochemistry</td>
<td>5</td>
</tr>
<tr>
<td>BIOB 412 - Hybridomas</td>
<td>2</td>
</tr>
<tr>
<td>BIOB 415 - Adv Immunology Methods</td>
<td>1</td>
</tr>
<tr>
<td>BIOB 413 - Flow Cytometry</td>
<td>1</td>
</tr>
<tr>
<td>BIOB 414 - Advanced Microscopy</td>
<td>1</td>
</tr>
<tr>
<td>University Core and Electives</td>
<td>5</td>
</tr>
<tr>
<td>BIOM 400 - Medical Microbiology</td>
<td>3</td>
</tr>
<tr>
<td>BIOB 477 - Genome Science and Gene Expression</td>
<td>5</td>
</tr>
<tr>
<td>Choose one of the following:</td>
<td>4</td>
</tr>
<tr>
<td>ANSC 265 - Anatomy and Physiology of Domestic Animals - Lecture (AND)</td>
<td></td>
</tr>
<tr>
<td>ANSC 266 - Anatomy and Physiology of Domestic Animals - Lab</td>
<td></td>
</tr>
<tr>
<td>BIOH 201 - Hum Anatomy &amp; Physiology I</td>
<td></td>
</tr>
<tr>
<td>BIOH 211 - Hum Anatomy &amp; Physiology II</td>
<td></td>
</tr>
</tbody>
</table>

University Core and Electives 3
Year Total: 15 15

**Senior Year**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHSX 205 - College Physics I</td>
<td>4</td>
</tr>
<tr>
<td>IMID 499R - Biotech Internship</td>
<td>4</td>
</tr>
<tr>
<td>University Core and Electives</td>
<td>7</td>
</tr>
<tr>
<td>PHSX 207 - College Physics II</td>
<td>4</td>
</tr>
<tr>
<td>BIOB 424 - Ethical Practice of Science</td>
<td>3</td>
</tr>
<tr>
<td>IMID 499 - Biotechnology Capstone</td>
<td>2</td>
</tr>
<tr>
<td>University Core and Electives</td>
<td>6</td>
</tr>
</tbody>
</table>

Year Total: 15 15
Total Program Credits: 60

* BIOH 201 Hum Anatomy & Physiology I may also be taken in the spring.

**Recommended Electives**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ANSC 320 - Animal Nutrition</td>
<td>4</td>
</tr>
<tr>
<td>ANSC 321 - Physiology of Animal Reproduction</td>
<td>4</td>
</tr>
<tr>
<td>ANSC 322 - Principles of Animal Breeding and Genetics</td>
<td>3</td>
</tr>
<tr>
<td>ANSC 337 - Disease of Domestic Livestock</td>
<td>3</td>
</tr>
<tr>
<td>ANSC 421 - Assisted Reproduction Technologies w/ Lab</td>
<td>4</td>
</tr>
<tr>
<td>BCH 441 - Biochemistry of Macromolecules</td>
<td>3</td>
</tr>
<tr>
<td>BCH 442 - Metabolic Regulation</td>
<td>3</td>
</tr>
<tr>
<td>BCH 444R - Biochemistry &amp; Molecular Biology Methods</td>
<td>3</td>
</tr>
<tr>
<td>BIOB 425 - Adv Cell &amp; Molecular Biology</td>
<td>3</td>
</tr>
<tr>
<td>BIOB 410 - Immunology</td>
<td>3</td>
</tr>
<tr>
<td>BIOH 201 - Hum Anatomy &amp; Physiology I</td>
<td>5</td>
</tr>
<tr>
<td>BIOH 211 - Hum Anatomy &amp; Physiology II</td>
<td>4</td>
</tr>
<tr>
<td>BIOH 405 - Hematology</td>
<td>3</td>
</tr>
<tr>
<td>BIOM 431 - Medical Bacteriology</td>
<td>3</td>
</tr>
<tr>
<td>BIOM 435 - Virology</td>
<td>3</td>
</tr>
<tr>
<td>BIOM 450 - Microbial Physiology</td>
<td>3</td>
</tr>
<tr>
<td>BIOO 310 - Comparative Vertebrate Anatomy</td>
<td>4</td>
</tr>
<tr>
<td>BIOO 412 - Animal Physiology</td>
<td>3</td>
</tr>
<tr>
<td>EQUS 327 - Equine Lameness</td>
<td>3</td>
</tr>
<tr>
<td>EQUS 346 - Equine Reproductive Management</td>
<td>4</td>
</tr>
<tr>
<td>IMID 492 - Independent Study</td>
<td>1-3</td>
</tr>
<tr>
<td>IMID 490R - Undergraduate Research</td>
<td>1-6</td>
</tr>
</tbody>
</table>
CHMY 211 Elements of Organic Chemistry serves as the prerequisite for additional Chemistry courses, which are required in the Biotechnology Degree, Animal Systems Option. Graduate departments at some universities require that students have one year of organic Chemistry. Therefore, students potentially interested in graduate school can take the CHMY 321/CHMY 323 series of organic Chemistry during their sophomore year.

If one of these is used as a departmental requirement, then it cannot count as elective credits.

A minimum of 120 credits is required for graduation; 42 of these credits must be in courses numbered 300 or above.

### Microbial Systems Option

All Biotechnology Options have the same Freshman and Sophomore year requirements.

#### Freshman Year

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>WRIT 101W - College Writing I</td>
<td>3</td>
</tr>
<tr>
<td>BIOB 105CS - Introduction to Biotechnology</td>
<td>3</td>
</tr>
<tr>
<td>BIOB 170IN - Principles of Biological Diversity</td>
<td>4</td>
</tr>
<tr>
<td>CHMY 141 - College Chemistry I</td>
<td>4</td>
</tr>
<tr>
<td>Select one of the following:</td>
<td>3</td>
</tr>
<tr>
<td>BIOB 318 - Biometry</td>
<td></td>
</tr>
<tr>
<td>STAT 216Q - Introduction to Statistics</td>
<td></td>
</tr>
<tr>
<td>M 165Q - Calculus for Technology I</td>
<td></td>
</tr>
<tr>
<td>BIOB 160 - Principles of Living Systems</td>
<td></td>
</tr>
<tr>
<td>or BIOB 260 - Cellular and Molecular Biology</td>
<td></td>
</tr>
<tr>
<td>CHMY 143 - College Chemistry II</td>
<td>4</td>
</tr>
<tr>
<td>Select one of the following:</td>
<td>3-4</td>
</tr>
<tr>
<td>M 161Q - Survey of Calculus I</td>
<td></td>
</tr>
<tr>
<td>M 166Q - Calculus for Technology II</td>
<td></td>
</tr>
</tbody>
</table>

| University Core and Electives         | 11      |
| Year Total:                           | 39-40   |

#### Sophomore Year

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOB 375 - General Genetics</td>
<td>3</td>
</tr>
<tr>
<td>CHMY 321 - Organic Chemistry I</td>
<td>4</td>
</tr>
<tr>
<td>or CHMY 211 - Elements of Organic Chemistry</td>
<td></td>
</tr>
<tr>
<td>BIOM 360 - General Microbiology</td>
<td>5</td>
</tr>
<tr>
<td>CHMY 323 - Organic Chemistry II</td>
<td>4</td>
</tr>
<tr>
<td>ECNS 101IS - Economic Way of Thinking</td>
<td>3</td>
</tr>
<tr>
<td>University Core and Electives</td>
<td>8-12</td>
</tr>
<tr>
<td>Year Total:</td>
<td>27-31</td>
</tr>
</tbody>
</table>

Total Program Credits: 66-71

* If a student takes BIOB 318 Biometry or STAT 216Q Introduction to Statistics, then the student must take M 161Q Survey of Calculus. If a student takes M 165Q Calculus for Technology I, then the student must take M 166Q Calculus for Technology II.

** If a student takes CHMY 321 Organic Chemistry I, the student must take CHMY 323 Organic Chemistry II.

### Microbial Systems Option

#### Junior Year

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BCH 380 - Biochemistry</td>
<td>5</td>
</tr>
<tr>
<td>PHSX 205 - College Physics I</td>
<td>4</td>
</tr>
<tr>
<td>BIOL 410 - Immunology</td>
<td>3</td>
</tr>
<tr>
<td>University Core and Electives</td>
<td>3</td>
</tr>
<tr>
<td>PHSX 207 - College Physics II</td>
<td>4</td>
</tr>
<tr>
<td>University Core and Electives</td>
<td>11</td>
</tr>
<tr>
<td>Year Total:</td>
<td>15</td>
</tr>
<tr>
<td><strong>Senior Year</strong></td>
<td></td>
</tr>
<tr>
<td>BIOM 450 - Microbial Physiology</td>
<td>3</td>
</tr>
<tr>
<td>BIOM 494 - Seminar/Workshop</td>
<td>1</td>
</tr>
<tr>
<td>BIOM 490R - Undergraduate Research</td>
<td>3</td>
</tr>
<tr>
<td>University Core and Electives</td>
<td>8</td>
</tr>
<tr>
<td>BIOM 430 - Applied and Environmental Microbiology</td>
<td>4</td>
</tr>
<tr>
<td>BIOM 452 - Soil &amp; Environmental Microbiology</td>
<td>3</td>
</tr>
<tr>
<td>BIOM 410 - Microbial Genetics</td>
<td>3</td>
</tr>
<tr>
<td>BIOM 494 - Seminar/Workshop</td>
<td>1</td>
</tr>
<tr>
<td>University Core and Electives</td>
<td>4</td>
</tr>
<tr>
<td>Year Total:</td>
<td>15</td>
</tr>
</tbody>
</table>

Total Program Credits: 60

Select at least three of the following:

- BIOM 405 - Host-Associated Microbiomes
- BIOM 425 - Toxicology: Science of Poisons
- BIOM 435 - Virology
- BIOM 431 - Medical Bacteriology & BIOM 432 - and Med Bacteriology Lab
- BIOM 455R - Research Mthds in Microbiology
- BIOL 477 - Genome Science and Gene Expression
- BIOH 405 - Hematology & BIOH 406 - and Hematology Laboratory
- BCH 441 - Biochemistry of Macromolecules
- BCH 442 - Metabolic Regulation
- BCH 444R - Biochemistry & Molecular Biology Methods
- EENV 447 - Hazardous Waste Management
- ENSC 245IN - Soils
- ENSC 272CS - Water Resources
- ENSC 353 - Environmental Biogeochemistry
- EBC 438 - Bioprocess Engin
- EMAT 251 - Materials Structures and Prop

A minimum of 120 credits is required for graduation; 42 of these credits must be in courses numbered 300 or above.

### Plant Systems Option

#### Freshman Year

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>WRIT 101W - College Writing I</td>
<td>3</td>
</tr>
<tr>
<td>BIOB 105CS - Introduction to Biotechnology</td>
<td>3</td>
</tr>
<tr>
<td>BIOB 170IN - Principles of Biological Diversity</td>
<td>4</td>
</tr>
<tr>
<td>CHMY 141 - College Chemistry I</td>
<td>4</td>
</tr>
<tr>
<td>BIOM 160 - Principles of Living Systems</td>
<td></td>
</tr>
<tr>
<td>or BIOM 260 - Cellular and Molecular Biology</td>
<td></td>
</tr>
<tr>
<td>CHMY 143 - College Chemistry II</td>
<td>4</td>
</tr>
<tr>
<td>Select one of the following:</td>
<td>3</td>
</tr>
</tbody>
</table>

Total Program Credits: 3

Select one of the following:

- BIOM 405 - Host-Associated Microbiomes
- BIOM 425 - Toxicology: Science of Poisons
- BIOM 435 - Virology
- BIOM 431 - Medical Bacteriology & BIOM 432 - and Med Bacteriology Lab
- BIOM 455R - Research Mthds in Microbiology
- BIOL 477 - Genome Science and Gene Expression
- BIOH 405 - Hematology & BIOH 406 - and Hematology Laboratory
- BCH 441 - Biochemistry of Macromolecules
- BCH 442 - Metabolic Regulation
- BCH 444R - Biochemistry & Molecular Biology Methods
- EENV 447 - Hazardous Waste Management
- ENSC 245IN - Soils
- ENSC 272CS - Water Resources
- ENSC 353 - Environmental Biogeochemistry
- EBC 438 - Bioprocess Engin
- EMAT 251 - Materials Structures and Prop

A minimum of 120 credits is required for graduation; 42 of these credits must be in courses numbered 300 or above.
BIOB 318 - Biometry
STAT 216Q - Introduction to Statistics
M 165Q - Calculus for Technology I

Select one of the following: 3-4
M 161Q - Survey of Calculus
M 166Q - Calculus for Technology II

University Core and Electives 11
Year Total: 39-40

Sophomore Year
BIOB 375 - General Genetics 3
CHMY 321 - Organic Chemistry I 4
or CHMY 211 - Elements of Organic Chemistry 4
CHMY 323 - Organic Chemistry II** 4
BIOM 360 - General Microbiology 5
ECNS 101IS - Economic Way of Thinking 3
University Core and Electives 8-12
Year Total: 27-31

Junior Year
BCH 380 - Biochemistry 5
BIOB 430 - Plant Biotechnology 3
BIOO 433 - Plant Physiology 3
HORT 447 - Advanced Plant Propagation 3
PHSX 205 - College Physics I 4
PHSX 207 - College Physics II 4
University Core and Electives 8
Year Total: 30

Senior Year
Select one of the following: 1-6
BIOB 490R - Undergraduate Research
BIOB 498 - Internship/Cooperative Edu
BIOB 499 - Senior Seminar/Capstone 2
BIOM 421 - Concepts of Plant Pathology 3
BIOM 460 - Plant and Microbial Biology 2
Select one of the following: 3-4
BCH 444R - Biochemistry & Molecular Biology Methods
BIOM 455R - Research Methods in Microbiology
University Core and Electives 18-12
Year Total: 30

Total Program Credits: 66-71

* If a student takes BIOB 318 Biometry or STAT 216Q Introduction to Statistics, then the student must take M 161Q Survey of Calculus. If a student takes M 165Q Calculus for Technology I, then the student must take M 166Q Calculus for Technology II.

** If a student takes CHMY 321 Organic Chemistry I, the student must take CHMY 323 Organic Chemistry II.

Junior Year
Credits
BCH 380 - Biochemistry 5
BIOB 430 - Plant Biotechnology 3
BIOO 433 - Plant Physiology 3
HORT 447 - Advanced Plant Propagation 3
PHSX 205 - College Physics I 4
PHSX 207 - College Physics II 4
University Core and Electives 8
Year Total: 30

Senior Year
Credits
Select one of the following: 1-6
BIOB 490R - Undergraduate Research
BIOB 498 - Internship/Cooperative Edu
BIOB 499 - Senior Seminar/Capstone 2
BIOM 421 - Concepts of Plant Pathology 3
BIOM 460 - Plant and Microbial Biology 3
Select one of the following: 3-4
BCH 444R - Biochemistry & Molecular Biology Methods
BIOM 455R - Research Methods in Microbiology
University Core and Electives 18-12
Year Total: 30

Total Program Credits: 60

Restrictive Courses
Select five of the following:
AGSC 341 Field Crop Prod 3
AGSC 441 Plant Breeding & Genetics 3
BCH 441 Biochemistry of Macromolecules 3
BCH 442 Metabolic Regulation 3
BIOB 425 Adv Cell & Molecular Biology 3
BIOB 428 Molecular Evolution 3
or BIOB 420 Evolution
BIOB 477 Genome Science and Gene Expression 5
BIOB 480 Conservation Genetics 3
or BIOB 484 Population Genetics
BIOE 424 Ecology of Fungi 3
BIOM 410 Microbial Genetics 3
BIOM 423 Mycology 3
BIOM 430 Applied and Environmental Microbiology 4
BIOM 450 Microbial Physiology 3
BIOO 437 Plant Development 3

Entomology Minor (Non-Teaching)
The College of Agriculture offers an undergraduate Entomology minor (non-teaching) in addition to the graduate program in Entomology. The entomology minor provides students majoring in various areas of the agricultural and biological sciences with a discrete set of courses emphasizing the important discipline of entomology. The minor was designed to serve the needs of students in both the College of Agriculture and the College of Letters and Science (Biology and Microbiology). In addition to the minor students may also undertake undergraduate research projects, internships, special topics and undergraduate creative activity projects with individual faculty housed in the Department of Animal and Range Sciences, Land Resources and Environmental Sciences, and Plant Science and Plant Pathology.

Required Courses
BIOO 262IN Introduction to Entomology 3
AGSC 401 Integrated Pest Management 3
BIOO 465 Insect Identification 4
Choose one of the following: 1-3
BIOB 490R Undergraduate Research
ANSC 490R Undergraduate Research
ENSC 490R Undergraduate Research

Restricted Elective Courses
Choose three of the following: 12-13
AGSC 341 Field Crop Prod 3
ANSC 410 Veterinary Entomology and Parasitology 3
BCH 380 Biochemistry 5
BIOB 318 Biometry 3
or STAT 216Q Introduction to Statistics
BIOB 375 General Genetics 3
BIOB 420 Evolution 3
BIOE 370 General Ecology (equiv to 270) 3
or NRSM 240 Natural Resource Ecology
BOE 422 Insect Ecology 3
BOE 428 Freshwater Ecology 3
BIOM 250 Microbiology for Health Sciences: Infectious Diseases 3
BIOM 421 Concepts of Plant Pathology 3
BIOO 412 Animal Physiology 3
ENSC 407 Environmental Risk Assessment 3
WILD 301 Princ of Fish & Wildlife Mgmt 3

Total Credits 21-24
Environmental Horticulture

*Note:* MSU’s programs in the biological sciences are distributed across multiple departments. MSU does not have a single Department of Biology. For additional options see Biological Sciences (p. 81) at MSU.

Department of Plant Sciences and Plant Pathology
http://plantsciences.montana.edu/

The department participates in MSU’s Genetics Minor and recommends this minor to students particularly interested in genetics.

The curriculum in Environmental Horticulture is administered by the Department of Plant Sciences and Plant Pathology. Options are available in Environmental Horticulture Science, and Landscape Design.

Faculty members who advise students and teach courses are also active researchers in their disciplines. Students learn current knowledge and technology through formal coursework and gain valuable first-hand experience in departmental laboratories, greenhouses, and at field research farms. Students are encouraged to seek additional learning experiences outside the classroom by working in summer jobs and internship with private industry and government agencies.

Each student works closely with a faculty advisor to formulate a program of study which is appropriate with the student’s career goals and also fits into one of the following options.

**Environmental Horticulture Science Option**

Horticulture is the science and art of growing and maintaining plants for food and for the enjoyment and improvement of the human environment. Its application through research has led to improved varieties of plants to benefit our daily lives. Students studying horticulture take fundamental courses in biology and chemistry prior to taking specialized courses such as plant materials, plant physiology, commercial plant production, plant propagation, turfgrass management and horticulture capstone and landscape management.

Graduates of this program are prepared for careers in such area as nursery crop production; landscape nurseries; greenhouse businesses; botanic gardens; golf courses; grounds maintenance; cooperative extension service; and research with private companies, public agencies or institutions of higher learning.

**Landscape Design Option**

The Landscape Design option will prepare students to solve aesthetic and functional landscape problems. Students learn written, oral and graphic communication skills which are necessary to convey creative solutions for landscape planning. This blend of art and science which utilizes both technical and creative studies leads to problem-solving skills for beautiful, functional and efficient landscape design solutions. Emphasis is placed on utilization of plant materials to solve specific site problems. Graduates are employed by landscape nurseries, landscape contractors, and planning agencies; others become self-employed as landscape designers and contractors. Many students have chosen to continue advanced studies in programs of landscape architecture.

**Undergraduate Programs**

- Environmental Horticulture Science Option (p. 86)
- Landscape Design Option (p. 87)

**Undergraduate Minors**

- Environmental Horticulture Minor (Non-Teaching) (p. 86)

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### Environmental Horticulture Minor (Non-Teaching)

<table>
<thead>
<tr>
<th>Required Courses</th>
</tr>
</thead>
<tbody>
<tr>
<td>HORT 105 - Miracle Growing</td>
</tr>
<tr>
<td>BIOC 170IN - Principles of Biological Diversity</td>
</tr>
<tr>
<td>CHMY 121IN - Introduction to General Chemistry</td>
</tr>
<tr>
<td>HORT 231 - Woody Ornamentals</td>
</tr>
<tr>
<td>HORT 232 - Herbaceous Ornamentals</td>
</tr>
<tr>
<td>HORT 245 - Plant Propagation</td>
</tr>
</tbody>
</table>

| Elective courses | 12 |
|------------------|
| HORT 310 - Turfgrass Management | |
| HORT 337 - Vegetable Production | |
| HORT 343 - Comm Plant Production | |
| HORT 345 - Market Gardening | |
| BIOM 421 - Concepts of Plant Pathology | |
| BIOO 433 - Plant Physiology | |
| HORT 447 - Advanced Plant Propagation | |

**Total Credits**

32

### Environmental Horticulture Science Option

**Freshman Year**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>AGSC 101 - Introduction to Agricultural and Environmental Resources</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>BIOC 170 IN - Principles of Biological Diversity</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>BIOC 160 - Principles of Living Systems</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>BIOC 110CS - Introduction to Plant Biology</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>HORT 105 - Miracle Growing</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>CHMY 121IN - Introduction to General Chemistry</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>M 105Q - Contemporary Mathematics (formerly M 145Q, Math for Liberal Arts)</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>WRIT 101W - College Writing I</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>University Core and Electives</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td><strong>Year Total:</strong></td>
<td><strong>30</strong></td>
<td></td>
</tr>
</tbody>
</table>

**Sophomore Year**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHMY 123 - Introduction of Organic Chemistry and Biochemistry</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>BIOO 262IN - Introduction to Entomology</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>ENSC 245IN - Soils</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>HORT 231 - Woody Ornamentals</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>HORT 232 - Herbaceous Ornamentals</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>HORT 245 - Plant Propagation</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>BIOO 220 - General Botany</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Select two of the following:</td>
<td>3-4</td>
<td></td>
</tr>
<tr>
<td>AGED 105 - Microcomputers in Agricultural Management</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BMGT 205 - Prof Business Communication</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BMIS 211 - Intro to Bus Decision Support</td>
<td></td>
<td></td>
</tr>
<tr>
<td>WRIT 201 - College Writing II</td>
<td></td>
<td></td>
</tr>
<tr>
<td>WRIT 221 - Intermediate Tech Writing</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SPNS 102 - Elementary Spanish II</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AGED 312R - Communicating Agriculture</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Total Credits**

32
AGED 482 - Non-Formal Teaching Methods in Agriculture
University Core and Electives 4-5
Year Total: 30

Junior Year

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>HORT 310</td>
<td>Turfgrass Management</td>
<td>3</td>
</tr>
<tr>
<td>AGSC 356</td>
<td>Plant Nutrition and Soil Fertility Management</td>
<td>3</td>
</tr>
<tr>
<td>BIOB 377</td>
<td>Practical Genetics</td>
<td>3</td>
</tr>
<tr>
<td>HORT 343</td>
<td>Comm Plant Production</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Select one of the following:</td>
<td>3</td>
</tr>
<tr>
<td>BIOB 318</td>
<td>Biometry</td>
<td></td>
</tr>
<tr>
<td>STAT 216Q</td>
<td>Introduction to Statistics</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Select one of the following:</td>
<td>3</td>
</tr>
<tr>
<td>ACTG 201</td>
<td>Principles of Financial Acct</td>
<td></td>
</tr>
<tr>
<td>BMGT 335</td>
<td>Management and Organization</td>
<td></td>
</tr>
<tr>
<td>BMKT 325</td>
<td>Principles of Marketing</td>
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University Core and Electives 12
Year Total: 27

Senior Year

<table>
<thead>
<tr>
<th>Course Code</th>
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<tbody>
<tr>
<td>HORT 447</td>
<td>Advanced Plant Propagation</td>
<td>3</td>
</tr>
<tr>
<td>HORT 485R</td>
<td>Horticulture Capstone I</td>
<td>1</td>
</tr>
<tr>
<td>HORT 486R</td>
<td>Horticulture Capstone II</td>
<td>2</td>
</tr>
<tr>
<td>BIOM 421</td>
<td>Concepts of Plant Pathology</td>
<td>3</td>
</tr>
<tr>
<td>BIII 433</td>
<td>Plant Physiology</td>
<td>3</td>
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<tr>
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<td>Select three of the following:</td>
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<tr>
<td>BIOM 360</td>
<td>General Microbiology</td>
<td></td>
</tr>
<tr>
<td>AGSC 450</td>
<td>Plant Disease Control</td>
<td></td>
</tr>
<tr>
<td>BIOB 430</td>
<td>Plant Biotechnology</td>
<td></td>
</tr>
<tr>
<td>HORT 337</td>
<td>Vegetable Production</td>
<td></td>
</tr>
<tr>
<td>HORT 345</td>
<td>Market Gardening</td>
<td></td>
</tr>
<tr>
<td>BIII 435</td>
<td>Plant Systematics</td>
<td></td>
</tr>
<tr>
<td>AGSC 441</td>
<td>Plant Breeding &amp; Genetics</td>
<td></td>
</tr>
<tr>
<td>BIII 416</td>
<td>Alpine Ecology</td>
<td></td>
</tr>
<tr>
<td>BIII 423</td>
<td>Mycology</td>
<td></td>
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<tr>
<td>BIII 424</td>
<td>Ecology of Fungi</td>
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<tr>
<td>AGED 315</td>
<td>Electrical and Power Systems Operation</td>
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<tr>
<td>HORT 490R</td>
<td>Undergraduate Research</td>
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University Core & Elective 11-12
Year Total: 30

Total Program Credits: 120

A minimum of 120 credits is required for graduation; 42 of these credits must be in courses numbered 300 and above.

**Landscape Design Option**

**Freshman Year**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>ARCH 151RA</td>
<td>Design Fundamentals I</td>
<td>4</td>
</tr>
<tr>
<td>BII 170IN</td>
<td>Principles of Biological Diversity</td>
<td>4</td>
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<tr>
<td>CMY 121IN</td>
<td>Introduction to General Chemistry</td>
<td>4</td>
</tr>
<tr>
<td>M 105Q</td>
<td>Contemporary Mathematics (formerly M 145Q, Math for Liberal Arts)</td>
<td>3</td>
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<tr>
<td>BIII 110CS</td>
<td>Introduction to Plant Biology</td>
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<tr>
<td>HORT 151</td>
<td>Landscape Dsgn/Hist/Theory</td>
<td>3</td>
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<tr>
<td>HORT 105</td>
<td>Miracle Growing</td>
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<tr>
<td>WRIT 101W</td>
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University Core and Electives 7
Year Total: 30

**Sophomore Year**

<table>
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<tr>
<td>ENSC 245IN</td>
<td>Soils</td>
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<tr>
<td>HORT 231</td>
<td>Woody Ornamentals</td>
<td>3</td>
</tr>
<tr>
<td>HORT 232</td>
<td>Herbaceous Ornamentals</td>
<td>3</td>
</tr>
<tr>
<td>HORT 225</td>
<td>Landscape Graphics I</td>
<td>3</td>
</tr>
<tr>
<td>HORT 226</td>
<td>Landscape Graphics II</td>
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<tr>
<td>EGEN 115</td>
<td>Engineering Graphics</td>
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<td>Select two of the following:</td>
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<tr>
<td>BIII 145RA</td>
<td>Web Design</td>
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<tr>
<td>AGED 312R</td>
<td>Communicating Agriculture</td>
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<tr>
<td>BMGT 205</td>
<td>Prof Business Communication</td>
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<tr>
<td>BIII 211</td>
<td>Intro to Bus Decision Support</td>
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<tr>
<td>SPNS 101</td>
<td>Elementary Spanish I</td>
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<tr>
<td>WRIT 201</td>
<td>College Writing II</td>
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<tr>
<td>WRIT 221</td>
<td>Intermediate Tech Writing</td>
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University Core & Electives 7
Year Total: 29

**Junior Year**

<table>
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<tbody>
<tr>
<td>HORT 331</td>
<td>Planting Design</td>
<td>3</td>
</tr>
<tr>
<td>HORT 310</td>
<td>Turfgrass Management</td>
<td>3</td>
</tr>
<tr>
<td>HORT 335</td>
<td>Site Development</td>
<td>4</td>
</tr>
<tr>
<td>HORT 336</td>
<td>Landscape Construction</td>
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</tr>
<tr>
<td></td>
<td>Select two of the following:</td>
<td>6</td>
</tr>
<tr>
<td>ACTG 201</td>
<td>Principles of Financial Acct</td>
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</tr>
<tr>
<td>ACTG 202</td>
<td>Principles of Managerial Acct</td>
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</tr>
<tr>
<td>BMGT 335</td>
<td>Management and Organization</td>
<td></td>
</tr>
<tr>
<td>BMKT 325</td>
<td>Principles of Marketing</td>
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</tr>
<tr>
<td>ECIV 308</td>
<td>Construction Practice</td>
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<tr>
<td>BMGT 448</td>
<td>Entrepreneurship</td>
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University Core and Electives 10
Year Total: 30

**Senior Year**

<table>
<thead>
<tr>
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<th>Course Title</th>
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<tbody>
<tr>
<td>HORT 432</td>
<td>Advanced Landscape Design</td>
<td>4</td>
</tr>
<tr>
<td>HORT 440</td>
<td>Urban Planning and Design</td>
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</tr>
<tr>
<td></td>
<td>Select two of the following:</td>
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<tr>
<td>HORT 245</td>
<td>Plant Propagation</td>
<td></td>
</tr>
<tr>
<td>HORT 343</td>
<td>Comm Plant Production</td>
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</tr>
<tr>
<td>HORT 345</td>
<td>Market Gardening</td>
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<td>Select three (at least 12 total credits) of the following from a specialization track:</td>
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<tr>
<td></td>
<td>Applied- Art/Design/Architecture</td>
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<tr>
<td>ARTZ 105RA</td>
<td>Visual Language - Drawing</td>
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<tr>
<td>ARTZ 211RA</td>
<td>Drawing I</td>
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<tr>
<td>GDSN 223</td>
<td>Design Principles</td>
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<tr>
<td>GDSN 224</td>
<td>Form and Content</td>
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<tr>
<td>GDSN 374</td>
<td>Digital Visualization</td>
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<tr>
<td>ARCH 152</td>
<td>Design Fundamentals II</td>
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<tr>
<td>ARCH 450</td>
<td>Community Design Center</td>
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<tr>
<td>History- Art/Design/Architecture</td>
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<td></td>
</tr>
<tr>
<td>ARTH 200IA</td>
<td>Art of World Civilization I</td>
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</tr>
<tr>
<td>ARTH 201IA</td>
<td>Art of World Civilization II</td>
<td></td>
</tr>
<tr>
<td>ARTH 360</td>
<td>History of Asian Art and Architecture</td>
<td></td>
</tr>
</tbody>
</table>
Environmental Sciences

Note: MSU’s programs in the biological sciences are distributed across multiple departments. MSU does not have a single Department of Biology. For additional options see Biological Sciences at MSU.

Department of Land Resources & Environmental Sciences

http://landresources.montana.edu/

Effective management of land and water resources requires a solid fundamental understanding of the processes and relationships in land and natural resources systems, combined with applications of environmental science and applied ecology. The Environmental Sciences curriculum is designed to provide this classroom, laboratory, and field training. Graduates of this degree program will:

1. possess a broad knowledge of biological, physical, and chemical processes important across landscapes;
2. receive training in applied ecology, soil and water science, and land resources analysis;
3. be capable of critical analysis of land resource problems; and
4. be experienced with teamwork required to develop and implement effective land management strategies. They will be the scientists most capable of making significant advances and contributions in the 21st century!

Environmental Sciences

This program is for students who wish to obtain a more general Environmental Sciences degree and design more of their course of study than possible in one of the below options. The required courses in this major are also required in each of the options, allowing for a relatively seamless transfer to one of them if accomplished by the end of the student’s second year.

Career opportunities: Environmental consulting firms, industry, government agencies, and the military careers where the focus is on using scientific knowledge to protect the environment and human health. An environmental scientist might pursue a career in consulting, research, or teaching. Consulting firms offer opportunities to help businesses and agencies comply with environmental laws and policy. This degree can also prepare a student for a wide range of graduate studies.

Environmental Biology Option

This option is intended to train students who are interested in understanding the ecology of organisms in natural environments, and/or in understanding how organisms may be used to clean up environments that have been disturbed by human activities. The curriculum launches from a base in environmental science which includes a broad knowledge of organisms (including plants, animals, and microorganisms) and the physical and chemical characteristics of natural environments. A special feature of this option is that it emphasizes cross-training between the traditional disciplines of Biology and Microbiology. Students trained in Biology or Microbiology normally focus on either large or small organisms.

ARTH 410 - Medieval Art
ARTH 421 - Late Gothic Painting
ARTH 422 - Early Renaissance to 15th Century Art
ARTH 424 - High Renaissance and Mannerism
ARTH 426 - Baroque Art in Italy and Southern Europe, 1600-1700
ARTH 427 - Baroque Art in Northern Europe
ARTH 430 - 19th Century Art
ARTH 432 - Art in the Age of Revolution
ARTH 435 - Art in the United States
ARTH 438 - Beginnings of Modern Art
ARTH 440 - 20th Century Art
ARCH 322IA - World Architecture I
ARCH 323IA - World Architecture II
ARCH 424 - Contemporary Architectural History and Theory
ARCH 425 - West Architectural History
ARCH 426 - History of Identity of Contemporary Places
ARCH 427 - Non-Western Architectural History
Plant, Water, & Land Ecology
BIOE 370 - General Ecology (equiv to 270) (Planning)
BIOE 408 - Rocky Mountain Vegetation (Planning)
BIOE 416 - Alpine Ecology (Planning)
BIOE 421 - Yellowstone Wildlife Ecology (Planning)
BIOE 428 - Freshwater Ecology
ENSC 272C5 - Water Resources (Planning)
ENSC 444 - Watershed Hydrology (Planning)
ENSC 448 - Stream Restoration Ecology
NRSM 101 - Natural Resource Conservation
NRSM 240 - Natural Resource Ecology (Planning)
NRSM 330 - Fire Ecology and Mgmt (Planning)
NRSM 350 - Vegetation of Western Wildlands
NRSM 421 - Holistic Thought/Mgmt
NRSM 453 - Habitat Inventory and Analysis (Planning)
WILD 438 - Wildlife Habitat Ecology (Planning)

Planning
GPHY 121D - Human Geography (GIS/GPS)
GPHY 321 - Urban Geography
GPHY 325 - Cultural Geography (GIS/GPS)
GPHY 365 - Geographical Planning
GPHY 411 - Biogeography
GPHY 445 - Adv. Regional Geography (GIS/GPS)
GIS/GPS
GPHY 284 - Intro to GIS Science & Cartog
GPHY 357 - GPS Fund/App in Mapping
GPHY 384 - Adv GIS and Spatial Analysis

Construction
AGED 333 - Construction Technology (Plant, Water, & Land Ecology)
ARCH 241 - Building Construction I (Plant, Water, & Land Ecology)
SRVY 230 - Intro to Srvyg for Engineers

Internship

HORT 498 - Internship
University Core & Elective 4
Year Total: 30
Total Program Credits: 120

A minimum of 120 credits is required for graduation; 42 of these credits must be in courses numbered 300 and above.
or on human biology and disease. But, even biologists trained as ecologists have a poor understanding of microorganisms, despite the fact that they appreciate the great importance of microorganisms in most natural environments. Similarly, most microbiologists do not understand the diversity of large organisms and are never exposed to natural principles of ecology and evolution. In the LRES Environmental Biology option, students will develop a knowledge of the diversity of organisms and their interrelated functions in complex environments. In later stages of the curriculum, students may select from a wide array of upper division courses in environmental microbiology, natural ecosystems, applied ecology, and policy and planning that enable them to specialize in areas best-suited to their own career vision.

Career opportunities: Environmental industries and consulting firms that address problems associated with disturbed environments. Biotechnology companies that attempt to exploit biological diversity for the benefit of humans. Government jobs in environmental management and policy making. Graduate training that leads to independent research in basic and applied ecology, environmental biology, and environmental microbiology.

Geospatial & Environmental Analysis Option

Effective management of agricultural and other managed land resources requires individuals to have sound fundamental understanding of the processes and relationships in land systems, combined with excellent skills in modern land inventory and analysis techniques including geographic information systems (GIS), global positioning systems (GPS), remote sensing, and an appreciation for the intricacies of land resources and land use practices. The Land Resource Sciences curricula are designed to provide classroom, laboratory, and field training. Graduates of this program will: (i) possess a broad knowledge of land processes, (ii) be able to critically analyze and solve land resource problems, and (iii) work in teams to develop and implement effective land management strategies. They will be the premier land resource users and managers in the 21st century.

This degree is for students interested in land resources and their management at landscape scales. All human activities depend on the world’s land and water resource base. The air we breathe, the water we drink, and the food we eat all depend upon activities occurring and interacting across broad extents of the Earth’s land surface. This curriculum is based on the philosophy that our well-being requires knowledge-based decision making involving land and natural resources across these large areas.

Students build on knowledge of the basic natural sciences with course work in geology, biology, geography, soils, and ecology. Then, courses in remote sensing, geographic information systems, global positioning and statistics provide tools for gathering, processing, analyzing, and displaying information about land resources across large areas. Finally, students learn how to integrate land resource information with social and financial realities to support balanced management decisions. Throughout the program, students are encouraged to gain hands-on experience with land, people and information through field trips, internships, and the capstone field course. The knowledge and skills of land resource analysis and management are needed wherever there are land resources. Graduates in the LRES Geospatial & Environmental Analysis option can be the environmental scientists and managers most capable of providing information for sound management of the land resource base.

Career Opportunities: Careers in natural resource management, environmental consulting, precision agriculture, watershed management, and land mapping, requiring professionals who can work outdoors on the land and indoors with data and computer applications dealing with geographic information systems and remote sensing. Employment with federal government land management agencies, such as the Forest Service, Bureau of Land Management, Natural Resources Conservation Service, and Bureau of Reclamation; state agencies, such as departments of natural resources; local and regional planning organizations; private organizations which own and manage land (timber companies, ranches, farms, recreation areas); consulting firms; conservation organizations such as land trusts; and Congressional staffs. Graduate training leading to independent research in remote sensing, ecological processes, and soil and water science.

Land Rehabilitation Option

The Land Rehabilitation curriculum provides training in site remediation and restoration ecology, including soil remediation, re-vegetation, riparian and riparian restoration, investigation of impacted geologic resources, amelioration of contaminated soils and water, integrated management of invasive species, and remediation of sites impacted by industrial, recreational, and land management activities. Emphasis is placed on developing a broad understanding of hydrologic, soil, and plant processes from both a basic and an applied science approach. Coursework in the chemical, biological, and environmental sciences provides a foundation of knowledge. During the junior and senior years, students take courses in soil, water and plant sciences that range from molecular to landscape in scale. Students will acquire skills in plant identification and landscape inventory including geographic information systems. Land rehabilitation is critically important to Montana, to the surrounding region, and to the United States. Graduates possess a broad knowledge of land rehabilitation processes, are able to critically analyze and solve problems, and can work in teams to develop and implement effective land management strategies. Studies in Land Rehabilitation will infuse students with critical knowledge and skills needed to analyze and manage lands requiring rehabilitation. Students will also receive foundation skills in writing, communication, arts, humanities and social sciences.

Career Opportunities: Worker and manager for local, state, and federal agencies responsible for land rehabilitation and remediation, ecological restoration, invasive species management, and land resources management. Land reclamation managers for environmental consulting, mining, and highway construction companies. Stepping stone to Graduate School for independent research and advanced coursework in restoration ecology, soil sciences, geology, hydrology, ecology, and the plant sciences. Environmental consulting and non-profit organization related to restoration and conservation.

Soil and Water Science Option

The Soil and Water Science Option provides students with fundamental training in basic biological, chemical, and physical sciences and advanced training in soil and water sciences. Students are encouraged through choice electives to emphasize specific course sequences to help them understand the underlying processes central to managed and natural landscapes, as well as to develop practical skills and abilities relevant to applying this knowledge in land resource management and the environmental sciences.

Water is perhaps the most unique substance on earth, having a multitude of seemingly anomalous properties, and literally forms the basis for life as we know it. Soils form the precious ‘skin’ of the Earth, the critical interface between atmospheric and geologic/groundwater systems. The multitude of physical, chemical, and biological processes that occur in the three-phase soil system (solids, water and air) are critical to sustainability of natural and managed ecosystems. Soils and water will be among the most critical limiting resources in coming decades. The LRES Soil and Water Science Option provides students with advanced training in the chemical, physical, and biological sciences, and integration of these fundamentals in applications related to soil science, hydrology, watershed management, pollution treatment and prevention, land rehabilitation, agricultural and natural resources management, and bioremediation. Students develop relevant skills in written and oral communication, and gain experience in modern measurement, monitoring and analysis techniques used in land and water sciences and management.
Career opportunities: Environmental industries and consulting firms that work on problems associated with soils, water, contaminant transport, fate of chemicals in the environment, and water resource management. Local, state, or federal government positions in natural resources and environmental sciences management and policy. Advanced graduate training to prepare for research and management positions in soil sciences, hydrology, water resources, land reclamation, and related areas.

Undergraduate Programs
• Environmental Sciences (p. 90)
• Environmental Biology Option (p. 91)
• Geospatial & Environmental Analysis Option (p. 91)
• Land Rehabilitation Option (p. 92)
• Soil & Water Science Option (p. 93)

Undergraduate Minors
• Soil Science Minor (Non-Teaching) (p. 94)
• Entomology Minor (Non-Teaching) (p. 85)
• Water Resources Minor (Non-Teaching) (p. 197)

Environmental Sciences - Environmental Sciences Option

Freshman Year

<table>
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<tr>
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<td>ENSC 110</td>
<td>Lnd Res Environ Sciences</td>
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<tr>
<td>BIOB 170IN</td>
<td>Principles of Biological Diversity</td>
<td>4</td>
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<tr>
<td>BIOB 160</td>
<td>Principles of Living Systems</td>
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<tr>
<td>CHMY 141</td>
<td>College Chemistry I</td>
<td>4</td>
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<td>CHMY 143</td>
<td>College Chemistry II</td>
<td>4</td>
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<tr>
<td>M 161Q</td>
<td>Survey of Calculus (or higher)</td>
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<tr>
<td>WRIT 101W</td>
<td>College Writing I</td>
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<tr>
<td>University Seminar (US Core)</td>
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Sophomore Year

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<tr>
<td>ENSC 245IN</td>
<td>Soils</td>
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<td>ENSC 260</td>
<td>Evolution for Env Scientists</td>
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<td>Choose one of the following:</td>
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<tr>
<td>GPHY 262</td>
<td>Spatial Sci Tech &amp; Application</td>
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<td>GPHY 284</td>
<td>Intro to GIS Science &amp; Cartog</td>
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<td>PHSX 205</td>
<td>College Physics I</td>
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<td>WRIT 201</td>
<td>College Writing II</td>
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Junior Year

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<tr>
<td>ENSC 353</td>
<td>Environmental Biogeochemistry</td>
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<td>Choose one of the following:</td>
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<tr>
<td>ENSC 464</td>
<td>Computational Techniques Environm</td>
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<td>ENSC 465</td>
<td>Environmental Biophysics</td>
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<tr>
<td>NRSM 240</td>
<td>Natural Resource Ecology</td>
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<td>BIOE 370</td>
<td>General Ecology (equiv to 270)</td>
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Senior Year

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<tbody>
<tr>
<td>ENSC 444</td>
<td>Watershed Hydrology</td>
<td>3</td>
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<td>Choose one of the following:</td>
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<tr>
<td>NRSM 430</td>
<td>Natural Resource Law</td>
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<tr>
<td>PSCI 362</td>
<td>Natural Resource Policy</td>
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<td>ENSC 499R</td>
<td>LRES Capstone</td>
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</table>

Total Program Credits: 120

Each student shall work closely with their faculty advisor to plan an integrated set of elective courses appropriate to their academic and professional goals.

RESTRICTED ELECTIVES - Choose at least 21 credits of directed electives from the following:

- AGSC 401 Integrated Pest Management 3
- AGSC 428 Sustainable Cropping Systems 3
- BIOE 375 Ecological Responses to Climate Change 3
- BIOE 408 Rocky Mountain Vegetation 2
- BIOE 416 Alpine Ecology 3
- BIOE 422 Insect Ecology 3
- BIOE 428 Freshwater Ecology 3
- BIOE 455 Plant Ecology 3
- BIOM 415 Microbial Diversity, Ecology, and Evolution 3 (Spring odd years)
- BIOM 452 Soil & Environmental Microbiology 3
- ENSC 407 Environmental Risk Assessment 3
- ENSC 410R Biodiversity Methods 3
- ENSC 443 Weed Ecology and Management 3
- ENSC 445 Watershed Analysis 3
- ENSC 448 Stream Restoration Ecology 3
- ENSC 460 Soil Remediation 3
- ENSC 461 Restoration Ecology 3
- ENSC 468 Ecosystem Biogeochem 3
- ERTH 307 Principles of Geomorphology 4
- ERTH 432R Surface Water Resources 3
- GPHY 357 GPS Fund/App in Mapping 3
- GPHY 384 Adv GIS and Spatial Analysis 3
- GPHY 426 Remote Sensing 3
- GPHY 429R Applied Remote Sensing 3
- GPHY 457 Adv GPS Mapping for GIS 3
- GPHY 484R Applied GIS & Spatial Analysis 3
- NRSM 421 Holistic Thought/Mgmt 4
- NRSM 455 Riparian Ecology & Management 3
- WILD 438 Wildlife Habitat Ecology 3

FREE ELECTIVES - Choose 21-23 credits of free electives, 15 of which must be 300/400 level. You may choose courses from the RESTRICTED ELECTIVES BLOCK.

Because some of our courses are offered during alternate years, the proposed scheduling of courses in junior and senior years may need to be modified. Work with an advisor to determine an individual schedule.

A minimum of 120 credits is required for graduation; at least 42 of these credits must be in courses numbered 300 and above.
## Environmental Biology Option

### Freshman Year

<table>
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<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>ENSC 110</td>
<td>Lnd Res Environ Sciences</td>
<td>3</td>
</tr>
<tr>
<td>BIOB 170IN</td>
<td>Principles of Biological Diversity</td>
<td>4</td>
</tr>
<tr>
<td>BIOB 160</td>
<td>Principles of Living Systems</td>
<td>4</td>
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<tr>
<td>CHMY 141</td>
<td>College Chemistry I</td>
<td>4</td>
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<td>College Chemistry II</td>
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<tr>
<td>M 161Q</td>
<td>Survey of Calculus (or higher)</td>
<td>4</td>
</tr>
<tr>
<td>WRIT 101W</td>
<td>College Writing I</td>
<td>3</td>
</tr>
<tr>
<td>University Seminar (US Core)</td>
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### Sophomore Year

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<th>Course Code</th>
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<tbody>
<tr>
<td>ENSC 245IN</td>
<td>Soils</td>
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<tr>
<td>ENSC 260</td>
<td>Evolution for Env Scientists</td>
<td>3</td>
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<tr>
<td>Choose one of the following:</td>
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<tr>
<td>GPHY 262</td>
<td>Spatial Sci Tech &amp; Application</td>
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<tr>
<td>GPHY 284</td>
<td>Intro to GIS Science &amp; Cartog</td>
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<tr>
<td>STAT 216Q</td>
<td>Introduction to Statistics (or higher)</td>
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<td>PHSX 205</td>
<td>College Physics I</td>
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<td>WRIT 201</td>
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### Junior Year

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<td>CHMY 211</td>
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<td>BIOM 360</td>
<td>General Microbiology</td>
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<td>BCH 380</td>
<td>Biochemistry</td>
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<td>ENSC 353</td>
<td>Environmental Biogeochemistry</td>
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<td>Choose one of the following:</td>
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<tr>
<td>BIOE 370</td>
<td>General Ecology (equiv to 270)</td>
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<td>NRSM 240</td>
<td>Natural Resource Ecology</td>
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<td>ENSC 468</td>
<td>Ecosystem Biogeochem</td>
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### Senior Year

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<tr>
<td>Choose one of the following:</td>
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<tr>
<td>BIOE 422</td>
<td>Insect Ecology</td>
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<tr>
<td>BIOM 415</td>
<td>Microbial Diversity, Ecology, and Evolution</td>
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<tr>
<td>BIOE 455</td>
<td>Plant Ecology</td>
<td></td>
</tr>
<tr>
<td>BIOM 452</td>
<td>Soil &amp; Environmnt Microbiology</td>
<td>3</td>
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<tr>
<td>ENSC 444</td>
<td>Watershed Hydrology</td>
<td>3</td>
</tr>
<tr>
<td>Choose one of the following:</td>
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<td>1-3</td>
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<tr>
<td>ENSC 464</td>
<td>Computational Techniques Environmental Science</td>
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<td>ENSC 465</td>
<td>Environmental Biopysics</td>
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<tr>
<td>Choose one of the following:</td>
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<td>NRSM 421</td>
<td>Holistic Thought/Mgmt</td>
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<td>NRSM 453</td>
<td>Habitat Inventory and Analysis</td>
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<tr>
<td>WILD 301</td>
<td>Princ of Fish &amp; Wildlife Mgmt</td>
<td>3</td>
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<td>WILD 438</td>
<td>Wildlife Habitat Ecology</td>
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<td><strong>Total Program Credits:</strong></td>
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### Restricted Electives

Choose 18-20 credits from the following:

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<tr>
<th>Course Code</th>
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<tbody>
<tr>
<td>AGSC 401</td>
<td>Integrated Pest Management</td>
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<tr>
<td>BIOB 375</td>
<td>General Genetics</td>
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<td>BIOB 420</td>
<td>Evolution</td>
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<td>BIOE 375</td>
<td>Ecological Responses to Climate Change</td>
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<td>BIOE 405</td>
<td>Behavioral and Evolutionary Ecology</td>
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<tr>
<td>BIOE 408</td>
<td>Rocky Mountain Vegetation</td>
<td>2</td>
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<tr>
<td>BIOE 428</td>
<td>Freshwater Ecology</td>
<td>3</td>
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<tr>
<td>BIOM 410</td>
<td>Microbial Genetics</td>
<td>3</td>
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<tr>
<td>BIOM 423</td>
<td>Mycology (even years)</td>
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<tr>
<td>BIOM 430</td>
<td>Applied and Environmental Microbiology</td>
<td>4</td>
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<tr>
<td>BIOM 450</td>
<td>Microbial Physiology</td>
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<tr>
<td>BIOM 455R</td>
<td>Research Mthds in Microbiology</td>
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<tr>
<td>BIOO 412</td>
<td>Animal Physiology</td>
<td>3</td>
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<td>BIOO 415</td>
<td>Ichthyology</td>
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<td>BIOO 433</td>
<td>Plant Physiology</td>
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<td>BIOO 470</td>
<td>Ornithology</td>
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<td>BIOO 475</td>
<td>Mammalogy</td>
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<td>ECNS 332</td>
<td>Econ of Natural Resources</td>
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<tr>
<td>ENSC 407</td>
<td>Environmental Risk Assessment (odd years)</td>
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</tr>
<tr>
<td>ENSC 410R</td>
<td>Biodiversity Methods</td>
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<td>Weed Ecology and Management</td>
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<td>Watershed Analysis</td>
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<td>Stream Restoration Ecology</td>
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<td>ENSC 461</td>
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<td>Remote Sensing</td>
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## Geospatial and Environmental Analysis Option

### Freshman Year

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</thead>
<tbody>
<tr>
<td>ENSC 110</td>
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<td>Principles of Biological Diversity</td>
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<td>BIOB 160</td>
<td>Principles of Living Systems</td>
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<tr>
<td>WRIT 101W</td>
<td>College Writing I</td>
<td>3</td>
</tr>
<tr>
<td>University Seminar (US Core)</td>
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<td><strong>Year Total:</strong></td>
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### Sophomore Year

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<tr>
<th>Course Code</th>
<th>Course Title</th>
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<tbody>
<tr>
<td>ERTH 101IN</td>
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### Land Rehabilitation Option

<table>
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<th>Credits</th>
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<tr>
<td>ENSC 245IN - Soils</td>
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<tr>
<td>ENSC 260 - Evolution for Env Scientists</td>
<td></td>
</tr>
<tr>
<td>GPHY 284 - Intro to GIS Science &amp; Cartog</td>
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<tr>
<td>PHSX 205 - College Physics I</td>
<td></td>
</tr>
<tr>
<td>STAT 216Q - Introduction to Statistics</td>
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<td>STAT 217Q - Intermediate Statistical Concepts</td>
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#### Junior Year

<table>
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<th>Course</th>
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<tbody>
<tr>
<td>ENSC 353 - Environmental Biogeochemistry</td>
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<tr>
<td>Choose one of the following:</td>
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<tr>
<td>NRSM 240 - Natural Resource Ecology</td>
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<tr>
<td>BIOE 370 - General Ecology (equiv to 270)</td>
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<tr>
<td>GPHY 357 - GPS Fund/App in Mapping</td>
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#### Senior Year

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<th>Course</th>
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<tr>
<td>ENSC 444 - Watershed Hydrology</td>
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<td>ENSC 454 - Landscape Pedology</td>
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<tr>
<td>Choose one of the following:</td>
<td>1-3</td>
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<tr>
<td>ENSC 464 - Computational Techniques Environmental Science</td>
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<td>ENSC 465 - Environmental Biophysics</td>
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<td>GPHY 429R - Applied Remote Sensing</td>
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<td>GPHY 484R - Applied GIS &amp; Spatial Analysis</td>
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<td>ENSC 499R - LRES Capstone</td>
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#### Total Program Credits:

**120**

Restricted Electives

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<td>AGSC 428 - Sustainable Cropping Systems</td>
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<tr>
<td>BIOE 375 - Ecological Responses to Climate Change</td>
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<td>BIOE 408 - Rocky Mountain Vegetation</td>
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<tr>
<td>BIOE 416 - Alpine Ecology</td>
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<td>BIOE 428 - Freshwater Ecology</td>
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<td>BIOE 455 - Plant Ecology</td>
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<td>BIOM 415 - Microbial Diversity, Ecology, and Evolution</td>
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<td>BIOM 452 - Soil &amp; Environmental Microbiology</td>
<td>3</td>
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<td>BIOO 433 - Plant Physiology</td>
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<td>BIOO 435 - Plant Systematics</td>
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<td>ECNS 332 - Econ of Natural Resources</td>
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<td>ENSC 407 - Environmental Risk Assessment</td>
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<td>ENSC 445 - Watershed Analysis</td>
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<td>ENSC 448 - Stream Restoration Ecology</td>
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<td>ENSC 460 - Soil Remediation</td>
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<td>ENSC 461 - Restoration Ecology</td>
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<td>ENSC 468 - Ecosystem Biogeochem</td>
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<td>NRSM 453 - Habitat Inventory and Analysis</td>
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<td>NRSM 455 - Riparian Ecology &amp; Management</td>
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<td>SRVY 375 - Analytic Photogrammetry and Remote Sensing</td>
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<tr>
<td>SRVY 230 - Intro to Surv for Engineers</td>
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<tr>
<td>STAT 411 - Methods for Data Analysis I</td>
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</table>

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### Land Rehabilitation Option

#### Freshman Year

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<tr>
<td>BIOM 170FN - Principles of Biological Diversity</td>
<td>4</td>
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<td>BIOM 160 - Principles of Living Systems</td>
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<td>CHMY 141 - College Chemistry I</td>
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<td>CHMY 143 - College Chemistry II</td>
<td>4</td>
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<tr>
<td>WRIT 101W - College Writing I</td>
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<td>M 161Q - Survey of Calculus (or higher)</td>
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<tr>
<td>University Seminar (US) Core</td>
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<tr>
<td><strong>Year Total:</strong></td>
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#### Sophomore Year

<table>
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<tr>
<th>Course</th>
<th>Credits</th>
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<tbody>
<tr>
<td>BOOO 230 - Identification of Seed Plants</td>
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</tr>
<tr>
<td>ENSC 245IN - Soils</td>
<td>3</td>
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<tr>
<td>ENSC 260 - Evolution for Env Scientists</td>
<td>3</td>
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<td>Take one of the following:</td>
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<tr>
<td>GPHY 262 - Spatial Sci Tech &amp; Application</td>
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<td>GPHY 284 - Intro to GIS Science &amp; Cartog</td>
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#### Junior Year

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
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<tbody>
<tr>
<td>ENSC 353 - Environmental Biogeochemistry</td>
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</tr>
<tr>
<td>BIOM 452 - Soil &amp; Environmental Microbiology</td>
<td>3</td>
</tr>
<tr>
<td>ENSC 443 - Weed Ecology and Management</td>
<td>3</td>
</tr>
<tr>
<td>ENSC 445 - Landscape Pedology</td>
<td>3</td>
</tr>
</tbody>
</table>

Each student shall work closely with their faculty advisor to plan an integrated set of elective courses appropriate to their academic and professional goals.
Take one of the following:  
- BIOE 370 - General Ecology (equiv to 270)  
- NRSM 240 - Natural Resource Ecology  

University Core and Electives: 15  

Year Total: 30  

**Senior Year**  

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENSC 410R - Biodiversity Methods</td>
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</tr>
<tr>
<td>ENSC 444 - Watershed Hydrology</td>
<td>3</td>
</tr>
<tr>
<td>ENSC 448 - Stream Restoration Ecology</td>
<td>3</td>
</tr>
<tr>
<td>ENSC 460 - Soil Remediation</td>
<td>3</td>
</tr>
<tr>
<td>ENSC 461 - Restoration Ecology</td>
<td>3</td>
</tr>
<tr>
<td>Take one of the following:</td>
<td>1-3</td>
</tr>
<tr>
<td>ENSC 464 - Computational Techniques Environmental Science</td>
<td></td>
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<tr>
<td>ENSC 465 - Environmental Biophysics</td>
<td></td>
</tr>
<tr>
<td>Take one of the following:</td>
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</tr>
<tr>
<td>NRSM 430 - Natural Resource Law</td>
<td></td>
</tr>
<tr>
<td>PSCI 362 - Natural Resource Policy</td>
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Year Total: 29  

**Sophomore Year**  

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>ENSC 245IN - Soils</td>
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</tr>
<tr>
<td>Choose one of the following two semester Math Sequences:</td>
<td>6-8</td>
</tr>
<tr>
<td>M 165Q - Calculus for Technology I</td>
<td></td>
</tr>
<tr>
<td>M 166Q - Calculus for Technology II</td>
<td></td>
</tr>
<tr>
<td>OR</td>
<td></td>
</tr>
<tr>
<td>M 171Q - Calculus I</td>
<td></td>
</tr>
<tr>
<td>M 172Q - Calculus II</td>
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<tr>
<td>CHMY 211 - Elements of Organic Chemistry</td>
<td>5</td>
</tr>
<tr>
<td>ENSC 260 - Evolution for Env Scientists</td>
<td>3</td>
</tr>
<tr>
<td>STAT 216Q - Introduction to Statistics (or higher)</td>
<td>3</td>
</tr>
<tr>
<td>GEO 208IN - Earth Materials</td>
<td>3</td>
</tr>
<tr>
<td>Take one of the following:</td>
<td>3</td>
</tr>
<tr>
<td>GPHY 262 - Spatial Sci Tech &amp; Application</td>
<td></td>
</tr>
<tr>
<td>GPHY 284 - Intro to GIS Science &amp; Cartog</td>
<td></td>
</tr>
<tr>
<td>WRIT 201 - College Writing II</td>
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Year Total: 29-31  

**Junior Year**  

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<tbody>
<tr>
<td>Choose one of the following:</td>
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<tr>
<td>NRSM 240 - Natural Resource Ecology</td>
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<tr>
<td>BIOE 370 - General Ecology (equiv to 270)</td>
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<tr>
<td>PHSX 205 - College Physics I</td>
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<td>ENSC 353 - Environmental Biogeochemistry</td>
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<tr>
<td>ERTH 307 - Principles of Geomorphology</td>
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<td>Take one of the following:</td>
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<tr>
<td>BIOM 452 - Soil &amp; Environmntl Microbiology</td>
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<tr>
<td>ENSC 460 - Soil Remediation</td>
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<tr>
<td>ENSC 468 - Ecosystem Biogeochem</td>
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Year Total: 30  

**Senior Year**  

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<tbody>
<tr>
<td>BIOE 428 - Freshwater Ecology</td>
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<tr>
<td>ENSC 448 - Stream Restoration Ecology</td>
<td></td>
</tr>
<tr>
<td>ENSC 461 - Restoration Ecology</td>
<td></td>
</tr>
<tr>
<td>BIOE 455 - Plant Ecology</td>
<td></td>
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<tr>
<td>Take two of the following:</td>
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<tr>
<td>BIOE 428 - Freshwater Ecology</td>
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<tr>
<td>ENSC 448 - Stream Restoration Ecology</td>
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</tr>
<tr>
<td>BIOE 455 - Plant Ecology</td>
<td></td>
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<tr>
<td>Take one of the following:</td>
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</tr>
<tr>
<td>NRSM 430 - Natural Resource Law</td>
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<tr>
<td>PSCI 362 - Natural Resource Policy</td>
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<tr>
<td>Take one of the following:</td>
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<tr>
<td>ENSC 464 - Computational Techniques Environmental Science</td>
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<td>AND</td>
<td></td>
</tr>
<tr>
<td>ENSC 445 - Watershed Analysis</td>
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<td>OR</td>
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Each student shall work closely with their faculty advisor to plan an integrated set of elective courses appropriate to their academic and professional goals.

**Soil and Water Sciences Option**  

**Freshman Year**  

<table>
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<tr>
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<tbody>
<tr>
<td>ENSC 110 - Lnd Res Environ Sciences</td>
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<tr>
<td>BIOB 160 - Principles of Living Systems</td>
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<tr>
<td>CHMY 141 - College Chemistry I</td>
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<tr>
<td>CHMY 143 - College Chemistry II</td>
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<tr>
<td>ERTH 101IN - Earth System Sciences</td>
<td>4</td>
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<tr>
<td>WRIT 101W - College Writing I</td>
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<tr>
<td>University Seminar (US) Core</td>
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Year Total: 29  

<table>
<thead>
<tr>
<th>Course</th>
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<tbody>
<tr>
<td>CHMY 211 - Elements of Organic Chemistry</td>
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<tr>
<td>ENSC 260 - Evolution for Env Scientists</td>
<td>3</td>
</tr>
<tr>
<td>STAT 216Q - Introduction to Statistics (or higher)</td>
<td>3</td>
</tr>
<tr>
<td>GEO 208IN - Earth Materials</td>
<td>3</td>
</tr>
<tr>
<td>Take one of the following:</td>
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</tr>
<tr>
<td>GPHY 262 - Spatial Sci Tech &amp; Application</td>
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<tr>
<td>GPHY 284 - Intro to GIS Science &amp; Cartog</td>
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</tr>
<tr>
<td>WRIT 201 - College Writing II</td>
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</table>

Year Total: 29-31  

<table>
<thead>
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Year Total: 30  

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
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<tbody>
<tr>
<td>ENSC 245IN - Soils</td>
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<tr>
<td>Choose one of the following:</td>
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</tr>
<tr>
<td>NRSM 430 - Natural Resource Law</td>
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<td>PSCI 362 - Natural Resource Policy</td>
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<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td>ENSC 444 - Watershed Hydrology</td>
<td>3</td>
</tr>
<tr>
<td>ENSC 454 - Landscape Pedology</td>
<td>3</td>
</tr>
<tr>
<td>Take two of the following:</td>
<td>6</td>
</tr>
<tr>
<td>BIOE 428 - Freshwater Ecology</td>
<td></td>
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<tr>
<td>ENSC 448 - Stream Restoration Ecology</td>
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<tr>
<td>Take one of the following:</td>
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<tr>
<td>AND</td>
<td></td>
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<tr>
<td>ENSC 445 - Watershed Analysis</td>
<td></td>
</tr>
<tr>
<td>OR</td>
<td></td>
</tr>
</tbody>
</table>

Because some courses are offered during alternate years, the proposed scheduling of courses in junior and senior years may need to be modified. Students should work with an advisor for their individual schedules.

A minimum of 120 credits is required for graduation; at least 42 of these credits must be in courses numbered 300 and above.
Soil Science Minor (Non-Teaching)

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>ENSC 245IN</td>
<td>Soils</td>
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</tr>
<tr>
<td>ENSC 353</td>
<td>Environmental Biogeochemistry</td>
<td>3</td>
</tr>
<tr>
<td>BIOM 452</td>
<td>Soil &amp; Environmental Microbiology</td>
<td>3</td>
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<tr>
<td>ENSC 454</td>
<td>Landscape Pedology</td>
<td>3</td>
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<tr>
<td>ENSC 465</td>
<td>Environmental Biophysics</td>
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<tr>
<td>ENSC 465</td>
<td>Environmental Biophysics</td>
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</table>

Choose two from the following:

- ENSC 444 Watershed Hydrology
- ENSC 460 Soil Remediation
- ENSC 461 Restoration Ecology

Total Credits: 26

Total Program Credits: 120

Restricted Electives

Choose 6-9 Credits from the following

- AGSC 454 Agrostology: 3
- BHE 375 Ecological Responses to Climate Change: 3
- BHE 428 Freshwater Ecology (if not taken above): 3
- BHE 455 Plant Ecology: 3
- BIOM 415 Microbial Diversity, Ecology, and Evolution: 3
- BIOM 452 Soil & Environmental Microbiology: 3
- CHMY 311 Fundamental Analytical Chemistry: 4
- EENV 441 Natural Treatment Systems: 3
- ENSC 407 Environmental Risk Assessment: 3
- ENSC 410R Biodiversity Methods: 3
- ENSC 443 Weed Ecology and Management: 3
- ENSC 445 Watershed Analysis: 3
- ENSC 448 Stream Restoration Ecology (if not taken above): 3
- ENSC 460 Soil Remediation: 3
- ENSC 461 Restoration Ecology (if not taken above): 3
- ERTH 432R Surface Water Resources: 3
- GEO 309 Sedimentation and Stratigraphy: 4
- GPHY 357 GPS Fund/App in Mapping: 3
- GPHY 384 Advanced GIS and Spatial Analysis: 3
- GPHY 426 Remote Sensing: 3
- GPHY 429R Applied Remote Sensing: 3
- GPHY 484R Applied GIS & Spatial Analysis: 3
- NRSM 421 Holistic Thought/Mgmt: 4
- NRSM 455 Riparian Ecology & Management: 3
- STAT 411 Methods for Data Analysis I: 3

Total Credits: 21

Total Credits: 120

Genetics Minor

Genetics is a fundamental topic in biology and an important component of many biological disciplines. Montana State University offers a wide variety of genetics courses taught by faculty in five departments (Animal and Range Science, Cell Biology and Neuroscience, Ecology, Microbiology and Immunology, and Plant Sciences and Plant Pathology). A Genetics Minor is available to students majoring in these departments.

In order to earn a Genetics Minor, a student must take 13 units of required courses and 15 units of elective courses (see below) and must earn a grade of at least C- in every course. Students interested in this minor should consult the genetics advisor within each department to decide whether the Genetics Minor is appropriate for them and to help select specific courses. Course requirements for the Genetics Minor are consistent across all departments.

Required Courses

- BIOB 160 Principles of Living Systems: 4
- or BIOB 260 Cellular and Molecular Biology
- BIOB 375 General Genetics: 3
- or BIOH 320 Biomedical Genetics
- BIOB 480 Conservation Genetics: 3
- or BIOB 484 Population Genetics
- STAT 216Q Introduction to Statistics: 3
- or BIOB 318 Biometry

Elective Courses

Choose 15 credits from the following:

- AGSC 441 Plant Breeding & Genetics: 3
- ANSC 322 Principles of Animal Breeding and Genetics: 3
- BCH 444R Biochemistry & Molecular Biology Methods: 3
- BIOB 420 Evolution: 3
- BIOB 428 Molecular Evolution: 3
- BIOB 430 Plant Biotechnology: 3
- BIOB 467R Gene Construction: 4
- BIOB 477 Genome Science and Gene Expression
- BIOB 480 Conservation Genetics (if not taken as a requirement)
- BIOB 484 Population Genetics (if not taken as a requirement)
- BIOH 422 Genes and Cancer: 3
- BIOH 455 Molecular Medicine: 3
- BIOH 465R Gene Expression Lab: From Genes to Proteins to Cells: 3
- BIOM 410 Microbial Genetics: 3
- BIOM 415 Microbial Diversity, Ecology, and Evolution: 3
- BIOM 450 Microbial Physiology: 3
- BIOM 455R Research Mthds in Microbiology: 4
- BIOM 435 Plant Systematics: 3

Total Credits: 28
Requirements for Admission to Upper Division Courses in Biology
For admission to upper division (numbered 300 or higher) Biology (BIOB, BIOE, BIOO, BIOM) and Fish and Wildlife Management (WILD) courses, students must have completed at least 45 total university credits with a cumulative GPA of at least 2.5 for all courses and have also earned a "C-" or better for any prerequisite courses. Limited exceptions may be made by consent of instructor. Any student who obtains enrollment in an upper division biology course without satisfying these requirements will be required to withdraw from the course. Specific courses may have additional prerequisites.

Natural Resources and Rangeland Ecology

Note: MSU’s programs in the biological sciences are distributed across multiple departments. MSU does not have a single Department of Biology. For additional options see Biological Sciences (p. 81) at MSU.

Department of Animal and Range Sciences
http://animalrange.montana.edu/

Students who complete the requirements for a B.S. degree in Natural Resources and Rangeland Ecology in the Department of Animal and Range Sciences will be eligible for a variety of natural resource jobs with state and federal agencies or private industries or will be eligible to pursue a Master of Science degree. The two options available within this degree offer students an opportunity to study the interaction of livestock and wildlife and their rangeland habitats. Emphasis is placed on soil, water and vegetation attributes which influence habitat ecology and management for livestock and wildlife. The curriculum in both these options has been designed to allow students to score at the highest level for employment with federal agencies. We are professionally accredited by the Society for Range Management.

Rangeland Ecology and Management Option
This option is designed to emphasize management of rangeland environments. Courses in resource inventory, watershed, rangeland restoration and vegetation ecology are required to give the student a background in ecological principles used to manage rangelands in the western United States. Students in this option can select courses which focus on production agriculture or other natural resource areas. This option is designed to train students for employment with state or federal land management agencies, as well as private industry or graduate school.

Wildlife Habitat Ecology and Management Option
This option provides students with a broad based background in wildlife habitat, rangeland ecology, and wildlife-livestock interactions common in the western United States. The focus will be on wildlife habitat, major vegetation types, rangeland livestock production, soils, and water within the framework of total resource management. Habitat management under a variety of uses and goals will be discussed. Courses specifically designed for this option include classes in wildlife habitat ecology, habitat restoration, wildlife-livestock habitat issues and wildlife-livestock nutrition. Students who graduate with a degree in this option will be eligible for employment in private industry, state and federal land agencies, or to pursue a Master of Science degree.

Undergraduate Programs
- Rangeland Ecology and Management Option (p. 95)
- Wildlife Habitat Ecology and Management Option (p. 96)

• Natural Resources and Rangeland Ecology Minor (Non-Teaching) (p. 95)

Natural Resources and Rangeland Ecology Minor (Non-Teaching)
NRSM 101 Natural Resource Conservation 3
NRSM 102 Montana Range Plants 1
BIOO 230 Identification of Seed Plants 4
NRSM 350 Vegetation of Western Wildlands 3
NRSM 351 Biomes of Western Wildlands 2
AGSC 454 Agrostology 3
or BIOO 435 Plant Systematics 3
NRSM 240 Natural Resource Ecology 3
NRSM 353 Grazing Ecology and Management 3
NRSM 453 Habitat Inventory and Analysis 3
Take two of the following: 6
WILD 325 Wildlife-Livestock Nutrition
NRSM 455 Riparian Ecology & Management
NRSM 330 Fire Ecology and Mgmt
WILD 438 Wildlife Habitat Ecology
WILD 355 Wildlife and Livestock Habitat Restoration
WILD 426 Wildlife Habitat Management
Total Credits 31

A Natural Resources and Rangeland Ecology Minor does not meet qualifications for professional employment with federal agencies.

All students are responsible for meeting prerequisites for upper division courses.

Rangeland Ecology and Management Option

Freshman Year

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>NRSM 101</td>
<td>Natural Resource Conservation</td>
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<tr>
<td>NRSM 102</td>
<td>Montana Range Plants</td>
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<tr>
<td>BIOO 230</td>
<td>Identification of Seed Plants</td>
<td>4</td>
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<tr>
<td>NRSM 350</td>
<td>Vegetation of Western Wildlands</td>
<td>3</td>
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<td>NRSM 351</td>
<td>Biomes of Western Wildlands</td>
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<tr>
<td>AGSC 454</td>
<td>Agrostology</td>
<td>3</td>
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<tr>
<td>or BIOO 435</td>
<td>Plant Systematics</td>
<td>3</td>
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<td>NRSM 240</td>
<td>Natural Resource Ecology</td>
<td>3</td>
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<tr>
<td>NRSM 353</td>
<td>Grazing Ecology and Management</td>
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<td>NRSM 453</td>
<td>Habitat Inventory and Analysis</td>
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<td>WILD 325</td>
<td>Wildlife-Livestock Nutrition</td>
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<td>NRSM 455</td>
<td>Riparian Ecology &amp; Management</td>
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<td>NRSM 330</td>
<td>Fire Ecology and Mgmt</td>
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<td>WILD 438</td>
<td>Wildlife Habitat Ecology</td>
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<td>WILD 355</td>
<td>Wildlife and Livestock Habitat</td>
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Sophomore Year

<table>
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<td>NRSM 240</td>
<td>Natural Resource Ecology</td>
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<tr>
<td>AGSC 342</td>
<td>Forages</td>
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<tr>
<td>ENSC 245IN</td>
<td>Soils</td>
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<td>Choose one of the following:</td>
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<tr>
<td>BMGT 205</td>
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<td>WRIT 201</td>
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<tr>
<td>WRIT 221</td>
<td>Intermediate Tech Writing</td>
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Wildlife Habitat Ecology and Management Option

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<tr>
<td>NRSM 101 - Natural Resource Conservation</td>
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<td>NRSM 102 - Montana Range Plants</td>
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<tr>
<td>BIOB 170IN - Principles of Biological Diversity</td>
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<td>CHMY 121IN - Introduction to General Chemistry</td>
<td>4</td>
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<td>ECNS 101IS - Economic Way of Thinking</td>
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<td>ANSC 100 - Introduction to Animal Science</td>
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<td>BIOB 160 - Principles of Living Systems</td>
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<tr>
<td>NRSM 235 - Range and Pasture Monitoring</td>
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<td>NRSM 240 - Natural Resource Ecology</td>
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<td>ENSC 245IN - Environmental Science</td>
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<td>BMGT 205 - Prof Business Communication</td>
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<td>WRIT 201 - College Writing II</td>
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<td>WRIT 221 - Intermediate Tech Writing</td>
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<td>ANSC 222 - Livestock in Sustain Systems</td>
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<tr>
<td>CHMY 123 - Introduction of Organic Chemistry and Biochemistry</td>
<td>4</td>
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<tr>
<td>BIOO 230 - Identification of Seed Plants</td>
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<tr>
<td>BIOB 318 - Biometry</td>
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<tr>
<td>STAT 216Q - Introduction to Statistics</td>
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<th>Junior Year</th>
<th>Credits</th>
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<tr>
<td>NRSM 330 - Fire Ecology and Mgmt</td>
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<tr>
<td>GPHY 284 - Intro to GIS Science and Cartography</td>
<td>3</td>
<td></td>
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<tr>
<td>or GPHY 262 - Spatial Science and Application</td>
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<tr>
<td>ENSC 461 - Restoration Ecology</td>
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<td>Choose one of the following:</td>
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<tr>
<td>AGSC 454 - Agrostology</td>
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<td>BIOO 435 - Plant Systematics</td>
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<tr>
<td>University Core and Restricted Electives</td>
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<tr>
<td>WILD 325 - Wildlife-Livestock Nutrition</td>
<td>3</td>
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<td>NRSM 350 - Vegetation of Western Wildlands</td>
<td>3</td>
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<td>NRSM 351 - Biomes of Western Wildlands</td>
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<td>NRSM 353 - Grazing Ecology and Management</td>
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<td>WILD 301 - Princ of Fish and Wildlife Mgmt</td>
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<tr>
<td>NRSM 453 - Habitat Inventory and Analysis</td>
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<tr>
<td>ENSC 454 - Landscape Pedology</td>
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<tr>
<td>University Core and Restricted Electives</td>
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<td></td>
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<tr>
<td>ANSC 410 - Veterinary Entomology and Parasitology</td>
<td>3</td>
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<tr>
<td>ANSC 432R - Sheep Management</td>
<td>3-4</td>
<td></td>
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<tr>
<td>or ANSC 434R - Beef Cattle Management</td>
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<tr>
<td>ERTH 101IN - Earth System Sciences</td>
<td>4</td>
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<tr>
<td>BIOE 428 - Freshwater Ecology</td>
<td>3</td>
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<tr>
<td>NRSM 421 - Holistic Thought/Mgmt</td>
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<tr>
<td>ENSC 443 - Weed Ecology and Management</td>
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<tr>
<td>ENSC 444 - Watershed Hydrology</td>
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Total Program Credits: 120

Restricted Electives (Select six credits)

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<tbody>
<tr>
<td>AGBE 210IS - Economics of Ag Business</td>
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<tr>
<td>ANSC 232 - Livestock Management - Sheep</td>
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<tr>
<td>or ANSC 234 - Livestock Management - Beef</td>
</tr>
<tr>
<td>ANSC 320 - Animal Nutrition</td>
</tr>
<tr>
<td>ANSC 337 - Disease of Domestic Livestock</td>
</tr>
<tr>
<td>ANSC 410 - Veterinary Entomology and Parasitology</td>
</tr>
<tr>
<td>ANSC 432R - Sheep Management</td>
</tr>
<tr>
<td>or ANSC 434R - Beef Cattle Management</td>
</tr>
<tr>
<td>ERTH 101IN - Earth System Sciences</td>
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<td>BIOE 428 - Freshwater Ecology</td>
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<tr>
<td>NRSM 421 - Holistic Thought/Mgmt</td>
</tr>
<tr>
<td>ENSC 443 - Weed Ecology and Management</td>
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<tr>
<td>ENSC 444 - Watershed Hydrology</td>
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</table>
Crop Science Option

Continued increases in food and fiber crop production are essential for the future of humankind. Yet increased production places increased pressure on our soil, water, and other finite resources. The challenge for crop scientists is to implement crop and soil management schemes that maintain and increase production, but at the same time conserve our soil and water resources and preserve the delicate balance in the agroecosystem.

Course requirements in the Crop Science option are designed to acquaint students with the principles underlying crop and soil management. Thus soil fertility, plant physiology, crop production, crop breeding, and pest management, along with courses in the biological and physical sciences are included in this area of study.

Graduates from this option find careers in farming and ranching; as crop production specialists; in pest management; in seed, fertilizer, and chemical industries; with banks and other lending institutions; Cooperative Extension Service and with a government agency such as the Natural Resource Conservation Service.

Plant Biology Option

Plant biology provides a broad education in the plant sciences. The expertise of the Plant Sciences faculty provides an opportunity to focus at the cellular and molecular level, but opportunities also exist for emphasis in plant ecology and systematics. Course requirements include beginning and advanced courses in biology, microbiology, biochemistry, physiology, genetics, plant development, ecology, and systematics.

Graduates are prepared for post-graduate school, and academic and professional careers.

Undergraduate Programs
- Crop Science Option (p. 97)
- Plant Biology Option (p. 98)

Undergraduate Minor
- Genetics Minor (Non-Teaching) (p. 94)

Graduate Programs
- Plant Sciences and Plant Pathology (p. 293)

Crop Science Option

A minimum of 120 credits is required for graduation; 42 of these credits must be in courses numbered 300 and above. University core requirements must be completed.

Restrict Electives (Select 6 Credits)

<table>
<thead>
<tr>
<th>Course</th>
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<tr>
<td>ANSC 265</td>
<td>Anatomy and Physiology of Domestic</td>
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<td>Animals - Lecture</td>
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<td>ANSC 266</td>
<td>Anatomy and Physiology of Domestic</td>
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<td>Animals - Lab</td>
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<td>BIOE 405</td>
<td>Behavioral and Evolutionary Ecology</td>
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<td>BIOE 428</td>
<td>Freshwater Ecology</td>
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<tr>
<td>BIOO 310</td>
<td>Comparative Vertebrate Anatomy</td>
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<td>BIOO 470</td>
<td>Ornithology</td>
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<td>BIOO 475</td>
<td>Mammalogy</td>
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<td>ENSC 444</td>
<td>Watershed Hydrology</td>
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<td>GPHY 411</td>
<td>Biogeography</td>
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<td>NRSM 430</td>
<td>Natural Resource Law</td>
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<tr>
<td>WILD 429</td>
<td>Yellowstone Wildlife Habitat Ecology</td>
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Total Program Credits: 120

Crop Science Option

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<tr>
<td>AGSC 265</td>
<td>Range &amp; Wildlife Policy and Planning</td>
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<td>WILD 426</td>
<td>Wildlife Habitat Management</td>
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<td>WILD 438</td>
<td>Wildlife Habitat Ecology</td>
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<td>BIOE 370</td>
<td>General Ecology (equiv to 270)</td>
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<tr>
<td>BIOO 433</td>
<td>Plant Physiology</td>
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Total Program Credits: 120

Crop Science Option

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<tr>
<th>Course</th>
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<tbody>
<tr>
<td>BIOB 110CS</td>
<td>Introduction to Plant Biology</td>
<td>3</td>
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<tr>
<td>CHMY 1211N</td>
<td>Introduction to General Chemistry</td>
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<tr>
<td>CHMY 123</td>
<td>Introduction of Organic Chemistry and</td>
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<td></td>
<td>Biochemistry</td>
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<td>WRIT 101W</td>
<td>College Writing I</td>
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<tr>
<td>M 105Q</td>
<td>Contemporary Mathematics (formerly M 145Q, Math for Liberal Arts)</td>
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Year Total: 30

Sophomore Year

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<tr>
<td>ECNS 101IS</td>
<td>Economic Way of Thinking</td>
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<tr>
<td>BIOO 262IN</td>
<td>Introduction to Entomology</td>
<td>3</td>
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<tr>
<td>ENSC 245IN</td>
<td>Soils</td>
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<td>BIOO 220</td>
<td>General Botany</td>
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<td>AGSC 342</td>
<td>Forages</td>
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</tbody>
</table>

Department of Plant Sciences and Plant Pathology

http://plantsciences.montana.edu/

Plant Science

Note: MSU’s programs in the biological sciences are distributed across multiple departments. MSU does not have a single Department of Biology. For additional options see Biological Sciences (p. 81) at MSU.

Faculty members who advise students and teach courses are also active researchers in their respective disciplines. Students learn current knowledge and technology through formal course work and gain valuable first-hand experience in departmental laboratories, greenhouses, and field research farms. Students are encouraged to gain additional learning experiences outside the classroom by working as research assistants in faculty programs, summer jobs, and internships with private industry and government agencies.

Each student works closely with a faculty advisor to formulate a program of study that is appropriate with the student’s career goals and also fits into either the Crop Science or Plant Biology options.
**Plant Biology Option**

### Freshman Year

- **Credits**
- **BIOB 170IN - Principles of Biological Diversity** 4
- **BIOB 160 - Principles of Living Systems** 4

A minimum of 120 credits is required for graduation; 42 of these credits must be in courses numbered 300 and above.

### Additional Requirements:

A minimum of 20 credits of advisor-approved plant biology electives must be taken, at least 16 of which must be upper division. Up to 7 total credits may be included from BIOB/HORT 490R, BIOB/HORT 492, and BIOB/HORT 498 courses. Electives could come from any plant biology courses in the Plant Sciences and Plant Pathology Department (e.g., AGSC 454--Agrostology, BIOO 435--Plant Systematics, BIOO 437--Plant Development, BIOO 458--Plant Cell Physiology), other plant courses in the Plant Sciences and Plant Pathology Department (e.g., BIOM 421--Concepts of Plant Pathology, BIOM 423--Mycology, etc.), and selected courses in the departments of Animal & Range Sciences, Land Resources & Environmental Sciences, Ecology, Microbiology, Cell Biology & Neuroscience, Earth Sciences, Mathematical Sciences, and Computer Science.

### Pre-Veterinary Curriculum

MSU offers pre-veterinary coursework and advising for students interested in pursuing admission into any school or college of veterinary medicine. MSU’s pre-veterinary curriculum is not a major from which students will graduate, and ‘pre-vet’ is not a degree-granting option on the MSU campus. Rather, it is an advising program and a series of required undergraduate classes that prepare students for admission into schools of veterinary medicine. The Pre-Veterinary Intake major is supported through the College of Agriculture, and we offer several resources to students who...
are interested in attending a veterinary medical program after their MSU baccalaureate careers. MSU’s College of Agriculture and College of Letters and Science have pre-vet advisors available who work with students as they prepare to apply for admission to schools of veterinary medicine.

The State of Montana does not have a college of veterinary medicine. However, Montana State University participates in the WIMU Regional Program in Veterinary Medicine, a cooperative program offered through Washington State University’s College of Veterinary Medicine. The program’s first year of study is on the MSU campus, with the next three years of study housed in Pullman, on the Washington State University campus. Montana currently supports ten students through this program. Montana residents may also compete for admission to veterinary school through a contract agreement with WICHE (Western Interstate Commission for Higher Education). Information on the current status of this program in Montana may be obtained by contacting the Commissioner for Higher Education Office in Helena, MT.

Veterinary School Course Reverse Transfer

Pre-veterinary students are strongly encouraged to complete a Bachelor’s degree before enrolling in a College of Veterinary Medicine. Bachelor’s degrees are necessary for graduation from some veterinary schools. Baccalaureate degrees are usually required for entrance to graduate schools, so if the student intends to pursue a graduate degree after completing veterinary school, the lack of a bachelor’s degree is prohibitive. Additionally, certain scholarships or fellowships require the applicant to have an undergraduate degree. However, a completed baccalaureate degree is not required for admission to many of the 33 accredited Veterinary Schools in the United States. Montana State University developed a reverse-transfer process for those students who chose to begin their Veterinary Medicine studies before completing their Bachelor’s degree.

This procedure provides a standardized process whereby veterinary students who have not completed their MSU undergraduate degrees are able to use up to 15 veterinary school course credits for reverse-transfer back to MSU to complete the baccalaureate degrees. Each reverse-transferred course may be used towards fulfillment of a single requirement (i.e., double-counting is not allowed).

Reverse-transfer courses are graduate (veterinary school) courses transferred back to MSU to complete a degree at MSU. This process may be used by veterinary school students from any department that files the appropriate paperwork to be posted to the Registrar’s Office website. Note that it is the student’s responsibility to complete the required procedures and all paperwork according to the specified deadlines.

Qualifications

MSU students desiring to follow this plan must meet the following qualifications:

1. The student must have a minimum of 105 undergraduate credits posted to their MSU transcript prior to reverse transfer of Veterinary School credits. Of those 105 credits:
   - All general education requirements (e.g., Core 2.0) must be complete.
   - No more than 15 other upper-division credits may be substituted by reverse-transferred courses.
   - Grades in courses counting toward degree requirements must meet established grade requirements, typically C- or better, or P for Veterinary School courses if they are only offered as Pass/Marginal/Fail.

2. The student must have a minimum of 105 undergraduate credits posted to their MSU transcript prior to reverse transfer of Veterinary School courses if they are only offered as Pass/Marginal/Fail.

3. The student can apply for completion of their undergraduate degree requirements (using reverse-transfer courses) only after the first year of veterinary school has been completed. This would most commonly occur during the next fall semester but may occur later as well. The following steps are required:

   - File an “Intent to Register” Form, making sure to declare the degree specified above in the reverse-transfer petition (see item 2), with the Registrar’s Office by the established deadline in the semester prior to the intended term of graduation (October 1st for graduation in spring, March 1st for graduation in summer or fall).
   - Complete an Application for Baccalaureate Degree and submit this application with the graduation fee required of all graduating students. The deadlines for graduation application are the same as those for the “Intent to Register” (October 1st for graduation in spring, March 1st for graduation in summer or fall).
   - Register for credit in absentia (prior to the 10th day of class of the intended graduation term).
   - Have an official copy of their veterinary school transcript submitted to Montana State University - Office of the Registrar once the required courses have been completed.

Policy Considerations

This reverse-transfer policy has been approved by the faculty senate and adherence to the procedures herein circumvent the need for a Graduation and Admissions Review Committee (GARC) petition in relation to the following graduation standards:

   - The residency requirement that 23 of a student’s last 30 credits be completed through MSU.
   - The 9-credit limit on reservation-of-credit when using graduate-level courses for an undergraduate degree.
   - The 12-credit limit as to applicability of Pass/Fail courses used toward undergraduate degree requirements.
   - The use of Pass/Fail courses for degree requirements.

The need for these exceptions varies depending upon the given veterinary school and their embedded grading policies.

MSU Pre-Veterinary Course Requirements

This outline is designed to qualify students to apply to the WIMU program; carefully read all information on required courses, and if you have any
opportunities in agricultural business, public health and community food- and bioenergy-related areas in order to prepare students for career internships. The degree plan is intended to encompass a wide range of skills and knowledge, and in specific, self-selected focus areas through work closely with faculty to gain hands-on experience enhancing practical food and health, and related food and bioenergy system topics. Students interested in the interconnected processes of crop production, processing, pest management, general agronomy, and information services. Students may select from an array of upper division courses in natural ecosystems, cropping systems, pest management, community supported agriculture, food processing, food marketing, retailing and distribution. The Sustainable Food Systems Option draws from both the physical and social sciences in the areas of food and nutrition, family and consumer sciences, plant sciences, environmental sciences, ecology, sociology, and political science. Emphasis in this option is on health and consumer issues related to food production and food systems. Students gain hands-on experience with food processing, food cooperative management, alternative food distribution systems, and small business operations. Having a better understanding of the interconnections among food production, food policy, food security and health, helps prepare graduates capable of addressing interdisciplinary food system problems such as obesity, food insecurity and poverty, food safety, and loss of indigenous foods, among others.

Career Opportunities
Graduates from this option are prepared for careers in community nutrition, community food security, public health, Extension education, food and nutrition policy and education, food enterprise, culinary arts and management, community supported agriculture, food processing, food marketing, retailing and distribution.

Agroecology Option
Agroecology explores how crops and pest organisms interact with their environment, and the application of technology to efficiently and sustainably produce crops. Agroecology focuses on application of principles of population and community ecology, as well as environmental science, to cropland ecosystems. The curriculum is based on the philosophy that to be able to successfully predict management outcomes and thus make informed recommendations, one must understand fundamental principles of evolution, ecology, soil science, agronomy, and pest management. The curriculum originates from a base in biological science which includes a broad knowledge of organisms (including plants, animals, and microorganisms) and the physical and chemical characteristics of environments. In the Agroecology curriculum, students will develop a knowledge of the diversity of organisms and how they interact in natural and managed ecosystems. Furthermore, the curriculum will build on this knowledge in courses that demonstrate the application of ecology and environmental science principles. Students will also learn how new technologies like remote sensing and geographic information systems are modernizing agriculture. In later stages of the curriculum, students may select from an array of upper division courses in natural ecosystems, cropping systems, pest management, applied ecology, and policy and planning that enable them to specialize in food or bioenergy-related areas best suited to their own career vision.

Career Opportunities
Graduates from this option find careers in environmental industries and consulting firms that solve problems associated with agroecosystems or agricultural practices; government jobs in environmental management and policy making; agricultural industry positions associated with precision agriculture, pest management, general agronomy, and information services. Students will be prepared for graduate training that leads to independent research in basic and applied ecology, environmental biology, cropping systems, precision agriculture, ecologically-based pest management, or weed science.

Sustainable Food & Bioenergy Systems
This program is a unique interdisciplinary curriculum designed for students interested in the interconnected processes of crop production, processing, distribution, and utilization of food and bioenergy. The degree focuses on ecologically sound, socially just, and economically viable farming methods, food and health, and related food and bioenergy system topics. Students work closely with faculty to gain hands-on experience enhancing practical skills and knowledge, and in specific, self-selected focus areas through internships. The degree plan is intended to encompass a wide range of food- and bioenergy-related areas in order to prepare students for career opportunities in agricultural business, public health and community food security, natural resource conservation, bioenergy production, marketing, distribution, and local food systems.
Sustainable Crop Production Option
Where does our food come from? Are there ways to sustainably maintain production levels and yet protect our natural resources? Is it possible to improve the quality and nutrition of our food supply? Are local food systems a viable alternative to corporate agricultural production? Can crops grown for bioenergy production reduce our use of fossil fuels and lessen carbon dioxide emissions? The answers to these questions and many more are discovered by students in the Sustainable Crop Production Option. The curriculum is designed to acquaint students with a broad range of principles and issues in sustainable crop production, including soil fertility, plant physiology, greenhouse production, pest management, and small business management. Both large- and small-scale food and bioenergy production systems are examined.

Career Opportunities
Graduates from this option are prepared for careers in agricultural production, community nutrition, community food security, public health, Extension education, food and nutrition policy and education, food enterprise, culinary arts and management, community supported agriculture, food processing, food marketing, retailing and distribution.

Sustainable Livestock Production Option
Sustainable Livestock Production focuses on the biological understanding of animal agriculture and its continued presence in sustainable grazing systems as well as its potential role in sustainable farming systems. Students will be introduced to the principles, practices and issues impacting the production, processing and preservation of safe, wholesome, nutritious, and palatable meat along with the regulatory requirements for selling animal products. Sustainable Livestock Production focuses on the science of animal production, but expands student learning to a larger systems understanding to the role of domestic livestock in sustainable systems. In addition, students will be exposed to the role of strategic grazing in landscape management as well as using livestock to manage potential waste streams from other industries.

Career Opportunities
Graduates from this option are prepared for careers in both the production and allied industries associated with animal agriculture and will also prepare the student for opportunities in extension and graduate work.

Undergraduate Programs
• Agroecology Option (p. 101)
• Sustainable Food Systems Option (p. 103)
• Sustainable Crop Production Option (p. 102)
• Sustainable Livestock Production Option (p. 103)

Agroecology Option
Land Resources and Environmental Sciences

Freshman Year
ENSC 110 - Lnd Res Environ Sciences 3
SFBS 146 - Introduction to Sustainable Food and Bioenergy Systems 3
BIOB 1701N - Principles of Biological Diversity 4
BIOB 110CS - Introduction to Plant Biology 3
CHMY 141 - College Chemistry I 4
M 121Q - College Algebra 3
ECNS 101IS - Economic Way of Thinking 3
WRIT 101W - College Writing I 3
University Core and Electives 3
Year Total: 29

Sophomore Year
Credits
BIOB 160 - Principles of Living Systems 4
CHMY 143 - College Chemistry II 4
Choose one of the following: 4-5
  BCH 104RN - The Biochemistry of Health for Non-Science Majors
  CHMY 123 - Introduction of Organic Chemistry and Biochemistry
CHMY 211 - Elements of Organic Chemistry 3
ECHM 205CS - Energy and Sustainability 3
ENSC 245IN - Soils 3
GPHY 284 - Intro to GIS Science & Cartog 3
NUTR 221CS - Basic Human Nutrition 3
NUTR 226 - Food Fundamentals 3
Choose one of the following: 3
SFBS 298 - Internship
SFBS 296 - Practicum: Towne’s Harvest
Year Total: 30-31

Junior Year
Credits
Choose one of the following: 3
  BIOB 318 - Biometry
  STAT 216Q - Introduction to Statistics
Choose one of the following: 3
  NRSM 240 - Natural Resource Ecology
  BIOE 370 - General Ecology (equiv to 270)
ENSC 353 - Environmental Biogeochemistry 3
NUTR 351 - Nutrition and Society 3
Choose one of the following: 3-4
  AGBE 315 - Ag in a Global Context
  ECNS 204IS - Microeconomics
  NRSM 421 - Holistic Thought/Mgmt
University Core and Electives 15
Year Total: 30-31

Senior Year
Credits
Choose two of the following: 6
  AGSC 401 - Integrated Pest Management
  AGSC 428 - Sustainable Cropping Systems
  BIOM 421 - Concepts of Plant Pathology
  ENSC 443 - Weed Ecology and Management
Choose one of the following: 3
  BIOE 455 - Plant Ecology
  BIOO 433 - Plant Physiology
  BIOM 452 - Soil & Environmntl Microbiology
  ENSC 468 - Ecosystem Biogeochem
SFBS 498 - Internship 1-12
SFBS 499 - Senior Thesis/Capstone 3
University Core and Electives 15
Year Total: 28-39

Total Program Credits: 120

Restricted Electives
Take 21 credits of the following
Each student shall work closely with their faculty advisor to plan an integrated set of elective courses appropriate to their academic and professional goals.

Because some of our courses are offered during alternate years, the proposed scheduling of courses in junior and senior years may need to be modified. Work with your advisor to determine an individual schedule.

A minimum of 120 credits is required for graduation; at least 42 of these credits must be in courses numbered 300 and above.

# Sustainable Crop Production Option

## Plant Sciences and Plant Pathology

### Freshman Year

<table>
<thead>
<tr>
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<th>Course Title</th>
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<tr>
<td>SFBS 146</td>
<td>Introduction to Sustainable Food and Bioenergy Systems</td>
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<td>BIOB 170IN</td>
<td>Principles of Biological Diversity</td>
<td>4</td>
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<td>ECNS 101IS</td>
<td>Economic Way of Thinking</td>
<td>3</td>
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<tr>
<td>BIOB 110CS</td>
<td>Introduction to Plant Biology</td>
<td>3</td>
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<tr>
<td>ENSC 110</td>
<td>Land Resources and Environment Sciences</td>
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<td>ENSC 245IN</td>
<td>Soils</td>
<td>3</td>
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<tr>
<td>CHMY 121IN</td>
<td>Introduction to General Chemistry</td>
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<tr>
<td>CHMY 141</td>
<td>College Chemistry I</td>
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<td>Select one of the following:</td>
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<tr>
<td>M 105Q</td>
<td>Contemporary Mathematics (formerly M 145Q, Math for Liberal Arts)</td>
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<td>M 121Q</td>
<td>College Algebra</td>
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Year Total: 30

### Sophomore Year

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<td>NUTR 221CS</td>
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<td>AGSC 341</td>
<td>Field Crop Prod</td>
<td>3</td>
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<tr>
<td>BIOM 103IN</td>
<td>Unseen Universe: Microbes</td>
<td>3</td>
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<td>ECHM 205CS</td>
<td>Energy and Sustainability</td>
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<td>Select one of the following:</td>
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<td>SFBS 296</td>
<td>Practicum: Towne’s Harvest</td>
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<td>SFBS 298</td>
<td>Internship</td>
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<tbody>
<tr>
<td>NASX 232D</td>
<td>MT Indians: Cultures, Histories, Current Issues</td>
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<td>PSCI 230D</td>
<td>Introduction to International Relations</td>
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<td>STAT 216Q</td>
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<td>AGBE 210IS</td>
<td>Economics of Ag Business</td>
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<tr>
<td>ECNS 204IS</td>
<td>Microeconomics</td>
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<tr>
<td>ANSC 222</td>
<td>Livestock in Sustain Systems</td>
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University Core and Electives | 6
Year Total: 30

### Junior Year

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<td>HORT 337</td>
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<td>SFBS 327</td>
<td>Measure Innovation in Food Sys</td>
<td>3</td>
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<tr>
<td>BIOE 370</td>
<td>General Ecology (equiv to 270)</td>
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</tr>
<tr>
<td>FCS 239</td>
<td>Contemporary Consumer Issues</td>
<td>3</td>
</tr>
<tr>
<td>NUTR 351</td>
<td>Nutrition and Society</td>
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<tr>
<td>AGSC 428</td>
<td>Sustainable Cropping Systems</td>
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<td>Select three of the following:</td>
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<tr>
<td>AGBE 315</td>
<td>Ag in a Global Context</td>
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<td>BIOB 377</td>
<td>Practical Genetics</td>
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<td>HORT 345</td>
<td>Market Gardening</td>
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<td>NRSM 421</td>
<td>Holistic Thought/Mgmt</td>
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<td>NUTR 322</td>
<td>Food Service System Management</td>
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<td>NUTR 395</td>
<td>Pract: Quant Foods Prod &amp; Mgmt</td>
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<td>SFBS 346</td>
<td>Sustainable Food and Bioenergy Systems</td>
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<tr>
<td>SFBS 466</td>
<td>Food System Resilience, Vulnerability and Transformation</td>
<td>3</td>
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<tr>
<td>SFBS 498</td>
<td>Internship</td>
<td>2-12</td>
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<td>SFBS 499</td>
<td>Senior Thesis/Capstone</td>
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<td>SFBS 445R</td>
<td>Culinary Marketing: Farm/Table</td>
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<td>SFBS 451R</td>
<td>Sustainable Food Systems</td>
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Year Total: 30

### Senior Year

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<tr>
<td>AGSC 356</td>
<td>Plant Nutrition and Soil Fertility Management</td>
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<td>SFBS 466</td>
<td>Food System Resilience, Vulnerability and Transformation</td>
<td>3</td>
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<tr>
<td>SFBS 498</td>
<td>Internship</td>
<td>2-12</td>
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<tr>
<td>SFBS 499</td>
<td>Senior Thesis/Capstone</td>
<td>3</td>
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<tr>
<td>Select one of the following:</td>
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<tr>
<td>SFBS 445R</td>
<td>Culinary Marketing: Farm/Table</td>
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<tr>
<td>SFBS 451R</td>
<td>Sustainable Food Systems</td>
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<tr>
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<tr>
<td>SFBS 429</td>
<td>Small Business and Entrepreneurship in Food and Health</td>
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<tr>
<td>BMGT 469</td>
<td>Community Entrepreneurship &amp; Nonprofit Management</td>
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<td>Select four of the following:</td>
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<tr>
<td>AGSC 342</td>
<td>Forages</td>
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<td>AGSC 401</td>
<td>Integrated Pest Management</td>
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</tr>
<tr>
<td>AGSC 441</td>
<td>Plant Breeding &amp; Genetics</td>
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<tr>
<td>AGSC 450</td>
<td>Plant Disease Control</td>
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<tr>
<td>BIOM 421</td>
<td>Concepts of Plant Pathology</td>
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</tr>
<tr>
<td>ENSC 443</td>
<td>Weed Ecology and Management</td>
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<tr>
<td>HORT 245</td>
<td>Plant Propagation</td>
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<tr>
<td>NASX 415</td>
<td>Native Food Systems</td>
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University Core and Electives | 6
Year Total: 30
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<tr>
<td>PSCI 406</td>
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<tr>
<td>PSCI 436</td>
<td>Politics of Food &amp; Hunger</td>
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<tr>
<td>HORT 492</td>
<td>Independent Study</td>
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<td>Year Total:</td>
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<td>Total Program Credits:</td>
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### Sustainable Food Systems Option

#### Health and Human Development

**Freshman Year**

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<tbody>
<tr>
<td>BIOB 110CS</td>
<td>Introduction to Plant Biology</td>
<td>3</td>
</tr>
<tr>
<td>CHMY 121IN</td>
<td>Introduction to General Chemistry or CHMY 141 - College Chemistry I</td>
<td>4</td>
</tr>
<tr>
<td>ECNS 101IS</td>
<td>Economic Way of Thinking</td>
<td>3</td>
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<tr>
<td>M 121Q</td>
<td>College Algebra</td>
<td>3</td>
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<tr>
<td>SFBS 146</td>
<td>Introduction to Sustainable Food and Bioenergy Systems</td>
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Choose one of the following:

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<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>SFBS 296</td>
<td>Practicum: Towne’s Harvest or SFBS 298 - Internship</td>
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<tr>
<td>SOCI 101IS</td>
<td>Introduction to Sociology</td>
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</tr>
<tr>
<td>WRIT 101W</td>
<td>College Writing I</td>
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University Core and Directed Electives

Year Total: 30

**Sophomore Year**

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<tr>
<td>ANSC 222</td>
<td>Livestock in Sustain Systems</td>
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<td>FCS 239</td>
<td>Contemporary Consumer Issues</td>
<td>3</td>
</tr>
<tr>
<td>NUTR 221CS</td>
<td>Basic Human Nutrition</td>
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<tr>
<td>NUTR 226</td>
<td>Food Fundamentals</td>
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<td>Food Fundamentals Lab</td>
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<tbody>
<tr>
<td>ACTG 201</td>
<td>Principles of Financial Acct</td>
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<tr>
<td>BGEN 210</td>
<td>Accounting &amp; Finance Basics</td>
<td>3</td>
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<tr>
<td>FCS 337</td>
<td>Personal and Family Finance I</td>
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Choose one of the following:

<table>
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<tr>
<th>Course Code</th>
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<tbody>
<tr>
<td>BIOB 318</td>
<td>Biometry</td>
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<td>STAT 216Q</td>
<td>Introduction to Statistics</td>
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Choose one of the following:

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<th>Course Title</th>
<th>Credits</th>
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<tr>
<td>BIOM 103IN</td>
<td>Unseen Universe: Microbes or BIOM 250 - Microbiology for Health Sciences: Infectious Diseases</td>
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University Core and Directed Electives 7

Year Total: 30

**Junior Year**

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<td>AGSC 341</td>
<td>Field Crop Prod</td>
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<td>ECHM 205CS</td>
<td>Energy and Sustainability</td>
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<td>ENSC 245IN</td>
<td>Soils</td>
<td>3</td>
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<td>NUTR 321</td>
<td>Nutrition in the Life Cycle</td>
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<td>NUTR 322</td>
<td>Food Service System Management</td>
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<td>SFBS 327</td>
<td>Measure Innovation in Food Sys</td>
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Choose one of the following:

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<tr>
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<tbody>
<tr>
<td>NUTR 395</td>
<td>Pract: Quant Foods Prod &amp; Mgmt</td>
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University Core and Directed Electives 9

Year Total: 30

**Senior Year**

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<tbody>
<tr>
<td>NUTR 351</td>
<td>Nutrition and Society</td>
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<td>SFBS 451R</td>
<td>Sustainable Food Systems</td>
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<td>SFBS 466</td>
<td>Food System Resilience, Vulnerability and Transformation</td>
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<td>SFBS 498</td>
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<td>SFBS 499</td>
<td>Senior Thesis/Capstone</td>
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<tr>
<td>SFBS 429</td>
<td>Small Business and Entrepreneurship in Food and Health or BMGT 469 - Community Entrepreneurship &amp; Nonprofit Management</td>
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University Core and Directed Electives 12

Year Total: 30

Total Program Credits: 120

### Sustainable Livestock Production Option

#### Animal and Range Sciences

**Freshman Year**

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<tr>
<td>ANSC 100</td>
<td>Introduction to Animal Science</td>
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<tr>
<td>NRSM 101</td>
<td>Natural Resource Conservation</td>
<td>3</td>
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<td>NRSM 102</td>
<td>Montana Range Plants</td>
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<td>Introduction to Sustainable Food and Bioenergy Systems</td>
<td>3</td>
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<td>BIOB 160</td>
<td>Principles of Living Systems</td>
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<td>CHMY 121IN</td>
<td>Introduction to General Chemistry</td>
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</tr>
<tr>
<td>ENSC 110</td>
<td>Lnd Res Environ Sciences</td>
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<td>BIOB 110CS</td>
<td>Introduction to Plant Biology</td>
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Year Total: 30

Total Program Credits: 120
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<td>WRIT 101W - College Writing I</td>
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<td>COMX 111US - Introduction to Public Speaking (formerly COM 110US)</td>
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<td></td>
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<td>or AGED 140US - Leadership Dev For Agriculture</td>
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<tr>
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<td><strong>Junior Year</strong></td>
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<tr>
<td></td>
<td></td>
<td>ANSC 222 - Livestock in Sustain Systems</td>
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<td>CHMY 123 - Introduction of Organic Chemistry and Biochemistry</td>
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<td></td>
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<td>NUTR 221CS - Basic Human Nutrition</td>
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<td>ENSC 245IN - Soils</td>
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<td>ANSC 265 - Anatomy and Physiology of Domestic Animals - Lecture</td>
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<td>ANSC 266 - Anatomy and Physiology of Domestic Animals - Lab</td>
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<td></td>
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<td>ANSC 205 - Intro to Meat Evaluation</td>
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<td>ANSC 232 - Livestock Management - Sheep I</td>
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<td>ANSC 234 - Livestock Management - Beef I</td>
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<td></td>
<td>NRSM 235 - Range and Pasture Monitoring</td>
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<td></td>
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<td>BMGT 205 - Prof Business Communication</td>
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<td></td>
<td></td>
<td>or WRIT 221 - Intermediate Tech Writing</td>
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<td>ECNS 101IS - Economic Way of Thinking</td>
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<td>STAT 216Q - Introduction to Statistics</td>
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<td>ANSC 498 - Internship</td>
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<td>ANSC 432R - Sheep Management</td>
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<td>NUTR 351 - Nutrition and Society</td>
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<td>SFBS 445R - Culinary Marketing: Farm/Table</td>
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<td>or SFBS 451R - Sustainable Food Systems</td>
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<td>SFBS 499 - Senior Thesis/Capstone</td>
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<td>AGSC 401 - Integrated Pest Management</td>
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<td>ANSC 410 - Veterinary Entomology and Parasitology</td>
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<td>BIOE 375 - Holistic Thought/Mgmt</td>
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<td>ENSC 353 - Environmental Biogeochemistry</td>
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<td>ENSC 443 - Weed Ecology and Management</td>
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<td>Choose one of the following:</td>
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<td>PSCI 436 - Politics of Food &amp; Hunger</td>
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<td>PSCI 406 - The Political Economy of Energy</td>
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<td>SFBS 429 - Small Business and Entrepreneurship in Food and Health</td>
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<td>Total Program Credits: 120-121</td>
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**College of Arts and Architecture**

*William Shields, Dean*

**Undergraduate Programs Available:**

- B.A. and B.F.A. in Art (p. 105)
- B.A. in Environmental Design (p. 115)
- B.A. in Film and Photography (p. 117)
- B.A. in Music (p. 120)
- B.A. in Music Technology (p. 121)
- Bachelor of Music Education (p. 123)

The College of Arts and Architecture includes the School of Architecture, the School of Art, the School of Film and Photography, and the School of Music. Shakespeare in the Parks, a theater outreach performance company is also affiliated with the College. The College houses the offices and production studios of Montana Public Broadcasting System and MSU’s public television station, KUSM. The curriculum provides for baccalaureate degree programs with majors in Architecture (Environmental Design), Art (Ceramics, Jewelry and Metalsmithing, Painting and Drawing, Printmaking, and Sculpture), Graphic Design, Art History, Art Education K-12 Broadfield Option, Film, Photography, Music, Music Technology and Music Education.

A Master of Architecture, Master of Arts in Art History, Master of Fine Arts in Art and Master of Fine Arts in Science and Natural History Filmmaking degrees are offered at the graduate level.
All College of Arts and Architecture students take a broad spectrum of humanities and science core courses to provide depth and substance to their artistic explorations.

Art

The School of Art is committed to making available the best possible faculty, curriculum, facilities, and experiences for a professional education in the studio arts, graphic design, art education and art history. On both the undergraduate and graduate levels, the School seeks to prepare students for careers in the visual arts and to enrich the cultural lives of all University students. Additionally, the School recognizes its responsibility to serve as a cultural resource for the community, state, and nation.

The School of Art, fully accredited by the National Association of Schools of Arts and Design, was established in 1893 and its first graduate degree was conferred in 1932. As an academic department of the University, the School of Art is a subdivision of the College of Arts and Architecture and is allied with the School of Architecture, School of Film and Photography and the School of Music.

The School’s faculty is composed of practicing artists, designers, and scholars, each teaching in the particular discipline of his or her professional involvement. The regular faculty is augmented by graduate teaching assistants and by visiting artists/scholars who are part of an active program of lectures, workshops, and critiques supported by the National Endowment for the Arts, the Montana Arts Council, the Associated Students of Montana State University, and the MONTS Speakers Program. The Helen E. Copeland Gallery located in Haynes Hall, and the Waller-Yoblonksy Gallery located in the Melvin Graduate Art Studios, display continuous exhibitions covering all aspects of the visual arts.

The curriculum is divided into eight areas of study: art history, ceramics, graphic design, jewelry and metalsmithing, painting, drawing, printmaking, and sculpture. Curricula within these areas lead to the Bachelor of Fine Arts (BFA) in Graphic Design and Studio Arts, and the Bachelor of Arts (BA) in Art History, Art Education K-12 Broadfield, and Liberal Arts Studio. Minors are also available in Art History (non-teaching) and Art Education K-12 (available for teaching majors only). The graduate degrees offered are the Master of Fine Arts in Studio Art (MFA) and the Master of Arts in Art History (MA). For information on the Master of Fine Arts and Master of Arts degrees, consult the graduate section of this bulletin.

Admission to Art Programs

During the Fall of the first year in the School of Art, students receive formative assessment of their work through the Foundations Portfolio Critique helping prepare them for the remaining three and half year curriculum leading to the Bachelor of Arts in Studio Arts, the Bachelor of Arts in Art Education, the Bachelor of Fine Arts in Studio Arts and the Bachelor of Fine Arts in Graphic Design. All applications for admission are subject to the approval of the School of Art Admissions Committee. Total enrollment in the program shall be limited by the teaching resources and space capacities of the School of Art. Spaces available each year will be awarded to those applicants with the greatest creative promise and highest scholastic achievement. The School of Art does not accept Advanced Placement Studio Art credits to fulfill the foundations level courses but does allow substitution for some 200 level studio courses.

Students transferring from other academic departments within the university may be required to take ARTZ 105RA, ARTZ 109RA & ARTZ 110RA regardless of prior coursework. Portfolio critique for transfer students will take place as needed depending on transfer credits and the program of study. Contact the School of Art for details and deadlines.

BFA Admission to Studio Arts and Graphic Design

In the Studio Arts Option-BFA and Graphic Design Option-BFA a formative assessment is required for all students before admittance to 300 level courses. Prospective students who are transferring from similar programs at other institutions must also submit portfolios. Contact the School of Art for details and deadlines.

The curriculum for art majors is composed of both required and elective courses within the School, and supporting courses from the other schools and departments of the College of Arts and Architecture and the University. Students may be limited to two studio courses per semester based on space availability and teaching resources. Required courses outside of the School of Art have either specific application to the student’s particular concentration or general application to a liberal arts education. The purpose of the curriculum is to develop perceptual and technical skills and to establish a foundation of ideas which gives meaning and direction to this training. The many and varied departments within the University offer the art student a rich source of technical, philosophical, and scientific information.

Semester In Italy Program

Each spring the School of Art offers a semester of study in Italy. This program provides upper-level students with an enriching opportunity to participate in an intensive studio and art history experience by immersing participants in the art and culture of Italy. Course offerings vary from year to year. Please contact the School of Art for more information.

Internship Program

It is possible for students to earn academic credit while working outside of the University, employed by businesses, individual artists, craftpersons, designers, or other agencies through the School of Art’s Art and Design Internship Program. To be eligible, students must be art majors and be of junior standing. Further, they must have the recommendation of their academic advisor and approval by the Director of the School of Art. Accepted students enroll for internship credits under ARTZ 498 and GDSN 498.

Computer Notebook Requirement

Laptop Computers with specific software are required for all upper level graphic design courses. Contact the School of Art for specifications.

GPA Requirement

Art majors must maintain a cumulative GPA of 2.5 or higher to remain in the curriculum.

Program Fee

Because of the unique nature of equipment and materials used in the School of Art, all majors are assessed an additional fee. Students in some courses will also be required to purchase additional materials on their own. Please inquire at the School of Art office for specific fees.

Undergraduate Programs

- Graphic Design Option - B.F.A (p. 109)
- Studio Arts Option - B.F.A (p. 112)
- Art Education K-12 Broadfield Option - B.A. (p. 106)
- Art History Option - B.A. (p. 107)
- Liberal Arts Studio Option - B.A (p. 111)

Undergraduate Minors

- Art History Minor (Non-teaching) (p. 107)
- Art Education K-12 Minor (p. 107)
### Graduate Programs

- M.F.A. in Art (p. 299)
- M.A. in Art History (p. 298)

### Art Education K-12 Broadfield Option - B.A.

#### Freshman Year

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
<th>Fall</th>
<th>Spring</th>
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<tr>
<td>ARTZ 109 - Visual Language: Comprehensive Foundations</td>
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<tr>
<td>ARTH 200IA - Art of World Civilization I</td>
<td>4</td>
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<tr>
<td>University Core and Electives</td>
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<tr>
<td>ARTZ 105RA - Visual Language - Drawing</td>
<td>3</td>
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<tr>
<td>ARTZ 110 - Visual Language: Ideation and Creativity</td>
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<tr>
<td>ARTH 201IA - Art of World Civilization II</td>
<td>4</td>
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<td>EDU 202 - Early Field Experience</td>
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<td>EDU 223IS - Educ Psych and Adolescent Dev</td>
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Year Total: 15 15

#### Sophomore Year

<table>
<thead>
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<th>Course</th>
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<tbody>
<tr>
<td>Art Studio-Beginning Choose two of the following:</td>
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<tr>
<td>ARTZ 221 - Painting I</td>
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<td></td>
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<tr>
<td>ARTZ 231RA - Ceramics I</td>
<td></td>
<td></td>
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<tr>
<td>ARTZ 251 - Sculpture I</td>
<td></td>
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<tr>
<td>ARTZ 261 - Metals I</td>
<td></td>
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<tr>
<td>ARTZ 271 - Printmaking I</td>
<td></td>
<td></td>
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<tr>
<td>EDU 211D - Multicultural Education</td>
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<td>University Core and Electives</td>
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<tr>
<td>ARTZ 211RA - Drawing I</td>
<td>4</td>
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Art Studio-Beginning Choose one of the following: 4
- ARTZ 221 - Painting I
- ARTZ 231RA - Ceramics I
- ARTZ 251 - Sculpture I
- ARTZ 261 - Metals I
- ARTZ 271 - Printmaking I

#### Junior Year

<table>
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<tr>
<th>Course</th>
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<th>Spring</th>
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<tbody>
<tr>
<td>ARTZ 312 - Intermediate Drawing</td>
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Art Studio-Beginning Choose one of the following: 4
- ARTZ 221 - Painting I
- ARTZ 231RA - Ceramics I
- ARTZ 251 - Sculpture I
- ARTZ 261 - Metals I
- ARTZ 271 - Printmaking I

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
<th>Fall</th>
<th>Spring</th>
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<tbody>
<tr>
<td>EDU 382 - Assessmt, Curric, Instructn</td>
<td>3</td>
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<td>EDSP 306 - Exceptional Learners</td>
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Year Total: 14 15

#### Senior Year

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<td>Art Studio-Advanced Choose two of the following:</td>
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<td>ARTZ 312 - Intermediate Drawing</td>
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<tr>
<td>ARTZ 322 - Intermediate Painting</td>
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<tr>
<td>ARTZ 332 - Intermediate Ceramics</td>
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<td>ARTZ 352 - Intermediate Sculpture</td>
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<td>ARTZ 361 - Metals II</td>
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<td>ARTZ 373 - Intermediate Printmaking - Lithography</td>
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<td>ARTZ 374 - Intermediate Printmaking - Serigraphy</td>
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<td>ARTZ 375 - Intermediate Printmaking - Intaglio</td>
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<td>ARTZ 376 - Intermediate Printmaking - Relief</td>
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<tr>
<td>ARTZ 379 - Alternative Print Media</td>
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Art History-Elective Choose one of the following: 3
- ARTH 302 - Survey of Ancient Art
- ARTH 310 - Ancient Art Mesoamerica
- ARTH 312 - History of Decorative Arts
- ARTH 323 - History of Printmaking
- ARTH 375 - Roman, Etruscan, Greek
- ARTH 400 - Art and Architecture of Egypt
- ARTH 402 - Greek Art and Architecture
- ARTH 406 - Roman Art and Architecture
- ARTH 421 - Late Gothic Painting
- ARTH 422 - Early Renaissance to 15th Century Art
- ARTH 424 - High Renaissance and Mannerism
- ARTH 426 - Baroque Art in Italy and Southern Europe, 1600-1700
- ARTH 427 - Baroque Art in Northern Europe
- ARTH 430 - 19th Century Art
- ARTH 432 - Art in the Age of Revolution
- ARTH 435 - Art in the United States
- ARTH 440 - 20th Century Art
- ARTH 451 - Contemporary Art
- ARTH 460 - Contemporary Art & Ecology
- ARTH 461 - Art and Social Activism
- EDU 497 - Methods | 3 |
- EDU 395 - Practicum | 3 |
| University Core and Electives   | 2       |      |        |

Year Total: 18 15
### Art History Minor (Non-Teaching)

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<tr>
<td>ARTH 492</td>
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(One credit must be on a topic from group I)

Choose six of the following, at least one from each group: 18

**Group I - Ancient Medieval**

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<td>ARTH 375</td>
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<td>ARTH 400</td>
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<td>ARTH 402</td>
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<td>ARTH 406</td>
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<td>ARTH 410</td>
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**Group II - Renaissance & Baroque**

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<td>ARTH 421</td>
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<tr>
<td>ARTH 422</td>
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<td>ARTH 424</td>
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<td>ARTH 426</td>
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<td>ARTH 427</td>
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**Group III - Modern & Contemporary**

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<td>ARTH 430</td>
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<td>ARTH 432</td>
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<td>ARTH 435</td>
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<td>ARTH 438</td>
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<td>ARTH 440</td>
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<td>ARTH 461</td>
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**Group IV - Non-Western, Diversity, Theory**

<table>
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<td>ARTH 310</td>
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<td>ARTH 360</td>
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### Art History Option - B.A.

#### Freshman Year

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<td>ARTZ 109RA</td>
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<td>ARTZ 200IA</td>
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<td>University Core and Electives</td>
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<td>ARTZ 201IA</td>
<td>4</td>
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<tr>
<td>ARTZ 110RA</td>
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<tr>
<td>Humanities Elective Requirement</td>
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Take one course from the English, History or Philosophy Department.

University Core and Electives  
Year Total:  

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<th>Sophomore Year</th>
<th>Credits</th>
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<td>Fall</td>
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**Art History (Group I)**

Choose one of the following:

<table>
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<th>Course Code</th>
<th>Course Title</th>
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<tbody>
<tr>
<td>ARTH 302</td>
<td>Survey of Ancient Art</td>
</tr>
<tr>
<td>ARTH 375</td>
<td>Roman, Etruscan, Greek</td>
</tr>
<tr>
<td>ARTH 400</td>
<td>Art and Architecture of Egypt</td>
</tr>
<tr>
<td>ARTH 402</td>
<td>Greek Art and Architecture</td>
</tr>
<tr>
<td>ARTH 406</td>
<td>Roman Art and Architecture</td>
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<tr>
<td>ARTH 410</td>
<td>Medieval Art</td>
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**Art History (Group III)**

Choose one of the following:

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<th>Course Title</th>
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<tbody>
<tr>
<td>ARTH 430</td>
<td>19th Century Art</td>
</tr>
<tr>
<td>ARTH 435</td>
<td>Art in the United States</td>
</tr>
<tr>
<td>ARTH 438</td>
<td>Beginnings of Modern Art</td>
</tr>
<tr>
<td>ARTH 440</td>
<td>20th Century Art</td>
</tr>
<tr>
<td>ARTH 451</td>
<td>Contemporary Art</td>
</tr>
<tr>
<td>ARTH 461</td>
<td>Art and Social Activism</td>
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**Foreign Language**

3

PHOT 113RA - Understanding Photography  
3

University Core and Electives  
3

**Art History (Group II)**

Choose one of the following:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
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<tbody>
<tr>
<td>ARTH 421</td>
<td>Late Gothic Painting</td>
</tr>
<tr>
<td>ARTH 422</td>
<td>Early Renaissance to 15th Century Art</td>
</tr>
<tr>
<td>ARTH 424</td>
<td>High Renaissance and Mannerism</td>
</tr>
<tr>
<td>ARTH 426</td>
<td>Baroque Art in Italy and Southern Europe, 1600-1700</td>
</tr>
<tr>
<td>ARTH 427</td>
<td>Baroque Art in Northern Europe</td>
</tr>
<tr>
<td>ARTH 430</td>
<td>19th Century Art</td>
</tr>
<tr>
<td>ARTH 432</td>
<td>Art in the Age of Revolution</td>
</tr>
<tr>
<td>ARTH 435</td>
<td>Art in the United States</td>
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<td>ARTH 438</td>
<td>Beginnings of Modern Art</td>
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<td>ARTH 440</td>
<td>20th Century Art</td>
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<td>ARTH 451</td>
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<tr>
<td>ARTH 460</td>
<td>Contemporary Art &amp; Ecology</td>
</tr>
<tr>
<td>ARTH 461</td>
<td>Art and Social Activism</td>
</tr>
<tr>
<td>ARTH 491</td>
<td>Special Topics</td>
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**Foreign Language**

3

University Core and Electives  
5

**Junior Year**

<table>
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<tr>
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<tbody>
<tr>
<td>ARTH 492</td>
<td>Independent Study</td>
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Choose one of the following:

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<tr>
<th>Course Code</th>
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<tbody>
<tr>
<td>ARTH 421</td>
<td>Late Gothic Painting</td>
</tr>
<tr>
<td>ARTH 422</td>
<td>Early Renaissance to 15th Century Art</td>
</tr>
<tr>
<td>ARTH 424</td>
<td>High Renaissance and Mannerism</td>
</tr>
<tr>
<td>ARTH 426</td>
<td>Baroque Art in Italy and Southern Europe, 1600-1700</td>
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**Art History Electives (art rubric)**

Choose one of the following:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
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<tbody>
<tr>
<td>ARTH 302</td>
<td>Survey of Ancient Art</td>
</tr>
<tr>
<td>ARTH 310</td>
<td>Ancient Art Mesoamerica</td>
</tr>
<tr>
<td>ARTH 312</td>
<td>History of Decorative Arts</td>
</tr>
<tr>
<td>ARTH 323</td>
<td>History of Printmaking</td>
</tr>
<tr>
<td>ARTH 360</td>
<td>History of Asian Art and Architecture</td>
</tr>
<tr>
<td>ARTH 375</td>
<td>Roman, Etruscan, Greek</td>
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<td>Art and Architecture of Egypt</td>
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</tr>
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</table>
**Montana State University**

**ARTH 427 - Baroque Art in Northern Europe**
**ARTH 430 - 19th Century Art**
**ARTH 432 - Art in the Age of Revolution**
**ARTH 435 - Art in the United States**
**ARTH 438 - Beginnings of Modern Art**
**ARTH 440 - 20th Century Art**
**ARTH 451 - Contemporary Art**
**ARTH 460 - Contemporary Art & Ecology**
**ARTH 461 - Art and Social Activism**
**ARTH 495 - Field Study**

**Foreign Language** 3
**University Core and Electives** 5

**Year Total:** 15 15

**Senior Year**

Art History Electives (ART rubric or other)

Choose two of the following: 6

- ARTH 302 - Survey of Ancient Art
- ARTH 310 - Ancient Art Mesoamerica
- ARTH 312 - History of Decorative Arts
- ARTH 323 - History of Printmaking
- ARTH 360 - History of Asian Art and Architecture
- ARTH 375 - Roman, Etruscan, Greek
- ARTH 400 - Art and Architecture of Egypt
- ARTH 402 - Greek Art and Architecture
- ARTH 406 - Roman Art and Architecture
- ARTH 410 - Medieval Art
- ARTH 421 - Late Gothic Painting
- ARTH 422 - Early Renaissance to 15th Century Art
- ARTH 424 - High Renaissance and Mannerism
- ARTH 426 - Baroque Art in Italy and Southern Europe, 1600-1700
- ARTH 427 - Baroque Art in Northern Europe
- ARTH 430 - 19th Century Art
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- ARTH 435 - Art in the United States
- ARTH 438 - Beginnings of Modern Art
- ARTH 440 - 20th Century Art
- ARTH 451 - Contemporary Art
- ARTH 460 - Contemporary Art & Ecology
- ARTH 461 - Art and Social Activism
- ARTH 491 - Special Topics

Humanities Elective Requirement 3

Take one course from the English, History or Philosophy Department.

University Core and Electives 3

**Year Total:** 15 15

**Total Program Credits:** 120

A minimum of 120 credits is required for graduation; 42 of these credits must be in courses numbered 300 and above.

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**Graphic Design Option - B.F.A.**

**Freshman Year**

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<thead>
<tr>
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<th>Course Name</th>
<th>Credits</th>
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<tbody>
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<td>ARTZ 105RA</td>
<td>Visual Language - Drawing</td>
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<tr>
<td>ARTZ 109RA</td>
<td>Visual Language: Comprehensive Foundation</td>
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<td>ARTH 200IA</td>
<td>Art of World Civilization I</td>
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<td>ARTZ 110RA</td>
<td>Visual Language: Ideation and Creativity</td>
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<td>MART 145RA</td>
<td>Web Design</td>
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<td>ARTH 201IA</td>
<td>Art of World Civilization II</td>
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<td>PHOT 113RA</td>
<td>Understanding Photography</td>
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**Year Total:** 15 15

**Sophomore Year**

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<tr>
<td>GDSN 223</td>
<td>Design Principles</td>
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Art Studio Beginning (must include one 2D and one 3D)

Choose one of the following: 4

- ARTZ 211RA - Drawing I
- ARTZ 221 - Painting I
- ARTZ 231RA - Ceramics I
ARTZ 251 - Sculpture I  
ARTZ 261 - Metals I  
ARTZ 271 - Printmaking I  

Art History Elective  
Choose one of the following:  
3  
ARTH 302 - Survey of Ancient Art  
ARTH 310 - Ancient Art Mesoamerica  
ARTH 312 - History of Decorative Arts  
ARTH 323 - History of Printmaking  
ARTH 360 - History of Asian Art and Architecture  
ARTH 375 - Roman, Etruscan, Greek  
ARTH 400 - Art and Architecture of Egypt  
ARTH 402 - Greek Art and Architecture  
ARTH 406 - Roman Art and Architecture  
ARTH 410 - Medieval Art  
ARTH 421 - Late Gothic Painting  
ARTH 424 - Early Renaissance to 15th Century Art  
ARTH 427 - High Renaissance and Mannerism  
ARTH 426 - Baroque Art in Italy and Southern Europe, 1600-1700  
ARTH 427 - Baroque Art in Northern Europe  
ARTH 430 - 19th Century Art  
ARTH 432 - Art in the Age of Revolution  
ARTH 438 - Beginnings of Modern Art  
ARTH 440 - 20th Century Art  
ARTH 435 - Art in the United States  
ARTH 441 - Art Now  
ARTH 451 - Contemporary Art  
ARTH 460 - Contemporary Art & Ecology  
ARTH 461 - Art and Social Activism  
ARTH 491 - Special Topics  

University Core and Electives  

Art History Elective  
Choose one from the list above.  
3  
ARTH 302 - Survey of Ancient Art  
ARTH 310 - Ancient Art Mesoamerica  
ARTH 312 - History of Decorative Arts  
ARTH 323 - History of Printmaking  
ARTH 360 - History of Asian Art and Architecture  
ARTH 375 - Roman, Etruscan, Greek  
ARTH 400 - Art and Architecture of Egypt  
ARTH 402 - Greek Art and Architecture  
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ARTH 410 - Medieval Art  
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ARTH 427 - Baroque Art in Northern Europe  
ARTH 430 - 19th Century Art  
ARTH 432 - Art in the Age of Revolution  
ARTH 438 - Beginnings of Modern Art  
ARTH 440 - 20th Century Art  
ARTH 435 - Art in the United States  
ARTH 441 - Art Now  
ARTH 451 - Contemporary Art  
ARTH 460 - Contemporary Art & Ecology  
ARTH 461 - Art and Social Activism  
ARTH 491 - Special Topics  

Advanced Graphic Design studio electives  
Choose one of the following:  
4  
ARTZ 211RA - Drawing I  
ARTZ 221 - Painting I  
ARTZ 231RA - Ceramics I  
ARTZ 251 - Sculpture I  
ARTZ 261 - Metals I  
ARTZ 271 - Printmaking I  

University Core and Electives  

Portfolio Review is required for all students before admittance to 300 level design courses.  

Year Total:  
15  
15  

Junior Year  

Advanced Graphic Design studio electives  
Choose one of the following:  
5  
GDSN 367 - Identity Systems  
GDSN 368 - Art Direction  
GDSN 369 - Publication Design  
GDSN 371 - Motion Graphics  
GDSN 372 - Interaction Design  
GDSN 373 - Illustration  
GDSN 374 - Digital Visualization  
GDSN 375 - Letterpress  
GDSN 376 - Screenprinting  
GDSN 377 - Design and Society  

University Core and Electives  

Choose two of the following:  
10  
GDSN 367 - Identity Systems  
GDSN 368 - Art Direction  
GDSN 369 - Publication Design  
GDSN 371 - Motion Graphics  
GDSN 372 - Interaction Design  
GDSN 373 - Illustration  
GDSN 374 - Digital Visualization  
GDSN 375 - Letterpress  
GDSN 376 - Screenprinting  
GDSN 377 - Design and Society  

Year Total:  
15  
15  

Senior Year  

Advanced Studio  

Choose one of the following:  
5  
GDSN 366 - History of Graphic Design  
GDSN 465 - Professional Studio  
GDSN 378 - Guerrilla Advertising  
GDSN 492 - Independent Study  
GDSN 498 - Internship  

University Core and Electives  

Choose one from the list above.  
5
Take one of the following:  
ARTZ 312 - Intermediate Drawing  
ARTZ 322 - Intermediate Painting  
ARTZ 332 - Intermediate Ceramics  
ARTZ 352 - Intermediate Sculpture  
ARTZ 361 - Metals II  
ARTZ 373 - Intermediate Printmaking - Lithography  
ARTZ 374 - Intermediate Printmaking - Serigraphy  
ARTZ 375 - Intermediate Printmaking - Intaglio  
ARTZ 376 - Intermediate Printmaking - Relief  
ARTZ 379 - Alternative Print Media  
ARTZ 411 - Guided Research - Drawing  
ARTZ 421 - Guided Research - Painting  
ARTZ 431 - Guided Research - Ceramics  
ARTZ 453 - Guided Research - Sculpture  
ARTZ 461 - Guided Research - Metalsmithing  
ARTZ 472 - Guided Research - Printmaking  
ARTZ 491 - Special Topics  
GDSN 378 - Guerrilla Advertising  
GDSN 499 - Senior Portfolio  

University Core and Electives  5  
Advanced Studio  2  
Choose one from the list above.  5  
GDSN 499 - Senior Portfolio  5  
University Core and Electives  5  
Year Total:  15  15  
Total Program Credits:  120

All Graphic Design courses must be taken in sequence. A minimum of 120 credits is required for graduation; 42 of these credits must be in courses numbered 300 and above.

**Liberal Arts Studio Option - B.A.**

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<thead>
<tr>
<th>Year</th>
<th>Credits</th>
<th>Fall</th>
<th>Spring</th>
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<tbody>
<tr>
<td><strong>Freshman Year</strong></td>
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<tr>
<td>ARTZ 105RA - Visual Language - Drawing</td>
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<td>ARTZ 109RA - Visual Language: Comprehensive Foundation</td>
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<tr>
<td>ARTH 200IA - Art of World Civilization I</td>
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<td>University Core and Electives</td>
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<tr>
<td>ARTZ 110RA - Visual Language: Ideation and Creativity</td>
<td>4</td>
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<tr>
<td>ARTH 201IA - Art of World Civilization II</td>
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**Sophomore Year**

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<tr>
<th>Credits</th>
<th>Fall</th>
<th>Spring</th>
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<tbody>
<tr>
<td>ARTZ 231RA - Ceramics I</td>
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<td>ARTZ 251 - Sculpture I</td>
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<td>ARTZ 261 - Metals I</td>
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<tr>
<td>GDSN 223 - Design Principles</td>
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<th>Credits</th>
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<th>Spring</th>
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<tbody>
<tr>
<td>ARTZ 251 - Sculpture I</td>
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Choose one of the following:  4  
ARTZ 221 - Painting I  
ARTZ 231RA - Ceramics I  
ARTZ 251 - Sculpture I  
ARTZ 261 - Metals I  
GDSN 223 - Design Principles

Choose one of the following:  5  
ARTZ 251 - Sculpture I  
ARTZ 261 - Metals I  
GDSN 223 - Design Principles

Semester in Italy Option (Fall and Spring, 15 credits)

Choose one of the following:  4  
ARTZ 221 - Painting I  
ARTZ 231RA - Ceramics I  
ARTZ 251 - Sculpture I  
ARTZ 261 - Metals I  
GDSN 223 - Design Principles

Choose one of the following:  5  
ARTZ 251 - Sculpture I  
ARTZ 261 - Metals I  
GDSN 223 - Design Principles
### Studio Arts Option - B.F.A.

**Freshman Year**

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<td>Visual Language: Comprehensive</td>
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**Sophomore Year**

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<td>ARTZ 322</td>
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<td>ARTZ 332</td>
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<td>ARTZ 361</td>
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**Junior Year**

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**Senior Year**

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**Year Total:**

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<th>Fall</th>
<th>Spring</th>
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<tbody>
<tr>
<td>14</td>
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**Total Program Credits:**

| Total Program Credits | 120 |

A minimum of 120 credits is required for graduation; 42 of these credits must be in courses numbered 300 and above.
ARTZ 282 - Photographic Image and its construction

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<tr>
<td>ARTZ 211RA - Drawing I</td>
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<tr>
<td>ARTZ 221 - Painting I</td>
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<tr>
<td>ARTZ 231RA - Ceramics I</td>
<td></td>
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<tr>
<td>ARTZ 251 - Sculpture I</td>
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<tr>
<td>ARTZ 261 - Metals I</td>
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<tr>
<td>ARTZ 271 - Printmaking I</td>
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<tr>
<td>ARTZ 282 - Photographic Image and its construction</td>
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<tr>
<td>Art History Elective</td>
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<td>Must have at least one contemporary/modern course</td>
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<tr>
<td>ARTH 310 - Ancient Art Mesoamerica</td>
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<tr>
<td>ARTH 323 - History of Printmaking</td>
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<td>ARTH 360 - History of Asian Art and Architecture</td>
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<td>ARTZ 375 - Roman, Etruscan, Greek</td>
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<tr>
<td>ARTZ 400 - Art and Architecture of Egypt</td>
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<td>ARTZ 402 - Greek Art and Architecture</td>
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<td>ARTH 422 - Early Renaissance to 15th Century Art</td>
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<tr>
<td>ARTZ 424 - High Renaissance and Mannerism</td>
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<td>ARTH 426 - Baroque Art in Italy and Southern Europe, 1600-1700</td>
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<td>ARTZ 427 - Baroque Art in Northern Europe</td>
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<td>ARTH 430 - 19th Century Art</td>
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<tr>
<td>ARTH 432 - Art in the Age of Revolution</td>
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<tr>
<td>ARTH 435 - Art in the United States</td>
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<tr>
<td>ARTH 438 - Beginnings of Modern Art</td>
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<td>ARTZ 440 - 20th Century Art</td>
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<td>ARTH 451 - Contemporary Art</td>
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<tr>
<td>ARTH 460 - Contemporary Art &amp; Ecology</td>
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<td>ARTH 461 - Art and Social Activism</td>
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<td>ARTH 495 - Field Study</td>
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<td>PHOT 113RA - Understanding Photography</td>
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<tr>
<td>University Core and Electives</td>
<td>3</td>
</tr>
<tr>
<td>Portfolio Review is required before admittance to the BFA major medium. Students who fail portfolio review may continue in the BA option or may reapply to the BFA program the following year.</td>
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<td>ARTZ 332 - Intermediate Ceramics</td>
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<tr>
<td>ARTZ 352 - Intermediate Sculpture</td>
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<tr>
<td>ARTZ 361 - Metals II</td>
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<tr>
<td>ARTZ 373 - Intermediate Printmaking - Lithography</td>
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<tr>
<td>ARTZ 374 - Intermediate Printmaking - Serigraphy</td>
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<td>ARTZ 375 - Intermediate Printmaking - Intaglio</td>
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<td>ARTZ 376 - Intermediate Printmaking - Relief (Art History Elective)</td>
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<td>ARTZ 379 - Alternative Print Media</td>
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<td>Art History Elective</td>
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<td>ARTH 495</td>
<td>Field Study</td>
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**University Core and Electives:** 2

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<th>Semester in Italy Option</th>
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**Major Medium**

Choose one of the following: 5

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<tr>
<th>Course Code</th>
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<td>Metals II</td>
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<td>ARTZ 373</td>
<td>Intermediate Printmaking - Lithography</td>
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<tr>
<td>ARTZ 375</td>
<td>Intermediate Printmaking - Intaglio</td>
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<tr>
<td>ARTZ 376</td>
<td>Intermediate Printmaking - Relief</td>
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<tr>
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**Advanced Studio Elective**

Choose one of the following: 5

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<td>Intermediate Printmaking - Relief</td>
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<td>ARTZ 379</td>
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**ARTZ 494 - Undergraduate Seminar** 3

**Art History Elective**

Must have at least one contemporary/modern course

Choose one of the following: 3

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<td>History of Decorative Arts</td>
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**Senior Year**

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<td>Senior Thesis: Studio</td>
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**University Core and Electives:** 3

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**Major Medium**

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<td>ARTZ 379</td>
<td>Alternative Print Media</td>
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</table>

**ARTZ 499R - Senior Thesis: Studio** 3

Choose one of the following: 5
empowers students to critically engage the complexities of society and the natural environment by instilling the fundamental principles of design and inspiring a spirit of exploration and creative experimentation in shaping the built environment.

It is in our design studios that this philosophy is most clearly demonstrated. Each studio is conceived to build upon the previous studio in a manner that develops a student’s mastery of the science of architecture while at the same time exposing the student to the rich diversity of our faculty’s philosophical beliefs. Within a structured sequence of increasingly complex problems, emphasis is placed on teaching both an iterative design process and the visualization skills necessary to demonstrate the resultant design proposals. The science of architecture is continuously evolving and will do so over the life of every architect. We are committed to preparing our students to enter the profession with both contemporary scientific knowledge and emerging technical expertise to further this evolution while at the same time ensuring that our graduates are grounded in the fundamental drawing design thinking, investigative and communication skills that have been central to architecture throughout its history. In addition to the science of architecture, we are equally committed to ensuring that our graduates acquire a critical philosophy with which they can engage the design of the built environment.

Knowing how to build is a matter of science and technology but knowing what to build is a question of morality, ethics, and aesthetic responsibility. In this regard the faculty shares a commitment to the stewardship of our environment. This is particularly important in the Northern Rockies where our historic fabric of cities, rural communities and the natural landscape coexist in a tenuous balance. Focusing on the broad principles of creating a sustainable social, cultural, economic and physical environment we utilize the region, from its major cities to its national parks, as the canvas for our teaching, research and creative activities.

Architecture

Briefly defined, architecture is the art and science of designing buildings that provide appropriate accommodation for human activities. Professional practice requires a person with the unique combination of creative ability, technical knowledge, human understanding, and administrative skill. The undergraduate Environmental Design curriculum, which leads to the Bachelor of Arts in Environmental Design degree, prepares students to enter the graduate program in Architecture at MSU or serves as a basis for application to other graduate programs or for employment as a non-architect in environmental design fields. However, the Bachelor of Arts in Environmental Design degree by itself does not qualify students to become registered architects. Students wishing to become registered architects must complete the graduate program of study and receive the accredited Master of Architecture degree.

Once admitted to the Environmental Design program, and after completing their fourth year design studios, students with an acceptable academic record may apply to the Master of Architecture professional program. Specific dates for graduate applications can be obtained from the main office of the School of Architecture. The program offers a professional education as well as exposure to other academic disciplines, and provides the foundation for an internship with a practicing architect.

In most states, a graduate with a professional degree in architecture needs to complete the requirements of the Intern Development Program (IDP) developed by the National Council of Architectural Registration Boards (NCARB) in which students gain varied experience in an architectural office. Graduates of the Master of Architecture program are qualified to take the Architectural Registration Exam in order to obtain a professional license. A person is not authorized to practice architecture until the architectural licensing examination is passed and a license is issued.
Other areas of employment open to the architecture graduate include construction, government service, industry, and education.

In addition to the college preparatory curriculum, high school students planning on enrolling in architecture are especially encouraged to take art courses such as basic design and drawing.

Students begin the undergraduate program in the fall semester because the first course of the design studio sequence is offered fall semester only. Students that have completed their university core requirements or have completed a previous degree may enroll in an accelerated first year design sequence offered in the summer semester.

Admission of transfer students is selective; only those students whose past academic performance and portfolio submission indicate a probability of success are admitted.

**Admission to the Environmental Design Program**

Admission to the first year of the Environmental Design Program is open. At the end of the spring semester of the first year of the Environmental Design Program, students will undergo a substantive portfolio review to assess their preparedness for the subsequent three years of the Bachelor of Arts in Environmental Design degree program. All portfolio reviews will be undertaken by the Second Year Admissions Committee. Total enrollment in the program shall be limited by the teaching resources and space capacities of the School of Architecture.

To continue into the second year of the environmental design program first year Environmental Design students must:

1. Be in good scholastic standing with a cumulative GPA of 3.0 or higher.
2. Have satisfactorily completed all required course work of the first year of the Environmental Design Program.
3. Have a design portfolio that indicates creative potential. The design portfolio will be evaluated by faculty in the School of Architecture to assess a student’s preparedness for the subsequent three years of the program. Transfer students from other architecture or environmental design programs must have, prior to acceptance and advanced design year placement, an overall grade-point average of 3.0 or above and a high quality, creative portfolio. Transfer students planning to attend the fall semester must submit their application and portfolio to the Environmental Design Program by May 1. Applications received after that date will be considered on a space-available basis only.

Portfolio review procedures for the Environmental Design Program:

1. First year Environmental Design students will obtain an application for portfolio review including portfolio requirements, from the School of Architecture after March 1st. The completed application form, plus portfolio of design and graphic work, are to be submitted to the School of Architecture by May 1.
2. First year students are required to submit a portfolio including examples of their design and graphic work.
3. An applicant who has previously undergone the portfolio review and was found to not be prepared for the subsequent years of the Environmental Design Program or who fails to enroll in the second year environmental design program after being accepted or who fails to complete ARCH 253 must re-apply for the portfolio review in the regular manner.

First year Environmental Design students who are found to not be prepared for the subsequent years of the program have the right to meet with the Second Year Admissions Committee, Undergraduate Coordinator or Director for a review of their materials.

Students who are found to not be prepared for the subsequent years of the Environmental Design Program may not take ARCH 253, ARCH 254, ARCH 261, or ARCH 262 and upper division courses in the curriculum without permission of the director. Former students who have withdrawn after being admitted to the program must be in good scholastic standing for re-admission and will be readmitted on a space available basis only. Former students must contact the School in writing, stating their intent to return, at least two months prior to their return so that a decision can be made regarding space availability.

**Architecture Internship Program**

This is an optional enrichment program for students who, for a short period in their education, would benefit at least as much from professional experience as academic experience. The goals of the program are those of the required architecture courses plus those which can be sought only in the office context, such as familiarization with the relationship of all aspects of professional practice.

Students must obtain their own employment in an architecture firm for a continuous period of not less than 12 weeks.

Students must apply in writing to the coordinator of the program by the eight week of the semester prior to the internship which will take place during the student’s fourth year in Environmental Design. The Internship Coordinator and Director reviews all applications and makes the decision concerning acceptance into the program. A student meeting the criteria listed below may still be denied acceptance if the faculty determines that the student would benefit more from a formal design studio. The criteria for admission are:

1. A minimum 2.75 overall cumulative grade point average and a minimum 3.0 in all architecture courses.
2. Completion of all required courses as tabulated through the third year.

**Foreign Study Program**

This is an optional enrichment program which allows qualified students to participate in an intensive semester of foreign study. Students pay the additional costs of travel, lodging, and administration related to this program in addition to normal tuition and fees. The program is typically offered Spring or Summer semesters, subject to funding constraints and student demand, and is organized and directed by a faculty member(s) from the School of Architecture.

The criteria for participation in the Foreign Study Program are as follows:

1. A high degree of self-motivation and self-discipline as demonstrated by performance in required course work.
2. A minimum 3.0 overall cumulative grade point average and a minimum 3.0 in all architecture courses.
3. Completion of ARCH 121IA, ARCH 322IA and ARCH 323IA.
4. Completion of all required courses as tabulated through the third year.

Admission to the program requires submission of a request in writing to the coordinator of the program by December 1st of the third year of the environmental design program. A cash deposit will be required at this time.

**Standard of Work in Architecture Courses**

Any student receiving two consecutive grades of C- or lower in any design sequence course will be required to repeat the last course in which a C- or lower was received.

**Financial**

Costs for an architectural education are similar to, though somewhat higher than, other programs in the university. An academic exposure to both rural and urban settings through class field trips, the integration of
computer technology, networking, digital fabrication, printing as well as other program enhancements are an important part of an architect’s education. In order to meet this need and help defray costs of the field trips, computer integration, lecture series and program enhancements, a Program Fee is assessed to each student in the environmental design and architectural programs that reflects the student’s degree status in the program. For current Program Fee costs, students may contact the School of Architecture. Students are required to purchase their own personal computer, which meets the specifications of the School of Architecture, during the second year of the Environmental Design undergraduate program. The computer will be an essential tool for use throughout the Professional Program.

Beyond normal tuition, fees, room, board, and supplies, an architectural student requires drawing equipment and materials for drawing and models during the school year. This can be expected to add at least another $600 per year to the cost. Inquiries for financial aid or assistance should be sent directly to the Office of Financial Aid Services at Montana State University.

### Curriculum in Environmental Design

#### Freshman Year

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>Credits</th>
<th>Fall</th>
<th>Spring</th>
</tr>
</thead>
<tbody>
<tr>
<td>ARCH 121IA</td>
<td>Introduction to Design</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ARCH 151RA</td>
<td>Design Fundamentals I</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>M 151Q</td>
<td>Precalculus</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>or M 171Q</td>
<td>Calculus I</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>University Core</td>
<td></td>
<td>3</td>
<td></td>
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<tr>
<td>ARCH 152</td>
<td>Design Fundamentals II</td>
<td>4</td>
<td></td>
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<tr>
<td>PHSX 205</td>
<td>College Physics I</td>
<td>4</td>
<td></td>
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<tr>
<td>or PHSX 220</td>
<td>Physics I (w/ calculus)</td>
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<td>University Core</td>
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#### Sophomore Year

<table>
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<th>Credits</th>
<th>Fall</th>
<th>Spring</th>
</tr>
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<tbody>
<tr>
<td>ARCH 241</td>
<td>Building Construction I</td>
<td>3</td>
<td></td>
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</tr>
<tr>
<td>ARCH 253</td>
<td>Architectural Design I</td>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ARCH 261</td>
<td>Architectural Graphics I</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ARCH 322IA</td>
<td>World Architecture I</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>University Core</td>
<td></td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ARCH 262</td>
<td>Arch Graphics II</td>
<td>3</td>
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<td></td>
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<tr>
<td>ARCH 254</td>
<td>Architectural Design II</td>
<td>5</td>
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<td></td>
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<tr>
<td>ARCH 323IA</td>
<td>World Architecture I</td>
<td>3</td>
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<tr>
<td>University Core</td>
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#### Junior Year

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<th>Course Name</th>
<th>Credits</th>
<th>Fall</th>
<th>Spring</th>
</tr>
</thead>
<tbody>
<tr>
<td>ARCH 331</td>
<td>Environmental Controls I</td>
<td>4</td>
<td></td>
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<tr>
<td>ARCH 363</td>
<td>Architectural Graphics III</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ARCH 343</td>
<td>Arch Structures II</td>
<td>4</td>
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<tr>
<td>ARCH 355</td>
<td>Architectural Design III</td>
<td>5</td>
<td></td>
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<tr>
<td>ARCH 332</td>
<td>Environmental Controls II</td>
<td>4</td>
<td></td>
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<tr>
<td>ARCH 340</td>
<td>Building Construction II</td>
<td>4</td>
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<tr>
<td>ARCH 344</td>
<td>Arch Structures III</td>
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<td>ARCH 356</td>
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<td>Year Total:</td>
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#### Senior Year

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>Credits</th>
<th>Fall</th>
<th>Spring</th>
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<tbody>
<tr>
<td>Non-Architecture Electives</td>
<td></td>
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#### Senior Year

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>Credits</th>
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<th>Spring</th>
</tr>
</thead>
<tbody>
<tr>
<td>University Core</td>
<td></td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ARCH 431</td>
<td>Sustainability in Architecture</td>
<td>3</td>
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</tr>
<tr>
<td>Choose one of the Following Option Studios</td>
<td></td>
<td>5-12</td>
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<tr>
<td>ARCH 414</td>
<td>Architectural Study Abroad</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ARCH 428</td>
<td>Foreign Study History</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ARCH 450</td>
<td>Community Design Center</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ARCH 458</td>
<td>Arch Design VI</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ARCH 498</td>
<td>Internship</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ARCH 413</td>
<td>Professional Practice</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ARCH 457</td>
<td>Architectural Design V</td>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ARCH 452</td>
<td>Research Methods in Arch</td>
<td>3</td>
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<tr>
<td>Non-Architecture Electives</td>
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<td>6</td>
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<td></td>
</tr>
</tbody>
</table>

Year Total: 14-21 17

Total Program Credits: 126

ARCH 414, ARCH 428, ARCH 498 and ARCH 450 are offered both Summer and Fall semesters in the Senior year to provide diverse options. A minimum of 126 credits is required for graduation; 42 of these credits must be in courses numbered 300 and above.

The School of Architecture reserves the right to retain student work for exhibiton and instructional purposes.

### Additional Professional Program Requirement

For students interested in obtaining a Bachelor of Arts in Environmental Design degree leading to a Master of Architecture degree, 45 non-architecture credits, taken at either the undergraduate or graduate level, must be completed prior to the completion of the Master of Architecture degree program. For additional advising information please contact the School of Architecture at 160 Cheever Hall, 994-4255.

### Additional Professional Program Requirements (PMSEM)

Students interested in obtaining a Bachelor of Arts in Environmental Design degree and considering entry into the Professional Master of Science and Engineering Management Degree (p. 341) will be required to take additional Math, English, Natural Science, Business and Engineering courses from those listed above. Students interested in this Engineering Management focus should contact the Department of Civil Engineering, 3900 Cobleigh Hall, 994-2111 to obtain the specific course requirements.

### Graduate Programs

- Master of Architecture (p. 295)

### Film and Photography

#### The School of Film and Photography

The School of Film and Photography (SFP) prepares students to meet the challenges of a rapidly expanding media environment as informed critical thinkers and professionally trained creative artists. Our students develop their own voices as tomorrow’s leaders through intensive hands-on exploration of motion picture, photography, theatre and new media production.

The School of Film and Photography offers a Bachelor of Arts degree with concentrations (options) in Film and Photography, as well as a minor in Photography.

The two degree options share a common foundation dedicated to the relationships between film and photography as integrated arts and technologies that profoundly shaped the twentieth century and serve as the foundation of new media in the twenty-first century. This integrated foundation permits students to take courses in Film or Photography while...
they complete the requirements of the option they have selected as their concentration.

Both options provide flexibility for students to broaden their education with course work outside of the School of Film and Photography. All of our students are encouraged to consider the benefits of study abroad and/or minoring in another area of interest. While we aim to provide professional film and photography training, we place equal importance on providing our students with a broad education to prepare them for a wide range of future opportunities not confined to these industries.

After the completion of a successful freshman year of introductory courses in media production, analysis, and history, students will continue to develop advanced skills and knowledge of photography and/or filmmaking over the next three years.

Transfer Students
Students who intend to transfer to The School of Film and Photography should seek prior approval of credit taken elsewhere in order to be certain that these credits will fulfill requirements in the Film or Photography options. In no case may a class completed with a grade below “C-” elsewhere be applied toward the program requirements for the degree. Any class that is not an equivalent class within the Montana university system must be approved by the SFP Director and Advisor on the basis of a review of the syllabus of the course taken elsewhere. A challenge exam or portfolio review may be required for any transfer credit at the discretion of the SFP Director or Advisor.

Course and Program Fees
Course fees are assessed to all students enrolled in foundation courses FILM 112 and PHOT 113RA. Students in either the Film or Photography option are charged a program fee per semester.

Undergraduate Programs
- Film Option (p. 118)
- Photography Option (p. 119)

Undergraduate Minor
- Photography Minor (Non-Teaching) (p. 119)

Film Option
Students in the Film Option gain hands-on experience in all aspects of motion picture production, supported by theatrical production work. Students have opportunities to engage in film production throughout the program, starting in the first year and culminating in a senior thesis film project. At the same time, students study film history, film aesthetics, and the film industry, to broaden their understanding of the film medium and inform their personal filmmaking goals.

Film Option Foundations
Upon completion of all of the four required foundation courses and two university Core requirements, WRIT 101W and University Seminar (US), interested students may apply for acceptance into the Film option. The Film Option will accept no more than 48 students each and a wait list will be generated for applicants beyond that number. Students wait listed will be contacted if space becomes available. Selection will be based on the average of grades (GPA) earned in the required foundation courses and the successful completion of WRIT 101W and US.

In order to apply for acceptance into the Film Option for the following year, students must submit an application form by April 30. Students must also submit a portfolio consisting of one individual film project completed in FILM 112 and a written statement. Portfolios are due by the last day of spring semester finals week.

All applicants will be notified of the review outcome by email. If unsuccessful, students may reapply the following year. Students who wish to reapply may retake any courses during the intervening year to improve their chances of success.

Film Option Curriculum
Please note that some Film program-related courses are listed under different headings, including:

<table>
<thead>
<tr>
<th>Course</th>
<th>Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>THTR 304</td>
<td>Theatre Production</td>
</tr>
<tr>
<td>MUST 380</td>
<td>Interdisciplinary Proj I: Film</td>
</tr>
<tr>
<td>MUST 382</td>
<td>Interdisciplinary Projects II</td>
</tr>
</tbody>
</table>

Foundation Courses (typically taken in freshman year)

<table>
<thead>
<tr>
<th>Course</th>
<th>Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>FILM 100H</td>
<td>Intro to Film &amp; Photography</td>
</tr>
<tr>
<td>FILM 112</td>
<td>Aesthetics of Film Production</td>
</tr>
<tr>
<td>FILM 101H</td>
<td>Understanding Film and Media</td>
</tr>
<tr>
<td>PHOT 113RA</td>
<td>Understanding Photography</td>
</tr>
<tr>
<td>WRIT 101W</td>
<td>College Writing I</td>
</tr>
<tr>
<td></td>
<td>University Seminar (topic of choice)</td>
</tr>
</tbody>
</table>

* FILM 112, WRIT 101W and University Seminar are offered both fall and spring semesters and may be taken in either semester.

Film Option Requirements

<table>
<thead>
<tr>
<th>Course</th>
<th>Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>FILM 201D</td>
<td>Film History I: Origins to the 1960’s</td>
</tr>
<tr>
<td>FILM 202D</td>
<td>Film History II: 1960’s to the Present</td>
</tr>
<tr>
<td>FILM 212</td>
<td>Aesthetics of Film Production</td>
</tr>
<tr>
<td>FILM 251</td>
<td>Scriptwriting</td>
</tr>
<tr>
<td>FILM 254</td>
<td>Acting for Film</td>
</tr>
<tr>
<td></td>
<td>Choose two of the following</td>
</tr>
<tr>
<td>FILM 381</td>
<td>Studies in Film</td>
</tr>
<tr>
<td>FILM 449</td>
<td>Film and Documentary Theory</td>
</tr>
<tr>
<td>FILM 481</td>
<td>Advanced Studies in Film</td>
</tr>
<tr>
<td>FILM 494</td>
<td>Seminar/Workshop</td>
</tr>
<tr>
<td></td>
<td>Other film-related studies course(s) approved by advisor</td>
</tr>
<tr>
<td></td>
<td>Choose two of the following:</td>
</tr>
<tr>
<td>FILM 371</td>
<td>Non-Fiction Film Production</td>
</tr>
<tr>
<td>FILM 372</td>
<td>Fiction Film Production</td>
</tr>
<tr>
<td>THTR 304</td>
<td>Theatre Production</td>
</tr>
<tr>
<td>FILM 499</td>
<td>Senior Production</td>
</tr>
<tr>
<td>SFP Electives (at least 4 other SFP courses*)</td>
<td>12</td>
</tr>
<tr>
<td>Non-SFP Electives (at least 3 courses**)</td>
<td>9</td>
</tr>
<tr>
<td>Total Credits</td>
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</tr>
</tbody>
</table>

* SFP Electives are any courses offered in the School of Film & Photography including THTR 304, MUST 380 and MUST 382 that are not serving to fulfill any requirements listed above. Any of the studies or production courses listed above in excess of the number required in each category can be taken as SFP Electives. This requirement is intended to permit Film and Photography students to explore their individual interests in greater depth in one area or more broadly in both areas.
** Non-SFP Electives are any courses offered outside the School of Film & Photography, not including THTR 304, MUST 380 and MUST 382, that are not serving to fulfill university CORE requirements. This requirement is intended to encourage Film and Photography students to develop an area of knowledge to inform their pursuits as creative artists. Completion of a minor outside of the School of Film and Photography will fulfill this requirement.

A minimum of 120 credits is required for graduation, 42 of these credits must be in courses numbered 300 or above.

**Photography Minor (Non-Teaching)**

The School of Film and Photography offers a Photography minor on a space-available basis. The minor consists of 28 credits. Typically, the minor will require a minimum of 2 1/2 years to complete. Photography minors must meet the same eligibility requirements as majors described above, excluding FILM 112. Accepted Photo minors are required to purchase a Mac laptop computer.

**Photography Minor Curriculum**

**Foundation Courses**

- FILM 100H  Intro to Film & Photography  3
- PHOT 113RA  Understanding Photography  3
- PHOT 213  Intermediate Photography  3

**Photography Minor Requirements**

- PHOT 255  Intro to Color Photography  4
- PHOT 258  View Camera  4
- PHOT 303  Early History of Photography  3
- or PHOT 304  Recent History of Photography  3

Choose two of the following Photography production courses:  8

- PHOT 331  Prof Practices in Photography  
- PHOT 350  Advanced Color Photography  
- PHOT 352  Advanced Lighting Practices  
- PHOT 359  Alternative Photographic Techniques  
- PHOT 371  Portraiture  
- PHOT 373  Non-Fiction Photography  
- PHOT 374  Experimental Photography  
- OR other photography-related production course(s) approved by advisor

Total Credits  28

**Photography Option**

The Photography option offers both artistic and applied approaches to the medium, providing a solid foundation for those entering a professional field and those choosing to pursue postgraduate education. Accredited by the National Association of Schools of Art and Design, the Photography option sets high standards for production and is one of the few comprehensive four-year photography degree programs in a sizable geographical area of the north central and northwest United States. Coursework covers everything from traditional silver-based darkroom techniques to alternative processes as well as emphasis in digital technologies across the curriculum.

**Photography Option Foundations**

Upon completion of all of the four required Photography foundation courses and two university Core requirements, WRIT 101W and University Seminar (US), interested students may apply for acceptance into the Photography option. The Photography option will accept up to 36 students each year and establish a wait list for the rest. Selection will be based on the grade point average (GPA) earned in the required foundation courses, the successful completion of WRIT 101W and US core, and a portfolio review based on work completed in PHOT 213 Intermediate Photography.

In order to apply for acceptance into the Photography Option for the following year, students must submit an application form by April 30. Portfolio submissions will be accepted immediately after the scheduled final critique of assignments in PHOT 213.

All applicants will be notified of the review outcome on or before May 30th. Within the first two weeks of the fall semester immediately following the review, should room become available in the major for wait listed students, they will be admitted in descending order of preference. It is the student’s responsibility to provide accurate contact information for this to occur. Once the two-week period is over, the wait list will be retired, and students not placed may reapply the following year. Students who wish to reapply may retake any courses during the intervening year to improve their chances of success.

Those accepted into the program after the freshman year will be required to purchase a Macintosh laptop computer that meets the specifications of the department by the fall semester of their sophomore year. Students will be notified of these specifications upon a successful portfolio review outcome in May.

**Photography Option Curriculum**

**Foundation Courses (typically taken in freshman year)**

- FILM 100H  Intro to Film & Photography  3
- FILM 112  Aesthetics of Film Prodctn I  3
- PHOT 113RA  Understanding Photography  3
- PHOT 213  Intermediate Photography  3
- WRIT 101W  College Writing I  3
- University Seminar (topic of choice)  3

* FILM 112, WRIT 101W and University Seminar are offered both fall and spring semesters and may be taken in either semester.

**Photography Option Requirements**

- PHOT 255  Intro to Color Photography  4
- PHOT 258  View Camera  4

Choose four of the following Film & Photo Studies courses (must include 303 or 304):  12

- FILM 101IH  Understanding Film and Media  
- FILM 201D  Film History I: Origins to the 1960’s  
- FILM 202D  Film History II: 1960’s to the Present  
- PHOT 303  Early History of Photography  
- PHOT 304  Recent History of Photography  
- FILM 381  Studies in Film  
- PHOT 401  Contemp Issues in Photography  
- FILM 449  Film and Documentary Theory  
- FILM 481  Advanced Studies in Film  

Take two of the following Photography Production courses:

- PHOT 331  Prof Practices in Photography  
- PHOT 350  Advanced Color Photography  
- PHOT 352  Advanced Lighting Practices  
- PHOT 359  Alternative Photographic Techniques  
- PHOT 371  Portraiture  
- PHOT 373  Non-Fiction Photography  

 Additionally, all incoming music majors must demonstrate their level of musicianship through auditions before being accepted into an applied studio. Some ensembles require an audition.

The School of Music is committed to contributing to the musical world and communities of Montana by providing a musically enriched environment. Inspired by the belief that music is central to human ways of life, the School of Music affirms the University’s mission to serve the people and students. The School of Music offers classes to all students regardless of major and some music courses satisfy University core requirements. Membership in School of Music ensembles is open to all students regardless of major. Interested students may study band and orchestral instruments, voice, piano, and guitar. Some ensembles require an audition.

All incoming music majors must demonstrate their level of musicianship through auditions before being accepted into an applied studio. Additionally, all incoming music majors must demonstrate their level of musicianship through theory, aural perception, and keyboard skills prerequisites. Any exceptions will be at the sole discretion of the Director.

Students are required to adhere to the current concert/lecture attendance policy as stated in the School of Music Music Major Handbook.

The following requirements must be met for admission to the School of Music.

**Bachelor of Arts in Music**

The Bachelor of Arts in Music degree emphasizes the study of music within a broad program of general study. A non-teaching minor is also offered by the School of Music.

Students are required to audition with the appropriate applied instrumental or vocal faculty prior to, or at the latest, during the first semester of study for all music programs. Placement in MUSI 195 (Applied Music) will be at the sole determination of the applied studio professor. Students with limited experience on their principal instrument are responsible for obtaining preparatory instruction and basic music-reading skills and may be required to complete MUSI 102 in order to develop the required skills necessary to be accepted for applied study and enroll in MUSI 195. If accepted for applied lessons, music majors must enroll in Applied Music each semester of residency. Advancement to the next level will be by performance jury and with the approval of the applied music instructor. An appearance on a recital as soloist must be completed before advancement to MUSI 395. Successful completion of at least one semester of MUSI 395 is required to graduate. All BA students and all applied music students are expected to participate in the School’s band, choral, and orchestral ensembles. Acceptable ensembles are listed in the Music Major Handbook.

Music

School of Music

The School of Music at Montana State University offers dynamic programs in music, music technology, and music education, preparing students for various professions in music and music education, along with lifelong musical enhancement.

Inspired by the belief that music is central to human ways of life, the School of Music affirms the University’s mission to serve the people and communities of Montana by providing a musically enriched environment.

The School of Music is committed to contributing to the musical world through performance, scholarship, composition, leadership, and by nurturing the musical expression, understanding, discovery, and creativity of its faculty and students.

The School of Music offers classes to all students regardless of major and some music courses satisfy University core requirements.
For **music elective** credits below, a maximum of 2 credits of ensembles can be applied for all 8 music elective credits, NO Applied Lessons.

### Freshman Year Credits

<table>
<thead>
<tr>
<th>Course</th>
</tr>
</thead>
<tbody>
<tr>
<td>MUSI 100 - Aural Perception I</td>
</tr>
<tr>
<td>MUSI 141 - Aural Perception II</td>
</tr>
<tr>
<td>MUSI 105 - Music Theory I</td>
</tr>
<tr>
<td>MUSI 106 - Music Theory II</td>
</tr>
<tr>
<td>MUSI 135 - Keyboard Skills I</td>
</tr>
<tr>
<td>MUSI 136 - Keyboard Skills II</td>
</tr>
<tr>
<td>MUSI 195 - Applied Music I</td>
</tr>
<tr>
<td>MUSI 195 - Applied Music I</td>
</tr>
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</table>

**Year Total:** 18

### Sophomore Year Credits

<table>
<thead>
<tr>
<th>Course</th>
</tr>
</thead>
<tbody>
<tr>
<td>MUSI 100 - Applied Music IV</td>
</tr>
<tr>
<td>MUSI 240 - Aural Perception III</td>
</tr>
<tr>
<td>MUSI 241 - Aural Perception IV</td>
</tr>
<tr>
<td>MUSI 205 - Music Theory III</td>
</tr>
<tr>
<td>MUSI 206 - Music Theory IV</td>
</tr>
<tr>
<td>MUSI 230 - Interm Keyboard: Repertoire</td>
</tr>
<tr>
<td>MUSI 231 - Interm Keyboard: Accompanying</td>
</tr>
<tr>
<td>MUSI 232 - Interm Keyboard: Opn Scre Rdng</td>
</tr>
<tr>
<td>MUSI 233 - Interm Keyboard Skill: Jazz</td>
</tr>
<tr>
<td>MUSI 295 - Applied Music II</td>
</tr>
<tr>
<td>MUSI 295 - Applied Music II</td>
</tr>
<tr>
<td>MUSI 307IA - World Music</td>
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<tr>
<td>Ensemble</td>
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**Year Total:** 17

### Junior Year Credits

<table>
<thead>
<tr>
<th>Course</th>
</tr>
</thead>
<tbody>
<tr>
<td>MUSI 100 -</td>
</tr>
<tr>
<td>MUSI 301 - Music History I</td>
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<tr>
<td>MUSI 302 - Music History II</td>
</tr>
<tr>
<td>MUSI 303 - Music History of 20th Century</td>
</tr>
<tr>
<td>MUSI 395 - Applied Music III</td>
</tr>
<tr>
<td>MUSI 395 - Applied Music III</td>
</tr>
<tr>
<td>MUSI 103RA Fundamentals of Musical Creation</td>
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**Year Total:** 17

### Senior Year Credits

<table>
<thead>
<tr>
<th>Course</th>
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<tbody>
<tr>
<td>MUSI 100 -</td>
</tr>
<tr>
<td>MUSI 499R - Senior Capstone Project</td>
</tr>
<tr>
<td>MUSI 495 - Applied Music III</td>
</tr>
<tr>
<td>MUSI 495 - Applied Music IV</td>
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<tr>
<td>Ensemble</td>
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<tr>
<td>Music Electives</td>
</tr>
</tbody>
</table>

**Year Total:** 18

**Total Program Credits:** 120

A minimum of 120 credits is required for graduation; 42 of these credits must be in courses numbered 300 or above.

### Bachelor of Arts in Music Technology

The **Bachelor of Arts in Music Technology** is a synthesis of traditional musical training and application through new technologies. Students develop skills in areas including music composition and theory, recording, sound synthesis, sound design for film and theater, audio for film, video, and multimedia, film scoring, notation and sequencing, orchestration, interdisciplinary collaboration, music business, and instrumental or vocal performance. Working alongside faculty, Music Technology majors compose original music and collaborate on artistic works and projects with students from across campus. This combination of academic study, creative work, community involvement, and hands-on training produces well-rounded musicians and digital media artists. Potential career opportunities are diverse and include, but are not limited to audio, sound design, and music composition for film, television, theater, concert hall, multimedia art, computer games, and virtual environments, music technology sales and representation, live sound reinforcement, recording, private studio instruction, and further studies in composition or digital audio technology and related media.

Students with limited musical experience may be required to complete MUSI 103RA Fundamentals of Musical Creation before beginning the Music Theory, Aural Perception, and Keyboard Skills sequence, as determined by placement examination, in consultation with the Coordinator of Music Technology and Music Faculty.

It is required that students audition with the appropriate applied instrumental or vocal faculty prior to or at the latest, during their first week the first semester of study in the Music Technology program. Placement in MUSI 195 Applied Music I will be at the sole determination of the applied studio professor. Students with limited experience on their principal instrument are responsible for obtaining preparatory instruction and basic music-reading skills and may be required to complete MUSI 102 in order to develop the required skills necessary to be accepted for applied study and enroll in MUSI 195. For those students planning on studying guitar, basic preparatory skills may be obtained via MUSI 160, MUSI 161, and / or MUSI 260 (Beginning Guitar/Intermediate Guitar), as determined by placement examination, in consultation with the Guitar Faculty. Music Technology students wishing to study piano as their primary instrument may be accepted for applied study (MUSI 195) by the following methods:

1. By earning an A- or A in MUSI 135 and MUSI 136
2. By earning a grade of “C” or better in a minimum of two semesters of Advanced Keyboard Skills (MUSI 230, MUSI 231, MUSI 232, or MUSI 233)
3. By audition and subsequent permission of the instructor

Music Technology students wishing to study piano as a secondary instrument may be admitted to MUSI 195 only by fulfilling requirements #2 and #3 of the above.

All Music Technology majors must enroll in Applied Music for a minimum of three semesters. Advancement to the next level will be by performance jury and with the approval of the applied music instructor. Successful completion of one semester at the MUSI 295 level or higher is required for graduation. All students must successfully complete a minimum of three semesters of large ensemble performance, as listed in the music major
handbook. Music Technology students are required to completed two semesters of MUSI 485 Acoustic Composition.

Students are required to adhere to the current concert/lecture attendance policy as stated in the School of Music "Music Major Handbook."

Music Technology majors must receive the grade of "C" or better in all music content courses (MUST/MUSI/MUSE), EELE 217, CAA 490R, CAA 290R, and FILM 259. Further, a grade of "C+" or better is required in all courses that will be counted toward the 42 upper-division credits required in all degrees. Courses with a passing grade of D-, D, or D+ may only be counted toward the overall 120 credit requirement.

As with many degree programs at MSU, the Music Technology curriculum is sequential in nature, with upper-level courses building upon knowledge acquired in previous course work. Completion of a course with a "C" or better is required to satisfy all music (MUST/MUSI/MUSE) prerequisites. Any exceptions will be at the sole discretion of the School of Music Director and the Coordinator of Music Technology.

The following Foundation Courses are limited to a maximum of two enrollments (assigned grade or withdrawal) in order to meet the "C" or better requirement of the B.A. in Technology. Any exceptions will be at the sole discretion of the School of Music Director and the Coordinator of Music Technology.

- MUSI 140 Aural Perception I and MUSI 141 Aural Perception II
- MUSI 105 Music Theory I and MUSI 106 Music Theory II
- MUSI 135 Keyboard Skills I and MUSI 136 Keyboard Skills II
- MUST 115 Introduction to Digital Music
- MUST 125 MIDI and Electro-Acoustic Comp

Undergraduate Music Technology majors are required to be enrolled for a minimum of six credits each semester, and to make consistent progress toward the degree requirements each semester until graduation. Any exceptions will be at the sole discretion of the School of Music Director and the Coordinator of Music Technology. (For example, post-baccalaureate students pursuing a second bachelor’s degree in Music Technology may be exempt from the six hour requirement.)

Music Technology is a broad field encompassing a wide variety of topics, and Music Technology programs at different institutions vary significantly in emphasis and curriculum order. Therefore, transfer credits for Music Technology courses (MUST 115, MUST 220, MUST 125, MUST 341, MUST 380, MUST 382, MUST 384, and Music Technology electives) will not generally be awarded. The Coordinator of Music Technology and the School of Music Director reserve the right to award transfer credits in exceptional circumstances, at their sole discretion. Annual program fees are assessed to all Music Technology majors. Program fees support emergent equipment needs and maintenance of the computer lab and individual studios. These fees enable Music Technology students to accomplish their work efficiently and to gain necessary experience with current hardware and software.

**Bachelor of Arts in Music Technology**

**Freshman Year**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>MUSI 140 - Aural Perception I</td>
<td>1</td>
</tr>
<tr>
<td>MUSI 141 - Aural Perception II</td>
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<tr>
<td>MUSI 105 - Music Theory I</td>
<td>3</td>
</tr>
<tr>
<td>MUSI 106 - Music Theory II</td>
<td>3</td>
</tr>
<tr>
<td>MUSI 135 - Keyboard Skills I</td>
<td>1</td>
</tr>
<tr>
<td>MUSI 136 - Keyboard Skills II</td>
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</tr>
<tr>
<td>MUSI 195 - Applied Music I or MUSI 160 - Beginning Guitar</td>
<td>1</td>
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**Sophomore Year**

<table>
<thead>
<tr>
<th>Course</th>
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<tbody>
<tr>
<td>MUSI 195 - Applied Music I or MUSI 161 - Intermediate Guitar II</td>
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<td>MUST 115 - Introduction to Digital Music</td>
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<td>MUST 125 - MIDI and Electro-Acoustic Comp</td>
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<tr>
<td>University Core and Electives</td>
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<td>Ensemble</td>
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<td>Year Total:</td>
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**Junior Year**

<table>
<thead>
<tr>
<th>Course</th>
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<tbody>
<tr>
<td>MUSI 195 - Applied Music I (If Not Previously Completed)*</td>
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</tr>
<tr>
<td>MUSI 295 - Applied Music II (If Not Previously Completed)*</td>
<td>(1)</td>
</tr>
<tr>
<td>MUSI 301 - Music History I or MUSI 302 - Music History II</td>
<td>3</td>
</tr>
<tr>
<td>MUSI 307IA - World Music</td>
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<td>MUSI 485 - Acoustic Composition</td>
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<tr>
<td>MUSI 485 - Acoustic Composition</td>
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</tr>
<tr>
<td>MUST 305 - Orchestration for New Media</td>
<td>3</td>
</tr>
<tr>
<td>MUST 350 - Real-Time Computer Music</td>
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<tr>
<td>MUST 382 - Interdisciplinary Projects II or CAA 490R/290R - Collaborative Rch/Creative</td>
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<tr>
<td>MUST 384 - Film Scoring</td>
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<td>Ensemble</td>
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**Senior Year**

<table>
<thead>
<tr>
<th>Course</th>
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</thead>
<tbody>
<tr>
<td>MUSI 303 - Music History of 20th Century</td>
<td>3</td>
</tr>
<tr>
<td>MUST 380 - Interdisciplinary Proj I: Film</td>
<td>3</td>
</tr>
<tr>
<td>MUST 498 - Internship (or Music Technology Elective)</td>
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<td>MUST 499R - Senior Recital/Capstone Pjt</td>
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<tr>
<td>Computer Engineering, Electrical Engineering, Computer Science, Physics, or Business</td>
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<tr>
<td>Fine Arts, Social Sciences, or Humanities (non-Music)</td>
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<td>Upper Division Electives</td>
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<td>Electives</td>
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<td>Year Total:</td>
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</table>

Total Program Credits: 120

* Guitar principals will be placed in the appropriate level of performance coursework (Beginning Guitar I, Beginning Guitar II, Intermediate Guitar, or Applied Lessons MUSI 195) by audition before, or at the latest, during the first week of the first semester of study.

A minimum of 120 credits is required for graduation; 42 of these credits must be in courses numbered 300 or above. Of the available elective credits:
• 17 total credits must be earned in Fine Arts, Social Sciences, Humanities, Computer Engineering, Electrical Engineering, Computer Science, Physics, or Business (non-music).
  • 11 of the total credits must be in Fine Arts, Social Sciences, Humanities, Computer Engineering, Electrical Engineering, Computer Science, Physics, or Business (non-music).
  • 3 of the total credits must be in Computer Engineering, Electrical Engineering, Computer Science, Physics, or Business (non-music).
  • 3 of the total credits must be in Fine Arts, Social Sciences, or Humanities (non-music).
  • 6 elective credits must be non-music.
  • The remaining 8 credits may be free electives (music or non-music).

Bachelor of Music Education

The Bachelor of Music Education (K-12 Broadfield) degree leads to certification to teach music at all levels of the public schools. A selection of courses in music education, music theory, and music history are offered at the graduate level. A Master of Education degree with an emphasis in music is available through the Department of Education. Please see http://www.montana.edu/wwwedu/grad/ci/index.shtml#tab=1 for more information.

Bachelor of Music Education (BME) degree students are required to audition with the appropriate applied instrumental or vocal faculty prior to, or at the latest, during the first semester of study for all music programs. Placement in MUSI 195 (Applied Music) will be at the sole determination of the applied studio professor. Students with limited experience on their principal instrument are responsible for obtaining preparatory instruction and basic music-reading skills and may be required to complete MUSI 102 in order to develop the required skills necessary to be accepted for Applied Music each semester of residency. Advancement to the next level will be by performance jury and with the approval of the applied music instructor. A recital, or an appearance in a recital as soloist, must be completed before advancement to MUSI 395 (Applied Music III). Additionally, BME majors must fulfill the chamber music requirement through applied study prior to advancement to MUSI 395. BME students must successfully complete at least one semester of MUSI 395 before student teaching. Students are required to adhere to the current concert/lecture attendance policy as stated in the School of Music "Music Major Handbook."

BME degree students are classified as either Instrumental or Choral majors. All BME majors are expected to participate in an ensemble every semester in residence. Acceptable ensembles are listed in the music major handbook. As a portion of the required ensemble courses, choral majors are required to enroll in choir (MUSI 112, MUSI 312, or MUSI 426) and complete one term of an instrumental ensemble. As a portion of the required ensemble courses, string, piano and guitar majors are required to complete one term each of an instrumental and a choral ensemble. As a portion of the required ensemble courses, wind and percussion majors must enroll in MUSI 155 (Marching Band) for two semesters and a choral ensemble for one semester.

BME students must receive the grade of "C" or better in ALL music content and education classes to be approved for student teaching. BME students must also demonstrate guitar proficiency by either passing the guitar proficiency examination or completing MUSI 160 with a grade of "C" or better. Further, a grade of "C" or better is required in all courses that will be counted toward the 42 upper-division credits required in all degrees. Courses with a passing grade of D-, D, or D+ may only be counted toward the overall 120 credit requirement.

As with many degree programs at MSU, the music curriculum is sequential in nature, with upper-level courses building upon knowledge acquired in previous course work. Completion of a course with a "C" or better is required to satisfy all music (MUST/MUSI/MUSE) prerequisites. Any exceptions will be at the sole discretion of the Director.

The following Foundation Courses may be taken a maximum of two times in order to meet the "C" or better requirement of the BME in Music.

• MUSI 140 Aural Perception I and MUSI 141 Aural Perception II
• MUSI 105 Music Theory I and MUSI 106 Music Theory II
• MUSI 135 Keyboard Skills I and MUSI 136 Keyboard Skills II

Freshman Year

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>MUSI 100 -</td>
<td>0</td>
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<tr>
<td>MUSI 105 - Music Theory I</td>
<td>3</td>
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<tr>
<td>MUSI 140 - Aural Perception I</td>
<td>1</td>
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<td>MUSI 135 - Keyboard Skills I</td>
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<tr>
<td>MUSI 106 - Music Theory II</td>
<td>3</td>
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<tr>
<td>MUSI 141 - Aural Perception II</td>
<td>1</td>
</tr>
<tr>
<td>MUSI 136 - Keyboard Skills II</td>
<td>1</td>
</tr>
<tr>
<td>MUSE 134 - Techniques: Percussion</td>
<td>1</td>
</tr>
<tr>
<td>MUSE 123 - Techniques: Voice</td>
<td>1</td>
</tr>
<tr>
<td>MUSI 195 - Applied Music I</td>
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<tr>
<td>MUSI 195 - Applied Music I</td>
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<tr>
<td>Ensemble</td>
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<td>University Core</td>
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Sophomore Year

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<tbody>
<tr>
<td>MUSI 100 -</td>
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<tr>
<td>MUSI 205 - Music Theory III</td>
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<tr>
<td>MUSI 240 - Aural Perception III</td>
<td>1</td>
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<tr>
<td>MUSI 231 - Intern Keyboard: Accompanying</td>
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<tr>
<td>MUSI 206 - Music Theory IV</td>
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<tr>
<td>MUSI 241 - Aural Perception IV</td>
<td>1</td>
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<tr>
<td>MUSI 232 - Intern Keyboard: Opn Sce Rndo</td>
<td>1</td>
</tr>
<tr>
<td>MUSE 130 - Techniques: Flute &amp; Clarinet</td>
<td>1</td>
</tr>
<tr>
<td>MUSE 132 - Techniques: Brass</td>
<td>1</td>
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<tr>
<td>MUSE 220 - Intro to Comp App Music Ed</td>
<td>2</td>
</tr>
<tr>
<td>MUSE 239 - Beginning Conducting</td>
<td>1</td>
</tr>
<tr>
<td>MUSI 301 - Music History I</td>
<td>3</td>
</tr>
<tr>
<td>EDU 222IS - Educ Psych &amp; Child Development or EDU 223IS - Educ Psych and Adolescent Dev</td>
<td>3</td>
</tr>
<tr>
<td>EDU 211D - Multicultural Education</td>
<td>3</td>
</tr>
<tr>
<td>MUSE 383 - Assessment in Music Education</td>
<td>3</td>
</tr>
<tr>
<td>MUSI 295 - Applied Music II</td>
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<td>MUSI 295 - Applied Music II</td>
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Junior Year

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<tr>
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</thead>
<tbody>
<tr>
<td>MUSI 100 -</td>
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</tr>
<tr>
<td>MUSI 302 - Music History II</td>
<td>3</td>
</tr>
<tr>
<td>MUSI 303 - Music History of 20th Century</td>
<td>3</td>
</tr>
<tr>
<td>MUSI 335 - Instrumental Conducting</td>
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<tr>
<td>MUSI 336 - Choral Conducting</td>
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</table>
Completion of a course with a "C" or better is required to satisfy all music prerequisites. Any exceptions will be at the sole discretion of the SOM Director.

The following Foundation Courses may be taken a maximum of two times in order to meet the "C" or better requirement of the music minor.

- MUSI 140 Aural Perception I and MUSI 141 Aural Perception II
- MUSI 105 Music Theory I and MUSI 106 Music Theory II
- MUSI 135 Keyboard Skills I and MUSI 136 Keyboard Skills II

Nine upper-division credits in music must be completed for the music minor.

A music minor is for students pursuing formal music education. Nine upper-division credits in music must be completed for the music minor.

MUSI 105 Music Theory I 3
MUSI 106 Music Theory II 3
MUSI 140 Aural Perception I 1
MUSI 141 Aural Perception II 1
MUSI 195 Applied Music I 1
Choose one of the following: 3
MUSI 101IA Enjoyment of Music
MUSI 211IA Masterworks in Music
MUSI 295 Applied Music II 1
MUSI 307IA World Music 3
Music Ensembles 4
Music Electives 6
Total Credits 26
The College of Education, Health and Human Development provides studies for those persons interested in careers in the helping professions associated with education, school counseling, family and consumer sciences, physical education, exercise science, health, counseling, and nutrition. These functions are carried out within the college’s two departments: the Department of Education; and the Department of Health and Human Development.

The Department of Education is composed of three units: Curriculum and Instruction, for the preparation of undergraduate and graduate teacher education majors who seek teaching careers in either elementary or secondary schools; Educational Leadership, offering graduate programs in K-12 administration; and Adult and Higher Education offering graduate programs for those seeking advanced study in adult education and higher education administration.

The college has additional programs that help persons transition from other careers into becoming educators. The Lewis and Clark Region Troops to Teachers assists qualified military personnel in making the transition from the armed services to the classroom. Northern Plains Transition to Teaching moves seasoned professionals with established records of excellence into new careers in public school classrooms.

The Department of Health and Human Development administers a variety of curricula that prepares students for various careers including community health, dietetics, exercise science, early childhood education and child services, family and consumer sciences, kinesiology, nutrition science, and sustainable food and bioenergy systems. Teaching careers are offered in family and consumer sciences and health enhancement K-12 (health and physical education). A post-baccalaureate dietetics internship is also offered, the only internship program in the state of Montana.

The college cooperates with other agencies in Montana in the improvement of educational programs and services through its After-School Partnership, Child Development Center, Early Childhood Project, Field Placement and Licensure, Indian Education for All, Human Development Clinic, Montana Team Nutrition, and other public service centers and activities.

**Graduate Programs Available**

In addition to its baccalaureate degree programs, the college offers graduate-level programs leading to the Master of Science in Health and Human Development and the Master of Education, the Education Specialist degree, and the Doctor of Education with emphasis in Administration, Adult and Higher Education, or Curriculum and Instruction, or a PhD in Education, Adult and Higher Education.

Montana State University is a member of the American Association of Colleges for Teacher Education and is accredited by the Northwest Association of Secondary and Higher Schools. Professional programs for the preparation of elementary and secondary teachers at the baccalaureate level are accredited by the Council for the Accreditation of Educator Preparation, as are the master’s level programs for the preparation of elementary school principals, high school principals, and the doctoral program in education administration. All education programs are approved by the Montana Board of Public Education. Marriage and family, mental health, and school counseling programs are accredited by the Council for Accreditation of Counseling and Related Educational Programs of the American Counseling Association. The Dietetics program is accredited by Accreditation Council for Education in Nutrition and Dietetics for the Academy of Nutrition and Dietetics.

**Department of Education**

The Department of Education has three program areas: Curriculum & Instruction, Educational Leadership, and Adult & Higher Education. As the undergraduate teacher education unit, Curriculum & Instruction provides programs in elementary education and secondary education. The Teacher Education Program is nationally accredited by the Teacher Education Accreditation Council (Council for the Accreditation of Educator Preparation (TEAC/CAEP)) as well as by the Montana Board of Public Education.

Curriculum & Instruction also offers a Master’s degree for advanced professional development for practicing teachers and other education professionals; a graduate endorsement in Library Media, and a Doctoral degree (Ed.D.) for those preparing to teach in education departments at the university level.

The Educational Leadership program offers a Master’s degree for the principalship, a Superintendent’s Endorsement obtained beyond the Master’s degree, an Education Specialist degree, and a Doctoral degree to prepare individuals who are seeking careers in a variety of areas of Educational Leadership. The Educational Leadership program is nationally accredited by the Teacher Education Accreditation Council (TEAC) as well as by the Montana Board of Public Education.

The program in Adult and Higher Education offers Master’s and Doctoral level degrees and a College Teaching Certificate for those seeking careers in Higher Education or other post-secondary educational venues.

**Mission Statement**

The mission of the Department of Education is to prepare highly qualified professional educators and administrators through exemplary campus and distance based programs and field placements in quality public and private schools. In addition, the department contributes to the State of Montana and the nation through the faculty’s active research and outreach efforts.

**Undergraduate Teacher Education Program—Conceptual Framework**

The Teacher Education Program at MSU believes that learning to teach in educational settings is a complex task requiring a thoughtful blending of content mastery with carefully guided field experiences. In order to meet the multiple demands of an ever-changing profession, we ensure that students demonstrate their competencies in guided field experiences through every phase of our program. Thus, students who graduate from the Teacher Education Program at MSU are engaged in and committed to:

1. **Content Mastery**
   
   The Teacher Education Program at MSU has been designed to provide our students with a rich and well-balanced education grounded in the liberal arts & sciences and current educational theory, research, and practice. Students participate in learning communities within our program in which they develop in-depth content knowledge for their work as classroom teachers and school leaders. Our graduates understand the central concepts, tools of inquiry, and structures of the disciplines and can create standards-based learning experiences that are meaningful for students.

2. **Understanding Development and Diversity of Learners**
   
   Graduates of the Teacher Education Program understand how K-12 students learn and develop and can provide learning opportunities which are adapted to diverse learners and support their intellectual, social, and personal development. Our graduates are committed to...
building a caring, respectful, and supportive learning environment and are prepared to provide access to the necessary tools to help every student learn. They are also cognizant of and committed to Montana’s American Indian cultures and the values embodied by the Indian Education for All Act.

3. Pedagogical and Technological Proficiency
We believe that professional educators must have sound pedagogical content knowledge and be skilled in the use of research-based instructional practices. Our graduates understand and use a variety of instructional strategies to foster students’ motivation for learning and encourage their conceptual understandings through the development of critical thinking, problem solving, and performance/work force skills. Our graduates understand the principles of differentiated instruction and can integrate these concepts and practices into their teaching. The graduates of our Teacher Education Program also demonstrate knowledge of effective verbal and nonverbal communication techniques and effectively use educational technology to foster active inquiry, collaboration, and supportive interaction in the classroom.

4. Excellence in Instructional Design and Assessment
It is essential for teachers to understand and practice alignment in curriculum, standards, and assessments. Our program is committed to current models of instructional design in which our candidates focus on defining learning outcomes and determining evidence that all learners have met curricular goals. Our graduates plan instruction based upon knowledge of subject matter, students, the community, and curriculum goals. They also understand how to analyze pre-, formative, and summative assessment of student learning for individuals, small groups, or whole class settings to ensure the intellectual, social, and personal development of every learner.

5. Professionalism in Practice and Reflection
Continuous improvement of the education profession depends upon the systematic practice of professional reflection, inquiry, and collaboration to discover new and more effective educational approaches. Our graduates demonstrate the ability to reflect on classroom decision-making with regard to content, diversity, pedagogy and assessment in order to improve teaching and learning. They are reflective practitioners who examine their own biases and endeavor to provide equitable educational opportunities for students. They also demonstrate an understanding that education happens in a context and develop effective relationships with family and community members. As candidates move from campus to the K-12 classroom, they are expected to adhere to and model our program’s Professional Expectations and Montana’s Code of Ethics for teachers.

Graduate Programming within the Department of Education (p. 302)

Link to the Department of Education Overview (p. 300)

Elementary Education K-8

The Department of Education offers a teacher education program for students seeking teaching careers in grades kindergarten through eight (K-8). The Elementary Education major is designed to provide a broad educational foundation with a focus on how science, technology, engineering and math interconnect within the language arts, social studies, arts, and health enhancement curricula. This program content is essential in the preparation of successful K-8 pre-service teachers.

Prospective elementary school teachers follow a program of study the first two years which is essentially the same for all students. There is sufficient flexibility, however, for specialization in the various teaching options available.

One of the major attributes of the Elementary Education program at Montana State University is its extensive field experience component. This includes service learning experiences in the freshman year, micro-teaching experiences in the After School Partnership in the sophomore year, and two practicum teaching semesters prior to student teaching. During these semesters, students spend the equivalent of four half-days for a minimum of eight weeks in supervised settings working directly with children while concurrently completing methods courses on campus. The final clinical experience is student teaching where students spend fourteen weeks in a supervised classroom setting.

Students in the Elementary Education K-8 program can choose to add the following options: early childhood, mathematics, science, and/or special education. These options permit students to focus in these specific areas in addition to completing the K-8 degree requirements. The options, while not providing additional endorsements in the specialties addressed, do allow for added study in each area. Students can also pursue teaching minors which would provide additional endorsements in the State of Montana: http://www.montana.edu/fieldplacement/tepp-approval.shtml

Graduate degree programs are offered for students who wish to pursue advanced programs in curriculum and instruction (See The Graduate School’s website (p. 300)).

Coursework Required for Elementary Education K-8

See Teacher Education Program (p. 131) for entrance requirements.

EDUCORE - Discovering the Nature of the Disciplines

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>EDU 101US</td>
<td>Teaching and Learning</td>
<td>3</td>
</tr>
<tr>
<td>Writt 101W</td>
<td>College Writing I</td>
<td>3</td>
</tr>
<tr>
<td>M 133Q</td>
<td>Geometry &amp; Measure K-8 Teachers</td>
<td>3</td>
</tr>
<tr>
<td>EDU 211D</td>
<td>Multicultural Education</td>
<td>3</td>
</tr>
<tr>
<td>TE 250CS</td>
<td>Technology and Society</td>
<td>3</td>
</tr>
<tr>
<td>EDU 204IA</td>
<td>Arts &amp; Lifelong Learning</td>
<td>3</td>
</tr>
</tbody>
</table>

Choose one of the following:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>HSTA 101IH</td>
<td>American History I</td>
<td>4</td>
</tr>
<tr>
<td>HSTA 102IH</td>
<td>American History II</td>
<td></td>
</tr>
<tr>
<td>HSTR 101IH</td>
<td>Western Civilization I</td>
<td></td>
</tr>
<tr>
<td>HSTR 102IH</td>
<td>Western Civilization II</td>
<td></td>
</tr>
<tr>
<td>EDU 222IS</td>
<td>Edu Psych &amp; Child Development</td>
<td>3</td>
</tr>
<tr>
<td>IN</td>
<td>Met through courses below</td>
<td></td>
</tr>
<tr>
<td>R</td>
<td>Met through course below</td>
<td></td>
</tr>
</tbody>
</table>

Professional Content - Building a Strong Foundation

Choose one of the following:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>AMST 101D</td>
<td>Introduction to American Studies</td>
<td>3</td>
</tr>
<tr>
<td>ANTY 101D</td>
<td>Anthropology and the Human Experience</td>
<td>3</td>
</tr>
<tr>
<td>GPHY 121D</td>
<td>Human Geography</td>
<td></td>
</tr>
<tr>
<td>GPHY 141D</td>
<td>Geography of World Regions</td>
<td></td>
</tr>
<tr>
<td>SOCI 101S</td>
<td>Introduction to Sociology</td>
<td></td>
</tr>
<tr>
<td>M 132</td>
<td>Numbers &amp; Operations for K-8 Teachers</td>
<td>3</td>
</tr>
<tr>
<td>M 234</td>
<td>Higher Math for K-8 Teachers</td>
<td>3</td>
</tr>
<tr>
<td>Approved STEM Elective ’</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Life Science choose one of the following:</td>
<td>3-4</td>
<td></td>
</tr>
<tr>
<td>BIOB 100IN</td>
<td>Organism Function</td>
<td></td>
</tr>
<tr>
<td>BIOM 103IN</td>
<td>Unseen Universe: Microbes</td>
<td></td>
</tr>
<tr>
<td>Earth Science choose one of the following:</td>
<td>3-4</td>
<td></td>
</tr>
<tr>
<td>ERTH 101IN</td>
<td>Earth System Sciences</td>
<td></td>
</tr>
<tr>
<td>ERTH 212RN</td>
<td>Yellowstone: Scientific Lab</td>
<td></td>
</tr>
<tr>
<td>GEO 103CS</td>
<td>Intro to Envrmntl Geology</td>
<td></td>
</tr>
<tr>
<td>GEO 105IN</td>
<td>Oceanography</td>
<td></td>
</tr>
</tbody>
</table>
GEO 111IN - Dinosaurs
GEO 140IN - Planetary Geoscience

Physical Science choose one of the following: 3-4

CHMY 102CS - Applying Chemistry to Society
PHSX 103IN - The Physics of How Things Work
PHSX 201IN - Physics by Inquiry

NASX 105D - Intro Native Amer Studies 3
or NASX 205D - Native Americans Contemp Soc
or NASX 232D - MT Indian Cult, Hist, Cur Issu

PSCI 210S - Introduction to American Government 3

EDU 330 - Emergent Literacy 3
EDU 331 - Lit and Literacy for Children 3
EDU 370 - Integrating Tech into Educ 2
EDU 382 - Assessmt, Curric, Instructn 3
EDU 397 - Methods (K-8 Health Enhancement) 3
EDU 382 - Assessmt, Curric, Instructn 3

Electives 11-13

K-8 Teaching Methods - Developing Instructional Materials
EDU 342 - Managing the Learning Envir 3
EDU 395 - Practicum (I) 3
EDU 397 - Methods (K-8 Language Arts Methods) 3
EDU 397 - Methods (K-8 Creative Arts Methods) 3
EDU 397R - Methods:K-8 Social Studies 3
EDU 397 - Methods (K-8 Math Methods) 3
EDU 397 - Methods (K-8 Science Methods) 3
EDU 395 - Practicum (II) 3
EDU 438 - Ltrcy Asmnt, Diagnos and Instr 3
EDU 495 - Student Teaching 12

Total Credits 120

Note: A student must be admitted into the Teacher Education Program before enrolling in the Developing Instructional Materials K-8 Teaching Methods courses.

Recommended Program Sequence Elementary Education K-8

**Freshman Year**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>WRIT 101W - College Writing I</td>
<td>3</td>
</tr>
<tr>
<td>EDU 101US - Teaching and Learning</td>
<td>3</td>
</tr>
<tr>
<td>M 132 - Numbers &amp; Operations for K-8 Teachers</td>
<td>3</td>
</tr>
<tr>
<td>EDEC 160A - Early Child Dev.</td>
<td>3</td>
</tr>
<tr>
<td>Choose one of the following:</td>
<td>3</td>
</tr>
<tr>
<td>AMST 101D - Introduction to American Studies</td>
<td></td>
</tr>
<tr>
<td>ANTY 101D - Anthropology and the Human Experience</td>
<td></td>
</tr>
<tr>
<td>GPHY 121D - Human Geography</td>
<td></td>
</tr>
<tr>
<td>GPHY 141D - Geography of World Regions</td>
<td></td>
</tr>
<tr>
<td>SOCI 101IS - Introduction to Sociology</td>
<td></td>
</tr>
<tr>
<td>M 135Q - Geometry &amp; Measure K-8 Teachers</td>
<td>3</td>
</tr>
<tr>
<td>Elective</td>
<td>3</td>
</tr>
<tr>
<td>Total Year:</td>
<td>30</td>
</tr>
</tbody>
</table>

**Sophomore Year**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>HSTA 101IH - American History I</td>
<td>4</td>
</tr>
</tbody>
</table>

TE 250CS - Technology and Society 3
PHSX 201IN - Physics by Inquiry 3
or CHMY 102CS - Applying Chemistry to Society
or PHSX 103IN - The Physics of How Things Work
M 234 - Higher Math for K-8 Teachers 3
EDU 211D - Multicultural Education 3
EDU 331 - Lit and Literacy for Children 3
PSCI 210IS - Introduction to American Government 3
ERTH 101IN - Earth System Sciences 4
EDU 370 - Integrating Tech into Educ 2
Elective 3

Year Total: 31

**Junior Year**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>EDU 382 - Assessmt, Curric, Instructn</td>
<td>3</td>
</tr>
<tr>
<td>EDSP 306 - Exceptional Learners</td>
<td>3</td>
</tr>
<tr>
<td>EDU 330 - Emergent Literacy</td>
<td>3</td>
</tr>
<tr>
<td>Electives</td>
<td>6-8</td>
</tr>
<tr>
<td>EDU 397 - Methods (K-8 Creative Arts Methods)</td>
<td>3</td>
</tr>
<tr>
<td>EDU 397 - Methods (K-8 Science Methods)</td>
<td>3</td>
</tr>
<tr>
<td>EDU 395 - Practicum (I)</td>
<td>3</td>
</tr>
<tr>
<td>Year Total:</td>
<td>30-32</td>
</tr>
</tbody>
</table>

**Senior Year**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>EDU 397 - Methods (K-8 Math Methods)</td>
<td>3</td>
</tr>
<tr>
<td>EDU 397 - Methods (K-8 Social Studies Methods)</td>
<td>3</td>
</tr>
<tr>
<td>EDU 397 - Methods (K-8 Language Arts Methods)</td>
<td>3</td>
</tr>
<tr>
<td>EDU 395 - Practicum (II)</td>
<td>3</td>
</tr>
<tr>
<td>EDU 438 - Ltrcy Asmnt, Diagnos and Instr</td>
<td>3</td>
</tr>
<tr>
<td>EDU 495 Student Teaching K-8</td>
<td>12</td>
</tr>
<tr>
<td>Year Total:</td>
<td>27</td>
</tr>
</tbody>
</table>

Total Program Credits: 120

Certification in first aid and CPR required prior to student teaching semester.

A minimum of 120 credits is required for graduation; 42 of these credits must be in courses numbered 300 and above.

* See advisor to choose one course from STEM list (http://www.montana.edu/ehhd/educ/advising/forms/New%20Elementary%20Education%202012-2014.pdf)

**Early Childhood Education Option**

All early childhood education option students must meet the requirements of the Elementary Education K-8 curriculum, with these additions:

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>EDEC 160 - Early Childhood Development</td>
<td>3</td>
</tr>
<tr>
<td>EDEC 271 - Paraprofessional Experience in Early Childhood</td>
<td>2</td>
</tr>
<tr>
<td>EDEC 350 - Play and Learning in Early Childhood</td>
<td>3</td>
</tr>
<tr>
<td>EDEC 385 - Integrated Curriculum Early Childhood Education</td>
<td>4</td>
</tr>
<tr>
<td>EDSP 458 - Assessment and Intervention</td>
<td>4</td>
</tr>
</tbody>
</table>

Total Credits 16
Students choosing this option voluntarily select a program that requires additional coursework beyond the 120 credits required for a standard four-year degree.

**Mathematics Option**
All mathematics education option students must meet the requirements of the Elementary Education K-8 curriculum, with these additions:

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>EDU 497R</td>
<td>Methods: 5-8 Mathematics</td>
<td>3</td>
</tr>
<tr>
<td>STAT 216Q</td>
<td>Introduction to Statistics</td>
<td>3</td>
</tr>
<tr>
<td>M 420</td>
<td>Geometry, Measurement, and Data in the Middle Grades</td>
<td>3</td>
</tr>
<tr>
<td>or M 424</td>
<td>Algebraic Thinking and Number Sense in the Middle Grades</td>
<td></td>
</tr>
</tbody>
</table>

**Recommended Mathematics Elective (cannot double count in any credits)**

Choose two of the following:

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>M 149Q</td>
<td>Secrets of the Infinite</td>
</tr>
<tr>
<td>M 147Q</td>
<td>Language of Mathematics</td>
</tr>
<tr>
<td>M 151Q</td>
<td>Precalculus</td>
</tr>
<tr>
<td>M 161Q</td>
<td>Survey of Calculus</td>
</tr>
<tr>
<td>M 171Q</td>
<td>Calculus I</td>
</tr>
<tr>
<td>M 420</td>
<td>Geometry, Measurement, and Data in the Middle Grades</td>
</tr>
<tr>
<td>M 424</td>
<td>Algebraic Thinking and Number Sense in the Middle Grades</td>
</tr>
<tr>
<td>STAT 217Q</td>
<td>Intermediate Statistical Concepts</td>
</tr>
<tr>
<td>or another approved Mathematics course</td>
<td></td>
</tr>
</tbody>
</table>

Total Credits 15

Students choosing this option voluntarily select a program that requires additional coursework beyond the 120 credits required for a standard four-year degree.

**Science Education Option**
All science option students must meet the requirements of the Elementary Education K-8 curriculum, with these additions:(Note: Some of the listed courses may be taken in the regular Elementary Education K-8 curriculum, thus decreasing the number of credits required in this option.)

Choose one lab course and one additional course from the following:

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIBL 160</td>
<td>Principles of Living Systems</td>
</tr>
<tr>
<td>BIBL 103CS</td>
<td>Environmental Science and Society</td>
</tr>
<tr>
<td>BIBL 170IN</td>
<td>Principles of Biological Diversity</td>
</tr>
<tr>
<td>BIOM 101IN</td>
<td>Unseen Universe: Microbes</td>
</tr>
<tr>
<td>ERTH 101IN</td>
<td>Earth System Sciences</td>
</tr>
<tr>
<td>ERTH 212RN</td>
<td>Yellowstone: Scientific Lab</td>
</tr>
<tr>
<td>GEO 103CS</td>
<td>Intro to Envrtnl Geology</td>
</tr>
<tr>
<td>ASTR 110IN</td>
<td>Introduction to Astronomy: Mysteries of the Sky</td>
</tr>
<tr>
<td>CHMY 121IN</td>
<td>Introduction of General Chemistry</td>
</tr>
<tr>
<td>CHMY 141</td>
<td>College Chemistry I</td>
</tr>
<tr>
<td>PHSX 103IN</td>
<td>The Physics of How Things Work</td>
</tr>
<tr>
<td>PHSX 201IN</td>
<td>Physics by Inquiry</td>
</tr>
</tbody>
</table>

Total Credits 7-8

Students choosing this option voluntarily select a program that requires additional coursework beyond the 120 credits required for a standard four-year degree.

**Secondary Education (Grades 5-12 and K-12)**

The Department of Education offers teacher education programs for students seeking teaching careers in specific subject areas for grades five through twelve. General Science Broadfield, Social Studies Broadfield, and Technology Education Broadfield are three degrees which are totally administered and housed within the Department of Education. Several other programs are administered inter-departmentally such as English, history, and health enhancement. Students in these programs will enroll in the departments offering the teaching options in their chosen areas (see below).

In addition to its secondary programs, the Department of Education provides foundation coursework which is valuable to teachers at all levels in such areas as history and philosophy of education, multicultural education, educational psychology, assessment, curriculum, instructional technology, and exceptionality.

Teaching minors, that is, preparation for a second teaching field in addition to the major field, are offered by many departments. All teaching minors must be linked to a teaching major. Graduate degree programs are available for secondary teachers who are already licensed (see The Graduate School (p. 280)).

All students in secondary education programs must apply for admission to the Teacher Education Program at the beginning of the semester prior to taking their methods course(s) in their major(s) and minor(s). Application to the Secondary Education program should be turned into the Education Advising Center, Reid Hall 132.

**Professional Requirements for Secondary Education (Grades 5-12 and K-12)**
Students in 5-12 and K-12 teaching majors are required to take courses in certain areas of professional education. A grade of "C-" or better is required in all professional education courses; a "C-" is not acceptable. See the Teacher Education Program (p. 131) website for entrance requirements.

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>FCS 101S</td>
<td>Indiv and Fam Dev: Lifespan</td>
</tr>
<tr>
<td>or EDEC 160</td>
<td>Early Childhood Development</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHSX 205</td>
<td>College Physics I</td>
</tr>
<tr>
<td>PHSX 207</td>
<td>College Physics II</td>
</tr>
</tbody>
</table>

Total Credits 23-28
### Teaching Options Available

#### Option 1: Major in Secondary Education
Students enroll/major in the Department of Education.

- General Science Broadfield
- Social Studies Broadfield
- Technology Education Broadfield

#### Option 2: Subject Area Majors with Teaching Options
Students enroll/major in the appropriate departments outside of the Department of Education. See the Teacher Education Program (p. 131) page for entrance requirements.

- Agricultural Education Broadfield
- Art Education K-12 Broadfield
- Biology
- Chemistry
- English
- Family and Consumer Sciences
- Health Enhancement Broadfield K-12
- History
- Mathematics
- Modern Languages K-12 (French, German, Spanish)
- Music (School Music K-12)
- Physics

#### Option 3: Teaching Minors

- Art K-12
- Biology
- Chemistry
- Earth Science
- Economics
- Family and Consumer Sciences
- Government
- History
- Mathematics
- Modern Languages (French, German, Spanish)
- Physics
- Reading K-12
- Technology Education

### General Science Broadfield Option
The General Science Broadfield program prepares students to be licensed to teach all middle and senior high school science areas in the state of Montana. See the Teacher Education Program (p. 131) page for entrance requirements.

#### Program Sequence

<table>
<thead>
<tr>
<th>Freshman Year</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>EDU 101US - Teaching and Learning</td>
<td>3</td>
</tr>
<tr>
<td>FCS 101IS - Indiv and Fam Dev: Lifespan</td>
<td>3</td>
</tr>
<tr>
<td>or EDEC 160 - Early Childhood Development</td>
<td></td>
</tr>
<tr>
<td>WRIT 101W - College Writing I</td>
<td>3</td>
</tr>
<tr>
<td>M 161Q - Survey of Calculus</td>
<td>4</td>
</tr>
<tr>
<td>or M 171Q - Calculus I</td>
<td></td>
</tr>
<tr>
<td>BIOB 170IN - Principles of Biological Diversity</td>
<td>4</td>
</tr>
<tr>
<td>EDU 223IS - Educ Psych and Adolescent Dev</td>
<td>3</td>
</tr>
<tr>
<td>or EDU 222IS - Educ Psych &amp; Child Development</td>
<td></td>
</tr>
<tr>
<td>Total Credits</td>
<td>41</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Sophomore Year</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>EDU 370 - Integrating Tech into Educ</td>
<td>2</td>
</tr>
<tr>
<td>EDU 382 - Assessm, Curric, Instructn</td>
<td>3</td>
</tr>
<tr>
<td>EDSP 306 - Exceptional Learners</td>
<td>3</td>
</tr>
<tr>
<td>EDU 4XX - Teaching methods in minor</td>
<td>3</td>
</tr>
<tr>
<td>EDU 4YY - Teaching methods in major</td>
<td>3</td>
</tr>
<tr>
<td>EDU 495 - Student Teaching (Or K-12)</td>
<td>12</td>
</tr>
<tr>
<td>EDU 408 - Professional Issues: K-12</td>
<td>2</td>
</tr>
<tr>
<td>Total Credits</td>
<td>41</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Junior Senior Years</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>EDU 202 - Early Field Experience</td>
<td>1</td>
</tr>
<tr>
<td>EDU 223IS - Educ Psych and Adolescent Dev</td>
<td>3</td>
</tr>
<tr>
<td>or EDU 222IS - Educ Psych &amp; Child Development</td>
<td></td>
</tr>
<tr>
<td>EDU 211D - Multicultural Education</td>
<td>3</td>
</tr>
<tr>
<td>EDU 395 - Practicum (5-12 Or K-12)</td>
<td>3</td>
</tr>
<tr>
<td>EDU 495 - Student Teaching (Or K-12)</td>
<td>12</td>
</tr>
<tr>
<td>EDU 408 - Professional Issues: K-12</td>
<td>2</td>
</tr>
<tr>
<td>Total Credits</td>
<td>41</td>
</tr>
</tbody>
</table>
EDU 202 - Early Field Experience 1
CHMY 141 - College Chemistry I 4
PHSX 205 - College Physics I 4
Elective 3
Year Total: 32

<table>
<thead>
<tr>
<th>Sophomore Year</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>EDU 370 - Integrating Tech into Edu</td>
<td>2</td>
</tr>
<tr>
<td>CHMY 143 - College Chemistry II</td>
<td>4</td>
</tr>
<tr>
<td>IA/RA CORE</td>
<td>3</td>
</tr>
<tr>
<td>BIOB 160 - Principles of Living Systems</td>
<td>4</td>
</tr>
<tr>
<td>EDU 211D - Multicultural Education</td>
<td>3</td>
</tr>
<tr>
<td>PHSX 207 - College Physics II</td>
<td>4</td>
</tr>
<tr>
<td>ERTH 101IN - Earth System Sciences</td>
<td>4</td>
</tr>
<tr>
<td>BIOO 412 - Animal Physiology</td>
<td>3</td>
</tr>
<tr>
<td>or BIOO 433 - Plant Physiology</td>
<td></td>
</tr>
<tr>
<td>BIOE 370 - General Ecology (equiv to 270)</td>
<td>3</td>
</tr>
<tr>
<td>Elective</td>
<td>3</td>
</tr>
<tr>
<td>Year Total:</td>
<td>33</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Junior Year</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>EDU 380 - Assessmt, Curric, Instructn</td>
<td>3</td>
</tr>
<tr>
<td>BIOB 375 - General Genetics</td>
<td>3</td>
</tr>
<tr>
<td>CHMY 211 - Elements of Organic Chemistry</td>
<td>5</td>
</tr>
<tr>
<td>Electives</td>
<td>0-2</td>
</tr>
<tr>
<td>Earth Science Elective</td>
<td>4</td>
</tr>
<tr>
<td>BIOM 103IN - Unseen Universe: Microbes</td>
<td>3-5</td>
</tr>
<tr>
<td>or BIOM 360 - General Microbiology</td>
<td></td>
</tr>
<tr>
<td>IH Core (optional HSTR 101IH)</td>
<td>3</td>
</tr>
<tr>
<td>ERTH 303 - Weather and Climate</td>
<td>3</td>
</tr>
<tr>
<td>or GEO 211 - Earth History and Evolution</td>
<td></td>
</tr>
<tr>
<td>BIOB 420 - Evolution</td>
<td>3</td>
</tr>
<tr>
<td>EDSP 306 - Exceptional Learners</td>
<td>3</td>
</tr>
<tr>
<td>Year Total:</td>
<td>30-34</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Senior Year</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASTR 371 - Solar System Astronomy</td>
<td>4</td>
</tr>
<tr>
<td>HSTR 417 - Early Modern Science</td>
<td>3</td>
</tr>
<tr>
<td>or RLST 217H - Religion, Sci &amp; Environment</td>
<td></td>
</tr>
<tr>
<td>or HSTR 419 - Modern Science</td>
<td></td>
</tr>
<tr>
<td>Elective</td>
<td>3</td>
</tr>
<tr>
<td>EDU 494 - Seminar: Lab Safety</td>
<td>1</td>
</tr>
<tr>
<td>EDU 497 - Methods (5-12 Science)</td>
<td>3</td>
</tr>
<tr>
<td>EDU 395 - Practicum (5-12)</td>
<td>3</td>
</tr>
<tr>
<td><del>Student Teaching Semester</del></td>
<td></td>
</tr>
<tr>
<td>EDU 495 - Student Teaching</td>
<td>12</td>
</tr>
<tr>
<td>EDU 408 - Professional Issues: K-12</td>
<td>2</td>
</tr>
<tr>
<td>Year Total:</td>
<td>31</td>
</tr>
<tr>
<td>Total Program Credits:</td>
<td>128</td>
</tr>
</tbody>
</table>

A minimum of 128 credits is required for graduation; 42 of these credits must be in courses numbered 300 and above.

**Social Studies Broadfield Option**

The Social Studies Broadfield program prepares students to be licensed to teach all middle and high school social science areas in the state of Montana. See the Teacher Education Program (p. 131) page for entrance requirements.
EDU 408 - Professional Issues: K-12          2  
Year Total:                                30  
Total Program Credits:                    128  

A minimum of 128 credits is required for graduation; 42 of these credits must be in courses numbered 300 and above.

* Upper-division HIST electives: 
  15 -21 credits total: 
    • at least 6 credits in U.S. history 
    • at least 6 credits in non-Western history, e.g. Asian history 
    • at least 6 credits in European history 
    • at least 6 credits in history of race, class and gender 

Please Note: a course may satisfy more than one upper-division requirements, e.g. HSTA 408 Gender in America will satisfy both the U.S. history and race, class, and gender requirements.

** Upper-division PSCI electives: 
  12 - 18 credits total: 
    • at least 6 credits in U.S. politics (national, state or local) 
    • at least 6 credits in global/international politics 

Teacher Education Program
Montana State University is one of the units in the Montana University System charged with the responsibility of recommending teacher candidates for teacher licensure. In discharging this responsibility, the College of Education, Health and Human Development attempts to encourage, prepare, and recommend for licensure only those students who show promise of teaching excellence. Consequently, certain criteria have been established for admission to the Teacher Education Program, and screening procedures have been provided at several points in the program. 

The Teacher Education Program endeavors to select applicants who have the ability to become highly competent teachers. As an accredited teacher education program, the curriculum in teacher education adheres to the standards of the Montana Professional Educator Preparation Program Standards outlined by the Montana Office of Public Instruction (OPI) and the Teacher Education Accreditation Council/Council for the Accreditation of Educator Preparation (TEAC/CAEP). Within these guidelines, the Teacher Education faculty have the freedom and ultimate responsibility for the selection and evaluation of its students; the design, implementation, and evaluation of its curriculum; and the determination of who should be recommended for a degree and state licensure. Admission and retention decisions are based not only on prior satisfactory academic achievement, but also on a range of factors which serve to ensure that the teacher candidate can demonstrate the Professional Expectations required in the Teacher Education Program.

The program does not discriminate on the basis of race, color, creed, religion, national origin, gender, sexual orientation, age, marital status, or disability. When requested, the University will provide reasonable accommodations to otherwise qualified students with disabilities.

Admission to the Teacher Education Program
Admission to the Teacher Education Program requires completion of the "Application for Admission." These forms are available at www.montana.edu/ehhd/educadvising/index.shtml and must be turned into the Education Advising Center, Reid Hall 132. Students should apply to the Teacher Education Program during the semester prior to taking their methods/practicum coursework.

For Elementary Education majors, the requirements for admission to the Teacher Education Program are:

1. a cumulative grade-point average of at least 2.75

For Secondary Education majors, the requirements for admission to the Teacher Education Program are:

1. a cumulative grade-point average of at least 2.75
2. a 2.75 grade-point average in the teaching major, minor and option with no grade below a "C" in any of these areas
3. a current background check completed as outlined by Sec. 20-4-110 of the MCA

For Secondary Education majors, the requirements for admission to the Teacher Education Program are:

1. a cumulative grade-point average of at least 2.75
2. a 2.75 grade-point average in the teaching major and minor, with no grade below a "C" in any of these areas
3. a current background check completed as outlined by Sec. 20-4-110 of the MCA

Application and Approval for Student Teaching
Certain requirements must be met by all students desiring to student teach:

1. maintenance of the same standards required for admission into the program including satisfactory clearance on a federal criminal background check
2. completion of all required courses (meeting academic requirements as listed above) prior to student teaching
3. certification in first aid with CPR

Student teaching is limited to seniors. A completed application must be submitted to the Office of Field Placement and Licensure before any placement is made.

If special services or accommodations (for a disability) are needed or required while student teaching, requests must be submitted to the Office of Field Placement and Licensure before any placement is made.

Recommendation and Approval for Licensure
The requirements for recommendation by Montana State University for licensure include:

• completion of all courses in the Teacher Education Program as outlined in the individual’s approved plan
• maintenance of the same standards as are required for student teaching
• attaining a passing score on the Praxis II exam in every teaching major and minor
• completion of the licensure application (http://www.montana.edu/fieldplacement/pages/licensure_application.shtml)

Residency Requirements for Professional Education Courses
In order to recommend prospective teachers in elementary and/or secondary education for Montana teacher licensure, students must enroll in most methods, teaching practicum(s), and student teaching through the MSU-Bozeman campus.

Based on MSU graduation requirements, twenty-three of the last thirty credits earned to meet the graduation requirement (p. 54) must be MSU credits. Specific majors may have program-specific requirements for courses that must be taken from MSU to meet graduation requirements. Such requirements are clearly identified in the curriculum description for that department.

Second Degree and Non-degree Licensure
Students already holding valid Bachelor’s degrees may fulfill licensure requirements by completing a second undergraduate degree, or in some cases, a non-degree program. Students completing a second degree are required to complete 30 credits, nine of which must be 300-400 level. Students should contact the Office of Field Placement and Licensure for further information. Non-degree and second-degree students must meet the
same standards for program entrance and student teaching as first-degree students.

**Professional Expectations For Prospective Teachers**

The Professional Expectations for prospective teachers required by the Department of Education at Montana State University include communication competencies, intellectual (conceptual, integrative, and quantitative) abilities for problem solving and effective teaching, and professional, behavioral, and social competencies relevant to the performance of a professional educator.

Communication competencies are demonstrated by behaviors such as:

- Using appropriate grammar (syntax, inflection, and word choice) in oral communication
- Speaking distinctly and with confidence
- Communicating with sensitivity to the situation and circumstances of professors, students, peers, and colleagues
- Using correct spelling, standard English language mechanics, and meaningful word choice in written expression

Intellectual competencies are demonstrated by behaviors such as:

- Ability to master relevant content in subjects commonly taught in K-12 schools
- Ability to master pedagogical principles and their application in field settings at a level deemed appropriate by the faculty
- Ability to comprehend, memorize, analyze, and synthesize material
- Ability to develop reasoning and decision-making skills appropriate to the practice of teaching

Professional, behavioral, and social competencies are demonstrated by behaviors such as:

- Completing assignments and meeting responsibilities on time
- Participating fully in class and field settings
- Seeking assistance from instructors and supervisors when appropriate
- Developing positive relationships with peers and education professionals
- Working effectively in groups, actively listening to other viewpoints, and treating individuals with respect
- Perceiving a wide range of interpersonal cues from others and responding appropriately
- Displaying openness to new ideas and constructive criticism and using that criticism to improve performance
- Recognizing one’s own strengths and weaknesses and taking personal responsibility to respond appropriately
- Displaying professional appearance, poise, flexibility, and a positive attitude
- Prioritizing responsibilities
- Taking initiative
- Using good judgment, tact, and discretion

**Teaching Minors**

- Art K-12 (p. 132)
- Biology (p. 132)
- Chemistry (p. 133)
- Earth Science (p. 133)
- Economics (p. 133)
- Family and Consumer Sciences (p. 133)
- French K-12 (p. 133)
- German K-12 (p. 134)
- Government (p. 134)
- History (p. 134)
- Mathematics (p. 134)
- Physics (p. 134)
- Reading K-12 (p. 134)
- Spanish K-12 (p. 135)
- Technology Education (p. 135)

**Art K-12 Minor**

A student must receive a grade of C or better in all the courses required for this minor and have a GPA of 2.75 or higher.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ARTZ 109RA</td>
<td>Visual Language: Comprehensive Foundation</td>
<td>4</td>
</tr>
<tr>
<td>(formerly ARTZ 106RA)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ARTZ 110RA</td>
<td>Visual Language: Ideation and Creativity</td>
<td>4</td>
</tr>
<tr>
<td>(formerly ARTZ 108RA)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ARTZ 105RA</td>
<td>Visual Language - Drawing</td>
<td>3</td>
</tr>
<tr>
<td>ARTH 200IA</td>
<td>Art of World Civilization I</td>
<td>4</td>
</tr>
<tr>
<td>ARTH 201IA</td>
<td>Art of World Civilization II</td>
<td>4</td>
</tr>
<tr>
<td>Choose one of the following:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ARTZ 211RA</td>
<td>Drawing I</td>
<td>4</td>
</tr>
<tr>
<td>ARTZ 221</td>
<td>Painting I</td>
<td></td>
</tr>
<tr>
<td>ARTZ 231RA</td>
<td>Ceramics I</td>
<td></td>
</tr>
<tr>
<td>ARTZ 251</td>
<td>Sculpture I</td>
<td></td>
</tr>
<tr>
<td>ARTZ 261</td>
<td>Metals I</td>
<td></td>
</tr>
<tr>
<td>ARTZ 271</td>
<td>Printmaking I</td>
<td></td>
</tr>
<tr>
<td>Choose one of the following:</td>
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<td>5</td>
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<tr>
<td>ARTZ 312</td>
<td>Intermediate Drawing</td>
<td></td>
</tr>
<tr>
<td>ARTZ 322</td>
<td>Intermediate Painting</td>
<td></td>
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<tr>
<td>ARTZ 332</td>
<td>Intermediate Ceramics</td>
<td></td>
</tr>
<tr>
<td>ARTZ 352</td>
<td>Intermediate Sculpture</td>
<td></td>
</tr>
<tr>
<td>ARTZ 373</td>
<td>Intermediate Printmaking - Lithography</td>
<td></td>
</tr>
<tr>
<td>ARTZ 374</td>
<td>Intermediate Printmaking - Serigraphy</td>
<td></td>
</tr>
<tr>
<td>ARTZ 375</td>
<td>Intermediate Printmaking - Intaglio</td>
<td></td>
</tr>
<tr>
<td>ARTZ 376</td>
<td>Intermediate Printmaking - Relief</td>
<td></td>
</tr>
<tr>
<td>ARTZ 379</td>
<td>Alternative Print Media</td>
<td></td>
</tr>
<tr>
<td>EDU 397</td>
<td>Methods (K-5 Art)</td>
<td>3</td>
</tr>
<tr>
<td>EDU 497</td>
<td>Methods (5-12 Art)</td>
<td>3</td>
</tr>
<tr>
<td>Total Credits</td>
<td></td>
<td>34</td>
</tr>
</tbody>
</table>

**Biology Minor**

A student must receive a grade of C or better in all the courses required for this minor and have a GPA of 2.75 or higher.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOB 160</td>
<td>Principles of Living Systems</td>
<td>4</td>
</tr>
<tr>
<td>BIOB 170IN</td>
<td>Principles of Biological Diversity</td>
<td>4</td>
</tr>
<tr>
<td>BIOE 370</td>
<td>General Ecology (equiv to 270)</td>
<td>3</td>
</tr>
<tr>
<td>BIOB 420</td>
<td>Evolution</td>
<td>3</td>
</tr>
<tr>
<td>Choose one of the following:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BIOB 377</td>
<td>Practical Genetics</td>
<td></td>
</tr>
<tr>
<td>BIOB 375</td>
<td>General Genetics</td>
<td></td>
</tr>
<tr>
<td>Choose one of the following:</td>
<td></td>
<td>2</td>
</tr>
</tbody>
</table>
Choose one of the following: 3-5
BIOM 103IN Unseen Universe: Microbes
BIOM 360 General Microbiology

Choose one of the following: 3
BIOO 433 Plant Physiology
BIOO 412 Animal Physiology

Biology Electives (except BIOB 100IN) 3
EDU 497 Methods (5-12 Science) 3

Total Credits 31-33

Chemistry Minor

A student must receive a grade of C or better in all the courses required for this minor and have a GPA of 2.75 or higher.

BCH 380 Biochemistry 5
CHMY 141 College Chemistry I 4
CHMY 143 College Chemistry II 4
CHMY 211 Elements of Organic Chemistry 5
CHMY 361 Elements of Physical Chemistry 4
CHMY 362 Elements of Physical Chemistry Lab 1

Choose one of the following: 3
CHMY 311 Fundamental Analytical Chem
CHMY 401 Advanced Inorganic Chemistry
EDU 497 Methods (5-12 Science) 3

Total Credits 29

Earth Science Minor

A student must receive a grade of C or better in all the courses required for this minor and have a GPA of 2.75 or higher.

ERTH 101IN Earth System Sciences 4
ERTH 102CS Topics in Earth Sciences (Must take a minimum of 3 credits of ERTH 102CS) 1
ERTH 307 Principles of Geomorphology 4
ERTH 303 Weather and Climate 3
GEO 302 Mineralogy and Optical Mineral 4
GEO 211 Earth History and Evolution 3

Choose one of the following: 3
GEO 312 Dinosaur Paleontology
GEO 310 Invertebrate Paleontology
EDU 497 Methods (5-12 Science) 3

Total Credits 27

Students who are required to take more than 8 credits listed above in their major must take additional elective physical science courses in the Earth Sciences, Geography, or Geology rubric with the advice and consent of their minor advisor in Earth Sciences.

Economics Minor

A student must receive a grade of C or better in all the courses required for this minor and have a GPA of 2.75 or higher.

ECNS 101IS Economic Way of Thinking 3
ECNS 202 Principles of Macroeconomics 3

ECNS 204IS Microeconomics 3
ECNS 301 Intermediate Micro with Calc 3
ECNS 311 Intermediate Microeconomics with Economics Education Applications 3
ECNS 313 Money and Banking 3
One additional ECNS course at the 300 or 400 levels (no seminars, 492’s, or 490’s) 3
Approved Math course 3-4
EDU 497 Methods (5-12 Social Studies) 3

Total Credits 27-28

* NOTE: ECNS 251IS (Honors Economics, 4 credits) may be substituted for the three-course sequence: ECNS 101IS, ECNS 202, and ECNS 204IS.

Family Consumer Sciences Minor

A student must receive a grade of C or better in all the courses required for this minor and have a GPA of 2.75 or higher.

Choose one of the following two options: 3-6
FCS 101IS Indiv and Fam Dev: Lifespan
EDEC 160 Early Childhood Development & FCS 261 & Adult Development and Aging
EDU 497 Methods (5-12 Family & Cons Sci) 3
FCS 138 Survey of Family Finance and Consumer Issues 3

FCS 263 Relationships and Fam Systems 3
FCS 219 Apparel Construction 3
FCS 337 Personal and Family Finance I 3
FCS 450 Curric Dev in FCS Education 3
NUTR 221CS Basic Human Nutrition 3
FCS 218 Design, Fashion, and Textiles 3
NUTR 226 Food Fundamentals 3
NUTR 227 Food Fundamentals Lab 2

Total Credits 32-35

French K-12 Minor

A student must receive a grade of C or better in all the courses required for this minor and have a GPA of 2.75 or higher.

Freshman Year Credits
FRCH 101 - Elementary French I 3
FRCH 102D - Elementary French II 3
Year Total: 6

Sophomore Year Credits
FRCH 201D - Intermediate French I 3
FRCH 202D - Intermediate French II 3
EDU 496 - Methods: K-12 Modern Languages 4
Year Total: 10

Junior and Senior Year Credits
Take 12 additional upper division FRCH credits. 12
Year Total: 12

Total Program Credits: 28
German K-12 Minor

A student must receive a grade of C or better in all the courses required for this minor and have a GPA of 2.75 or higher.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>GRMN 101</td>
<td>Elementary German I</td>
<td>3</td>
</tr>
<tr>
<td>GRMN 102D</td>
<td>Elementary German II</td>
<td>3</td>
</tr>
<tr>
<td>GRMN 201D</td>
<td>Intermediate German I</td>
<td>3</td>
</tr>
<tr>
<td>GRMN 202D</td>
<td>Intermediate German II</td>
<td>3</td>
</tr>
<tr>
<td>GRMN 301</td>
<td>Oral and Written Expression I</td>
<td>3</td>
</tr>
<tr>
<td>GRMN 302</td>
<td>Oral and Written Expression II</td>
<td>3</td>
</tr>
<tr>
<td>EDU 496</td>
<td>Methods: K-12 Modern Languages</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Take 6 additional upper division GRMN credits (2 courses). At least one of these courses must be taught in German. ML100 may count toward the upper division course requirement.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total Credits</td>
<td>28</td>
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</table>

Government Minor

A student must receive a grade of C or better in all the courses required for this minor and have a GPA of 2.75 or higher.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>PSCI 210S</td>
<td>Introduction to American Government</td>
<td>3</td>
</tr>
<tr>
<td>PSCI 230D</td>
<td>Introduction to International Relations</td>
<td>3</td>
</tr>
<tr>
<td>PSCI 214S</td>
<td>Principles of Political Science</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Choose two of the following (American Institution or Advisor approved courses):</td>
<td></td>
</tr>
<tr>
<td>PSCI 346</td>
<td>American Presidency</td>
<td>3</td>
</tr>
<tr>
<td>PSCI 306</td>
<td>Legislative Process</td>
<td>3</td>
</tr>
<tr>
<td>PSCI 341</td>
<td>Political Parties and Elections</td>
<td>3</td>
</tr>
<tr>
<td>PSCI 471</td>
<td>American Constitutional Law</td>
<td>3</td>
</tr>
<tr>
<td>PSCI 302</td>
<td>Media &amp; Politics</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Choose two of the following (Political Processes and International/Political Theory or Advisor approved course):</td>
<td></td>
</tr>
<tr>
<td>PSCI 436</td>
<td>Politics of Food &amp; Hunger</td>
<td>3</td>
</tr>
<tr>
<td>PSCI 356</td>
<td>Classical Political Thought</td>
<td>3</td>
</tr>
<tr>
<td>PSCI 439</td>
<td>International Human Rights</td>
<td>3</td>
</tr>
<tr>
<td>PSCI 354</td>
<td>Contemporary Issues in Political Theory</td>
<td>3</td>
</tr>
<tr>
<td>EDU 497</td>
<td>Methods (5-12 Social Studies)</td>
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<td>Total Credits</td>
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History Minor

A student must receive a grade of C or better in all the courses required for this minor and have a GPA of 2.75 or higher.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
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<tbody>
<tr>
<td>HSTR 101IH</td>
<td>Western Civilization I</td>
<td>4</td>
</tr>
<tr>
<td>HSTR 102IH</td>
<td>Western Civilization II</td>
<td>4</td>
</tr>
<tr>
<td>HSTA 101IH</td>
<td>American History I</td>
<td>4</td>
</tr>
<tr>
<td>HSTA 102IH</td>
<td>American History II</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Choose one of the following:</td>
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</tr>
<tr>
<td>HSTR 130D</td>
<td>Latin American History</td>
<td>4</td>
</tr>
<tr>
<td>HSTR 135D</td>
<td>The Modern Middle East</td>
<td>3</td>
</tr>
<tr>
<td>HSTR 140D</td>
<td>Modern Asia</td>
<td>3</td>
</tr>
<tr>
<td>HSTR 145D</td>
<td>Reinventing Japan</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Upper Division History Elective</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Upper Division History Elective</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Upper Division History Elective</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Total Credits</td>
<td>22</td>
</tr>
</tbody>
</table>

Mathematics Minor

A student must receive a grade of C or better in all the courses required for this minor and have a GPA of 2.75 or higher.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>M 171Q</td>
<td>Calculus I</td>
<td>4</td>
</tr>
<tr>
<td>M 172Q</td>
<td>Calculus II</td>
<td>4</td>
</tr>
<tr>
<td>M 273Q</td>
<td>Multivariable Calculus</td>
<td>4</td>
</tr>
<tr>
<td>M 242</td>
<td>Methods of Proof</td>
<td>3</td>
</tr>
<tr>
<td>M 328</td>
<td>Higher Math for Sec Teachers</td>
<td>3</td>
</tr>
<tr>
<td>M 329</td>
<td>Modern Geometry</td>
<td>3</td>
</tr>
<tr>
<td>M 428</td>
<td>Mathematical Modeling for Teachers</td>
<td>3</td>
</tr>
<tr>
<td>STAT 332</td>
<td>Statistics for Scientists and Engineers</td>
<td>3</td>
</tr>
<tr>
<td>EDU 497</td>
<td>Methods (9-12 Mathematics)</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Total Credits</td>
<td>32</td>
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</table>

Physics Minor

A student must receive a grade of C or better in all the courses required for this minor and have a GPA of 2.75 or higher.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>PHSX 220</td>
<td>Physics I (w/ calculus)</td>
<td>4</td>
</tr>
<tr>
<td>PHSX 240</td>
<td>Honors Gen &amp; Mod Phys I</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Choose one of the following:</td>
<td></td>
</tr>
<tr>
<td>PHSX 222</td>
<td>Physics II (w/ calculus)</td>
<td>4</td>
</tr>
<tr>
<td>PHSX 242</td>
<td>Honors Gen &amp; Mod Phys II</td>
<td>4</td>
</tr>
<tr>
<td>PHSX 224</td>
<td>Physics III</td>
<td>4</td>
</tr>
<tr>
<td>PHSX 301</td>
<td>Intro Theoretical Physics</td>
<td>3</td>
</tr>
<tr>
<td>PHSX 261</td>
<td>Laboratory Electronics I</td>
<td>2</td>
</tr>
<tr>
<td>PHSX 262</td>
<td>Laboratory Electronics II</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Choose one of the following:</td>
<td></td>
</tr>
<tr>
<td>PHSX 320</td>
<td>Classical Mechanics</td>
<td>3</td>
</tr>
<tr>
<td>PHSX 423</td>
<td>Electricity and Magnetism</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Physics elective (200 level or above)</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Approved elective in Biology, Chemistry, or Earth Science</td>
<td>3</td>
</tr>
<tr>
<td>EDU 497</td>
<td>Methods (5-12 Science)</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Total Credits</td>
<td>30</td>
</tr>
</tbody>
</table>

Reading K-12 Minor

A student must receive a grade of C or better in all the courses required for this minor and have a GPA of 2.75 or higher.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>EDU 331</td>
<td>Lit and Literacy for Children</td>
<td>3</td>
</tr>
<tr>
<td>EDU 330</td>
<td>Emergent Literacy</td>
<td>3</td>
</tr>
<tr>
<td>EDU 397</td>
<td>Methods (K-8 Language Arts)</td>
<td>3</td>
</tr>
<tr>
<td>EDU 432</td>
<td>Lit and Literacy for Yng Adlts</td>
<td>3</td>
</tr>
<tr>
<td>EDU 401</td>
<td>Intro Lit Leadership Ed</td>
<td>3</td>
</tr>
<tr>
<td>EDU 438</td>
<td>Ltrcy Asmnt, Diagnos and Instr</td>
<td>3</td>
</tr>
<tr>
<td>EDU 481</td>
<td>Literacy Across the Curriculum</td>
<td>2</td>
</tr>
<tr>
<td>EDU 498</td>
<td>Internship</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Total Credits</td>
<td>22</td>
</tr>
</tbody>
</table>
Spanish K-12 Minor
A student must receive a grade of C or better in all the courses required for this minor and have a GPA of 2.75 or higher.

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPNS 101</td>
<td>Elementary Spanish I</td>
<td>3</td>
</tr>
<tr>
<td>SPNS 102D</td>
<td>Elementary Spanish II</td>
<td>3</td>
</tr>
<tr>
<td>SPNS 201D</td>
<td>Intermediate Spanish I</td>
<td>3</td>
</tr>
<tr>
<td>SPNS 202D</td>
<td>Intermediate Spanish II</td>
<td>3</td>
</tr>
<tr>
<td>EDU 496</td>
<td>Methods: K-12 Modern Languages</td>
<td>4</td>
</tr>
<tr>
<td>Take 12 additional upper division SPNS credits (4 courses).</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td><strong>Total Credits</strong></td>
<td></td>
<td><strong>28</strong></td>
</tr>
</tbody>
</table>

Technology Education Minor
A student must receive a grade of C or better in all the minor’s required courses and a student must have a GPA of 2.75 or higher.

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>TE 207</td>
<td>Materials and Processes</td>
<td>4</td>
</tr>
<tr>
<td>AGED 333</td>
<td>Construction Technology</td>
<td>3</td>
</tr>
<tr>
<td>or ARCH 241</td>
<td>Building Construction I</td>
<td>2</td>
</tr>
<tr>
<td>TE 101</td>
<td>Intro to Technology Ed</td>
<td>1</td>
</tr>
<tr>
<td>TE 406</td>
<td>Curriculum &amp; Facilities Plan</td>
<td>3</td>
</tr>
<tr>
<td>DSN 114</td>
<td>Introduction to CAD</td>
<td>3</td>
</tr>
<tr>
<td>TE 330</td>
<td>Alternative Power/Energy Tech</td>
<td>3</td>
</tr>
<tr>
<td>TE 331</td>
<td>Electronic Communication Technology</td>
<td>3</td>
</tr>
<tr>
<td>TE 353</td>
<td>Teaching Practices</td>
<td>1</td>
</tr>
<tr>
<td>TE 417</td>
<td>Manufacturing Technology</td>
<td>3</td>
</tr>
<tr>
<td>EDU 497</td>
<td>Methods (5-12 Ag. &amp; Tech Ed.)</td>
<td>3</td>
</tr>
<tr>
<td><strong>Total Credits</strong></td>
<td></td>
<td><strong>28</strong></td>
</tr>
</tbody>
</table>

Technology Education
Technology Education is an integrated discipline designed to develop students’ technological literacy. Through the study of past, present, and future technological systems, and their resources, processes, and impacts on society, students will better understand the role of technology in society.

The Technology Education Program at MSU is for individuals wishing to teach technology at the middle or high school level or to work within an industry where a broad understanding of technological concepts is important.

Two technology education options are available to allow for diversity in personal interests and career aspirations. The Broadfield Teaching Option is designed for in-depth study of Technology Education. The Industrial Technology Option is tailored for those individuals who are pursuing a career in industry which requires a broad background in technology.

The Technology Education Program is sequenced into three phases to develop a progression of inter-related information. The foundation phase constitutes the introduction to technology. This introduction forms the base for future study and an understanding of basic technological concepts.

The synthesis phase begins the in-depth study of the primary technology education components of communication, construction, manufacturing, and power/energy. During this phase students in the teaching option are involved in professional education course work and students in the industrial technology option begin selecting course work which is tailored to meet specific career goals.

The capstone phase of the program is structured to integrate the information and experiences of the preceding phases through applied learning activities. Students in the teaching option student teach at the middle/high school level. Students in the non-teaching option intern in business and industry areas related to their career interests.

<table>
<thead>
<tr>
<th>Program Sequence</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Freshman Year</td>
<td></td>
</tr>
<tr>
<td>CHMY 121IN - Introduction to General Chemistry</td>
<td>4</td>
</tr>
<tr>
<td>COM 111US - Introduction to Public Speaking (formerly COM 110US)</td>
<td>3</td>
</tr>
<tr>
<td>or EDU 101US - Teaching and Learning</td>
<td></td>
</tr>
<tr>
<td>EDU 202 - Early Field Experience</td>
<td>1</td>
</tr>
<tr>
<td>WRIT 101W - College Writing I</td>
<td>3</td>
</tr>
<tr>
<td>FCS 101S - Indiv and Fam Dev: Lifespan</td>
<td>3</td>
</tr>
<tr>
<td>or EDEC 160 - Early Childhood through Adolescent Development</td>
<td>4</td>
</tr>
<tr>
<td><strong>Total Credits</strong></td>
<td><strong>28</strong></td>
</tr>
<tr>
<td>Sophomore Year</td>
<td></td>
</tr>
<tr>
<td>TE 207 - Materials and Processes</td>
<td>4</td>
</tr>
<tr>
<td>EDU 223IS - Educ Psych and Adolescent Dev</td>
<td>3</td>
</tr>
<tr>
<td>or EDU 222IS - Educ Psych &amp; Child Development</td>
<td></td>
</tr>
<tr>
<td>M 151Q - Precalculus</td>
<td>4</td>
</tr>
<tr>
<td>TE 250CS - Technology and Society</td>
<td>3</td>
</tr>
<tr>
<td>EDU 211D - Multicultural Education</td>
<td>3</td>
</tr>
<tr>
<td>PHSX 205 - College Physics I</td>
<td>4</td>
</tr>
<tr>
<td>University Core and Electives</td>
<td>9</td>
</tr>
<tr>
<td><strong>Year Total:</strong></td>
<td><strong>30</strong></td>
</tr>
<tr>
<td>Junior Year</td>
<td></td>
</tr>
<tr>
<td>AGED 333 - Construction Technology</td>
<td>3</td>
</tr>
<tr>
<td>or ARCH 241 - Building Construction I</td>
<td></td>
</tr>
<tr>
<td>TE 330 - Alternative Power/Energy Tech</td>
<td>3</td>
</tr>
<tr>
<td>EDU 382 - Assessmt, Curric, Instructr</td>
<td>3</td>
</tr>
<tr>
<td>TE 331 - Electronic Communication Technology</td>
<td>4</td>
</tr>
<tr>
<td>EDSP 306 - Exceptional Learners</td>
<td>3</td>
</tr>
<tr>
<td>TE 410 - Computer Aided and Industrial Machining and Manufacturing</td>
<td>4</td>
</tr>
<tr>
<td>University Core and Electives</td>
<td>10</td>
</tr>
<tr>
<td><strong>Year Total:</strong></td>
<td><strong>30</strong></td>
</tr>
<tr>
<td>Senior Year</td>
<td></td>
</tr>
<tr>
<td>TE 353 - Teaching Practices</td>
<td>1</td>
</tr>
<tr>
<td>TE 406 - Curriculum &amp; Facilities Plan</td>
<td>3</td>
</tr>
<tr>
<td>TE 417 - Manufacturing Technology</td>
<td>3</td>
</tr>
<tr>
<td>EDU 395 - Practicum (5-12)</td>
<td>3</td>
</tr>
<tr>
<td>EDU 497 - Methods (5-12 Ag &amp; Tech Ed)</td>
<td>3</td>
</tr>
<tr>
<td>University Core and Electives</td>
<td>3</td>
</tr>
<tr>
<td>- Student Teaching Semester</td>
<td></td>
</tr>
<tr>
<td>EDU 495 - Student Teaching</td>
<td>12</td>
</tr>
<tr>
<td>EDU 408 - Professional Issues: K-12</td>
<td>2</td>
</tr>
<tr>
<td><strong>Year Total:</strong></td>
<td><strong>30</strong></td>
</tr>
<tr>
<td><strong>Total Program Credits:</strong></td>
<td><strong>120</strong></td>
</tr>
</tbody>
</table>
A minimum of 120 credits is required for graduation; 42 of these credits must be in courses numbered 300 and above.

## Industrial Technology Option

### Freshman Year

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>M 151Q - Precalculus</td>
<td>4</td>
</tr>
<tr>
<td>COM 110US -</td>
<td>3</td>
</tr>
<tr>
<td>WRIT 101W - College Writing I</td>
<td>3</td>
</tr>
<tr>
<td>TE 101 - Intro to Technology Ed</td>
<td>1</td>
</tr>
<tr>
<td>EEE 101 - Intro Electrical Fundamentals</td>
<td>3</td>
</tr>
<tr>
<td>DDSN 114 - Introduction to CAD</td>
<td>3</td>
</tr>
<tr>
<td>University Core and Electives</td>
<td>13</td>
</tr>
<tr>
<td><strong>Year Total:</strong></td>
<td><strong>30</strong></td>
</tr>
</tbody>
</table>

### Sophomore Year

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHMY 121IN - Introduction to General Chemistry</td>
<td>4</td>
</tr>
<tr>
<td>EGEN 105 - Intro to General Engineering</td>
<td>2</td>
</tr>
<tr>
<td>EGEN 125CS - Tech, Innovation, and Society</td>
<td>3</td>
</tr>
<tr>
<td>TE 207 - Materials and Processes</td>
<td>4</td>
</tr>
<tr>
<td>M 165Q - Calculus for Technology I</td>
<td>3</td>
</tr>
<tr>
<td>or STAT 216Q - Introduction to Statistics</td>
<td></td>
</tr>
<tr>
<td>TE 250CS - Technology and Society</td>
<td>3</td>
</tr>
<tr>
<td>University Core and Electives</td>
<td>11</td>
</tr>
<tr>
<td><strong>Year Total:</strong></td>
<td><strong>30</strong></td>
</tr>
</tbody>
</table>

### Junior Year

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>AGED 333 - Construction Technology</td>
<td>3</td>
</tr>
<tr>
<td>or ARCH 241 - Building Construction I</td>
<td></td>
</tr>
<tr>
<td>PHSX 205 - College Physics I</td>
<td>4</td>
</tr>
<tr>
<td>TE 330 - Alternative Power/Energy Tech</td>
<td>3</td>
</tr>
<tr>
<td>TE 331 - Electronic Communication Technology</td>
<td>4</td>
</tr>
<tr>
<td>TE 410 - Computer Aided and Industrial Machining and Manufacturing</td>
<td>4</td>
</tr>
<tr>
<td>University Core and Electives</td>
<td>12</td>
</tr>
<tr>
<td><strong>Year Total:</strong></td>
<td><strong>30</strong></td>
</tr>
</tbody>
</table>

### Senior Year

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>EGEN 310R - Multidisciplinary Engineering Design</td>
<td>3</td>
</tr>
<tr>
<td>TE 417 - Manufacturing Technology</td>
<td>3</td>
</tr>
<tr>
<td>TE 498 - Internship</td>
<td>2-12</td>
</tr>
<tr>
<td>University Core and Electives</td>
<td>12</td>
</tr>
<tr>
<td><strong>Year Total:</strong></td>
<td><strong>20-30</strong></td>
</tr>
<tr>
<td><strong>Total Program Credits:</strong></td>
<td><strong>120</strong></td>
</tr>
</tbody>
</table>

A minimum of 120 credits is required for graduation; 42 of these credits must be in courses numbered 300 and above.

## Health and Human Development

The Department of Health and Human Development (http://www.montana.edu/hhd) prepares students for careers that are dedicated to the enrichment of human well-being. Consequently, rewarding career opportunities are available to graduates within education and human service professions in private and public settings. Specific areas of study include community health, dietetics or nutrition science, early childhood education and child services, exercise science or kinesiology, and human development and family science. Students interested in teaching can pursue programs in family and consumer sciences 5-12 and health enhancement K-12 (health and physical education).

Health and Human Development offers master's degrees with options in counseling, including marriage and family counseling, mental health counseling, and school counseling; exercise and nutrition sciences, including exercise physiology and nutrition and sport and coaching sciences; family and consumer sciences, including early childhood education/child development and family science; family financial planning; and food, family and community health including community health and sustainable food systems. See the graduate catalog (p. 280) for additional information on graduate Health and Human Development programs (p. 327).

In addition to the career options, the department also offers recreational activity courses with an academic component for university credit. Physical activity courses under the ACT designated rubric are offered as an educational opportunity and as a service to the general student population. User fees vary depending on the activity. Each student enrolling in an activity course will be asked to sign an activity course waiver and release form.

### Mission Statement

The Department of Health and Human Development (http://www.montana.edu/hhd) strives to enrich human well-being through teaching, research, and outreach.

### Academic Advisors

The Health and Human Development academic advising office (http://www.montana.edu/hhd/advising), staffed with academic advisors to serve the needs of undergraduate students, is located in 121 Marga Hosaeus Fitness Center. Students are expected to meet with an advisor each semester to discuss their plan of study, academic progress, and course registration.

In addition, students are encouraged to meet with an academic advisor to discuss issues and questions regarding professional programs, career opportunities, and academic concerns. Academic advisors can assist students to appropriate referrals when necessary.

To receive advising or to inquire about programs in the Department of Health and Human Development (http://www.montana.edu/hhd), contact the Health and Human Development Advising Center by phone at (406) 994-4001, or by e-mail at hhadvising@montana.edu.

### Degrees and Options

The department offers six Bachelor of Science degrees. They include a B.S. in Community Health; a B.S. in Early Childhood Education and Child Services; a B.S. in Family and Consumer Sciences with options in Teaching (5-12) or Non-Teaching (Human Development and Family Science); a B.S. in Food and Nutrition with options in Dietetics or Nutrition Science; a B.S. in Health Enhancement K-12 (health and physical education teaching); and a B.S. in Health and Human Performance with options in Exercise Science or Kinesiology. For students who wish to pursue an interdisciplinary B.S. in Sustainable Food and Bioenergy Systems, the department offers an option in Sustainable Food Systems.

The department offers a Master of Science in Health and Human Development with options in Counseling (including marriage and family counseling and mental health counseling); Exercise and Nutrition Sciences (including exercise physiology and nutrition and sport and coaching sciences); Family and Consumer Sciences (including early childhood education/child development and family science); Family Financial Planning; and Food, Family and Community Health (including family and community health and sustainable food systems). The department offers a Master of Education in School Counseling.

### Minor Fields of Study

Minors provide a concentration of courses outside the student’s major and are intended to complement major course work. The minor is posted on the student’s transcript. Non-teaching minors are available in Coaching,
Human Development, and Personal and Family Finance. A teaching minor is available in Family and Consumer Sciences 5-12. For additional information on minor fields of study and requirements, please see the minors (p. 70) section of this catalog.

Certificates
Two certificate programs are offered through the department. An online graduate certificate in Addictions Counseling is offered as well as an online undergraduate certificate in Gerontology.

Degree Requirements
Bachelor of Science degrees in Community Health, Early Childhood Education and Child Services, Family and Consumer Sciences (Non-Teaching Human Development and Family Science), Food and Nutrition, and Health and Human Performance shall be conferred upon the successful completion of specified requirements and a minimum of 120 credits. The Bachelor of Science degrees in the teaching options of Family and Consumer Sciences 5-12 and Health Enhancement K-12 (health and physical education) shall be conferred upon the successful completion of specified requirements and a minimum of 122 and 128 credits, respectively. All undergraduate students must complete a minimum of 42 upper division credits.

A Master of Science degree in Health and Human Development shall be conferred upon completion of specified requirements and a minimum of 30 credits for the options of Family and Consumer Sciences, Exercise and Nutrition Sciences, and Sustainable Food Systems. A minimum of 36 credits is required for the Family Financial Planning and Food, Family and Community Health Sciences programs. A minimum of 60 credits is required in the graduate Counseling programs. The Master of Education in School Counseling carries a minimum of 48 credits; see the graduate catalog for further information.

Certifications and Licensures
Certifications and licensures are dependent on the student’s eligibility to sit for certification and licensing examinations and on passing those examinations. Several fields of study in the Department of Health and Human Development prepare students to sit for certification and licensing examinations. Many, but not all, certifications and licensures are offered as post-baccalaureate opportunities. See an advisor for additional information.

The following certifications are related to Health and Human Development disciplines:

Accredited Family Financial Counselor
The Department of Health and Human Development offers a three-course series that can aid students in becoming credentialed as an Accredited Financial Counselor (https://www.afcpe.org/certification/curriculum/ accredited-financial-counselor (AFC). The AFC credential is offered nationally through the Institute for Personal Finance. The credential requires two tests, an internship, and a year of work experience in helping consumers and families with financial matters. The three-course series prepares students to take the two tests. The department then helps students find placement for an internship involving helping consumers and families with finances. The AFC credential allows students to credibly indicate their expertise in personal and family finance to potential employers.

Certified in Family and Consumer Sciences
Students completing the family and consumer sciences major will be eligible to sit for the Certification in Family and Consumer Sciences (CFCS) exam set by the American Association of Family and Consumer Sciences (http://www.aafcs.org). The CFCS credential communicates to others within and outside of the profession that the individual certified in family and consumer sciences possesses a broad professional knowledge base in the field.

Certified Family Life Educator
Students completing the family and consumer sciences major will be eligible to apply for the CFLE (http://www.ncfr.org/cfle-certification) granted by the National Council on Family Relations (http://www.ncfr.org). Interested community health students may also complete additional courses and apply for provisional certification. Certified Family Life Educators serve as consultants, directors, educators, and coordinators in settings such as social services, child care, health and welfare, recreation, youth programs, community action, drug/alcohol rehabilitation centers, senior citizen programs, parent education, family service agencies, extension, and retirement/convalescent care centers.

Certified Health Education Specialist
Completion of the community health major establishes eligibility to sit for the Certified Health Education Specialist (http://www.nchec.org) examination (CHES). The CHES exam measures the possession, application, and interpretation of knowledge essential to the practice of community health/health education. The CHES certification is a national standard for health education practice and assists employers in identifying qualified health education practitioners.

Certified Personal Trainer/Certified Strength Coach
The National Strength and Conditioning Association (http://www.nsca.com/Home) provides opportunities to become a certified personal trainer or a certified strength coach.

Coaching Certification
Faculty in Health and Human Development partner with the Montana High School Association (http://www.mhsa.org) in the development and implementation of a coaching certification program. Although MHSA awards the certification, successful completion of the coaching minor offered in the department will prepare the future coach for the profession.

Family and Consumer Sciences 5-12 Teacher
The family and consumer sciences teacher preparation program is designed for students who want to become teachers of family and consumer sciences in public or private schools. Upon completion of the degree, students are recommended for licensure through the State of Montana (http://www.opi.mt.gov) in teaching grades 5-12.

Health Enhancement K-12 (Health and Physical Education) Teacher
The health enhancement K-12 teacher preparation program is designed for students who want to become teachers of health enhancement (health and physical education) in public or private schools. Upon completion of the degree, students are recommended for licensure though the State of Montana (http://www.opi.mt.gov) in teaching grades K-12.

Health Fitness Instructor and Exercise Test Technologist
The American College of Sports Medicine (http://acsm.org), the premier organization for health/fitness professionals and clinicians, offers the Health/Fitness Instructor and Exercise Test Technologist certifications at sanctioned test locations throughout the Pacific Northwest. The certification exams include written and practical components that emphasize the application of knowledge and hands-on skills typically acquired in an undergraduate exercise science or kinesiology program.
Licensed Professional Counselor or Licensed Clinical Professional Counselor

Counseling programs in the graduate program in Health and Human Development lead to the opportunity to become licensed in Montana (http://bsd.dli.mt.gov/license/bsd_boards/swp_board/board_page.asp) as a Licensed Professional Counselor (LPC) or Licensed Clinical Professional Counselor (LCPC). Following completion of a master’s degree, the student must complete a minimum of 1500 hours of supervised counseling practice prior to sitting for and passing the LPC examination.

Registered Dietitian Nutritionist

Upon completion of all Didactic Program in Dietetics classes in the dietetics option of the food and nutrition major with a C or better, students are given a verification statement that allows them to apply to a national post-baccalaureate supervised professional experience or internship. Upon its completion, the student may sit for the RDN examination given by the Commission on Dietetic Registration (http://www.cdrnet.org), the credentialing agency for The Academy of Nutrition and Dietetics (http://www.eatright.org). The RDN status enables a person to become licensed in Montana as a Licensed Dietitian Nutritionist by the Board of Medical Examiners (http://bsd.dli.mt.gov/license/bsd_boards/med_board/board_page.asp).

Course Requirements and Curricula for Majors

The curriculum and specific course requirements for each major and minor within the Department of Health and Human Development are listed below.

Undergraduate Programs

- Community Health Major (p. 139)
- Early Childhood Education and Child Services Major (p. 140)
- Family and Consumer Sciences Major (p. 142)

Family and Consumer Sciences Major- Teaching Option

(p. 141)

Family and Consumer Sciences Major - Non-Teaching
(Human Development and Family Science) Option

(p. 140)

- Food and Nutrition Major (p. 142)
  Food and Nutrition Major - Dietetics Option (p. 142)
  Food and Nutrition Major - Nutrition Science Option

(p. 143)

- Health Enhancement K-12 (Health and Physical Education Teaching)
  Major (p. 144)
- Health and Human Performance Major with Options in Exercise
  Science or Kinesiology (p. 145)
- Sustainable Food Systems Option (p. 147)

Undergraduate Minors

- Coaching Minor (Non-Teaching) (p. 138)
- Human Development Minor (Non-Teaching) (p. 147)
- Personal and Consumer Finance (Non-Teaching) (p. 147)

Certificate Program

- Gerontology (p. 144)

Graduate Programs

M.S. in Health & Human Development with options in:

- Counseling (p. 328)

- Exercise and Nutrition Sciences (p. 330)
- Family & Consumer Sciences (p. 331)
- Family Financial Planning (http://eu.montana.edu/online/degrees/lfp)
- Food, Family and Community Health Sciences (p. 332)

M.Ed. in School Counseling (p. 328)

Certificate program in Addiction Counseling (p. 389)

Graduate programs in the Department of Health and Human Development lead to a Master of Science degree in Health and Human Development with options in counseling, exercise and nutrition sciences, family and consumer sciences, and food, family, and community health sciences. The Master of Education degree is given to those completing the school counseling degree.

Graduate programs are coordinated by a graduate coordinator for the counseling program or by a graduate coordinator in exercise and nutrition sciences, and food, family, and community health sciences. General descriptions of the graduate options are included. More detailed information regarding curricula and requirements may be obtained on the Department of Health and Human Development website at www.montana.edu/hhd.

A minimum of 30 credits is required for the Master of Science degree in exercise and nutrition sciences, family and consumer sciences, and food, family, and community health sciences. Both thesis and non-thesis plans are available. Because of professional licensure requirements, a minimum of 60 credits is required for the counseling programs. The school counseling program requires a minimum of 48 credits. Transfer credits may not exceed the limit of nine set by The Graduate School and must be assessed by the respective graduate coordinator before acceptance to the program.

Coaching Minor

This coaching minor is one of the few in the northern Rocky Mountain region and is specifically designed to prepare those interested in coaching any sport at any entry level. It was based upon the National Standards for Sport Coaches that was developed by professional coach educators from the National Association of Sport and Physical Education (NASPE) and other sport organizations and universities across the USA.

1. COA 205 Introduction to Coaching is the ‘keystone’ course for this major. All students should start here.
2. In most cases, there will be NO credits given for PRIOR coaching experience that has not resulted in a written evaluation from an athletic director, director of coaching, head coach or other sport administrator.
3. The sports-specific courses (theories of coaching football, basketball, soccer, track and field, volleyball, etc.) have COA 205 as their prerequisite. No student should attempt taking any of these classes without successful completion of COA 205.

Students must receive a “C” or better (with the exception of COA 395, which is P/F) for the following courses. Students receiving an “F” in COA 395 must repeat that course with the same supervisor.

Required Courses

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>COA 205</td>
<td>Introduction to Coaching</td>
<td>3</td>
</tr>
<tr>
<td>COA 395</td>
<td>Practicum-Coaching Application</td>
<td>1</td>
</tr>
<tr>
<td>COA 405</td>
<td>Advanced Concepts in Coaching</td>
<td>3</td>
</tr>
<tr>
<td>HTH 455</td>
<td>The Ethic of Care</td>
<td>3</td>
</tr>
<tr>
<td>KIN 221</td>
<td>Hlth Anatomy &amp; Physiology</td>
<td>3</td>
</tr>
<tr>
<td>KIN 440R</td>
<td>Sport Psychology</td>
<td>3</td>
</tr>
<tr>
<td>NUTR 221CS</td>
<td>Basic Human Nutrition</td>
<td>3</td>
</tr>
</tbody>
</table>
Choose one of the following:  
KIN 105  End of Exercise Science  
KIN 320  Exercise Physiology

Choose one of the following:  
CHTH 435  Human Response To Stress  
NUTR 411  Nutrition for Sports/Exercise  
KIN 410  Adv Strength Training and Cond

Electives** Choose three of the following:  
COA 256  Coaching Track and Field  
COA 316  Football Coaching Theory  
COA 317  Basketball Coaching Theory  
COA 318  Soccer Coaching Theory  
COA 319  Volleyball Coaching Theory

<table>
<thead>
<tr>
<th>Year Total:</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Credits</td>
<td>28-30</td>
</tr>
</tbody>
</table>

* Taken three times, three different semesters in either three different sports OR three levels (elementary, junior high, high school, etc.) of the same sport.  
** Students must receive a "C-" or better.

**Community Health Major**

Graduates of the community health major are employed in entry-level positions conducting planning, administration, evaluation, research, and teaching in community health settings. The undergraduate program is concerned with improving health and well-being for all through the promotion of healthful lifestyles, healthy family functioning, community actions for health, and conditions that make it possible to live healthful lives. The program draws on public health, education, psychology, sociology, family science, and other social and behavioral sciences. Students are prepared to work in a variety of settings including family planning agencies, nonprofit agencies, state and federal health agencies, schools, and community health centers. This program stresses community involvement because community health emphasizes an interactive process. Students will be prepared to assess individual and community needs; plan, implement, and evaluate effective health programs; coordinate provision of services; act as a resource person; and communicate health needs, concerns and resources. Persons enrolling in this option should seriously consider earning a graduate degree in public health or some related area at some point in their career.

Completion of the community health major establishes eligibility to sit for the Certified Health Education Specialist (CHES) examination. The CHES exam measures the possession, application, and interpretation of knowledge essential to the practice of community health/health education. The CHES certification is a national standard for health education practice and assists employers in identifying qualified health education practitioners.

Students must receive a grade of "C" or higher in all required courses as outlined in the major.

**Freshman Year**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>COMX 111US</td>
<td>Introduction to Public Speaking</td>
<td>3</td>
</tr>
<tr>
<td>FCS 101IS</td>
<td>Indiv and Fam Dev: Lifespan</td>
<td>3</td>
</tr>
<tr>
<td>M 1xx or above</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>PSYX 100IS</td>
<td>Intro to Psychology</td>
<td>4</td>
</tr>
<tr>
<td>SOCI 101IS</td>
<td>Introduction to Sociology</td>
<td>3</td>
</tr>
<tr>
<td>WRIT 101W</td>
<td>College Writing I</td>
<td>3</td>
</tr>
<tr>
<td>University Core and Supporting Courses</td>
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<td>Year Total:</td>
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**Sophomore Year**

<table>
<thead>
<tr>
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<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOM 250</td>
<td>Microbiology for Health Sciences: Infectious Diseases</td>
<td>3</td>
</tr>
<tr>
<td>CCHT 205</td>
<td>Drugs and Society</td>
<td>3</td>
</tr>
<tr>
<td>CCHT 210</td>
<td>Foundations in Community Health</td>
<td>3</td>
</tr>
<tr>
<td>FCS 263</td>
<td>Relationships and Fam Systems</td>
<td>3</td>
</tr>
<tr>
<td>HTH 220</td>
<td>Human Sexuality</td>
<td>3</td>
</tr>
<tr>
<td>KIN 221</td>
<td>Hlth Anatomy &amp; Physiology</td>
<td>3</td>
</tr>
<tr>
<td>NUTR 221CS</td>
<td>Basic Human Nutrition</td>
<td>3</td>
</tr>
<tr>
<td>WRIT 221</td>
<td>Intermediate Tech Writing</td>
<td>3</td>
</tr>
<tr>
<td>University Core and Supporting Courses</td>
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<td></td>
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**Junior Year**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>CCHT 317</td>
<td>Health Behavior Theories</td>
<td>3</td>
</tr>
<tr>
<td>CCHT 435</td>
<td>Human Response To Stress</td>
<td>3</td>
</tr>
<tr>
<td>FCS 359</td>
<td>Theories and Skills for the Human Services</td>
<td>3</td>
</tr>
<tr>
<td>FCS 371</td>
<td>Research Methods in HHD</td>
<td>3</td>
</tr>
<tr>
<td>FCS 465R</td>
<td>Family Law &amp; Public Policy</td>
<td>3</td>
</tr>
<tr>
<td>HTH 455</td>
<td>The Ethic of Care</td>
<td>3</td>
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<tr>
<td>Supporting Courses</td>
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**Senior Year**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>CCHT 428</td>
<td>Health Disparities</td>
<td>3</td>
</tr>
<tr>
<td>CCHT 440</td>
<td>Principles Of Epidemiology</td>
<td>3</td>
</tr>
<tr>
<td>CCHT 445</td>
<td>Program Planning for CH</td>
<td>3</td>
</tr>
<tr>
<td>CCHT 443</td>
<td>Program Evaluation for Community Health</td>
<td>3</td>
</tr>
<tr>
<td>CCHT 498</td>
<td>Internship</td>
<td>6</td>
</tr>
<tr>
<td>HADM 445</td>
<td>Managing Healthcare Organizations</td>
<td>3</td>
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<tr>
<td>Supporting Courses</td>
<td>9</td>
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<tr>
<td>Year Total:</td>
<td>30</td>
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</tr>
<tr>
<td>Total Program Credits:</td>
<td>120</td>
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</table>

**Supporting Courses (21-35 credits)**

Select supporting courses from the list below. Select courses that will best compliment your professional goals in community health. Courses may be counted only once on your program of study. Check prerequisites to all courses.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BMGT 205</td>
<td>Prof Business Communication</td>
<td>3</td>
</tr>
<tr>
<td>BMGT 469</td>
<td>Community Entrepreneurship &amp; Nonprofit Management</td>
<td>3</td>
</tr>
<tr>
<td>CCHT 245</td>
<td>Physical Activity, Nutrition and Health in Aging</td>
<td>3</td>
</tr>
<tr>
<td>CCHT 325</td>
<td>Economic &amp; Public Policies in Aging</td>
<td>3</td>
</tr>
<tr>
<td>CCHT 405</td>
<td>Caregiving &amp; Aging Families</td>
<td>3</td>
</tr>
<tr>
<td>CCHT 430</td>
<td>Mental Health &amp; Social Issues in Aging</td>
<td>3</td>
</tr>
<tr>
<td>FCS 138</td>
<td>Srvy of Fam Fin and Cons Issue</td>
<td>3</td>
</tr>
<tr>
<td>FCS 261</td>
<td>Adult Development and Aging</td>
<td>3</td>
</tr>
<tr>
<td>FCS 271</td>
<td>Statistical Measures of Well-Being</td>
<td>3</td>
</tr>
<tr>
<td>FCS 337</td>
<td>Personal and Family Finance I</td>
<td>3</td>
</tr>
<tr>
<td>FCS 338</td>
<td>Personal and Family Finance II</td>
<td>3</td>
</tr>
<tr>
<td>FCS 461</td>
<td>Principles Wellbeing in Aging</td>
<td>3</td>
</tr>
<tr>
<td>FCS 464</td>
<td>Gnldr, Rce, Clss, and Fam Diver</td>
<td>3</td>
</tr>
<tr>
<td>NUTR 321</td>
<td>Nutrition in the Life Cycle</td>
<td>3</td>
</tr>
<tr>
<td>NUTR 351</td>
<td>Nutrition and Society</td>
<td>3</td>
</tr>
<tr>
<td>PSCI 200</td>
<td>Introduction to Conducting Political Inquiry</td>
<td>3</td>
</tr>
</tbody>
</table>
The early childhood education and child services (ECE&CS) major emphasizes the dual focus of education and services within the context of family, school, and community. Throughout the program, students are actively engaged in a variety of settings that include children, their families, and other early childhood professionals. Course work and field experience provide multiple opportunities for applied understanding of children’s growth and development, building family and community relationships, conducting observations and assessments, understanding developmentally appropriate practices, and promoting the well-being of young children and their families.

Graduates of the ECE&CS program are highly qualified for teaching, administration, and advocacy careers in a wide variety of settings including public and private early childhood education, early intervention and preschool special education settings, child-focused programs and community agencies, state or federal agencies, and nonprofit settings that support children and families. The ECE&CS major provides a strong background for admission to graduate programs in early childhood education, child development, child and family studies, social work, counseling, and other related behavioral and social science disciplines.

Students must receive a grade of "C" or higher in all required courses as outlined in the major.

**Freshman Year**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>EDEC 160</td>
<td>Early Childhood through Adolescent Development</td>
<td>3</td>
</tr>
<tr>
<td>EDEC 271</td>
<td>Paraprofessional Experience in Early Childhood</td>
<td>2</td>
</tr>
<tr>
<td>NUTR 221CS</td>
<td>Basic Human Nutrition</td>
<td>3</td>
</tr>
<tr>
<td>Choose one of the following:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ANTY 101D</td>
<td>Anthropology and the Human Experience</td>
<td></td>
</tr>
<tr>
<td>PSYX 100IS</td>
<td>Intro to Psychology</td>
<td></td>
</tr>
<tr>
<td>or SOCI 101IS</td>
<td>Introduction to Sociology</td>
<td></td>
</tr>
<tr>
<td>US 101US</td>
<td>First Year Seminar</td>
<td>3</td>
</tr>
<tr>
<td>WRIT 101W</td>
<td>College Writing I</td>
<td>3</td>
</tr>
<tr>
<td>Supporting Courses</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>University Core</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td>Year Total:</td>
<td>30-31</td>
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</tbody>
</table>

**Sophomore Year**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>EDEC 253</td>
<td>Health and Movement in Early Childhood</td>
<td>3</td>
</tr>
<tr>
<td>EDEC 288</td>
<td>Signing for Early Childhood Educators</td>
<td>3</td>
</tr>
<tr>
<td>FCS 263</td>
<td>Relationships and Fam Systems</td>
<td>3</td>
</tr>
<tr>
<td>Supporting Courses</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td>University Core</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Year Total:</td>
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</table>

**Junior Year**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>EDEC 350</td>
<td>Play and Learning in Early Childhood</td>
<td>3</td>
</tr>
<tr>
<td>EDEC 385</td>
<td>Integrated Curriculum Early Childhood Education</td>
<td>4</td>
</tr>
<tr>
<td>EDSP 306</td>
<td>Exceptional Learners</td>
<td>3</td>
</tr>
<tr>
<td>EDSP 307</td>
<td>Exceptional Learners Lab</td>
<td>1</td>
</tr>
<tr>
<td>FCS 359</td>
<td>Theor Skills for Helping Relat</td>
<td>3</td>
</tr>
<tr>
<td>FCS 371</td>
<td>Research Methods in HHD</td>
<td>3</td>
</tr>
<tr>
<td>Supporting Courses</td>
<td>13</td>
<td></td>
</tr>
<tr>
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</table>

**Senior Year**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>EDEC 430</td>
<td>Social and Emotional Development in the Young Child</td>
<td>3</td>
</tr>
<tr>
<td>EDEC 450</td>
<td>Literacy in the EC Classroom</td>
<td>3</td>
</tr>
<tr>
<td>EDEC 496</td>
<td>EC Advanced Practicum</td>
<td>3</td>
</tr>
<tr>
<td>EDSP 458</td>
<td>Assessment and Intervention</td>
<td>4</td>
</tr>
<tr>
<td>FCS 454</td>
<td>Professional Issues-Senior Sem</td>
<td>4</td>
</tr>
<tr>
<td>Choose one of the following:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FCS 455R</td>
<td>Program Plan and Admin in FCS or FCS 465R - Family Law &amp; Public Policy</td>
<td>3</td>
</tr>
<tr>
<td>Electives</td>
<td></td>
<td>10</td>
</tr>
<tr>
<td>Year Total:</td>
<td>30</td>
<td></td>
</tr>
</tbody>
</table>

**Total Program Credits:** 120-121

**Family & Consumer Sciences Major - Non-Teaching Option**

The family and consumer sciences non-teaching (human development and family science) option is an interdisciplinary program that prepares students for careers working with individuals and families. The program...
focuses on the social-emotional, physical, mental, spiritual, cultural, and societal aspects of human development across the lifespan (infancy, middle childhood, adolescence, adulthood, and late adulthood). Individuals develop in family contexts, and this program integrates the in-depth study of the family as a dynamic social unit. The program focuses on family behavior, strengths, and challenges using family-specific theoretical frameworks (family systems, family crisis) and research methods. Social, cultural, historical, political, and economic trends that influence family functioning and well-being are addressed. Students study a wide range of family issues including relational dynamics, parenting, human response to stress and crisis, family policies and laws, family finance and economics, work and family issues, and human services delivery and decision-making.

The non-teaching (human development and family science) option provides a strong background for students seeking careers in human services, family life education, family policy, and financial counseling. The curriculum prepares students to work in a wide range of organizations and settings (community-based social services, family intervention, business, government and public policy, faith-based organizations, healthcare and family wellness, and non-profit organizations). The degree program also prepares students to be strong candidates for graduate programs in marriage and family therapy, counseling, family financial planning, human development, family science, social work, law, and other related behavioral and social science disciplines.

Students completing the degree may apply for provisional certification as a Certified Family Life Educator (https://www.ncfr.org/sites/default/files/downloads/news/montana_state_univ_bozeman_1.pdf). MSU’s family and consumer sciences major is accredited by the National Council on Family Relations. Provisional certification is awarded at the completion of a baccalaureate degree and course work in the 11 family life substance areas. After two years’ work experience, the student may apply for full CFLE certification. Students are also encouraged to complete the courses required to take a national exam for the certification as an Accredited Financial Counselor (FCS 337, FCS 338, and FCS 339).

Students must receive a grade of "C" or higher in all required courses as outlined in the major.

Both teaching and non-teaching options take the following core classes:

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>EDEC 160</td>
<td>Early Childhood through Adolescent Development</td>
<td>3</td>
</tr>
<tr>
<td>FCS 138</td>
<td>Srvy of Fam Fin and Cons Issue</td>
<td>3</td>
</tr>
<tr>
<td>FCS 239</td>
<td>Contemporary Consumer Issues</td>
<td>3</td>
</tr>
<tr>
<td>FCS 263</td>
<td>Relationships and Fam Systems</td>
<td>3</td>
</tr>
<tr>
<td>FCS 337</td>
<td>Personal and Family Finance I</td>
<td>3</td>
</tr>
<tr>
<td>FCS 371</td>
<td>Research Methods in HHD</td>
<td>3</td>
</tr>
<tr>
<td>FCS 437</td>
<td>Managing Work and Family</td>
<td>3</td>
</tr>
<tr>
<td>FCS 457</td>
<td>Family Life Education</td>
<td>3</td>
</tr>
<tr>
<td>FCS 460</td>
<td>Parenting</td>
<td>3</td>
</tr>
<tr>
<td>FCS 464</td>
<td>Gndr, Rce, Clss, and Fam Diver</td>
<td>3</td>
</tr>
<tr>
<td>FCS 465R</td>
<td>Family Law &amp; Public Policy</td>
<td>3</td>
</tr>
<tr>
<td>NUTR 221CS</td>
<td>Basic Human Nutrition</td>
<td>3</td>
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<tr>
<td>Theor Skills for Helping Relat</td>
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Take the following:

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>FCS 338</td>
<td>Personal and Family Finance II &amp; Family Financial Counseling</td>
<td>3-6</td>
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<tr>
<td>or FCS 359</td>
<td>Theor Skills for Helping Relat</td>
<td></td>
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Total Credits: 39-42

**Freshman Year**

<table>
<thead>
<tr>
<th>Course</th>
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<tbody>
<tr>
<td>EDEC 160</td>
<td>Early Childhood through Adolescent Development</td>
<td>3</td>
</tr>
<tr>
<td>FCS 138</td>
<td>Srvy of Fam Fin and Cons Issue</td>
<td>3</td>
</tr>
<tr>
<td>LSCI 121</td>
<td>Library Research Skills</td>
<td>2</td>
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<td>US 101US</td>
<td>First Year Seminar</td>
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</tr>
<tr>
<td>WRIT 101W</td>
<td>College Writing I</td>
<td>3</td>
</tr>
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University Core and Electives: 16
Year Total: 30

**Sophomore Year**

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHTH 205</td>
<td>Drugs and Society</td>
<td>3</td>
</tr>
<tr>
<td>FCS 239</td>
<td>Contemporary Consumer Issues</td>
<td>3</td>
</tr>
<tr>
<td>FCS 261</td>
<td>Adult Development and Aging</td>
<td>3</td>
</tr>
<tr>
<td>FCS 263</td>
<td>Relationships and Fam Systems</td>
<td>3</td>
</tr>
<tr>
<td>FCS 271</td>
<td>Statistical Measures of Well-Being</td>
<td>3</td>
</tr>
<tr>
<td>HTH 220</td>
<td>Human Sexuality</td>
<td>3</td>
</tr>
<tr>
<td>NUTR 221CS</td>
<td>Basic Human Nutrition</td>
<td>3</td>
</tr>
</tbody>
</table>

University Core and Electives: 9
Year Total: 30

**Junior Year**

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHTH 435</td>
<td>Human Response To Stress</td>
<td>3</td>
</tr>
<tr>
<td>FCS 337</td>
<td>Personal and Family Finance I</td>
<td>3</td>
</tr>
<tr>
<td>FCS 371</td>
<td>Research Methods in HHD</td>
<td>3</td>
</tr>
<tr>
<td>FCS 460</td>
<td>Parenting</td>
<td>3</td>
</tr>
</tbody>
</table>

Choose one of the following:

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>FCS 338</td>
<td>Personal and Family Finance II &amp; Family Financial Counseling</td>
<td>3-6</td>
</tr>
<tr>
<td>or FCS 359</td>
<td>Theor Skills for Helping Relat</td>
<td></td>
</tr>
</tbody>
</table>

Restricted Electives: 12-15
Year Total: 30

**Senior Year**

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>FCS 437</td>
<td>Managing Work and Family</td>
<td>3</td>
</tr>
<tr>
<td>FCS 454</td>
<td>Professional Issues-Senior Sem</td>
<td>4</td>
</tr>
<tr>
<td>FCS 455R</td>
<td>Program Plan and Admin in FCS</td>
<td>3</td>
</tr>
<tr>
<td>FCS 457</td>
<td>Family Life Education</td>
<td>3</td>
</tr>
<tr>
<td>FCS 464</td>
<td>Gndr, Rce, Clss, and Fam Diver</td>
<td>3</td>
</tr>
<tr>
<td>FCS 465R</td>
<td>Family Law &amp; Public Policy</td>
<td>3</td>
</tr>
</tbody>
</table>

Restricted Electives: 11
Year Total: 30

Total Program Credits: 120

**Family & Consumer Sciences Major - Teaching Option**

Family and consumer sciences students learn to work through credit and not-for-credit education systems to empower individuals and families across the lifespan to manage the challenges of living and working in a diverse, global society. The unique focus is on families, work, and their interrelationships. The curriculum at MSU follows the National Standards for Family and Consumer Sciences Teachers and the National Standards for Family and Consumer Sciences Students. Therefore, students choosing this option will be well qualified to seek employment in a variety of educational settings including secondary public and private schools, extension, and public and private agencies. Upon successful completion of the program, candidates will be recommended for a Montana teaching license in Family and Consumer Sciences grades 5-12. Students are encouraged to complete the Certified Family Life Educator (https://www.ncfr.org/sites/default/files/
downloads/news/montana_state_univ_bozeman_1.pdf) and Accredited
Financial Counselor (http://www.afcpe.org/certification/curriculum/
accredited-financial-counselor) (FCS 337, FCS 338, and FCS 339)
designations as well as a teaching minor in a second field while attending
MSU to further increase their professional opportunities.

Additionally, the family and consumer sciences major prepares
undergraduate students to pursue graduate degrees in a variety of areas
including family and consumer sciences, curriculum and instruction, school
counseling, and adult education.

Students must receive a grade of "C" or higher in all required courses as
outlined in the major.

Note: The family and consumer sciences teaching option requires 122
credits.

<table>
<thead>
<tr>
<th>Freshman Year</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHTH 205 - Drugs and Society</td>
<td>3</td>
</tr>
<tr>
<td>FCS 101IS - Indiv and Fam Dev: Lifespan</td>
<td>3</td>
</tr>
<tr>
<td>FCS 138 - Srvy of Fam Fin and Cons Issue</td>
<td>3</td>
</tr>
<tr>
<td>Choose one of the following:</td>
<td>3</td>
</tr>
<tr>
<td>EDEC 160 - Early Childhood Development or FCS 261 - Adult Development and Aging or FCS 2xx - M 1xx-&quot;C&quot; or better in any 100-level or above M course</td>
<td>3</td>
</tr>
<tr>
<td>WRIT 101W - College Writing I</td>
<td>3</td>
</tr>
<tr>
<td>University Core and Electives</td>
<td>12</td>
</tr>
<tr>
<td>Year Total:</td>
<td>30</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Sophomore Year</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>EDU 202 - Early Field Experience</td>
<td>1</td>
</tr>
<tr>
<td>EDU 211D - Multicultural Education</td>
<td>3</td>
</tr>
<tr>
<td>EDU 223IS - Educ Psych and Adolescent Dev</td>
<td>3</td>
</tr>
<tr>
<td>FCS 218 - Design, Fashion, and Textiles</td>
<td>3</td>
</tr>
<tr>
<td>FCS 219 - Apparel Construction</td>
<td>3</td>
</tr>
<tr>
<td>FCS 239 - Contemporary Consumer Issues</td>
<td>3</td>
</tr>
<tr>
<td>FCS 263 - Relationships and Fam Systems</td>
<td>3</td>
</tr>
<tr>
<td>FCS 271 - Statistical Measures of Well-Being</td>
<td>3</td>
</tr>
<tr>
<td>HTH 220 - Human Sexuality</td>
<td>3</td>
</tr>
<tr>
<td>NUTR 221CS - Basic Human Nutrition</td>
<td>3</td>
</tr>
<tr>
<td>NUTR 226 - Food Fundamentals</td>
<td>3</td>
</tr>
<tr>
<td>NUTR 227 - Food Fundamentals Lab</td>
<td>2</td>
</tr>
<tr>
<td>Year Total:</td>
<td>33</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Junior Year</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>EDSP 306 - Exceptional Learners</td>
<td>3</td>
</tr>
<tr>
<td>EDSP 307 - Exceptional Learners Lab</td>
<td>1</td>
</tr>
<tr>
<td>EDU 342 - Managing the Learning Envir</td>
<td>3</td>
</tr>
<tr>
<td>EDU 370 - Integrating Tech into Educ</td>
<td>2</td>
</tr>
<tr>
<td>EDU 382 - Assessmt, Curric, Instructn</td>
<td>3</td>
</tr>
<tr>
<td>EDU 395 - Practicum</td>
<td>3</td>
</tr>
<tr>
<td>FCS 337 - Personal and Family Finance I</td>
<td>3</td>
</tr>
<tr>
<td>FCS 338 - Personal and Family Finance II</td>
<td>3</td>
</tr>
<tr>
<td>FCS 371 - Research Methods in HHD</td>
<td>3</td>
</tr>
<tr>
<td>FCS 437 - Managing Work and Family</td>
<td>3</td>
</tr>
<tr>
<td>FCS 460 - Parenting</td>
<td>3</td>
</tr>
<tr>
<td>Year Total:</td>
<td>30</td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>Senior Year</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>EDU 408 - Professional Issues: K-12</td>
<td>2</td>
</tr>
<tr>
<td>EDU 495 - Student Teaching</td>
<td>12</td>
</tr>
<tr>
<td>EDU 497 - Methods</td>
<td>3</td>
</tr>
<tr>
<td>FCS 450 - Curric Dev in FCS Education</td>
<td>3</td>
</tr>
<tr>
<td>FCS 457 - Family Life Education</td>
<td>3</td>
</tr>
<tr>
<td>Choose one of the following:</td>
<td>3</td>
</tr>
<tr>
<td>FCS 464 - Gnldr, Rce, Clss, and Fam Diver or FCS 465R - Family Law &amp; Public Policy</td>
<td></td>
</tr>
<tr>
<td>University Core or Elective</td>
<td>3</td>
</tr>
<tr>
<td>Year Total:</td>
<td>29</td>
</tr>
</tbody>
</table>

Total Program Credits: 122

**Family and Consumer Sciences Major**

The Family and Consumer Sciences (FCS) profession is dedicated to enhancing the relationships among individuals, families, communities and the environments in which they function. The family and consumer sciences profession takes leadership in improving individual, family, and community well-being; impacting the development, delivery, and evaluation of consumer goods and services; influencing the creation of policy; and shaping societal change, thereby enhancing the human condition.

Students in FCS take foundation courses in content areas based upon American Association of Family and Consumer Sciences (AAFCS) standards. In addition, students take restricted supporting courses in the program.

**Non-Teaching (Human Development and Family Science) Option (p. 140)**

**Teaching Option (p. 141)**

**Food and Nutrition Major**

The Department of Health and Human Development offers a major in the study of food and nutrition. Students who choose the nutrition science option generally intend to pursue a health profession or research-related career such as medicine, dentistry, industry, academia, etc. The dietetics option (p. 142) is designed for students wishing to become a registered dietician. A post-baccalaureate non-degree graduate- or graduate degree-level dietetic internship is required in order to be eligible to take the exam for dietetic registration. Montana State University currently offers a non-degree graduate dietetic internship. Admission to the internship is on a competitive basis. Information about degree requirements can be obtained from the Health and Human Development advising office located in the Hosaeus PE Complex. The nutrition science option (p. 143) is designed to prepare a student for admission to medical (allopathic or osteopathic), dental, or graduate school with an emphasis on nutrition and biochemistry.

**Standards of Work**

Students must receive a grade of C or higher in all required courses as outlined in the major.

**Dietetics Option (p. 142)**

**Nutrition Science Option (p. 143)**

**Food and Nutrition Major with Dietetics Option**

The dietetics option at Montana State University-Bozeman is accredited as a Didactic Program in Dietetics by the Accreditation Council for Education in Nutrition and Dietetics (ACEND) of the Academy of Nutrition and
Dietetics, 120 Riverside Plaza, Suite 2000, Chicago, IL, 60606-6995, (312) 899-0040, extension 5400. An MSU graduate will attain a verification statement upon completion of the ACEND-accredited dietetics program curriculum with a minimum of a “C” or better in each required program course. A graduate is then eligible to apply for an ACEND-accredited supervised practice/dietetic internship. Students who apply and are accepted to a post-graduate dietetic internship are eligible to take the national registration exam for dietitians upon completion of the dietetic internship. Once the individual has passed the exam, the individual has earned the credential “RD” (registered dietitian) or “RDN” (registered dietitian nutritionist) and must complete continuing education credits to maintain RD/RDN status. The dietetics option has a strong foundation in food nutrition, food service management, and clinical nutrition. Registered dietitians may find employment in health care facilities, industrial, school, and university food services, community nutrition services, private practice, sales for food service or health products, and other related fields.

Freshman Year

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOB 160 - Principles of Living Systems</td>
<td>4</td>
</tr>
<tr>
<td>CHMY 141 - College Chemistry I</td>
<td>4</td>
</tr>
<tr>
<td>CHMY 143 - College Chemistry II</td>
<td>4</td>
</tr>
<tr>
<td>Choose one of the following:</td>
<td>3</td>
</tr>
<tr>
<td>ANTY 101D - Anthropology and the Human Experience</td>
<td></td>
</tr>
<tr>
<td>or SOCI 101IS - Introduction to Sociology</td>
<td></td>
</tr>
<tr>
<td>Choose one of the following:</td>
<td>3</td>
</tr>
<tr>
<td>COMX 111US - Introduction to Public Speaking</td>
<td></td>
</tr>
<tr>
<td>or US 101US - First Year Seminar</td>
<td></td>
</tr>
<tr>
<td>FCS 101IS - Indiv and Fam Dev: Lifespan</td>
<td>3-4</td>
</tr>
<tr>
<td>or PSYX 100IS - Intro to Psychology</td>
<td></td>
</tr>
<tr>
<td>M 121Q - College Algebra</td>
<td>3</td>
</tr>
<tr>
<td>WRIT 101W - College Writing I</td>
<td>3</td>
</tr>
<tr>
<td>University Core and Electives</td>
<td>3</td>
</tr>
<tr>
<td>Year Total:</td>
<td>30</td>
</tr>
</tbody>
</table>

Sophomore Year

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Choose one of the following:</td>
<td>3</td>
</tr>
<tr>
<td>ACTG 201 - Principles of Financial Acct</td>
<td></td>
</tr>
<tr>
<td>or BGEN 210 - Accounting &amp; Finance Basics</td>
<td></td>
</tr>
<tr>
<td>BIOH 201 - Hum Anatomy &amp; Physiology I</td>
<td>5</td>
</tr>
<tr>
<td>Choose one of the following:</td>
<td>3</td>
</tr>
<tr>
<td>BIOM 103IN - Unseen Universe: Microbes</td>
<td></td>
</tr>
<tr>
<td>or BIOM 250 - Microbiology for Health Sciences: Infectious Diseases</td>
<td></td>
</tr>
<tr>
<td>Choose one of the following:</td>
<td>3</td>
</tr>
<tr>
<td>BMGT 205 - Prof Business Communication</td>
<td></td>
</tr>
<tr>
<td>WRIT 201 - College Writing II</td>
<td></td>
</tr>
<tr>
<td>WRIT 221 - Intermediate Tech Writing</td>
<td></td>
</tr>
<tr>
<td>Choose one of the following:</td>
<td>3</td>
</tr>
<tr>
<td>BIOB 318 - Biometry</td>
<td></td>
</tr>
<tr>
<td>or STAT 216Q - Introduction to Statistics</td>
<td></td>
</tr>
<tr>
<td>CHMY 211 - Elements of Organic Chemistry</td>
<td>5</td>
</tr>
<tr>
<td>NUTR 221CS - Basic Human Nutrition</td>
<td>3</td>
</tr>
<tr>
<td>NUTR 226 - Food Fundamentals</td>
<td>3</td>
</tr>
<tr>
<td>NUTR 227 - Food Fundamentals Lab</td>
<td>2</td>
</tr>
<tr>
<td>Year Total:</td>
<td>30</td>
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</tbody>
</table>

Junior Year

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BCH 380 - Biochemistry</td>
<td>5</td>
</tr>
<tr>
<td>BIOH 211 - Hum Anatomy &amp; Physiology II</td>
<td>4</td>
</tr>
</tbody>
</table>

Senior Year

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>FCS 359 - Theories and Skills for the Human Services</td>
<td>3</td>
</tr>
<tr>
<td>FCS 371 - Research Methods in HHD</td>
<td>3</td>
</tr>
<tr>
<td>NUTR 321 - Nutrition in the Life Cycle</td>
<td>3</td>
</tr>
<tr>
<td>NUTR 322 - Food Service System Management</td>
<td>3</td>
</tr>
<tr>
<td>NUTR 351 - Nutrition and Society</td>
<td>3</td>
</tr>
<tr>
<td>NUTR 395 - Pract: Quant Foods Prod &amp; Mgmt</td>
<td>3</td>
</tr>
<tr>
<td>NUTR 401 - Nutrition Assessment/Counsel</td>
<td>3</td>
</tr>
<tr>
<td>Year Total:</td>
<td>30</td>
</tr>
</tbody>
</table>

See the Food and Nutrition major website at http://www.montana.edu/hhd/ for a suggested list of electives.

Food and Nutrition Major with Nutrition Science Option

The nutrition science option is designed to prepare a student for admission to medical (allopathic or osteopathic), dental, or graduate school with an emphasis on nutrition and biochemistry. A student can earn a verification statement if all dietetic course requirements are met for the ACEND-accredited Didactic Program in Dietetics. Although the nutrition science option provides a strong background for most professional schools, students must contact individual schools for specific post-baccalaureate entrance requirements.

Students must receive a grade of “C” or higher in all required courses as outlined in the major.

Freshman Year

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHMY 141 - College Chemistry I</td>
<td>4</td>
</tr>
<tr>
<td>CHMY 143 - College Chemistry II</td>
<td>4</td>
</tr>
<tr>
<td>M 161Q - Survey of Calculus</td>
<td>4</td>
</tr>
<tr>
<td>PSYX 100IS - Intro to Psychology</td>
<td>4</td>
</tr>
<tr>
<td>STAT 216Q - Introduction to Statistics</td>
<td>3</td>
</tr>
<tr>
<td>WRIT 101W - College Writing I</td>
<td>3</td>
</tr>
<tr>
<td>University Core and Electives</td>
<td>3</td>
</tr>
<tr>
<td>Year Total:</td>
<td>30</td>
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</table>

Sophomore Year

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHMY 211 - Elements of Organic Chemistry</td>
<td>5</td>
</tr>
<tr>
<td>NUTR 221CS - Basic Human Nutrition</td>
<td>3</td>
</tr>
<tr>
<td>NUTR 226 - Food Fundamentals</td>
<td>3</td>
</tr>
<tr>
<td>NUTR 227 - Food Fundamentals Lab</td>
<td>2</td>
</tr>
<tr>
<td>Year Total:</td>
<td>30</td>
</tr>
</tbody>
</table>

Montana State University 143
Certificate of Gerontology

The certificate will provide courses specifically focused on aging to increase the knowledge and understanding of aging issues for individuals wishing to work with older adults and their families. In the field of gerontology, certificate programs are common due to the multi-disciplinary focus of gerontology. The intent of a gerontology certificate is to provide specific knowledge on aging issues to enhance students programs of study in other programs and disciplines.

The online gerontology certificate program is a joint endeavor shared by faculty (community health and family and consumer sciences) in the Department of Health and Human Development at Montana State University. Students will need to complete 3 required courses (9 credits) and 2 elective courses (6 credits), for a total of 15 credits with earned grades of “C” or higher to fulfill certificate requirements.

Admission process: Given that the gerontology certificate program is open to any interested MSU student, it is important to have a process in place by which to track student enrollment. Therefore, students will be required to submit an application to the program coordinator. Online admission forms will be available to students. Students will be asked to provide the program coordinator with the following information: name, major, and no more than one paragraph as to why the student is interested in obtaining a gerontology certificate. Students interested in the gerontology certificate must have a 2.0 GPA or higher to be eligible for the certificate program.

Program requirements: To receive a gerontology certificate, students must complete all three required courses and two elective courses for a total of 15 credits. Students must complete all coursework with a C or better.

**Required Courses**

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CTHH 245</td>
<td>Physical Activity, Nutrition and Health in Aging</td>
<td>3</td>
</tr>
<tr>
<td>CTHH 495</td>
<td>Pract Experience in Aging</td>
<td>3</td>
</tr>
<tr>
<td>FCS 261</td>
<td>Adult Development and Aging</td>
<td>3</td>
</tr>
</tbody>
</table>

Choose two of the following:

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CTHH 325</td>
<td>Economic &amp; Public Policies in Aging</td>
<td></td>
</tr>
<tr>
<td>CTHH 405</td>
<td>Caregiving &amp; Aging Families</td>
<td></td>
</tr>
<tr>
<td>CTHH 430</td>
<td>Mental Health &amp; Social Issues in Aging</td>
<td></td>
</tr>
<tr>
<td>FCS 461</td>
<td>Principles Wellbeing in Aging</td>
<td></td>
</tr>
</tbody>
</table>

**Total Credits** 15

**Health Enhancement: Health and Physical Education Teaching K-12 Broadfield Major**

The Health Enhancement Teacher Preparation program is designed for students who want to become teachers of Health Enhancement (Health and Physical Education) in public schools. Upon completion of the degree, students are eligible for certification in teaching K-12 Health Enhancement, Physical Education, and/or Health Education in Montana and other states.

Health Enhancement is a comprehensive approach to combining the traditional areas of Health Education and Physical Education. It is a contemporary curriculum where healthy lifestyles and concepts are achieved through skillful movement with an emphasis on physical fitness, healthy lifestyle management skills, and understanding of the total self (physical, intellectual, emotional, and social). In addition to the traditional approach to teaching fundamental movement, skills, games, and dance, this curriculum emphasizes the overall health of the individual as a value in life and enhances critical thinking, decision-making and problem-solving skills of future teachers and their students. Courses within this curriculum represent a combination of content knowledge (health enhancement, health education, and physical education) along with a strong background in pedagogical content knowledge (teaching methods and curriculum). Students majoring in Health Enhancement develop a professional development portfolio based on national beginning teacher standards. The final semester consists of student teaching in two public school placements.

**Criteria for Selection and Retention**

Admission to the Teacher Education Program. Any student who wishes to enter the Teacher Education Program must complete an “Application for the Teacher Education Program.” These forms are available at www.montana.edu/fieldplacement/. The plan must be signed by the advisor and the forms turned into the Education Advising Center, 132 Reid Hall. Students should apply to the Teacher Education Program by the end of their sophomore year.

The requirements for admission are:

1. cumulative grade point average of at least 2.75;
2. a grade of “C” or higher in all required courses;
3. approval of the advisor; and
4. no record of immoral conduct related to the teaching profession nor been judged guilty of a criminal offense as outlined by Section 20-4-110 of the Montana Code Annotated.

Application and approval for student teaching. Certain requirements must be met by all students desiring to student teach. These are:

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHMY 313</td>
<td>Neurophysiology</td>
<td>3</td>
</tr>
<tr>
<td>CHMY 323</td>
<td>Human Developmental Biology</td>
<td>4</td>
</tr>
<tr>
<td>NUTR 401</td>
<td>Nutrition Assessment/Counsel</td>
<td>3</td>
</tr>
<tr>
<td>NUTR 412</td>
<td>Macronutrient Metabolism</td>
<td>3</td>
</tr>
<tr>
<td>NUTR 425</td>
<td>Medical Nutrition Therapy I</td>
<td>3</td>
</tr>
<tr>
<td>NUTR 426</td>
<td>Medical Nutrition Therapy II</td>
<td>2</td>
</tr>
<tr>
<td>University Core and Electives</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Year Total:</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Total Program Credits** 120
1. maintenance of the same standards required for admission into the program including satisfactory clearance on a federal criminal background check;
2. completion of all required courses;
3. certification of first aid and CPR; and 4) approval of advisor.

Student teaching is limited to seniors. Application must be made to the Director of Field Placement and Certification no later than the following times:

- Fall student teaching: by the end of the first week in December of the year prior to student teaching.
- Spring student teaching: by the end of the second week of April of the year prior to student teaching.

The Praxis II exam in the area of physical education must be successfully passed one semester prior to student teaching.

Recommendation and approval for licensure. The requirements for recommendation by Montana State University for licensure include completion of courses in the Teacher Education Program as outlined in the individual’s approved plan; maintenance of the same standards as required for student teaching; and approval of the advisor and the Director of Field Placement and Certification.

<table>
<thead>
<tr>
<th>Freshman Year</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>COA 205 - Introduction to Coaching</td>
<td>3</td>
</tr>
<tr>
<td>DANC 150 - Social Dance</td>
<td>1</td>
</tr>
<tr>
<td>COMX 111US - Introduction to Public Speaking (formerly COM 110US)</td>
<td>3</td>
</tr>
<tr>
<td>FCS 101IS - Indiv and Fam Dev: Lifespan</td>
<td>3</td>
</tr>
<tr>
<td>HEE 195 - Paraprofessional Experience I</td>
<td>1</td>
</tr>
<tr>
<td>HEE 306 - Methods of Cond Act</td>
<td>3</td>
</tr>
<tr>
<td>KIN 105 - Fnd of Exercise Science</td>
<td>3</td>
</tr>
<tr>
<td>LSCI 121 - Library Research Skills</td>
<td>2</td>
</tr>
<tr>
<td>M 105Q - Contemporary Mathematics (formerly M 145Q, Math for Liberal Arts)</td>
<td>3</td>
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<tr>
<td>WRIT 101W - College Writing I</td>
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<tr>
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<tbody>
<tr>
<td>CTHH 205 - Drugs and Society</td>
<td>3</td>
</tr>
<tr>
<td>COA 316 - Football Coaching Theory</td>
<td>1</td>
</tr>
<tr>
<td>EDU 211D - Multicultural Education</td>
<td>3</td>
</tr>
<tr>
<td>EDU 223IS - Educ Psych and Adolescent Dev</td>
<td>3</td>
</tr>
<tr>
<td>EDU 370 - Integrating Tech into Educ</td>
<td>2</td>
</tr>
<tr>
<td>HEE 305 - Methods of Teaching Mvmt Expl</td>
<td>3</td>
</tr>
<tr>
<td>HTH 220 - Human Sexuality</td>
<td>3</td>
</tr>
<tr>
<td>KIN 221 - Hlth Anatomy &amp; Physiology</td>
<td>3</td>
</tr>
<tr>
<td>NUTR 221CS - Basic Human Nutrition</td>
<td>3</td>
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<td>University Core and Electives</td>
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<td>Year Total:</td>
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<table>
<thead>
<tr>
<th>Junior Year</th>
<th>Credits</th>
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<tbody>
<tr>
<td>COA 256 - Coaching Track and Field</td>
<td>2</td>
</tr>
<tr>
<td>COA 319 - Volleyball Coaching Theory</td>
<td>1</td>
</tr>
<tr>
<td>EDU 382 - Assessmt, Curric, Instructn</td>
<td>3</td>
</tr>
<tr>
<td>EDU 397 - Methods</td>
<td>3</td>
</tr>
<tr>
<td>EDU 497 - Methods</td>
<td>3</td>
</tr>
<tr>
<td>FCS 371 - Research Methods in HHD</td>
<td>3</td>
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</table>

<table>
<thead>
<tr>
<th>Senior Year</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>COA 317 - Basketball Coaching Theory</td>
<td>1</td>
</tr>
<tr>
<td>COA 318 - Soccer Coaching Theory</td>
<td>1</td>
</tr>
<tr>
<td>EDU 408 - Professional Issues: K-12</td>
<td>2</td>
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<tr>
<td>EDU 495 - Student Teaching</td>
<td>6</td>
</tr>
<tr>
<td>EDU 495 - Student Teaching</td>
<td>6</td>
</tr>
<tr>
<td>HEE 430 - Instrc Design in HE</td>
<td>3</td>
</tr>
<tr>
<td>HTH 455 - The Ethic of Care</td>
<td>3</td>
</tr>
<tr>
<td>KIN 320 - Exercise Physiology</td>
<td>4</td>
</tr>
<tr>
<td>KIN 440R - Sport Psychology</td>
<td>3</td>
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<td>University Core and Electives</td>
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<tr>
<td>Year Total:</td>
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Total Program Credits: 128

Electives (select 7-11 credits from the following courses)

- CTHH 435 Human Response To Stress | 3 |
- COA 395 Practicum-Coaching Application (may be repeated) | 1 |
- COA 405 Advanced Concepts in Coaching | 3 |
- KIN 270 Exercise Prog for Older Adults | 3 |
- KIN 410 Adv Strength Training and Cond | 3 |
- KIN 415 Adv Exercise Test and Prescrip | 4 |
- NUTR 411 Nutrition for Sports/Exercise | 3 |
- Free electives - Select 6 credits from any University Course | 6 |

A minimum of 128 credits is required for graduation; 42 of these credits must be in courses numbered 300 and above.

Health and Human Performance Major

The undergraduate major in Health and Human Performance (HHP) at Montana State University is a general pre-health professional curriculum that prepares students for health-related graduate programs (e.g., physical therapy, occupational therapy, medical school, etc.), exercise science graduate programs (e.g., exercise physiology, health promotion, biomechanics), as well as entry-level occupations within the health and wellness industry. HHP majors can choose to focus their course work within one of the following curriculum options: exercise science or kinesiology. Students within the exercise science option intend to pursue a health-related graduate degree to meet their career aspirations, whereas students within the kinesiology option will pursue careers within the health and wellness industry that do not require a graduate degree.

Exercise Science Option

The exercise science option within the Health and Human Performance (HHP) major focuses on both clinical and performance-based understandings of human movement. The exercise science option emphasizes a cross-disciplinary understanding of human movement through non-departmental courses in biology, anatomy and physiology, chemistry, physics, math, and statistics. These courses then serve as the foundation for mechanical (e.g., biomechanics), physiological, and nutritional perspectives within the departmental courses. The exercise science option specifically allows students to customize their junior and senior year course work as needed for later application to health-related graduate programs in physical therapy, occupational therapy, medical physician assistant, sports medicine, exercise science graduate programs (exercise physiology, health promotion,
biomechanics), as well as medical school. Additional careers for exercise science students can include those within the health and fitness industry (e.g., those requiring ACSM Certified Health Fitness Specialist and/or Certified Clinical Exercise Specialist certifications), corporate wellness programs, exercise rehabilitation programs (cardiac rehabilitation, gait laboratories, sport medicine facilities, older adult programs, etc.), as well as careers in the sport and rehabilitation medicine equipment industries. Regardless of a student’s career goals, each student’s course work will culminate in one of the following “capstone experience” courses: KIN 415 Advanced Exercise Testing and Prescription; KIN 430 Physical Fitness Program Design and Delivery; or a pre-approved internship (KIN 498).

Students must receive a grade of “C” or higher in all required courses as outlined in the major.

**Freshman Year**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
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<tbody>
<tr>
<td>BIOB 160 - Principles of Living Systems or BIBO 260 - Cellular and Molecular Biology</td>
<td>4</td>
</tr>
<tr>
<td>CHMY 141 - College Chemistry I</td>
<td>4</td>
</tr>
<tr>
<td>CHMY 143 - College Chemistry II</td>
<td>4</td>
</tr>
<tr>
<td>M 161Q - Survey of Calculus</td>
<td>4</td>
</tr>
<tr>
<td>PSYX 100IS - Intro to Psychology</td>
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<tr>
<td>University Core and Electives</td>
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**Sophomore Year**

<table>
<thead>
<tr>
<th>Course</th>
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<tbody>
<tr>
<td>BIOH 201 - Hum Anatomy &amp; Physiology I</td>
<td>5</td>
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<tr>
<td>KIN 105 - Find of Exercise Science</td>
<td>3</td>
</tr>
<tr>
<td>NUTR 221CS - Basic Human Nutrition</td>
<td>3</td>
</tr>
<tr>
<td>Choose one of the following sequences:</td>
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<tr>
<td>PHSX 205 - College Physics I &amp; PHSX 207 - College Physics II</td>
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<tr>
<td>PHSX 220 - Physics I (w/ calculus) &amp; PHSX 222 - Physics II (w/ calculus)</td>
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</tr>
<tr>
<td>STAT 216Q - Introduction to Statistics</td>
<td>3</td>
</tr>
<tr>
<td>STAT 217Q - Intermediate Statistical Concepts</td>
<td>3</td>
</tr>
<tr>
<td>University Core and Electives</td>
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**Junior Year**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
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<tbody>
<tr>
<td>BIOH 211 - Hum Anatomy &amp; Physiology II</td>
<td>4</td>
</tr>
<tr>
<td>FCS 371 - Research Methods in HHD</td>
<td>3</td>
</tr>
<tr>
<td>KIN 320 - Exercise Physiology</td>
<td>4</td>
</tr>
<tr>
<td>KIN 322 - Kinesiology</td>
<td>4</td>
</tr>
<tr>
<td>KIN 325R - Biomechanics</td>
<td>4</td>
</tr>
<tr>
<td>University Core and Approved Electives</td>
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<td><strong>Year Total:</strong></td>
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**Senior Year**

<table>
<thead>
<tr>
<th>Course</th>
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<tbody>
<tr>
<td>Choose two of the following:</td>
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<tr>
<td>KIN 410 - Adv Strength Training and Cond</td>
<td></td>
</tr>
<tr>
<td>KIN 4XX - Physical Performance Assessments</td>
<td></td>
</tr>
<tr>
<td>KIN 490R - Undergraduate Research</td>
<td></td>
</tr>
<tr>
<td>NUTR 411 - Nutrition for Sports/Exercise</td>
<td></td>
</tr>
<tr>
<td>Choose one of the following:</td>
<td>2-6</td>
</tr>
<tr>
<td>KIN 415 - Adv Exercise Test and Prescrip</td>
<td></td>
</tr>
<tr>
<td>KIN 430 -- Physical Fitness Program Design and Delivery</td>
<td></td>
</tr>
<tr>
<td>KIN 498 - Internship</td>
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<tr>
<td>University Core and Approved Electives</td>
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</tr>
</tbody>
</table>

**Year Total:** 30

**Total Program Credits:** 120

**Kinesiology Option**

The kinesiology option within the Health and Human Performance (HHP) major prepares graduates for careers requiring leadership in organizing, directing, and managing fitness and wellness programs in corporate and commercial settings. The overall goal of the kinesiology option is to develop basic knowledge, comprehension, and appreciation of a) historical and cultural perspectives of human movement, b) social and psychological influences of human movement, and c) physiological and biomechanical correlates of human performance. From this broad knowledge base, the program’s inherent flexibility allows students to pursue a variety of areas related to physical activity and sport. This option also prepares students for professional certifications in fitness and conditioning through professional organizations such as the American College of Sports Medicine (ACSM) and the National Strength and Conditioning Association (NSCA). Finally, each student’s course work will culminate in one of the following “capstone experience” courses: KIN 415 Advanced Exercise Testing and Prescription; KIN 430 Physical Fitness Program Design and Delivery; or a pre-approved internship (KIN 498).

Students must receive a grade of “C” or higher in all required and approved elective courses as outlined in the major.

**Freshman Year**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOB 160 - Principles of Living Systems</td>
<td>4</td>
</tr>
<tr>
<td>CHMY 141 - College Chemistry I</td>
<td>4</td>
</tr>
<tr>
<td>M 151Q - Precalculus</td>
<td>4</td>
</tr>
<tr>
<td>PSYX 100IS - Intro to Psychology</td>
<td>4</td>
</tr>
<tr>
<td>Choose one of the following:</td>
<td>3-5</td>
</tr>
<tr>
<td>BIOH 201 - Hum Anatomy &amp; Physiology I</td>
<td></td>
</tr>
<tr>
<td>KIN 221 - Hlth Anatomy &amp; Physiology</td>
<td></td>
</tr>
<tr>
<td>University Core and Electives</td>
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<tr>
<td><strong>Year Total:</strong></td>
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**Sophomore Year**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>COA 205 - Introduction to Coaching</td>
<td>3</td>
</tr>
<tr>
<td>KIN 105 - Find of Exercise Science</td>
<td>3</td>
</tr>
<tr>
<td>KIN 270 - Exercise Prog for Older Adults</td>
<td>3</td>
</tr>
<tr>
<td>NUTR 221CS - Basic Human Nutrition</td>
<td>3</td>
</tr>
<tr>
<td>PHSX 205 - College Physics I</td>
<td>4</td>
</tr>
<tr>
<td>STAT 216Q - Introduction to Statistics</td>
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</tr>
<tr>
<td>University Core and Electives</td>
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<td><strong>Year Total:</strong></td>
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**Junior Year**

<table>
<thead>
<tr>
<th>Course</th>
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<tbody>
<tr>
<td>FCS 371 - Research Methods in HHD</td>
<td>3</td>
</tr>
<tr>
<td>KIN 320 - Exercise Physiology</td>
<td>4</td>
</tr>
<tr>
<td>KIN 322 - Kinesiology</td>
<td>4</td>
</tr>
<tr>
<td>KIN 325R - Biomechanics</td>
<td>4</td>
</tr>
<tr>
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**Senior Year**

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<tr>
<th>Course</th>
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<tbody>
<tr>
<td>Choose two of the following:</td>
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<tr>
<td>CHTH 317 - Health Behavior Theories</td>
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<td>KIN 410 - Adv Strength Training and Cond</td>
<td></td>
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<tr>
<td>KIN 490R - Undergraduate Research</td>
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</tr>
<tr>
<td>NUTR 411 - Nutrition for Sports/Exercise</td>
<td></td>
</tr>
<tr>
<td>Choose one of the following:</td>
<td>2-6</td>
</tr>
<tr>
<td>KIN 415 - Adv Exercise Test and Prescrip</td>
<td></td>
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</tbody>
</table>
Required Courses

- FCS 338  Personal and Family Finance I  3
- FCS 339  Family Financial Counseling  3
- FCS 437  Managing Work and Family  3

Choose one of the following:

- BFIN 205  Personal Finance  3
- ECNS 202  Principles of Macroeconomics  3
- ECNS 204IS  Microeconomics  3
- FCS 359  Theories and Skills for the Human Services  3
- PSYX 477  Science of Psych Well-Being  3
- PSYX 481  Judgment & Decision Making  3

Total Credits  27

Human Development Minor

The Department of Health and Human Development offers a non-teaching minor in Human Development. Students in the minor examine current research, theory, and practice across the lifespan and select 9 credits of supporting courses based on their interests. The minor is designed to enhance the student’s major area of study and is a strong complement to all majors.

Required Courses

- EDEC 160  Early Childhood Development  3
- FCS 101IS  Indiv and Fam Dev: Lifespan  3
- FCS 260 Middle Childhood and Adolescent Dev  3
- FCS 261  Adult Development and Aging  3

Take 9 credits from the following:

- EDSP 306  Exceptional Learners  3
- FCS 263  Relationships and Fam Systems  3
- FCS 271  Statistical Measures of Well-Being  3
- FCS 337  Personal and Family Finance I  3
- FCS 359  Theories and Skills for the Human Services  3
- FCS 460  Parenting  3
- FCS 464  Gndr, Rce, Clss, and Fam Diver  3
- FCS 465R  Family Law & Public Policy  3

Approved substitutions (3 credits)

Total Credits  21

Personal and Consumer Finance Minor

The personal and consumer finance minor through the Department of Health and Human Development includes course work in economics, financial counseling, consumer decision-making, managing work and family, and personal finance knowledge and practice related to insurance, consumer credit, investment, retirement, estate planning, and taxation. The minor is comprised of nine courses (27 credits), eight of which are required, giving students the flexibility to choose one course from a variety of options in the areas of economics, psychology, or counseling. Over one-third of the courses are upper division.

The minor in personal and consumer finance offers business accounting, business finance, pre-counseling, psychology, and agriculture students the opportunity to combine knowledge in personal finance with their skills and knowledge in their majors. This minor is also a strong offering to students in family and consumer sciences education and social studies broadfield education. Seventeen states currently require a course or course work in personal finance at the high school level.

Required Courses

- ECNS 101IS  Economic Way of Thinking  3
- FCS 138  Survey of Family Finance and Consumer Issues  3
- FCS 239  Contemporary Consumer Issues  3
- FCS 263  Relationships and Fam Systems  3
- FCS 337  Personal and Family Finance I  3

Total Program Credits:  120

Sustainable Food & Bioenergy Systems

The Sustainable Food and Bioenergy Systems (SFBS) program offers an interdisciplinary, hands-on curriculum focused on the ecological, cultural, economic, and health aspects of food and bioenergy systems from production through consumption. The degree plan is intended to prepare and motivate students as agents of change to address society’s most pressing food and bioenergy issues towards sustained environmental and human well-being. Students of the program are provided with broad interdisciplinary training founded on a core SFBS curriculum while gaining disciplinary training by selecting one of four program options housed in either the College of Agriculture, or the College of Education, Health and Human Development: (1) Sustainable Food Systems, (2) Agroecology, (3) Sustainable Crop Production and, (4) Sustainable Livestock Production. The SFBS program seeks to enhance students’ practical and critical thinking skills to approach food systems through service-based learning internships, hands-on production, training on research methods, independent and group projects, story-telling, and community engagement. Students must receive a grade of “C” or higher in all required courses as outlined in the major.

Career Opportunities

Graduates from this option find careers in environmental industries and consulting firms that solve problems associated with agroecosystems or
agricultural practices; government jobs in environmental management and policy making; agricultural industry positions associated with precision agriculture, pest management, general agronomy, and information services. Students will be prepared for graduate training that leads to independent research in basic and applied ecology, environmental biology, cropping systems, precision agriculture, ecologically-based pest management, weed science, or agricultural entomology (pest management science).

**Sustainable Crop Production Option—Department of Plant Sciences and Plant Pathology**

Where does our food come from? Are there ways to sustainably maintain production levels and yet protect our natural resources? Is it possible to improve the quality and nutrition of our food supply? Are local food systems a viable alternative to corporate agricultural production? Can crops grown for bioenergy production reduce our use of fossil fuels and lessen carbon dioxide emissions? The answers to these questions and many more are discovered by students in the Sustainable Crop Production option. The curriculum is designed to train students in a broad range of principles and practices in sustainable crop production, including agronomy, soil fertility, plant genetics, plant physiology, greenhouse production, plant propagation, integrated pest management, and small business management. Both large- and small-scale food and bioenergy production systems are examined.

**Career Opportunities**

Graduates from this option find careers in conventional and organic farming; as crop production specialists and consultants; in pest management; in seed, fertilizer, and chemical industries; with banks and other lending institutions; and as managers of CSAs and local food organizations. Other career opportunities exist in the Extension Service, state and federal agencies, and private or nonprofit organizations.

**Sustainable Food Systems Option—Department of Health and Human Development**

The Sustainable Food Systems option trains students in the natural and social sciences to evaluate and mitigate outcomes of complex interactions in the food system for human health and nutrition. This option focuses on the interconnections between production, policy, food security, and health. Courses in this option provide disciplinary foundation in food and nutrition while providing an interdisciplinary framework that draws from ecology, environmental sciences, plant biology and chemistry, anthropology, sociology, economics, family and consumer sciences, and political science. Students develop practical and critical thinking skills through hands-on experience in service-based learning internships, organic farming, culinary fundamentals and management, training on research methods, and carrying out research projects in surrounding communities. Previous service-based learning experiences in this option have involved assessment of food access and food quality in health disparate environments, food processing, food cooperative management, alternative food distribution systems, and small business operations. It is expected that the multiple lenses and tools provided by this option to assess and manage food system outcomes for human health will empower graduates who are capable and enthusiastic to address food and health challenges such as obesity, food insecurity and poverty, food safety, and vulnerability of indigenous food systems.

**Career Opportunities**

Graduates from this option are prepared for a wide range of careers in basic and applied scientific research, community nutrition, community food security, public health, Extension education, food and nutrition policy, food enterprise, culinary arts and management, community-supported agriculture, food processing, food marketing, retailing, and distribution.

**Sustainable Livestock Production Option—Department of Animal and Range Sciences**

Sustainable Livestock Production focuses on the biological understanding of animal agriculture and its continued presence in sustainable grazing systems as well as its potential role in sustainable farming systems. Students will be introduced to the principles, practices and issues impacting the production, processing and preservation of safe, wholesome, nutritious, and palatable meat along with the regulatory requirements for selling animal products. Sustainable Livestock Production focuses on the science of animal production but expands students’ learning to a larger system of understanding, including the role of domestic livestock in sustainable systems. In addition, students will be exposed to the role of strategic grazing in landscape management as well as using livestock to manage potential waste streams from other industries.

**Career Opportunities**

Graduates from this option are prepared for careers in both the production and allied industries associated with animal agriculture. Graduates will also be prepared for opportunities in extension and graduate work.

**Undergraduate Curricula in Sustainable Food and Bioenergy Systems**

- Agroecology Option (p. 148)
- Sustainable Food Systems Option (p. 103)
- Sustainable Crop Production Option (p. 149)
- Sustainable Livestock Production Option (p. 103)

**Agroecology Option**

**Land Resources and Environmental Sciences**

<table>
<thead>
<tr>
<th>Freshman Year</th>
<th>Credits</th>
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<tbody>
<tr>
<td>ENSC 110 - Lnd Res Environ Sciences</td>
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<tr>
<td>SFBS 146 - Introduction to Sustainable Food and Bioenergy Systems</td>
<td>3</td>
</tr>
<tr>
<td>BIOB 110CS - Introduction to Plant Biology</td>
<td>3</td>
</tr>
<tr>
<td>BIOB 170IN - Principles of Biological Diversity</td>
<td>4</td>
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<tr>
<td>CHMY 141 - College Chemistry I</td>
<td>4</td>
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<tr>
<td>Take one of the following</td>
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<tr>
<td>ECNS 101IS - Economic Way of Thinking</td>
<td>3</td>
</tr>
<tr>
<td>M 121Q - College Algebra</td>
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<td>M 105Q - Contemporary Mathematics (formerly M 145Q, Math for Liberal Arts) (formerly M 145Q)</td>
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<tr>
<td>BIOB 160 - Principles of Living Systems</td>
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</tr>
<tr>
<td>CHMY 143 - College Chemistry II</td>
<td>4</td>
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<td>Choose one of the following:</td>
<td>4-5</td>
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<tr>
<td>BCH 104RN - The Biochemistry of Health for Non-Science Majors</td>
<td></td>
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<tr>
<td>CHMY 123 - Introduction of Organic Chemistry and Biochemistry</td>
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<tr>
<td>CHMY 211 - Elements of Organic Chemistry</td>
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<tr>
<td>ANSC 222 - Livestock in Sustain Systems</td>
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<tr>
<td>ECHM 205CS - Energy and Sustainability</td>
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</tr>
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<td>ENSC 245IN - Soils</td>
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<tr>
<td>NUTR 221CS - Basic Human Nutrition</td>
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</tr>
<tr>
<td>Take one of the following</td>
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### Sustainable Crop Production Option

#### Plant Sciences and Plant Pathology

##### Freshman Year

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
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<tbody>
<tr>
<td>SFBS 146</td>
<td>SFBS 146 - Introduction to Sustainable Food and Bioenergy Systems</td>
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</tr>
<tr>
<td>BIOL 170IN</td>
<td>BIOL 170IN - Principles of Biological Diversity</td>
<td>4</td>
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<tr>
<td>ECNS 101IS</td>
<td>ECNS 101IS - Economic Way of Thinking</td>
<td>3</td>
</tr>
<tr>
<td>BIOL 110CS</td>
<td>BIOL 110CS - Introduction to Plant Biology</td>
<td>3</td>
</tr>
<tr>
<td>ENSC 110</td>
<td>ENSC 110 - Lnd Res Environ Sciences</td>
<td>3</td>
</tr>
<tr>
<td>ENSC 245IN</td>
<td>ENSC 245IN - Soils</td>
<td>3</td>
</tr>
<tr>
<td>CHMY 121IN</td>
<td>CHMY 121IN - Introduction of General Chemistry</td>
<td>4</td>
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<tr>
<td>CHMY 141</td>
<td>CHMY 141 - College Chemistry I</td>
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</tr>
<tr>
<td>M 105Q</td>
<td>M 105Q - Contemporary Mathematics (formerly M 145Q, Math for Liberal Arts) (formerly M 145Q)</td>
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<td>M 121Q</td>
<td>M 121Q - College Algebra</td>
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##### Sophomore Year

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<tbody>
<tr>
<td>SFBS 296</td>
<td>SFBS 296 - Practicum: Towne’s Harvest</td>
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<tr>
<td>SFBS 298</td>
<td>SFBS 298 - Internship</td>
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<td>University Core and Electives</td>
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##### Junior Year

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<th>Course Title</th>
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<tbody>
<tr>
<td>SFBS 499</td>
<td>SFBS 499 - Senior Thesis/Capstone</td>
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</tr>
<tr>
<td>SFBS 498</td>
<td>SFBS 498 - Internship</td>
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</tr>
<tr>
<td>or ANSC 498</td>
<td>or ANSC 498 - Internship</td>
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<td>University Core and Electives</td>
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##### Senior Year

<table>
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<tr>
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<th>Course Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>AGSC 491</td>
<td>AGSC 491 - Plant Nutrition and Soil Fertility Management</td>
<td>3</td>
</tr>
<tr>
<td>SFBS 466</td>
<td>SFBS 466 - Food System Resilience, Vulnerability and Transformation</td>
<td>3</td>
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<tr>
<td>SFBS 498</td>
<td>SFBS 498 - Internship</td>
<td>2-12</td>
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<tr>
<td>SFBS 499</td>
<td>SFBS 499 - Senior Thesis/Capstone</td>
<td>3</td>
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<tr>
<td>University Core and Electives</td>
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<td>5-6</td>
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<td>30</td>
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</table>

### Total Program Credits: 119-120
ENSC 443 - Weed Ecology and Management
HORT 245 - Plant Propagation
AGSC 342 - Forages
BIOM 421 - Concepts of Plant Pathology
AGSC 450 - Plant Disease Control
AGSC 441 - Plant Breeding & Genetics
PSCI 406 - The Political Economy of Energy
NASX 415 - Native Food Systems
PSCI 436 - Politics of Food & Hunger
HORT 492 - Independent Study

University Core and Electives
Year Total: 30
Total Program Credits: 120

**Sustainable Food Systems Option**

**Health and Human Development**

**Freshman Year**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
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<tbody>
<tr>
<td>BIOB 110CS</td>
<td>Introduction to Plant Biology</td>
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<tr>
<td>Choose one of the following:</td>
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<tr>
<td>CHMY 121IN</td>
<td>Introduction to General Chemistry</td>
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<tr>
<td>or CHMY 141</td>
<td>College Chemistry I</td>
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<tr>
<td>ECNS 101IS</td>
<td>Economic Way of Thinking</td>
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<tr>
<td>M 121Q</td>
<td>College Algebra</td>
<td>3</td>
</tr>
<tr>
<td>SFBS 146</td>
<td>Introduction to Sustainable Food and Bioenergy</td>
<td>3</td>
</tr>
<tr>
<td>Systems</td>
<td>Choose one of the following:</td>
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<tr>
<td>SFBS 296</td>
<td>Practicum: Towne’s Harvest</td>
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<tr>
<td>or SFBS 298</td>
<td>Internship</td>
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<tr>
<td>SOCI 101IS</td>
<td>Introduction to Sociology</td>
<td>3</td>
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<td>WRIT 101W</td>
<td>College Writing I</td>
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**Sophomore Year**

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<tr>
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<th>Course Title</th>
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<tbody>
<tr>
<td>ANSC 222</td>
<td>Livestock in Sustain Systems</td>
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<tr>
<td>FCS 239</td>
<td>Contemporary Consumer Issues</td>
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<td>NUTR 221CS</td>
<td>Basic Human Nutrition</td>
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<td>NUTR 226</td>
<td>Food Fundamentals</td>
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<td>NUTR 227</td>
<td>Food Fundamentals Lab</td>
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<td>Choose one of the following:</td>
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<tr>
<td>ACTG 201</td>
<td>Principles of Financial Acct</td>
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<tr>
<td>BGEN 210</td>
<td>Accounting &amp; Finance Basics</td>
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<tr>
<td>FCS 337</td>
<td>Personal and Family Finance I</td>
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<td>Choose one of the following:</td>
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<tr>
<td>BIOB 318</td>
<td>Biometry</td>
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<tr>
<td>or STAT 216Q</td>
<td>- Introduction to Statistics</td>
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<td>Choose one of the following:</td>
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<tr>
<td>BIOM 103IN</td>
<td>- Unseen Universe: Microbes</td>
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<tr>
<td>or BIOM 250</td>
<td>- Microbiology for Health Sciences: Infectious Diseases</td>
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**Junior Year**

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<thead>
<tr>
<th>Course Code</th>
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<tbody>
<tr>
<td>AGSC 341</td>
<td>Field Crop Prod</td>
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</tr>
<tr>
<td>ECHM 205CS</td>
<td>Energy and Sustainability</td>
<td>3</td>
</tr>
<tr>
<td>ENSC 245IN</td>
<td>Soils</td>
<td>3</td>
</tr>
<tr>
<td>NUTR 321</td>
<td>Nutrition in the Life Cycle</td>
<td>3</td>
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<tr>
<td>NUTR 322</td>
<td>Food Service System Management</td>
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<tr>
<td>SFBS 327</td>
<td>Measure Innovation in Food Sys</td>
<td>3</td>
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<tr>
<td>Choose one of the following:</td>
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<tr>
<td>NUTR 395</td>
<td>Pract: Quant Foods Prod &amp; Mgmt</td>
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<tr>
<td>or SFBS 445R</td>
<td>Culinary Marketing: Farm/Table</td>
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<td>University Core and Directed Electives</td>
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**Senior Year**

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>NUTR 351</td>
<td>Nutrition and Society</td>
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<tr>
<td>SFBS 451R</td>
<td>Sustainable Food Systems</td>
<td>3</td>
</tr>
<tr>
<td>SFBS 466</td>
<td>Food System Resilience, Vulnerability and</td>
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</tr>
<tr>
<td>Transformation</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>SFBS 498</td>
<td>Internship</td>
<td>3</td>
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<tr>
<td>SFBS 499</td>
<td>Senior Thesis/Capstone</td>
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<td>Choose one of the following:</td>
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<tr>
<td>SFBS 429</td>
<td>Small Business and Entrepreneurship in Food</td>
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<tr>
<td>and Health</td>
<td>or BMGT 469 - Community Entrepreneurship &amp; Nonprofit Management</td>
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<tr>
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</tr>
<tr>
<td>Year Total:</td>
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</tbody>
</table>

**Total Program Credits:** 120

**Directed Electives (choose 18 credits)**

- AGBE 315 - Ag in a Global Context
- AGBE 337 - Agricultural Law
- AGED 482 - Non-Formal Teaching Methods in Agriculture
- AGSC 428 - Sustainable Cropping Systems
- AGSC 465R - Health, Agriculture, Poverty
- BIOE 375 - Ecological Responses to Climate Change
- BMGT 410 - Sustainable Business Practices
- BMKT 325 - Principles of Marketing
- ECNS 202 - Principles of Macroeconomics
- HORT 245 - Plant Propagation
- HORT 337 - Vegetable Production
- HORT 345 - Market Gardening
- HSTA 409 - Food in America
- NASX 232D - MT Indian Cult, Hist, Cur Issu
- NASX 415 - Native Food Systems
- NRSM 421 - Holistic Thought/Mgmt
- PSCI 230D - Introduction to International Relations
- PSCI 406 - The Political Economy of Energy
- PSCI 436 - Politics of Food & Hunger
- SFBS 346 - Sustainable Food and Bioenergy Systems
- Summer Field Course

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**College of Engineering**

*Brett Gunnink, Dean*

**General Information**

- College Mission (p. 151)
- College Vision (p. 151)
The College of Engineering provides administrative structure and support to the following academic departments and baccalaureate degree programs:

- **Department of Chemical & Biological Engineering (p. 153)**
  - BS Biological Engineering
  - BS Chemical Engineering
- **Department of Civil Engineering (p. 155)**
  - BS Civil Engineering
  - Bio-Resources Engineering Option
  - Civil Engineering Option
  - BS Construction Engineering Technology
- **Department of Computer Science (p. 161)**
  - BS Computer Science
- **Department of Electrical & Computer Engineering (p. 163)**
  - BS Computer Engineering
  - BS Electrical Engineering
- **Department of Mechanical & Industrial Engineering (p. 169)**
  - BS Financial Engineering
  - BS Industrial Engineering
  - BS Mechanical Engineering
  - BS Mechanical Engineering Technology

The College of Engineering offers several minors:

- Aerospace (p. 170)
- Computer Science (p. 162)
- Computer Engineering (p. 166)
- Electrical Engineering (p. 168)
- Engineering Management (p. 171)
- Financial Engineering (p. 74)
- Materials (p. 173)
- Mechatronics (p. 176)
- Military Studies: Air Force ROTC (p. 177) and Army ROTC (p. 178)

The College of Engineering provides administrative support for the Reserve Officers’ Training Corps (ROTC) programs in the Air Force and Army. A complete description of each individual degree program is provided later in this section under the heading of the appropriate department. The following is a highlight of the mission, goals, and objectives of the College of Engineering and applies to all of its programs.

**College Mission**

The College of Engineering will serve the State of Montana and the nation by:

- Fostering lifelong learning
- Integrating learning and discovery
- Developing and sharing technical expertise
- Empowering students to be tomorrow’s leaders

**College Vision**

The College of Engineering at Montana State University will be an outstanding collaborative community that achieves excellence in learning, innovation, discovery, and knowledge transfer. To realize this vision, the college will

- Leverage shared interests and talents among faculty and students in order to create knowledge across disciplinary lines.
- Effectively and efficiently balance breadth with depth in undergraduate education in order to prepare students for the global workforce.
- Be a leader in innovation and discovery in our identified focus areas.
- Successfully integrate research and innovation into the learning experience of both undergraduate and graduate students.
- Be recognized for the level of knowledge transfer to industry, governments, and citizens in the state of Montana.

**College Core Values**

Members of the MSU College of Engineering community approach all of their work with the following deeply held core values:

- **Life-long learning.** The college is a community that believes in and fosters life-long learning in all of its members—undergraduate students, graduate students, faculty, and staff. Life-long learning also extends beyond the college community to state and national constituencies.
- **Knowledge Discovery.** At the heart of the college community’s activities are knowledge discovery and dissemination and the creativity that accompanies these activities. We believe that knowledge discovery informs and enriches the life-long learning of the entire college community.
- **Collaboration.** We believe that collaboration and collegiality both inside and outside of our college community enrich all college activities.
- **Inclusiveness.** The college is a community that welcomes and encourages diverse points of view and backgrounds, believing that this inclusiveness enriches our creative learning environment.
- **Professionalism.** The College of Engineering community approaches all activities with a high degree of professionalism, working with integrity, honesty, and commitment to excellence.

**College Goals**

The goals of the College of the Engineering are as follows:

- Prepare the MSU COE community to engage effectively with the global community.
- Build on growing college synergy and increase cross-disciplinary activities at every level of the COE community, including not only faculty research and creative activity, but also the student experience.
- Establish the college as a leader in the state and national technological community.
Engineering Program Educational Objectives, Assessment, and FE Exam Requirement

ABET, Inc., the recognized accreditor for college and university programs in applied science, computing, engineering, and technology, has established standards and criteria for the accreditation of undergraduate computing, engineering and engineering technology programs. Individual programs have program educational objectives that are consistent with ABET and with the needs of the program’s constituents.

Assessment of program objectives is a dynamic and ongoing process. One assessment strategy is to examine the results of the Fundamentals of Engineering (FE) examination. The FE exam is a nationally normalized test that is required of graduating engineering seniors at MSU. Students are required to enroll in EGEN 488 (Fund of Engineering Exam), take the FE Exam, and make an honest and serious effort to pass the exam. Review sessions are available leading up to the exam.

For a complete and up-to-date listing of all program specific objectives as well as other educational outcomes assessment strategies, please refer to the College of Engineering website at www.coe.montana.edu.

Student Performance and Retention

Students admitted to MSU will automatically be eligible for admission to College of Engineering (COE) programs. The College of Engineering is committed to retaining each admitted student within the COE and MSU, and to helping them achieve their fullest academic potential.

Students are required by Board of Regents policy to achieve a C- or better grade in each class used to satisfy the COE Bachelor of Science degree requirements. If repeating a course is necessary in order to meet this requirement, students are expected to repeat the course successfully (C- or better) prior to taking a follow-on course for which the repeated course is a prerequisite.

Accreditation

The following engineering programs are specifically accredited by the Engineering Accreditation Commission of ABET, http://www.abet.org:

- Chemical Engineering
- Civil Engineering
- Computer Engineering
- Electrical Engineering
- Industrial Engineering
- Mechanical Engineering

Because the Biological Engineering degree is relatively new it has not yet gone through an accreditation review process. The program will undergo accreditation review in 2016.

The following engineering technology programs are accredited by the Technology Accreditation Commission of ABET, http://www.abet.org:

- Construction Engineering Technology
- Mechanical Engineering Technology


College of Engineering Program Fee

Engineering education is more expensive to deliver than education in most other disciplines, both at MSU and nationally. MSU strives to develop and maintain modern laboratories that benefit student learning. Because of increased equipment and maintenance costs, students enrolled within the College of Engineering (COE) at Montana State University in Bozeman are charged a program-wide fee with the following primary goals:

1. Help ensure that College programs maintain quality instructional laboratories, technical infrastructure within the College, and the ability to conduct staff-intensive program assessment (required for professional accreditation).
2. Help meet the higher cost of engineering education by augmenting existing state funds.
3. Help to support and increase student access to advanced technology within each of the COE programs.
4. Greatly increase the College’s ability to leverage private support for our programs, such as through matching grants.

Other engineering course fees (with the exception of CET and Fundamentals of Engineering exam fees) have been eliminated and the expenses formerly covered by these individual course fees will now be recovered from the program fee. The following fee structure is in place:

- $89.40 per semester for Freshmen (flat rate).
- $127.85 per semester for Sophomores through graduate level (flat rate).
- $50.75 flat rate for summer session collected once (one or more sessions), any level of student.

For more information about the Engineering Program Fee please refer to the College of Engineering website www.coe.montana.edu.

Total Credit Requirements

Montana State University requires a minimum of 120 semester credits for graduation. Of these, 42 credits must be in upper division courses (numbered 300 and above). All degree programs within the College of Engineering meet or exceed these standards, and specific requirements for each are tabulated in the sections describing these programs.

General Education Core

More than ever, engineers, technologists, and computer scientists must possess communication skills and an awareness of how design and policy decisions affect society. These topics plus other general education offerings are provided through a coherent program of general education required by all College of Engineering degree programs. University core requirements for communication, mathematics, and sciences are met or exceeded by all College of Engineering degree programs, and the College of Engineering encourages students’ participation in the broader areas of humanities, social sciences, arts and diversity. These areas are designed to complement the technical content of the degree program.

Electives

The engineering, technology, and computer science curricula as tabulated include "core curricula and elective" credits. Courses are selected by the student and advisor to fulfill block requirements in the core curriculum areas as well as professional electives. The student may also petition her or his department to include up to six advanced military science credits in her or his professional elective program.

Design Projects with Student Teams

The College of Engineering provides opportunities for students to engage in design projects, including working in multidisciplinary design teams.

Most programs require students to take EGEN 310, Multidisc Engineering Design, which is a multi-disciplinary design course. This course gives students the background and skills that they need to be successful in their senior capstone design course and also helps students understand the
complexities and benefits of working with students from other engineering disciplines, as well as computer science.

In the senior capstone course, students generally work with other students from their own discipline to solve an engineering design problem. A typical design project involves a student team synthesizing a solution to meet the needs of a customer, which could be an engineering company, a faculty member, or a governmental organization.

The student design team presents results in written and oral formats, and in many cases, the result includes a working prototype. All engineering and computer science students engaged in these design projects work in student design teams based on the needs to accomplish the goals of the project.

Capstone design projects contribute to the educational objectives of the academic programs by engaging seniors in challenging, team-oriented, real-world design efforts. The teams include the students and professionals from the sponsors as well as faculty supervisors for each project. At the conclusion of their design experience, the students will have accomplished the following:

1. Designed and developed information, or built a prototype as necessary, for a system, component, or process to meet design objectives.
2. Used creativity in meeting the design objectives.
3. Independently learned new information and applied this information to meet design objectives.
4. Worked effectively as a design team member.
5. Prepared and presented an effective written and/or oral technical report to the sponsor.
6. Accomplished a logical and practical sequence of safe and workable operations while meeting the design objectives.
7. Provided a global, societal, and economic context to the design as appropriate for the project.

Cooperative Education/Internship

The College of Engineering encourages students to gain professional experience related to their discipline that can complement and enhance their academic studies. To help gain professional experience, departments within the College operate a variety of cooperative education and internship programs. Most College of Engineering departments partner with regional and national companies to provide a structured program for qualified students. Interested students should contact Career Services and their respective department offices for more information about these programs.

Engineering Minority Program (EMPower)

The College of Engineering at MSU is committed to equal access to educational opportunities for all students. This commitment has led to nationally recognized efforts to help provide such opportunities. The Engineering Minority Program (known as EMPower) provides enrichment programs for pre-college students and focuses on customized retention plans and support of social and academic networks including scholarships for underrepresented students in Engineering and Computer Science fields.

The Designing Our Community (DOC) Program, which is part of EMPower, seeks to enhance outreach, recruitment and retention to increase the number of Native Americans who graduate from MSU with Engineering or Computer Science degrees. Our vision is to become firmly established as the premier institution of choice for Native American students in engineering, engineering technology and computer science in the northern Rockies and the northern Great Plains regions and to be a successful partner with Native American communities in developing the future workforce.

Chemical and Biological Engineering

The Department of Chemical and Biological Engineering (CHBE) prepares students with the knowledge and skills to contribute to society and their profession. The basis of both chemical and biological engineering is the useful transformation of materials from one form to another. This transformation may be brought about by chemical or biological processes. Chemical and biological engineers often function as process engineers. A typical process involves chemical or biological reactions followed by separation of desired products. But there are distinct differences in the design and operation of chemical and biological systems, and the chemical engineering and biological engineering degrees allow students to focus on either area of specialization. Both fields continue to develop as today’s research efforts create exciting new opportunities. Chemical engineers practice in a variety of fields: chemical manufacturing and petroleum refining, waste minimization and environmental engineering, materials and microelectronics, pharmaceuticals, bioengineering and biomedicine, and many others. Biological engineers work in many of the same areas: environmental engineering, materials, pharmaceuticals, bioengineering and biomedicine and the list will continue to expand as the field develops.

The outcome of the undergraduate program in chemical engineering is an accredited B.S. Ch.E. degree. We anticipate seeking accreditation for the biological engineering degree in the near future.

Our chemical engineering program objectives are as follows:

Our graduates:
- will be confident in their ability to apply chemical engineering fundamentals
- will be effective communicators and team members
- will be highly ethical engineering professionals
- will have the ability to pursue lifelong learning
- will be proactive problem solvers
- will embrace process safety

The Department provides graduate programs that lead to masters degrees in bioengineering, chemical engineering and environmental engineering, as well as the Ph.D. in Engineering, with chemical engineering and environmental engineering options. The graduate program complements students’ undergraduate experience by providing opportunities for advanced study, undergraduate research, and cooperative education experience. The department serves the state of Montana and the nation through education, research, and service, while encouraging diversity in the student population, to meet the mission of Montana State University and the College of Engineering.

The preparation of men and women competent to develop, design, and operate new chemical or biological systems, or to perform the research and development to improve existing products and processes, is a comprehensive process. Thus the curricula in chemical engineering and biological engineering are founded on the study of engineering principles of basic science, particularly chemistry, physics, biology, and mathematics. Safety and concern for the environment and society must be overriding concerns to chemical and bioengineering practitioners, and developing this awareness is another aspect of the department’s educational goals. Both chemical and biological engineers typically work as teams of professionals, sharing expertise and knowledge for greater achievement, so teamwork and communication are emphasized. The following curricula have been developed to provide these skills through faculty members who have extensive knowledge and experience in the field.

Dual Degree Program in Bioengineering

In partnership with Istanbul Technical University (ITU), the department offers a dual degree program in Bioengineering intended for Turkish
students enrolled at ITU. Students in the program complete unique coursework in Bioengineering at both campuses—coursework that neither campus alone can offer. Students are resident at ITU during years 1 and 3 and at MSU during years 2 and 4, and graduates receive degrees from both institutions. Detailed curricular requirements are available from the department.

Undergraduate Programs

- Biological Engineering (p. 154)
- Chemical Engineering (p. 154)

The department offers graduate programs leading to the Master of Science in Chemical Engineering degree and a Master of Science degree in Environmental Engineering. The department participates in the Doctor of Philosophy degree in Engineering through the College of Engineering, with options available in Chemical Engineering and Environmental Engineering.

Degree Offered

- M.S. in Chemical Engineering (p. 335)
- M.S. in Environmental Engineering (p. 336)
- Master of Engineering In Chemical Engineering (p. 338)
- Master of Engineering in Bioengineering (p. 338)
- Ph.D. in Engineering (p. 343)
- Ph.D. in Materials Science (p. 402)

Biological Engineering

The curriculum is 128 credits comprised of a Basic Program plus Electives which students select to meet both University Core requirements and requirements of the Bioengineering degree.

Student Performance and Retention Requirements: Students are required by Board of Regents policy to achieve a C- or better grade in each class used to satisfy the Bachelor of Science degree requirements. Moreover, students must achieve a C- or better grade prior to taking follow-on courses.

### Basic Program

**Freshman Year**

<table>
<thead>
<tr>
<th>Course</th>
<th>Fall</th>
<th>Spring</th>
</tr>
</thead>
<tbody>
<tr>
<td>EBIO 100 - Intro to Biological Engr or ECHM 100 - Intro to Chemical Engr</td>
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<td></td>
</tr>
<tr>
<td>CHMY 141 - College Chemistry I</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Univ Core Electives (IA, IH, IS or D)</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>M 171Q - Calculus I</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>US or W Core course</td>
<td>3</td>
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</tr>
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</table>

<table>
<thead>
<tr>
<th>Course</th>
<th>Fall</th>
<th>Spring</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHMY 143 - College Chemistry II</td>
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<td></td>
</tr>
<tr>
<td>M 172Q - Calculus II</td>
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**Sophomore Year**

<table>
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<th>Spring</th>
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<tr>
<td>M 273Q - Multivariable Calculus</td>
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<tr>
<td>PHSX 220 - Physics I (w/ calculus)</td>
<td>4</td>
<td></td>
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<td>ECHM 201 - Elementary Principles of Chemical and Biological Engineering</td>
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<tr>
<td>CHMY 211 - Elements of Organic Chemistry</td>
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<td>EBIO 216 - Elem Princ of Bioengineering</td>
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</table>

**Year Total:** 16 16

**Total Program Credits:** 128

A minimum of 128 credits is required for graduation; 42 of which must be in courses numbered 300 and above.

### Chemical Engineering

The curriculum is 128 credits comprised of a Basic Program plus Electives which students select to meet both University Core requirements and requirements of the Chemical Engineering degree. **Student Performance and Retention Requirements:** Students are required by Board of Regents policy to achieve a C- or better grade in each class used to satisfy the Bachelor of Science degree requirements. Moreover, students must achieve a C- or better grade prior to taking follow-on courses.

**Freshman Year**

<table>
<thead>
<tr>
<th>Course</th>
<th>Fall</th>
<th>Spring</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECHM 100 - Intro to Chemical Engr or EBIO 100 - Intro to Biological Engr</td>
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<tr>
<td>M 171Q - Calculus I</td>
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<td>Univ Core Electives (IA, IH, IS or D)</td>
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<td>US or W Core course</td>
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<tr>
<td>CHMY 141 - College Chemistry I</td>
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</tbody>
</table>
Montana State University

Technical Electives
ECHM 443 - Chem Engin Laboratory II
EGEN 488 - Fundamentals of Engineer Exam
CHMY 143 - College Chemistry II
Year Total: 16

Senior Year
ECHM 411R - Chemical Engineering Design I
ECHM 442 - Chem Engin Laboratory I or E9IO 442 - Bioengineering Lab I
ECHM 407 - Chem Engin Thermodynamics II
ECHM 424 - Transport Analysis
Technical Electives
ECHM 412R - Chemical Engineering Design II
ECHM 451 - Chemical Engineering Process Dynamics and Control
CHMY 373 - Physical Chemistry - Kinetics and Thermodynamics
EGEN 488 - Fundamentals of Engineer Exam
ECHM 443 - Chem Engin Laboratory II
Technical Electives
Year Total: 16

Total Program Credits: 128

A minimum of 128 credits is required for graduation; 42 of which must be in courses numbered 300 and above.

Civil Engineering Programs

Montana State University’s Department of Civil Engineering anticipates that engineering and construction practice will continue to evolve quickly with several very fundamental precepts for success. Among these is the premise that the engineers and constructors will continue to rely on fundamental engineering science coupled with contemporary computational tools to meet the engineering and construction challenges of the future.

We therefore choose to focus our curriculum on fundamental engineering basics and the application of modern engineering tools. Our civil and environmental engineering programs will be acknowledged for their strong emphasis and rigor in engineering science, design, and applications. Our construction programs will be acknowledged for their emphasis on engineering and management skills and the application of those skills to the construction industry. The emphasis of these programs will continue to be preparation of students for professional practice in the engineering and construction industries.

Incorporating our vision into the traditional mission of a land grant institution leads to a strong emphasis on undergraduate education. However, in making this a substantial portion of our mission, we also look beyond the undergraduate classroom. To ensure a quality faculty, and up-to-date curricula, we have a vibrant broad-based graduate program at the master’s level and a smaller subset of specialty areas at the doctorate level. A strong master’s program also positions the department favorably for the possibility of future changes in professional degree requirements and is consistent with our vision for education at MSU. The graduate program is essential to stimulate research activity and thus provide opportunities for students interested in research experiences across all levels of the curriculum, and to offer opportunity for formal study beyond the baccalaureate degree.

Mission

- Foremost, we will provide undergraduate education founded on a rigorous treatment of engineering fundamentals coupled with modern engineering tools. We see competency in mathematics, physical science, and engineering mechanics as crucial to our mission.
- Provide graduate education opportunities in a majority of traditional civil engineering areas.
  - The department will maintain sufficient breadth to provide post-baccalaureate education focused on professional practice.
  - The department will provide graduate opportunities in a subset of focus areas coupled to vibrant research programs with sound external funding.

Civil Engineering

Civil Engineers design and construct facilities which improve the welfare and raise the living standards of society. Civil Engineers are also involved with protecting and restoring our natural environment. These activities often are conducted at a large scale, involve a substantial investment of society’s resources, and are expected to perform their intended function well into the future; each such project is unique and demands ingenuity and creativity in its execution. A registered civil engineer is a professional with the legally recognized education and experience to work on these challenging projects under their own authority. Civil Engineering graduates enjoy extensive opportunities for employment in Montana, the Pacific Northwest, and the rest of the nation, both in private industry and
government agencies involved in infrastructure development, operations and maintenance, and protection of the natural environment.

The following sub-areas comprise the field of civil engineering: environmental engineering for water and wastewater treatment, solid and toxic waste handling, and air and water pollution problems; geotechnical engineering for making use of soil, rock, and ice as foundation materials; structural engineering for buildings, bridges, dams, piers, towers, and other erected facilities; transportation engineering for pedestrian and bicycle facilities, highways, railroads, airports, and pipelines; water resources engineering for water supply, irrigation, flood control, aquatic habitat improvement, groundwater management, and hydroelectric power generation; construction of engineered facilities; and engineering measurements, which include surveying, photogrammetry, and mapping.

The Civil Engineering Bachelor of Science Program is a traditionally structured program that provides graduates with a strong background in math, basic sciences and engineering mechanics, and prepares graduates to become registered professional engineers capable of practicing civil engineering in the areas of environmental, geotechnical, structural, transportation and water resources engineering. The background of graduates that select the Bio-Resources option is focused on soil, water resources and environmental concerns. Graduates that pursue the Land Surveying minor are prepared to become registered land surveyors engaged in measurement and mapping.

Upon graduating with a Bachelor of Science in Civil Engineering all students can expect to be able to:

- enter the profession of Civil Engineering and advance in the profession to become registered professional engineers and leaders in the field of Civil Engineering;
- work on multi-disciplinary teams and effectively communicate with Civil Engineers of various sub-disciplines, architects, contractors, the public and public agents, scientists and others to design and construct Civil Engineering projects;
- begin to develop expertise in one of the sub-disciplines of Civil Engineering and engage in the life-long learning necessary to advance in the Civil Engineering profession;
- contribute to society and the Civil Engineering profession through involvement in professional related and/or other service activity; and
- conduct their affairs in a highly ethical manner holding paramount the safety, health and welfare of the public and striving to comply with the principles of sustainable development.

Some students upon graduation can expect to be able to:

- earn advanced degrees in Civil Engineering or other fields.

Courses in the first two years of the program develop a student’s mathematical skills and understanding of the physical principles that underlie the practice of civil engineering. Engineering science courses in the second, third, and fourth years develop the student’s ability to apply mathematics and basic scientific principles to the solution of practical engineering problems. The third year student develops a broad perspective of the field and establishes the foundation for professional practice and further study. The student completes at least one course in each sub-area of civil engineering by the end of this year. Most of these courses are combinations of engineering science and design experiences. The fourth year includes a capstone professional practice and design experience, elective courses in a sub-area (or sub-areas) of civil engineering--most of which are combinations of engineering science and design experiences--and elective courses that help the student develop an appreciation for the role of the professional engineer in society. Additional experience in professional practice and design may be obtained through participation in the department’s optional internship program. Contemporary engineering aids are introduced in the first year and used in assignments throughout the rest of the program. Courses and assignments that develop oral and written communication skills are distributed throughout the curriculum and are components of the capstone professional practice and design experience in the fourth year.

The B.S. Degree in Civil Engineering at Montana State University offers students the flexibility to specialize in traditional civil engineering sub-disciplines at the senior level. Students may select their senior-level professional electives to focus on water resources, geotechnical, transportation, environmental, structural or construction engineering, and land surveying. A distinct pathway within the Bachelor of Science Degree in Civil Engineering is available to students that have, early in the curriculum, identified an interest in soil, water, and natural resources applications. The Bio-Resources Option focuses on these areas within civil engineering. In the first two years of their Civil Engineering curriculum, students in the Bio-Resources Option are directed to take specific science courses that support their bio-resource focus. Similarly, coursework in their third and fourth years focuses on soils, hydraulic, hydrologic, and environmental concerns. Civil engineering students in the Bio-Resources Option may take upper level professional electives in chosen areas of Civil Engineering or select from a few courses offered in other departments that are germane to the topic area. Professional employment opportunities for civil engineers choosing the Bio-Resources Option are similar to those for graduates not in the Option, but tend to focus on land reclamation, soil and water remediation, hydraulic and hydrologic design, environmental impact and assessment, and natural resource management.

The Civil Engineering Department also offers a minor in Land Surveying, as described in later sections of this catalog.

Graduating students are required to take the Fundamentals of Engineering exam as the first step toward professional engineering registration. EGEN 488 Fundamentals of Engineer Exam, a zero-credit course, is used to administer the exam. Students are encouraged to take the discipline-specific version. This examination is administered by the National Council of Examiners for Engineering and Surveying (NCEES). Students planning to take the comprehensive examination on surveying fundamentals as the initial step in becoming licensed as a registered land surveyor should review the education requirements for admission to this examination.

Graduate work leading to the Master of Science and Doctor of Philosophy degrees is recommended for qualified students desiring advanced professional attainment or careers in academic fields. The Civil Engineering Department offers a Master of Science degree targeted at qualified students interested in an advanced professional degree, for which the civil engineering work place is currently seeing an increased demand. The program consists of a concurrent schedule of undergraduate and graduate classes starting the senior year, allowing a Bachelor of Science degree and a Master of Science degree to be obtained in a total of ten semesters of study.

**Construction Engineering Technology**

The Construction Engineering Technology Bachelor of Science Program is a technically rigorous and production-oriented program that prepares graduates to enter and advance to leadership positions in the construction industry.

Upon graduating with a Bachelor of Science in Construction Engineering Technology all students can expect to be able to:

- enter the construction industry and advance toward leadership positions in the construction industry;
- work on multi-disciplinary teams and effectively communicate with constructors, architects, engineers, the public and public agents, scientists and others to complete construction projects;
• continue to develop professionally through work experiences and continuing education, expanding their knowledge base and keeping abreast of advances in construction and engineering practice;

• contribute to society and the construction industry through involvement in professional related and/or other service activity; and

• promote and advance the integrity of the construction industry, holding paramount the safety, health and welfare of their co-workers and the public, and striving to comply with the principles of sustainable development.

The curriculum provides a well rounded, four-year, technically specialized university education culminating in a Bachelor of Science degree in Construction Engineering Technology (CET). Knowledge of mathematics and physical sciences along with applied courses in business management, law, and human relations form a background to transform design, research and planning ideas into physical reality using contemporary construction practices. Faculty with industry experience instruct students in surveying, estimating, scheduling, quality control, safety, testing, and field analysis.

Graduates use their skills and abilities to construct transportation systems, utilities, buildings, dams, public health and environmental systems, irrigation, industrial facilities, municipal and public works, and also in surveying, mapping, and support of engineering design. Building, industrial, and heavy highway construction are emphasized with particular attention directed toward preparation for employment in management and supervisory positions in both field and office operations.

This curriculum provides the education necessary to work with engineers, architects, contractors, technicians, and owners. The student in this curriculum can be employed as field supervisor, estimator, scheduler, or superintendent; he or she may progress to the highest levels of management in the construction arena such as project and operations managers. Because effective communication is essential in carrying out management responsibilities, students in this curriculum are required to demonstrate good oral and written communication skills in their undergraduate studies. Other possible positions are employment with consulting engineers and architects in support activities involving plans and planning, acquisition of design data, surveying, construction inspection for quantity and quality control, sales engineering, plant expansion, and maintenance management activities.

Students planning to take the comprehensive examination on surveying fundamentals as the initial step to becoming licensed as a registered land surveyor should review the educational requirements for admission to this examination. Students who desire both the CET degree and land surveyor registration must complete a Land Surveying Minor.

Students are required to take the Constructor Qualification Examination Level I (CQE) administered by the American Institute of Constructors (AIC) which must be taken the semester that a student expects to graduate. Seniors are eligible to take the Fundamentals of Engineering (FE) examination administered by the National Council of Examiners for Engineering and Surveying (NCEES), which is required by the Montana Board of Professional Engineers and Land Surveyors to become a licensed professional engineer. Students who plan to take the FE examination are encouraged to take additional selected courses in calculus, dynamics, and thermodynamics.

**Student Performance and Retention Requirements**

Freshmen or transfer students entering the Civil Engineering Department cannot enroll in advanced courses until a suite of key entry-level courses is completed at a minimum performance level. The following mechanisms will be used in the Student Performance and Retention Initiative efforts:

1. Students will be required to successfully complete a suite of key courses (marked with an *) prior to taking any course from a select list of advanced courses (marked with a **), and must attain at least a C– in each of the key courses. In addition, each key course can be repeated at most one time.

2. Once the suite of key courses is satisfactorily completed, students are allowed to advance in their degree program. Intentional attempts by a student to circumvent the Student Performance and Retention Requirements will be considered academic misconduct.

3. Students who have difficulty meeting these requirements will work with their advisor to discuss changes that may enhance their academic performance and promote student success.

**Undergraduate Programs**

- Civil Engineering (p. 159)
- Bio-Resources Option (p. 157)
- Construction Engineering Technology (p. 160)
- Land Surveying Minor (p. 161)
- Land Surveying Non-Degree Certificate (p. 161)

**Graduate Programs**

- M.S. in Civil Engineering (p. 339)
- M.S. in Environmental Engineering (p. 336)
- M.S. in Land Rehabilitation (p. 286)
- Professional Master of Engineering and Management (PMSEM) (p. 341)
- Ph.D. in Engineering (p. 343)

The department offers graduate study leading to the Master of Science degrees in Civil Engineering, Environmental Engineering, and an interdisciplinary Master of Science degree in Land Rehabilitation. The department also participates in the Doctor of Philosophy in Engineering degree program through the College of Engineering, specifically in the Civil Engineering, Applied Mechanics and Environmental Engineering options.

The M.S. program is also available following a concurrent schedule of undergraduate and graduate classes starting the senior year, allowing a Bachelor of Science degree and a Master of Science degree to be obtained in a total of ten semesters of study. This program is intended for qualified students interested in an advanced degree for practitioners, for which the civil engineering work place is currently seeing an increased demand. Contact the department for further information on this program.

In addition, a Professional Master of Science and Engineering Management (p. 341) degree is available online. This 30-credit interdisciplinary graduate program is designed to help working professionals bridge the gap between science, engineering and business management in the work place.

For the M.S. and Ph.D. degrees, major study is offered in various combinations of the subject areas of transportation engineering, geotechnical engineering, fluid mechanics, hydraulic and hydrologic engineering, structural engineering, engineering mechanics, and environmental engineering.

**Bio-Resources Option**

<table>
<thead>
<tr>
<th>Freshman Year</th>
<th>Credits</th>
</tr>
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<tr>
<td><strong>Fall</strong></td>
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<tr>
<td>CHMY 141 - College Chemistry I*</td>
<td>4</td>
</tr>
<tr>
<td>M 171Q - Calculus I*</td>
<td>4</td>
</tr>
<tr>
<td>EGEN 115 - Engineering Graphics*</td>
<td>1</td>
</tr>
<tr>
<td>University Core</td>
<td>3</td>
</tr>
<tr>
<td><strong>Spring</strong></td>
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</table>

Montana State University
WRIT 101W - College Writing I  
ECIV 202 - Applied Analysis  
CHMY 143 - College Chemistry II  
DDSN 101 - CAD 1-A  
M 172Q - Calculus II  
PHSX 220 - Physics I (w/ calculus)*  
University Core and Prof. Electives**  
EGEN 330 - Business Fundamentals for Technical Design  
EGEN 324 - Applied Thermodynamics  
ECIV 332 - Engineering Hydraulics  
ECIV 308 - Construction Practice  
ECIV 331 - Engineering Hydrology*  
EENV 340 - Principles of Environmental Engineering  
ECIV 312 - Structures II  
EGEN 310R - Multidisciplinary Engineering Design**  
EGEN 324 - Applied Thermodynamics  
EGEN 330 - Business Fundamentals for Technical Professionals  
University Core and Prof. Electives**  

**University Core Electives for Civil Engineering/Bio-Resources Option majors must include one of the following courses:  
BGEN 242D - Intro to Int'l Business  
ECNS 101IS - Economic Way of Thinking  
PSCI 210IS - Introduction to American Government  
PSCI 214IS - Principles of Political Science  
PSCI 230D - Introduction to International Relations  

Additional requirements: Professional electives must include 15 credits total with 1 course from the Water Resources Engineering Group and 1 course from the Environmental Engineering Group. A maximum of 4 credits total from Individual Problems, Internships (max 2 cr.), and Undergraduate Research may be counted toward professional electives. The professional elective program must contain a minimum of 2 design intensive courses (see CE/BREN flow chart). Students must successfully complete all key courses prior to taking any professional electives. A maximum of 3 credit-hours may be included from a completed MSU minor, a prior or concurrent BS/BA degree in another major, or courses in a completed MSU Honors Program. A student may petition to include other senior or graduate level courses consistent with the degree program but not listed here (requires Academic Adviser and Department Head approval). A minimum of 128 credits is required for graduation; 42 of these credits must be in courses numbered 300 and above.

**Professional Elective Courses**

**Water Resources Engineering Group**

ECIV 431 - Open Channel Hydraulics  
ECIV 435 - Closed-Conduit Hydraulics  
EENV 434 - Groundwater Supply/Remediation  
EGEN 435 - Fluid Dynamics  

**Environmental Engineering Group**

EENV 440 - Water Chemistry for Envr Engr  
EENV 443 - Air Pollution Control  
EENV 445 - Hazardous Waste Treatment  
EENV 447 - Hazardous Waste Management  

**Supporting Topics Group**

BIOE 370 - General Ecology (equiv to 270)  
ECIV 309 - Building Information Modeling in Construction  
ECIV 315 - Structures II  
ECIV 350 - Transportation Engineering
<table>
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<tr>
<th>Course Code</th>
<th>Course Title</th>
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<td>ECIV 425</td>
<td>Geotechnical Structures</td>
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<td>ECIV 455</td>
<td>Survey Data Collection &amp; Analysis for Transportation Engineering</td>
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<td>ECIV 461</td>
<td>Cold Regions Infrastructure Engineering</td>
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<td>ECIV 490R</td>
<td>Undergraduate Research</td>
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<td>ECIV 498</td>
<td>Internship</td>
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<td>EENV 490R</td>
<td>Undergraduate Research</td>
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<tr>
<td>EGEN 498</td>
<td>Internship</td>
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<tr>
<td>ENSC 353</td>
<td>Environmental Biogeochemistry</td>
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<td>ENSC 444</td>
<td>Watershed Hydrology</td>
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<td>ENSC 448</td>
<td>Stream Restoration Ecology</td>
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<td>ENSC 460</td>
<td>Soil Remediation</td>
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<td>ENSC 461</td>
<td>Restoration Ecology</td>
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<tr>
<td>GPHY 384</td>
<td>Adv GIS and Spatial Analysis</td>
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<tr>
<td>SRVY 375</td>
<td>Analytic Photogrammetry and Remote Sensing</td>
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**Civil Engineering**

**Freshman Year**

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<th>Course Code</th>
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<td>M 171Q</td>
<td>Calculus I</td>
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<td>EGEN 115</td>
<td>Engineering Graphics</td>
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<td>WRIT 101W</td>
<td>College Writing I</td>
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<td>University Seminar - Choose one of the following:</td>
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<td>CLS 101US</td>
<td>Knowledge and Community</td>
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<tr>
<td>COMX 111US</td>
<td>Introduction to Public Speaking</td>
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<tr>
<td>(formerly COM 110US)</td>
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<tr>
<td>HONR 201US</td>
<td>Texts and Critics: Knowledge</td>
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<td>US 101US</td>
<td>First Year Seminar</td>
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<td>CHMY 143</td>
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<td>M 172Q</td>
<td>Calculus II</td>
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**Sophomore Year**

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<tr>
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<td>College Writing II</td>
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<tr>
<td>WRIT 221</td>
<td>Intermediate Tech Writing</td>
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<tr>
<td>HONR 202H</td>
<td>Texts and Critics: Imagination</td>
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</tr>
<tr>
<td>SRVY 230</td>
<td>Intro to Srvyg for Engineers</td>
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<tr>
<td>EGEN 201</td>
<td>Engineering Mechanics—Statics</td>
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<tr>
<td>M 273Q</td>
<td>Multivariable Calculus</td>
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<tr>
<td>PHSX 222</td>
<td>Physics II (w/ calculus)</td>
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<tr>
<td>ECIV 202</td>
<td>Applied Analysis</td>
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</tr>
<tr>
<td>EGEN 202</td>
<td>Engineering Mech.—Dynamics</td>
<td>3</td>
</tr>
<tr>
<td>EGEN 205</td>
<td>Mechanics of Mtls (equiv 305)</td>
<td>3</td>
</tr>
<tr>
<td>EGEN 350</td>
<td>Applied Engineering Data Analysis</td>
<td>2-3</td>
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<tr>
<td>or STAT 332</td>
<td>Statistics for Scientists and Engineers</td>
<td></td>
</tr>
<tr>
<td>M 274</td>
<td>Introduction to Differential Equation</td>
<td>4</td>
</tr>
</tbody>
</table>

Choose one of the following: 3-4

- BIOB 160 - Principles of Living Systems
- BIOM 103IN - Unseen Universe: Microbes
- ENSC 245IN - Soils
- EARTH 101IN - Earth System Sciences
- GPHY 284 - Intro to GIS Science & Cartog

Year Total: 17-18

**Junior Year**

<table>
<thead>
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<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>ECIV 312</td>
<td>Structures I**</td>
<td>3</td>
</tr>
<tr>
<td>ECIV 331</td>
<td>Engineering Hydrology**</td>
<td>2</td>
</tr>
<tr>
<td>ECIV 350</td>
<td>Transportation Engineering**</td>
<td>3</td>
</tr>
<tr>
<td>EGEN 310R</td>
<td>Multidisciplinary Engineering Design</td>
<td>3</td>
</tr>
<tr>
<td>EGEN 335</td>
<td>Fluid Mechanics**</td>
<td>3</td>
</tr>
<tr>
<td>ECIV 308</td>
<td>Construction Practice</td>
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<tr>
<td>ECIV 315</td>
<td>Structures II**</td>
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<tr>
<td>ECIV 320</td>
<td>Geotechnical Engineering**</td>
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</tr>
<tr>
<td>ECIV 332</td>
<td>Engineering Hydraulics**</td>
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<td>EENV 340</td>
<td>Princ of Envr Engineering**</td>
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<tr>
<td>EMAT 251</td>
<td>Materials Structures and Prop</td>
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<tr>
<td>EEE 250</td>
<td>Circuits, Devices and Motors</td>
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<tr>
<td>EGEN 324</td>
<td>Applied Thermodynamics</td>
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<td>EGEN 330</td>
<td>Business Fundamentals for Technical Professionals</td>
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**Senior Year**

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<thead>
<tr>
<th>Course Code</th>
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<th>Credits</th>
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<tbody>
<tr>
<td>ECIV 401</td>
<td>Civil Eng Practice and Ethics**</td>
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<tr>
<td>ECIV 402</td>
<td>Civil Engineering Design I**</td>
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<tr>
<td>University Core and Prof. Electives**</td>
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<tr>
<td>ECIV 499R</td>
<td>Capstone: Civil Eng Design II**</td>
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<tr>
<td>EGEN 488</td>
<td>Fundamentals of Engineer Exam**</td>
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<td>Total Program Credits:</td>
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</table>

* Key courses
** Advanced courses

University Core Electives for Civil Engineering majors must include one of the following courses:

- BGEN 242D - Intro to Int’l Business
- ECNS 101IS - Economic Way of Thinking
- PSCI 210IS - Introduction to American Government
- PSCI 214IS - Principles of Political Science
- PSCI 230D - Introduction to International Relations

Additional requirements: 15 credits of approved professional electives at the 300 level or above. A minimum of 2 courses in civil engineering (i.e., ECIV, EENV, SRVY, EGEN) and not more than 3 courses in any one civil engineering sub-area are required. A maximum of 4 credits total from Individual Problems, Internships (max. 2 cr.), and Undergraduate Research may be counted toward professional electives. The professional electives program must contain a minimum of 2 design intensive courses (see the
CE flow chart). Students must successfully complete all key courses prior to taking any professional electives. A maximum of 3 credit-hours may be included from a completed MSU minor, a prior or concurrent BS/BA degree in another major, or courses in a completed MSU Honors Program. A student may petition to include other senior or graduate level courses consistent with the degree program but not listed here (requires Academic Adviser and Department Head approval).

A minimum of 128 credits is required for graduation; 42 of these credits must be in courses numbered 300 and above.

### Professional Elective Courses

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>ECIV 307</td>
<td>Construction Estimating and Bidding</td>
<td>3</td>
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<tr>
<td>ECIV 309</td>
<td>Building Information Modeling in Construction</td>
<td>3</td>
</tr>
<tr>
<td>ECIV 404</td>
<td>Heavy Const Equip and Methods</td>
<td>3</td>
</tr>
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<td>ECIV 405</td>
<td>Construction Project Planning and Scheduling</td>
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<tr>
<td>ECIV 414</td>
<td>Steel Design</td>
<td>3</td>
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<tr>
<td>ECIV 415</td>
<td>Design of Masonry Structures</td>
<td>3</td>
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<tr>
<td>ECIV 416</td>
<td>Design of Wood and Timber Structures</td>
<td>3</td>
</tr>
<tr>
<td>ECIV 420</td>
<td>Earth and Foundation Engr</td>
<td>3</td>
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<tr>
<td>ECIV 425</td>
<td>Geotechnical Structures</td>
<td>3</td>
</tr>
<tr>
<td>ECIV 431</td>
<td>Open Channel Hydraulics</td>
<td>3</td>
</tr>
<tr>
<td>ECIV 435</td>
<td>Closed-Conduit Hydraulics</td>
<td>3</td>
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<tr>
<td>ECIV 451</td>
<td>Highway Pavements</td>
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</tr>
<tr>
<td>ECIV 452</td>
<td>Traffic Engineering and ITS</td>
<td>3</td>
</tr>
<tr>
<td>ECIV 454</td>
<td>Transportation Planning</td>
<td>3</td>
</tr>
<tr>
<td>ECIV 455</td>
<td>Survey Data Collection &amp; Analysis for Transportation Engineering</td>
<td>3</td>
</tr>
<tr>
<td>ECIV 456</td>
<td>Highway Geometric Design</td>
<td>3</td>
</tr>
<tr>
<td>ECIV 461</td>
<td>Cold Regions Infrastructure Engineering</td>
<td>3</td>
</tr>
<tr>
<td>ECIV 490R</td>
<td>Undergraduate Research</td>
<td>1-4</td>
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<tr>
<td>ECIV 492</td>
<td>Independent Study</td>
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<tr>
<td>ECIV 498</td>
<td>Internship</td>
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<tr>
<td>EENV 432</td>
<td>Advanced Engineering Hydrology</td>
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<tr>
<td>EENV 434</td>
<td>Groundwater Supply/Remediation</td>
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<td>EENV 440</td>
<td>Water Chemistry for Envr Engr</td>
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<td>EENV 441</td>
<td>Natural Treatment Systems</td>
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<td>EENV 443</td>
<td>Air Pollution Control</td>
<td>3</td>
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<tr>
<td>EENV 445</td>
<td>Hazardous Waste Treatment</td>
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<td>Hazardous Waste Management</td>
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<td>EGEN 415</td>
<td>Advanced Mechanics of Solids</td>
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<tr>
<td>EGEN 435</td>
<td>Fluid Dynamics</td>
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<tr>
<td>SRVY 355</td>
<td>Surveying Calculations</td>
<td>3</td>
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<td>SRVY 361</td>
<td>Intro Legal Princ in Surveying</td>
<td>3</td>
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<tr>
<td>SRVY 362</td>
<td>Public Land Survey System</td>
<td>3</td>
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<tr>
<td>SRVY 375</td>
<td>Analytic Photogrammetry and Remote Sensing</td>
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<td>SRVY 474</td>
<td>Project Design in Surveying</td>
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### Construction Engineering Technology

**Freshman Year**

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<thead>
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<th>Course Code</th>
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<tbody>
<tr>
<td>CHMY 121IN</td>
<td>Introduction to General Chemistry</td>
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**Sophomore Year**

<table>
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<tbody>
<tr>
<td>EGEN 115</td>
<td>Engineering Graphics†</td>
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<tr>
<td>ACTG 220</td>
<td>Survey of Accounting</td>
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<tr>
<td>ACTG 201</td>
<td>Principles of Financial Acct</td>
<td></td>
</tr>
<tr>
<td>EIND 373</td>
<td>Production Inventory Cost Analysis</td>
<td></td>
</tr>
<tr>
<td>ECIV 307</td>
<td>Construction Estimating and Bidding</td>
<td>3</td>
</tr>
<tr>
<td>ETCC 301</td>
<td>Concrete Technology†</td>
<td>3</td>
</tr>
<tr>
<td>EGEN 310R</td>
<td>Multidisciplinary Engineering Design†</td>
<td>3</td>
</tr>
<tr>
<td>EGEN 331</td>
<td>Applied Mechanics of Fluids†</td>
<td>3</td>
</tr>
<tr>
<td>HONR 201US</td>
<td>Texts and Critics: Knowledge</td>
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<tr>
<td>UH 201US</td>
<td>Texts and Critics: Knowledge</td>
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<tr>
<td>ECNS 202</td>
<td>Principles of Macroeconomics</td>
<td>3</td>
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<tr>
<td>DDSN 101</td>
<td>CAD 1-A</td>
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<tr>
<td>EMAT 251</td>
<td>Materials Structures and Prop</td>
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<tr>
<td>M 165Q</td>
<td>Calculus for Technology I†</td>
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<tr>
<td>PHSX 205</td>
<td>College Physics I†</td>
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<tr>
<td>WRIT 101W</td>
<td>College Writing I†</td>
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**Junior Year**

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<tr>
<td>PHSX 207</td>
<td>College Physics II†</td>
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<td>Choose one of the following:</td>
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<tr>
<td>BMGT 205</td>
<td>Prof Business Communication</td>
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<tr>
<td>WRIT 201</td>
<td>College Writing II†</td>
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<tr>
<td>WRIT 221</td>
<td>Intermediate Tech Writing</td>
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<tr>
<td>HONR 202H</td>
<td>Texts and Critics: Imagination</td>
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<td>ETCC 204</td>
<td>Appld Analysis for Const Tech</td>
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<tr>
<td>SRVY 273</td>
<td>Route Surveying†</td>
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<tr>
<td>EGEN 208</td>
<td>Applied Strength of Materials (University Core)**</td>
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<tr>
<td>University Core</td>
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<tr>
<td>Choose one of the following:</td>
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<tr>
<td>ERTH 101IN</td>
<td>Earth System Sciences</td>
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<tr>
<td>GPHY 284</td>
<td>Intro to GIS Science &amp; Cartog</td>
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<td>Year Total:</td>
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<td>16-18</td>
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**Senior Year**

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<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>EGEN 115</td>
<td>Engineering Graphics†</td>
<td>1</td>
</tr>
<tr>
<td>ACTG 220</td>
<td>Survey of Accounting</td>
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<tr>
<td>ACTG 201</td>
<td>Principles of Financial Acct</td>
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<tr>
<td>EIND 373</td>
<td>Production Inventory Cost Analysis</td>
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</tr>
<tr>
<td>ECIV 307</td>
<td>Construction Estimating and Bidding</td>
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</tr>
<tr>
<td>ETCC 301</td>
<td>Concrete Technology†</td>
<td>3</td>
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<tr>
<td>EGEN 310R</td>
<td>Multidisciplinary Engineering Design†</td>
<td>3</td>
</tr>
<tr>
<td>EGEN 331</td>
<td>Applied Mechanics of Fluids†</td>
<td>3</td>
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Technical-Professional Electives

**Senior Year**

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<th>Course Code</th>
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<th>Credits</th>
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<tr>
<td>BGEN 361</td>
<td>Principles of Business Law</td>
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<td>ECIV 404</td>
<td>Heavy Const Equip and Methods **</td>
<td>3</td>
</tr>
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<td>ECIV 405</td>
<td>Construction Project Planning and Scheduling **</td>
<td>3</td>
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<tr>
<td>EELE 354</td>
<td>Electric Power Applications **</td>
<td>3</td>
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<td>ETME 425</td>
<td>Building Systems **</td>
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<td>ETCC 499R</td>
<td>Capstone: Const Engin Tech **</td>
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<tr>
<td>ETCC 412</td>
<td>Structural Elements **</td>
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<td>University Core and Tech. Prof. Electives **</td>
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Total Program Credits: 128

* Key courses

** Advanced courses

Additional requirements: At least 7 credits of technical-professional electives with a minimum of 2 credits of Internship Electives (maximum 4 credits). See the CET flow chart for a list of Internship Electives. A maximum of 4 credits total from Individual Problems, Internships (if taking 2 internships, must be from two separate employers), and Undergraduate Research may be counted toward professional electives. Students must successfully complete all key courses prior to taking any professional electives. A maximum of 3 credit-hours may be included from a completed MSU minor, a prior or concurrent BS/BA degree in another major, or courses in a completed MSU Honors Program. A student may petition to include other senior or graduate level courses consistent with the degree program but not listed here (requires Academic Adviser and Department Head approval).

A minimum of 128 credits is required for graduation; 42 of these credits must be in courses numbered 300 and above.

**Technical-Professional Electives**

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<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>ARCH 331</td>
<td>Environmental Controls I</td>
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<tr>
<td>ARCH 332</td>
<td>Environmental Controls II</td>
<td>4</td>
</tr>
<tr>
<td>BFIN 322</td>
<td>Business Finance</td>
<td>3</td>
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<tr>
<td>BFIN 420</td>
<td>Investments I</td>
<td>3</td>
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<tr>
<td>BMGT 322</td>
<td>Operations Management</td>
<td>3</td>
</tr>
<tr>
<td>BMGT 335</td>
<td>Management and Organization</td>
<td>3</td>
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<tr>
<td>BMGT 329</td>
<td>Human Resource Management</td>
<td>3</td>
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<tr>
<td>BMGT 410</td>
<td>Sustainable Business Practices</td>
<td>3</td>
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<td>BMGT 464</td>
<td>International Management</td>
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<td>BMKT 325</td>
<td>Principles of Marketing</td>
<td>3</td>
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<tr>
<td>ECIV 309</td>
<td>Building Information Modeling in Construction</td>
<td>3</td>
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<td>ECIV 350</td>
<td>Transportation Engineering</td>
<td>3</td>
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<td>ECIV 461</td>
<td>Cold Regions Infrastructure Engineering</td>
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<tr>
<td>ECIV 492</td>
<td>Independent Study</td>
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<tr>
<td>ECIV 498</td>
<td>Internship</td>
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<tr>
<td>EGEN 324</td>
<td>Applied Thermodynamics</td>
<td>3</td>
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<tr>
<td>EGEN 498Z</td>
<td>Internship</td>
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<td>EIND 313</td>
<td>Work Design and Analysis</td>
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<tr>
<td>EIND 425</td>
<td>Technology Entrepreneurship</td>
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<td>EIND 434</td>
<td>Project Management for Engineers</td>
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<tr>
<td>ETCC 499R</td>
<td>Undergraduate Research</td>
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<td>ETCC 492</td>
<td>Independent Study</td>
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<tr>
<td>ETCC 498</td>
<td>Internship</td>
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</tbody>
</table>

**Land Surveying Minor**

This minor is designed to provide students with perspective and skills to pursue a successful career in surveying or a surveying related field. The focus is on courses related to surveying such as photogrammetry, global positioning systems, U.S. Public Land Survey System, legal principles of surveying, and project design in surveying. Enrollment in this minor is open to all engineering and non-engineering students.

The Land Surveying Minor, completed co-incident with a Civil Engineering or Construction Engineering Technology degree, is designed to satisfy the land surveying curriculum requirements established by the Montana Board of Professional Engineers and Professional Land Surveyors to be eligible to take the Fundamentals of Surveying (FS) Exam. Students from other major degree programs interested in pursuing professional land surveyor licensure should contact the Civil Engineering Department before enrolling in the Land Surveying Minor.

**Students must complete all of the following courses**

**Survey Techniques - 12 Credits**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>SRVY 230</td>
<td>Intro to Srvyg for Engineers</td>
<td>3</td>
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<tr>
<td>SRVY 273</td>
<td>Route Surveying</td>
<td>3</td>
</tr>
<tr>
<td>or ECIV 350</td>
<td>Transportation Engineering</td>
<td>3</td>
</tr>
<tr>
<td>SRVY 375</td>
<td>Analytic Photogrammetry and Remote Sensing</td>
<td>3</td>
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<tr>
<td>ECIV 456</td>
<td>Highway Geometric Design</td>
<td>3</td>
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<tr>
<td>or GPHY 426</td>
<td>Remote Sensing</td>
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**Principles and Practices of Land Surveying - 15 Credits**

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<td>SRVY 355</td>
<td>Surveying Calculations</td>
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<td>SRVY 361</td>
<td>Intro Legal Princ in Surveying</td>
<td>3</td>
</tr>
<tr>
<td>SRVY 362</td>
<td>Public Land Survey System</td>
<td>3</td>
</tr>
<tr>
<td>SRVY 474</td>
<td>Project Design in Surveying</td>
<td>3</td>
</tr>
<tr>
<td>BGEN 361</td>
<td>Principles of Business Law</td>
<td>3</td>
</tr>
<tr>
<td>or GPHY 457</td>
<td>Adv GPS Mapping for GIS</td>
<td>3</td>
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<tr>
<td>or AGBE 337</td>
<td>Agricultural Law</td>
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**Elective - 3 Credits**

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<td>Intro to GIS Science &amp; Cartog</td>
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</tr>
<tr>
<td>or GPHY 357</td>
<td>GPS Fund/App in Mapping</td>
<td>3</td>
</tr>
<tr>
<td>or GPHY 384</td>
<td>Adv GIS and Spatial Analysis</td>
<td>3</td>
</tr>
<tr>
<td>or GPHY 484R</td>
<td>Applied GIS &amp; Spatial Analysis</td>
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</tr>
</tbody>
</table>

Total Credits 30

* Courses have prerequisites that must be satisfied prior to enrollment in surveying minor courses. Contact the Civil Engineering Department for more information.

**Land Surveying Non-Degree Certificate**

**Computer Science**

A computer science degree is highly marketable. Between 2010 and 2020, one study projects that there will be a shortfall of 32 million technically
specialized professionals in the U.S., Europe, Japan, China and India. Consequently, students who graduate with a bachelor’s degree in CS are in high demand. The average starting salary is $65,000.

Our curriculum is designed with considerable flexibility, due to the numerous types of computer science jobs that exist. The bachelor’s degree provides every student with a strong fundamental understanding of the field. Students may then select from exciting computer science electives such as artificial intelligence, computational biology, computer networks, databases, embedded systems, multimedia, operating systems, software engineering, web design and special topics courses. Students who complete a bachelor’s degree will find themselves both highly marketable and well-prepared for graduate school.

The department also offers graduate programs leading to the M.S. and Ph.D. degrees in Computer Science.

The bachelor’s degree is accredited by the Computing Accreditation Commission of ABET, http://www.abet.org/.

Professional Option
The professional option allows a student to delve more deeply into both computer science and related technical areas. The compilers course, CSCI 468, serves as the capstone for this option.

Interdisciplinary Option
Many opportunities and challenges lie at the intersection of technology and other fields. The interdisciplinary option allows a student to pursue a minor of choice such as Entrepreneurship or Japanese Studies. During a student’s senior year, the minor area must be connected back to computer science through a senior project. CSCI 482R and CSCI 483R serve as the capstone for this option.

Undergraduate Programs
- Professional Option (p. 163)
- Interdisciplinary Option (p. 162)

Undergraduate Minors
- Computer Science Minor (Non-Teaching) (p. 162)

Graduate Programs
- M.S. in Computer Science (p. 348)
- Ph.D. in Computer Science (p. 348)

M.S. Degree Program
A Bachelor’s degree in Computer Science is recommended. Students with non-computer science degrees at the Bachelor’s level or above are also encouraged to apply; such students will generally be required to take appropriate courses while enrolled at MSU to make up computer science and related subject matter deficiencies prior to full acceptance into the computer science Master’s program. Factors that the department uses in its admissions process include GRE scores, TOEFL scores (for non-native English speakers), reference letters, GPA and previous coursework. For more information, please refer to www.cs.montana.edu/future-students-masters-program.html.

Details about applying can be found at www.montana.edu/gradschool/admissions/apply.html.
A minimum of 120 credits is required for graduation; 42 of these credits must be in courses numbered 300 and above. For more detailed requirements, please consult the Interdisciplinary Option Graduation Workshop, located at cs.montana.edu/forms.html.

### Professional Option

#### Freshman Year

<table>
<thead>
<tr>
<th>Course</th>
<th>Fall</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CSCI 111 - Programming with Java I</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>M 171Q - Calculus I</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>WRIT 101W - College Writing I</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>University Core and Electives</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>University Seminar Core</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>University Core and Electives</td>
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<td></td>
</tr>
<tr>
<td>M 172Q - Calculus II</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>CSCI 132 - Basic Data Structures and Algorithms</td>
<td>4</td>
<td></td>
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<tr>
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#### Sophomore Year

<table>
<thead>
<tr>
<th>Course</th>
<th>Fall</th>
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</thead>
<tbody>
<tr>
<td>CSCI 246 - Discrete Structures</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>WRIT 221 - Intermediate Tech Writing</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Science Electives</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>CSCI 215CS - Social &amp; Ethical Issues in CS</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>University Core</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>CSCI 112 - Programming with C I</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>CSCI 232 - Data Structures and Algorithms</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Math, Statistics, or Probability Elective</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Science Electives</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>University Core</td>
<td>3</td>
<td></td>
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<tr>
<td>Year Total</td>
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</table>

#### Junior Year

<table>
<thead>
<tr>
<th>Course</th>
<th>Fall</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>ESOF 322 - Software Engineering</td>
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#### Senior Year

<table>
<thead>
<tr>
<th>Course</th>
<th>Fall</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CSCI 482R - Interdisciplinary Project Instruction</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Science or Math Electives</td>
<td>4</td>
<td></td>
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<tr>
<td>Probability or Statistics Elective</td>
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<td></td>
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<tr>
<td>CS Electives</td>
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<td></td>
</tr>
<tr>
<td>CSCI 481 - Program Assessment</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>CSCI 483R - Interdisciplinary Project</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Science or Math Electives</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>CS Electives</td>
<td>3</td>
<td></td>
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<tr>
<td>CS or Related Electives</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>M 468 - Compilers</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>CSCI 481 - Program Assessment</td>
<td>0</td>
<td></td>
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<tr>
<td>Science or Math Electives</td>
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<td></td>
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<tr>
<td>CS Electives</td>
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<td></td>
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<tr>
<td>CS or Related Electives</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Year Total</td>
<td>16</td>
<td>14</td>
</tr>
</tbody>
</table>

### Electrical and Computer Engineering

The Electrical and Computer Engineering Department (ECE) offers degrees in several areas: a Bachelor of Science and Master of Science in Electrical Engineering, a Ph.D. in Engineering with an ECE option; a Master of Engineering with an EE option; and a Bachelor of Science in Computer Engineering. The programs leading to the B.S. in Electrical Engineering and B.S. in Computer Engineering are both accredited by the Engineering Accreditation Commission of ABET, http://www.abet.org.

The breadth and quality of each degree program are driven by the goals of the Electrical and Computer Engineering Department.

The mission of the department is to provide an excellent environment for the scholarly pursuits of education, discovery, and dissemination in electrical and computer engineering in support of Montana State University and the state of Montana. We strive to excel in teaching at both the undergraduate and graduate levels. We seek to attract and retain well-qualified undergraduate students and provide them with educational, research, and scholarship opportunities. We strive to train the next generation of academics and researchers by providing opportunities in world class research and experience in teaching. And, we seek to develop a competitive research program of regional, national, and international importance.

The goals of the Department are to:

1. Serve the State of Montana and the nation through education, research, and service to meet the mission of Montana State University and the College of Engineering.
2. Provide ABET accredited undergraduate programs in Electrical Engineering and Computer Engineering.
3. Be recognized by academic and industrial colleagues as delivering excellent undergraduate programs which provide students with a strong foundation in the contemporary and traditional areas of Electrical and Computer Engineering.

4. Encourage faculty members to maintain professional expertise through continued professional development so they can sustain excellence in teaching and advising and be competitive in research.

5. Provide excellent learning opportunities in lectures and modern laboratory facilities.

6. Provide graduate research opportunities which, coupled with undergraduate excellence, prepare students through advanced studies in current and emerging fields of state, national, and international importance.

7. Develop a competitive research program and disseminate new knowledge while mentoring graduate students completing requirements for advanced degrees.

Educational objectives for the BSEE and BSCpE degree programs are broad statements that describe what graduates are expected to attain within a few years after graduation.

In their first few years on the job, graduates of the Programs:

1. Pursue a professional career based on an education in the fundamentals of Electrical and Computer Engineering.

2. Engage in post-graduate education programs.

3. Provide a positive impact to the engineering community and to the community at large.

**Internship Opportunities**

Internships are encouraged for students seeking engineering experience during summer employment. A wide variety of engineering companies recruit undergraduate interns from MSU. A total of three credits of internship can be applied towards graduation as a professional elective at the rate of one credit per full-time summer engineering employment. An intern experience allows students to gain engineering industrial experience that complements their formal academic education. Students in the Electrical Engineering and the Computer Engineering degree programs are encouraged to investigate the possibilities of an internship experience according to opportunities announced each year. The MSU Career, Internship & Student Employment Services (http://www.montana.edu/careers) office located in 177 Strand Union Building also helps students identify internship opportunities.

**Research Opportunities**

Students in the Electrical Engineering and the Computer Engineering degree programs are also encouraged to investigate opportunities to work under the supervision of an ECE faculty member in a research lab either during the summer or during the academic year. All members of the ECE faculty have active research programs which regularly involve undergraduate students. Hands-on research experience complements the student’s formal academic education while providing familiarity with career opportunities in the research field. Students in the ECE department have opportunities for paid research positions in addition to receiving credit for conducting research by registering for EELE 290R or EELE 490R Undergraduate Research, or EELE 292 or EELE 492 Independent Study.

**Graduate Program**

Graduate school can provide an opportunity to gain education and experience in specialty areas that go beyond the scope or depth of the undergraduate curriculum, and offers advanced work in such areas as design, development work, research, and university-level teaching. The Electrical and Computer Engineering Department offers graduate programs leading to the research-based M.S. in Electrical Engineering, the coursework-only M.Eng. in Engineering with an EE option, and Ph.D. in Engineering with an ECE option. Our research provides excellent learning opportunities, including participation in interdisciplinary teams. A number of research and teaching assistantships are available on a competitive basis to qualified graduate students. Information regarding the ECE graduate program can be found at http://ece.montana.edu/research/eegrad1.htm.

For more information about the department and its programs, see the Electrical and Computer Engineering Department home page at http://ece.montana.edu

**Undergraduate Programs**

- Computer Engineering (p. 164)
- Electrical Engineering (p. 166)

**Graduate Programs**

- M.S. in Electrical Engineering (p. 348)
- M.Eng in Electrical Engineering (p. 348)
- Ph.D. in Engineering, Electrical & Computer Engineering option (p. 348)

**Computer Engineering**

The Electrical and Computer Engineering Department offers an accredited program for the Bachelor of Science Degree in Computer Engineering (BSCpE). The Montana State University Computer Engineering program is accredited by the Engineering Accreditation Commission of ABET http://www.abet.org.

In the fast-paced field of computers, the computer engineering graduate will be prepared for careers in exciting innovative technologies including embedded systems, programmable logic, hardware/software co-design, and digital signal processing. With increased processor capacity and processing speeds, re-programmable logic devices offer far-reaching opportunities for the computer engineer to create new applications unheard of today. The computer engineer uses knowledge of both electronics hardware and software to achieve state-of-the-art solutions, often involving programmable logic devices and microprocessors. The computer engineering curriculum is designed to prepare students for engineering careers where programming and software skills are blended with the understanding of hardware design.

The computer engineering program at MSU is interdisciplinary and incorporates substantial coursework from both the Electrical and Computer Engineering Department and the Computer Science Department. All students in the Electrical and Computer Engineering Department develop common skills in basic science, mathematics, basic electronics and circuits; however, the computer engineering student diverges from the electrical engineering student by taking more computer science and computer architecture courses, as well as a full complement of courses in microprocessors and programmable devices.

In the senior year each computer engineering student takes part in a capstone design project. This project allows the student to function as part of a team on a real world problem, and the student, in addition to accomplishing the design, must also communicate his or her work in both a written paper and an oral presentation. All projects are intended to bring the student’s academic training to a logical conclusion and further develop the problem-solving skills and the communication skills of the computer engineering graduate.

The computer engineering program educational outcomes are:

a. An ability to apply knowledge of mathematics, science, and engineering.
b. An ability to design and conduct experiments, as well as to analyze and interpret data.

c. An ability to design a system, component, or process to meet desired needs.

d. An ability to function on multi-disciplinary teams.

e. An ability to identify, formulate, and solve engineering problems.

f. An understanding of professional and ethical responsibility.

g. An ability to communicate effectively.

h. The broad education necessary to understand the impact of engineering solutions in a global and societal context.

i. A recognition of the need for, and an ability to engage in lifelong learning.

j. A knowledge of contemporary issues.

k. An ability to use the techniques, skills and modern engineering tools necessary for engineering practice.

l. Knowledge of the principles of project management and design trade-offs.

m. An ability to program microcontroller/microcomputer systems using assembly and high-level languages.

n. An ability to design digital systems using modern design tools.

o. An ability to analyze electrical and electronic systems.

p. An ability to implement real-time systems.

Student Performance and Retention Requirements
Students are required by Board of Regents policy to achieve a C- or better grade in each class used to satisfy the BSCpE degree requirements.

Undergraduate Programs
• Bachelor of Science in Computer Engineering (p. 165)
• Computer Engineering Minor (Non-Teaching) (p. 166)

Graduate Programs
Students enrolled in the Electrical Engineering (M.S. and M.Eng.) graduate program or the Electrical & Computer Engineering (Ph.D.) graduate program can pursue cutting edge computer engineering research projects.

Please refer to the ECE graduate program section (p. 348) of the catalog for more information.

B.S. in Computer Engineering

Freshman Year

<table>
<thead>
<tr>
<th>Credits</th>
<th>Fall</th>
<th>Spring</th>
</tr>
</thead>
<tbody>
<tr>
<td>M 171Q - Calculus I</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>EELE 101 - Intro Electrical Fundamentals</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>CLS 101US - Knowledge and Community or COMX 111US - Introduction to Public Speaking</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>CSCI 111 - Programming with Java I</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>M 172Q - Calculus II</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>PHSX 220 - Physics I (w/ calculus)</td>
<td>4</td>
<td></td>
</tr>
</tbody>
</table>

Sophomore Year

<table>
<thead>
<tr>
<th>Credits</th>
<th>Fall</th>
<th>Spring</th>
</tr>
</thead>
<tbody>
<tr>
<td>M 274 - Introduction to Differential Equation</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>PHSX 222 - Physics II (w/ calculus)</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>EELE 201 - Circuits I for Engineering</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>EELE 261 - Intro To Logic Circuits</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>University Core Elective</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>WRIT 101W - College Writing I</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>M 273Q - Multivariable Calculus</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>EGEN 350 - Applied Engineering Data Analysis</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>EELE 203 - Circuits II for Engineering</td>
<td>4</td>
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<tr>
<td>Year Total:</td>
<td>16</td>
<td>16</td>
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Junior Year

<table>
<thead>
<tr>
<th>Credits</th>
<th>Fall</th>
<th>Spring</th>
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</thead>
<tbody>
<tr>
<td>University Core Elective</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>EELE 371 - Microprocess HW and SW Systems</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>EELE 308 - Signals and Systems Analysis</td>
<td>3</td>
<td></td>
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<tr>
<td>EELE 317 - Electronics</td>
<td>4</td>
<td></td>
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<tr>
<td>CSCI 246 - Discrete Structures</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>EGEN 310R - Multidisciplinary Engineering Design</td>
<td>3</td>
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<tr>
<td>EELE 465 - Microcontroller Applications</td>
<td>4</td>
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<tr>
<td>EELE 367 - Logic Design</td>
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<tr>
<td>Choose one of the following:</td>
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</tr>
<tr>
<td>EELE 321 - Intro To Feedback Controls</td>
<td></td>
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<tr>
<td>ELE 477 - Digital Signal Processing</td>
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Senior Year

<table>
<thead>
<tr>
<th>Credits</th>
<th>Fall</th>
<th>Spring</th>
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</thead>
<tbody>
<tr>
<td>University Core Elective</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>EELE 488R - Electric Engineering Design I</td>
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<tr>
<td>EELE 475 - Hardwr/Softwr Eng Embedded Sys</td>
<td>3</td>
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<tr>
<td>EELE 334 - Electromagnetic Theory I</td>
<td>3</td>
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<tr>
<td>Two EELE/CSCI Electives</td>
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<td></td>
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<tr>
<td>University Core Elective</td>
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<tr>
<td>EELE 489R - Electrical Engr Design II</td>
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<tr>
<td>EELE 487 - Prof, Ethics &amp; Engr Practices</td>
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<td>EGEN 488 - Fundamentals of Engineer Exam</td>
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</tr>
<tr>
<td>EELE 466 - Comp Computer Architecture</td>
<td>4</td>
<td></td>
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<tr>
<td>Two EELE/CSCI Electives</td>
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<td>Year Total:</td>
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<td>17</td>
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<tr>
<td>Total Program Credits:</td>
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<td></td>
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</tbody>
</table>

* Elective requirements include 12 credits of humanities, social science, diversity, and arts classes as part of the University Core requirements, 12 credits of approved professional electives from the list below, including a minimum of 6 credits in Computer Science. There must be a minimum of 4 credits at the 300 level or above in the student’s professional elective package.

Professional Electives

<table>
<thead>
<tr>
<th>Credits</th>
<th>Fall</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACTG 201 - Principles of Financial Acct</td>
<td>3</td>
</tr>
<tr>
<td>ACTG 202 - Principles of Managerial Acct</td>
<td>3</td>
</tr>
</tbody>
</table>
Computer Engineering Minor (Non-Teaching Minor)

The Department of Electrical and Computer Engineering offers a non-teaching minor in Computer Engineering that provides a focus in computer programming, digital logic design, and microprocessor hardware/software. The minor requires a minimum of 30 credits: 23 credits in seven specified CS and EE courses and at least 7 credits (2 or 3 courses) of electives selected from among a specified list of upper-division EE courses. This minor is a useful complement to majors in science or engineering for those seeking a cross-disciplinary academic program. An EE major can complete a minor in Computer Engineering by taking CSCI 111, CSCI 132, and CSCI 232 (a total of 12 credits) plus two courses (7 cr min) from the specified elective list for the CpE minor. Completing the Computer Engineering minor requires 3 credits of professional electives beyond the minimum of 18 professional elective credits required for EE majors. Thus, an EE degree with a CpE minor can be completed in 128 credits.

Students must receive a grade of "C-" or better in all required courses for the CpE minor.

Electrical Engineering

The Electrical and Computer Engineering Department offers an accredited program leading to the Bachelor of Science degree in Electrical Engineering (BSEE). The Montana State University Electrical Engineering Program is accredited by the Engineering Accreditation Commission of ABET http://www.abet.org.

Electrical Engineering offers the graduate extensive opportunities in such fields as telecommunications, control systems, microprocessors, instrumentation, electromagnetic systems, optical and electro-optical systems, power electronics, fuel cells, electrical power, and computer-controlled devices. In addition, electrical engineers play key roles in interdisciplinary efforts such as communications networks, remote sensing, aerospace systems, medical instrumentation, transportation systems, manufacturing, and numerous other applications of great social impact. Electrical engineers are leaders in the development of such technological innovations as the Internet, high definition television, fiber optic communications, and personal communication systems. As an electrical engineer, employment opportunities are available in numerous engineering careers, such as advanced research and development, design and applications engineering, manufacturing engineering, sales, and management.

The undergraduate program is designed to provide the student with the fundamental background in Mathematics, basic science, engineering, and personal communication to allow the graduate to be a contributing member in the engineering community. The electrical engineering curriculum provides the integrated educational experience whereby the student develops the skills to identify and to solve technical problems by applying pertinent
electrical engineering knowledge to the solution of practical problems. This breadth of engineering knowledge and the ability to communicate that knowledge requires a broad-based education in various fields as well as professional elective courses. These professional electives enable the student to study in depth one or more of the following areas: logic design, digital signal processing, computer and microprocessor applications, electromagnetic theory, optics and photonics, control systems, electrical power systems, electronic circuits, and telecommunications.

Technical electives available outside the department allow students to broaden their knowledge and understanding of other engineering and scientific areas. These electives can also be used to take relevant coursework in business, finance, law, and management.

The electrical engineering program educational outcomes are:

- a. An ability to apply knowledge of mathematics, science, and engineering.
- b. An ability to design and conduct experiments, as well as to analyze and interpret data.
- c. An ability to design a system, component, or process to meet desired needs.
- d. An ability to function on multi-disciplinary teams.
- e. An ability to identify, formulate, and solve engineering problems.
- f. An understanding of professional and ethical responsibility.
- g. An ability to communicate effectively.
- h. The broad education necessary to understand the impact of engineering solutions in a global and societal context.
- i. A recognition of the need for, and an ability to engage in lifelong learning.
- j. A knowledge of contemporary issues.
- k. An ability to use the techniques, skills and modern engineering tools necessary for engineering practice.
- l. Knowledge of the principles of project management and design trade-offs.
- r. An ability to analyze and synthesize electronic devices and electrical systems.

Student Performance and Retention Requirements

Students are required by Board of Regents policy to achieve a C- or better grade in each class used to satisfy the BSEE degree requirements.

Undergraduate Programs

- B.S. in Electrical Engineering (p. 167)
- Electrical Engineering Minor (Non-Teaching) (p. 168)
- Optics Minor (Non-Teaching) (p. 169)

Graduate Programs

Please refer to the ECE graduate programs section (p. 348) of the catalog.

B.S. in Electrical Engineering

<table>
<thead>
<tr>
<th>Freshman Year</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>EELE 101 - Intro Electrical Fundamentals</td>
<td>Fall 3</td>
</tr>
<tr>
<td>M 171Q - Calculus I</td>
<td>Fall 4</td>
</tr>
<tr>
<td>CLS 101US - Knowledge and Community or COMX 111US - Introduction to Public Speaking</td>
<td>Fall 3</td>
</tr>
<tr>
<td>PHSX 220 - Physics I (w/ calculus)</td>
<td>Spring 4</td>
</tr>
<tr>
<td>WRIT 101W - College Writing I</td>
<td>Spring 3</td>
</tr>
<tr>
<td>M 172Q - Calculus II</td>
<td>Spring 4</td>
</tr>
<tr>
<td>PHSX 222 - Physics II (w/ calculus)</td>
<td>Spring 4</td>
</tr>
<tr>
<td>CSCI 112 - Programming with C I</td>
<td>Spring 3</td>
</tr>
<tr>
<td>Year Total:</td>
<td>14 14</td>
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</table>

<table>
<thead>
<tr>
<th>Sophomore Year</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>M 274 - Introduction to Differential Equation</td>
<td>Fall 4</td>
</tr>
<tr>
<td>PHSX 224 - Physics III</td>
<td>Fall 4</td>
</tr>
<tr>
<td>EELE 201 - Circuits I for Engineering</td>
<td>Fall 4</td>
</tr>
<tr>
<td>EELE 261 - Intro To Logic Circuits</td>
<td>Fall 4</td>
</tr>
<tr>
<td>University Core Elective*</td>
<td>Fall 3</td>
</tr>
<tr>
<td>EGEN 350 - Applied Engineering Data Analysis</td>
<td>Fall 2</td>
</tr>
<tr>
<td>M 273Q - Multivariable Calculus</td>
<td>Fall 4</td>
</tr>
<tr>
<td>CHMY 141 - College Chemistry I</td>
<td>Fall 4</td>
</tr>
<tr>
<td>EELE 203 - Circuits II for Engineering</td>
<td>Fall 4</td>
</tr>
<tr>
<td>Year Total:</td>
<td>16 17</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Junior Year</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>University Core Elective*</td>
<td>Fall 3</td>
</tr>
<tr>
<td>EELE 308 - Signals and Systems Analysis</td>
<td>Fall 3</td>
</tr>
<tr>
<td>EELE 317 - Electronics</td>
<td>Fall 4</td>
</tr>
<tr>
<td>EELE 334 - Electromagnetic Theory I</td>
<td>Fall 3</td>
</tr>
<tr>
<td>EELE 371 - Microprocess HW and SW Systems</td>
<td>Fall 4</td>
</tr>
<tr>
<td>University Core Elective*</td>
<td>Fall 3</td>
</tr>
<tr>
<td>EGEN 310R - Multidisciplinary Engineering Design</td>
<td>Fall 3</td>
</tr>
<tr>
<td>Choose two of the following:</td>
<td>7-8</td>
</tr>
<tr>
<td>EELE 321 - Intro To Feedback Controls</td>
<td>Spring</td>
</tr>
<tr>
<td>EELE 355 - Energy Conversion Devices</td>
<td>Spring</td>
</tr>
<tr>
<td>EELE 445 - Telecommunication Systems</td>
<td>Spring</td>
</tr>
<tr>
<td>EE Professional Elective*</td>
<td>Spring 3</td>
</tr>
<tr>
<td>Year Total:</td>
<td>17 16-17</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Senior Year</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>EELE 488R - Electric Engineering Design I</td>
<td>Fall 2</td>
</tr>
<tr>
<td>EELE 409 - EE Material Science</td>
<td>Fall 3</td>
</tr>
<tr>
<td>Two EE Professional Electives*</td>
<td>Fall 6</td>
</tr>
<tr>
<td>Non-EE Professional Elective*</td>
<td>Fall 3</td>
</tr>
<tr>
<td>University Core Elective*</td>
<td>Fall 3</td>
</tr>
<tr>
<td>EELE 489R - Electrical Engr Design II</td>
<td>Fall 3</td>
</tr>
<tr>
<td>EELE 487 - Prof, Ethics &amp; Engr Practices</td>
<td>Fall 1</td>
</tr>
<tr>
<td>EGEN 488 - Fundamentals of Engineer Exam</td>
<td>Fall 0</td>
</tr>
<tr>
<td>Choose one of the following:</td>
<td>3-4</td>
</tr>
<tr>
<td>EELE 321 - Intro To Feedback Controls</td>
<td>Spring</td>
</tr>
</tbody>
</table>
Professional Electives

ACTG 201  Principles of Financial Acct  3
ACTG 202  Principles of Managerial Acct  3
ASTR 371  Solar System Astronomy  4
ASTR 373  Stars, Galaxies, and the Universe  4
BCH 380  Biochemistry  5
BIOB 105CS  Introduction to Biotechnology  3
BIOB 160  Principles of Living Systems  4
BIOB 170IN  Principles of Biological Diversity  4
BIOB 260  Cellular and Molecular Biology  4
BIOH 185  Integrated Physiology I  4
BIOH 201  Hum Anatomy & Physiology I  5
BIOH 211  Hum Anatomy & Physiology II  4
BMKT 325  Principles of Marketing  3
CHMY 143  College Chemistry II  4
CHMY 211  Elements of Organic Chemistry  5
CHMY 321  Organic Chemistry I  4
CHMY 323  Organic Chemistry II  4
CS 204  Multimedia Dev Methods  3
CSCI 111  Programming with Java I  4
CSCI 132  Basic Data Structures and Algorithms  4
CSCI 232  Data Structures and Algorithms  4
CSCI 246  Discrete Structures  3
CSCI 300 & 400 level courses, no more than 1 cr CSCI 494  4
ECNS 309  Managerial Economics  3
EELE 300 & 400 level courses, excluding EELE 354  4
EGEN 201  Engineering Mechanics--Statics  3
EGEN 202  Engineering Mech--Dynamics  3
EGEN 205  Mechanics of Mtls (equiv 305)  3
EGEN 325  Engineering Economic Analysis  3
EGEN 330  Business Fundamentals for Technical Professionals  3
EGEN 355  Fluid Mechanics  3
EIND 354  Engineering Probability and Statistics I  3
EIND 364  Principles of Operations Research I  3
EIND 373  Production Inventory Cost Analysis  3
EIND 425  Technology Entrepreneurship  3
EIND 434  Project Management for Engineers  3
EIND 454  Engr Probability and Stats II  3
EMEC 300 & 400 level courses  4

ERTH 101IN  Earth System Sciences  4
ESOF 322  Software Engineering  3
ESOF 422  Advanced Software Engineering  3
GPHY 121D  Human Geography  3
GPHY 141D  Geography of World Regions  3
GPHY 284  Intro to GIS Science & Cartog  3
M 221  Introduction to Linear Algebra  3
M 242  Methods of Proof  3
M 300 & 400 level courses, excluding M 330  4
PHSX 300 & 400 level courses (no more than 1 cr PHSX 494), and excluding PHSX 305 and 499  4
WRIT 221  Intermediate Tech Writing  3
WRIT 429  Professional Writing  3

Electrical Engineering Minor (Non-Teaching)

The Department of Electrical and Computer Engineering offers a non-teaching minor in Electrical Engineering that provides interested students with an introductory understanding of electrical circuits, electronics, and properties of signals. Students then choose electives from among a variety of electrical engineering topics, such as telecommunications, optics, electronics, electrical power, and control systems. This minor requires a minimum of 30 credits in electrical engineering subjects, with 9 of those credits selected from a list of upper division elective courses. This minor complements majors in science or engineering for those seeking a cross-disciplinary academic program. A CpE major can complete a minor in Electrical Engineering by taking three EELE classes (9 cr min) from the specified elective list for the EE minor. This can be done within the 126 credits required for the CpE degree alone.

Required core courses for the minor (21 cr.):

EELE 101  Intro Electrical Fundamentals  3
EELE 201  Circuits I for Engineering  4
EELE 203  Circuits II for Engineering  4
EELE 308  Signals and Systems Analysis  3
EELE 317  Electronics  4
EELE 334  Electromagnetic Theory I  3
Choose at least nine credits from the following:  9

EELE 321  Intro To Feedback Controls  3
EELE 355  Energy Conversion Devices  3
EELE 409  EE Material Science  3
EELE 411  Advanced Analog Electronics  3
EELE 414  Intro to VLSI Design  3
EELE 422  Intro to Modern Control  3
EELE 432  Applied Electromagnetics  3
EELE 445  Telecommunication Systems  3
EELE 447  Mobile Wireless Communications  3
EELE 477  Digital Signal Processing  3
EELE 482  Electro-Optical Systems  3
EELE 484  Laser Engineering  3

Total Credits  30

Students must receive a grade of “C-” or better in all required courses for the EE minor.
Optics Minor (Non-Teaching)

The undergraduate non-teaching minor in optics provides a core set of knowledge and skills necessary to participate in the rapidly growing opportunities in optical science and engineering. Requirements include courses in optics, electrical engineering and physics, as well as electives chosen to match the interests and needs of each student.

Students pursuing the BS in Electrical Engineering can earn the Optics Minor within the 125 credits required for the major by careful selection of electives and by completing an optics-related capstone design project.

Students pursuing the BS in Physics Professional Option or the BS in Physics Interdisciplinary Option can earn the Optics Minor with no extra credits by carefully selecting physics electives, by taking EEE 482 as one of their university or declared area electives, and by completing optics-related research (PHSX 490R and PHSX 499R) as their required senior project.

Required core courses for minor (12 credits):

- EEE 334 Electromagnetic Theory I
- or PHSX 423 Electricity and Magnetism I
- EEE 432 Applied Electromagnetics
- or PHSX 425 Electricity and Magnetism II
- EEE 482 Electro-Optical Systems
- PHSX 427 Advanced Optics
- or PHSX 437 Laser Applications

Optics electives (choose at least 9 credits):

- CHMY 371 Physical Chemistry-Quantum Chemistry and Spectroscopy I
- PHSX 427 Advanced Optics
- PHSX 437 Laser Applications
- PHSX 444 Advanced Physics Lab
- EEE 408 Photovoltaic Systems
- EEE 481 Optical Design
- EEE 484 Laser Engineering
- EEE 488R Electric Engineering Design I
- EEE 489R Electrical Eng Design II
- PHSX 499 Senior Capstone Seminar
- EEE 490R Undergraduate Research
- PHSX 490R Undergraduate Research
- PHSX 494 Seminar/Workshop
- EEE 491 Special Topics
- EEE 492 Independent Study

Total Credits: 21

1 A maximum of four (4) credits of these classes may be used if the topic is directly related to optics, on approval by academic advisor and research advisor/instructor.

2 A maximum of three (3) credits of these classes may be used if the topic is directly related to optics, on approval by academic advisor and research advisor/instructor.

Note: The following 500-level classes can be taken as electives in the Optics minor by seniors with a cumulative grade-point average >= 3.25 (by petition to the Registrar) and provided all prerequisites are met.

- EEE 538 Adv Top Electromagnet & Optics
- EEE 581 Fourier Optics/Imaging Theory
- EEE 582 Optical Design
- EEE 583 Remote Sensing Systems
- PHSX 515 Advanced Topics In Physics (if topic is directly optics related)
- CHMY 527 Analytic Optical Spectroscopy
- CHMY 557 Quantum Mechanics
- CHMY 560 Symmetry, Orbitals, and Spectroscopy

Mechanical & Industrial Engineering

The mission of the Mechanical & Industrial Engineering Department is to serve the State of Montana, the region, and the nation by providing outstanding leadership and contributions in knowledge discovery, student learning, innovation and entrepreneurship, and service to community and profession. Our vision is to be a leader in discovery, learning, innovation, and service through focus on core competencies, multidisciplinary collaborations, and investment in the Departmental community. The Department is particularly focused on excellence in the following areas: design and manufacture, energy systems, materials and structures, measurement systems, and systems modeling.

The Mechanical and Industrial Engineering Department provides undergraduate programs leading to BS degrees in Industrial Engineering, Mechanical Engineering, and Mechanical Engineering Technology. The Department provides graduate programs leading to the MS degrees in Industrial Engineering and Mechanical Engineering. The Department also participates in an inter-disciplinary doctoral program leading to the Ph.D. degree with options in Industrial Engineering, Mechanical Engineering, or Engineering Mechanics. Further information on all of these programs may be found at http://www.coe.montana.edu/mie

Curricula in the Department of Mechanical and Industrial Engineering

Grade Policies
The Montana Board of Regents (BOR) grade policy requires C- or higher marks in all courses required for a degree. This policy affects students who entered or were readmitted to the system starting in Fall 2005. Students who enrolled prior to Fall 2005, and have not had a break in attendance of one year or more, are exempt from the Board of Regents C- policy. The complete policy is presented in the on-line catalog in the Curriculum, Enrollment, and Graduation (p. 51) section.

Prerequisite Policy
The Mechanical and Industrial Engineering Department enforces prerequisites. A prerequisite course is one which must be successfully completed before a student may enroll in the follow-on course. By Board of Regents policy, in order for a course to serve as a prerequisite, a grade of C- or higher must be earned. M&E students who earn below a C- in a course will be instructed to repeat the course during its next offering. They will also be instructed to drop any follow-on course that is affected by the unsatisfactory prerequisite grade.

Undergraduate Programs

- Financial Engineering (p. 73)
- Industrial and Management Systems Engineering (p. 172)
- Mechanical Engineering (p. 174)
- Mechanical Engineering Technology (p. 175)
Undergraduate Minors
- Aerospace Minor (p. 170)
- Building Energy Systems (p. 171)
- Financial Engineering Minor (p. 74)
- Engineering Management Minor (p. 171)
- Materials Minor (p. 173)
- Mechatronics Minor (p. 176)

Graduate Programs
- M.S. in Industrial and Management Engineering (p. 352)
- M.S. in Mechanical Engineering (p. 353)
- Ph.D. in Engineering -- Industrial Engineering and Mechanical Engineering options (p. 343)

Aerospace Minor
Montana State University, Bozeman offers a minor (minor for which there is no major) in aerospace called the Aerospace Minor. This minor provides a suite of courses from a wide variety of disciplines which are relevant to aerospace. The minor requires a minimum of 31 credits. Required courses comprise 16 credits in four (4) specified courses, which are common to Mechanical Engineering, Electrical Engineering, Physics, Civil Engineering, Chemical Engineering, Chemistry, and Industrial & Management Systems Engineering at MSU Bozeman. An additional required course, EMEC 368 Introduction to Aerospace, is the cornerstone, foundational course for the Aerospace Minor. An additional 12 elective credits (minimum of four courses) are required from a specified list which comprises the Aerospace Elective Courses. This minor is a useful complement to majors in science or engineering for those seeking a cross-disciplinary academic program with topics in aerospace. The required courses are carefully selected to ensure that students seeking the Aerospace Minor at MSU have the requisite math and science background to engage in specific applications to aerospace. The Aerospace Elective Courses were developed to provide students with a suite of courses from a wide variety of disciplines which are relevant to aerospace. These are Materials and Structures (needed for development of propulsion systems, environmental needs, etc.), Therm/Fluids (needed for an understanding of aeronautical systems, momentum equations relevant to propulsion systems, environmental needs, etc.), and Focused Topics (a series of focused and advanced topics applicable to aerospace. These courses include design, dynamics and control, Computer Aided Design (CAD), space science, etc.) The Certifying Officer for the Aerospace Minor is the current MSU Lysle A. Wood Distinguished Professor, and students with questions are encouraged to seek him/her by contacting the MSU Mechanical & Industrial Engineering Department.

The MSU Aerospace Minor = 19 required credits + 12 minimum elective credits = 31 minimum course credits for the Aerospace Minor; in some cases, this may be accomplished within the maximum 128 credits for certain B.S. degrees at MSU (with the Aerospace Minor inclusive). Students who have less than 19 course credits will fill the additional minimum 28 course credits with approved Aerospace Minor elective course credits. Students seeking a degree in ME or MET cannot use EMEC 368 as a Professional Elective for their major degree requirements.

Required Courses

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>M 171Q</td>
<td>Calculus I</td>
<td>4</td>
</tr>
<tr>
<td>M 172Q</td>
<td>Calculus II</td>
<td>4</td>
</tr>
<tr>
<td>PHSX 220</td>
<td>Physics I (w/ calculus)</td>
<td>4</td>
</tr>
<tr>
<td>PHSX 222</td>
<td>Physics II (w/ calculus)</td>
<td>4</td>
</tr>
<tr>
<td>EMEC 368</td>
<td>Introduction to Aerospace</td>
<td>3</td>
</tr>
</tbody>
</table>

Aerospace Minor Courses
Students take one course from each category below, plus one additional course from any of the three categories (Materials and Structures, Therm/Fluids, Focused Topics).

Materials and Structures
Choose at least one from the following:
- EMAT 350 Engineering Materials
- EMAT 463 Composite Materials
- EMEC 405 Finite Element Analysis
- EMEC 444 Mech Behavior of Materials
- EMEC 447 Aircraft Structures
- PHSX 442 Novel Mat for Physics/Engineer

Thermo/Fluids
Choose at least one from the following:
- ECHM 424 Transport Analysis
- EGEN 324 Applied Thermodynamics
- EGEN 335 Fluid Mechanics
- EGEN 435 Fluid Dynamics
- EMEC 326 Fundamentals of Heat Transfer
- EMEC 426 Thermodynamics of Propulsion Systems
- EMEC 430 Introduction to Combustion
- EMEC 436 Computational Fluid Dynamics
- ETME 422 Principles of HVAC I
- ETME 430 Fluid Power Systems Design

Focused Topics
Choose at least one from the following:
- EELE 308 Signals and Systems Analysis
- EELE 321 Intro To Feedback Controls
- EELE 422 Intro to Modern Control
- EELE 465 Microcontroller Applications
- EELE 482 Electro-Optical Systems
- EGEN 310R Multidisciplinary Engineering Design
- EIND 422 Introduction to Simulation
- EMEC 403 CAE IV--Design Integration
- EMEC 467 Micro-Electromechanical Systems
- ETME 410 Computerized Numerical Control and Computer-aided Manufacturing Technology
- ETME 415 Design for Manufacturing and Tooling
- PHSX 427 Advanced Optics
- PHSX 435 Astrophysics

Total Credits 31-35

Notes: The following constraints will be imposed on Aerospace Minor Courses:
- If a course (or redundant equivalent) is a specifically required course for the student’s major degree program, it will not be accepted as an aerospace minor elective.
- Additional Clarification: Elective courses in a student’s major degree program are not considered as required courses and can, therefore, be

* Acceptable substitute is defined as meeting the pre-requisites for the specific course in Aerospace Minor courses listed above, or as allowed by the instructor as an acceptable pre-requisite for the given Aerospace Minor course.
used as Aerospace Minor electives. Pre-requisites for courses will be enforced.

• An appeal to include additional classes for the Aerospace Minor can be made if the student/instructor can make a cogent argument as to how the course is relevant to aerospace.

• All academic policies relevant to MSU are in effect for the Aerospace minor; in particular, all courses used to fulfill the minor must have a grade of C- or better.

Building Energy Systems Minor

The students seeking Minor in Building Energy Systems must satisfy the degree requirements for an ME, MET, CE, CET, EE or Arch degree plus the following courses to obtain a Minor in Building Energy Systems. Montana State University, Bozeman, proposes to offer a non-teaching minor in building energy systems called the Building Energy Systems Minor. This minor provides a suite of courses from a wide variety of disciplines, which are relevant to the built environment. This minor requires a minimum of 23 credits comprised of 8 credits of required core coursework and 15 credits of elective coursework chosen from each of the 5 categories.

Core Coursework

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>ARCH 231CS</td>
<td>Issues in Sustainability</td>
</tr>
<tr>
<td>EGEN 324</td>
<td>Applied Thermodynamics</td>
</tr>
<tr>
<td>or EMEC 321</td>
<td>Thermodynamics II</td>
</tr>
<tr>
<td>ETME 424</td>
<td>Thermal Processes Lab</td>
</tr>
<tr>
<td>ETME 327</td>
<td>(Approval pending for ETME 327-Building Energy Systems Lab)</td>
</tr>
</tbody>
</table>

Integrated Building Design

Choose one from the following:

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>ETME 423</td>
<td>Principles of HVAC II</td>
</tr>
<tr>
<td>ARCH 450</td>
<td>Community Design Center</td>
</tr>
</tbody>
</table>

Power Systems

Choose one from the following:

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>EELE 250</td>
<td>Circuits, Devices and Motors</td>
</tr>
<tr>
<td>EELE 354</td>
<td>Electric Power Applications</td>
</tr>
<tr>
<td>EELE 355</td>
<td>Energy Conversion Devices</td>
</tr>
<tr>
<td>EELE 408</td>
<td>Photovoltaic Systems</td>
</tr>
<tr>
<td>EELE 455</td>
<td>Alternative Energy Power Gen</td>
</tr>
<tr>
<td>EELE 454</td>
<td>Power Systems Analysis</td>
</tr>
<tr>
<td>ETME 470</td>
<td>Renewable Energy Applications</td>
</tr>
</tbody>
</table>

Environmental Controls/HVAC

Choose one from the following:

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>ARCH 351</td>
<td>Environmental Controls I</td>
</tr>
<tr>
<td>ARCH 352</td>
<td>Environmental Controls II</td>
</tr>
<tr>
<td>ETME 422</td>
<td>Principles of HVAC I</td>
</tr>
<tr>
<td>ETME 425</td>
<td>Building Systems</td>
</tr>
</tbody>
</table>

Building Construction/Design

Choose one from the following:

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>ARCH 241</td>
<td>Building Construction I</td>
</tr>
<tr>
<td>ARCH 340</td>
<td>Building Construction II</td>
</tr>
<tr>
<td>ECIV 308</td>
<td>Construction Practice</td>
</tr>
<tr>
<td>ECIV 320</td>
<td>Geotechnical Engineering</td>
</tr>
</tbody>
</table>

Building Information Modeling

Choose one from the following:

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>ARCH 363</td>
<td>Architectural Graphics III</td>
</tr>
<tr>
<td>ECIV 309</td>
<td>Building Information Modeling in Construction</td>
</tr>
<tr>
<td>ETME 309</td>
<td>(Approval pending for ETME 309-Building Information Modeling for Mechanical, Electrical and Plumbing)</td>
</tr>
</tbody>
</table>

Engineering Management Minor

The Mechanical and Industrial Engineering Department within the College of Engineering offers a non-teaching minor in Engineering Management. The field of Engineering Management is focused on the managerial, financial and systems level aspects of engineering problem solving. Students are required to complete 21 credits for the minor by taking a core group of four courses and selecting an additional three elective courses. Students completing the minor will find themselves better prepared to successfully work in a technical leadership capacity. The Engineering Management minor is not available to Industrial & Management Systems Engineering majors. Students earn the minor by completing the following courses:

Required Pre-Requisite Courses

One of the following:

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>EGEN 350</td>
<td>Applied Engr Data Analysis</td>
</tr>
<tr>
<td>EIND 354</td>
<td>Engineering Probability and Statistics I</td>
</tr>
</tbody>
</table>

One of the following:

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>M 166Q</td>
<td>Calculus for Technology II</td>
</tr>
<tr>
<td>M 172Q</td>
<td>Calculus II</td>
</tr>
</tbody>
</table>

Recommended Core Elective Courses

One or more of the following:

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>BGEN 242D</td>
<td>Intro to Int’l Business</td>
</tr>
<tr>
<td>PSYX 100IS</td>
<td>Intro to Psychology</td>
</tr>
<tr>
<td>SOCI 101IS</td>
<td>Introduction to Sociology</td>
</tr>
</tbody>
</table>

Required Courses

EGEN 325 | Engineering Economic Analysis |
EIND 300 | Engineering Management & Ethics |
EIND 373 | Production Inventory Cost Analysis |
EIND 434 | Project and Engineering Management |

Technical Problem Solving Elective

Choose One:

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>EIND 455</td>
<td>DOE for Engineers</td>
</tr>
<tr>
<td>EIND 457</td>
<td>Regres &amp; Multivar Analysis</td>
</tr>
<tr>
<td>EIND 458</td>
<td>Production &amp; Engineering Mgmt</td>
</tr>
<tr>
<td>EIND 477</td>
<td>Quality Assurance</td>
</tr>
</tbody>
</table>

Managerial Problem Solving Elective Courses

Choose Two:

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>BMGT 329</td>
<td>Human Resource Management</td>
</tr>
<tr>
<td>BGEN 361</td>
<td>Principles of Business Law</td>
</tr>
<tr>
<td>BMGT 406</td>
<td>Negotiation/Dispute Resolution</td>
</tr>
<tr>
<td>BMGT 420</td>
<td>Leadership and Motivation</td>
</tr>
<tr>
<td>BMGT 464</td>
<td>International Management</td>
</tr>
<tr>
<td>ECNS 309</td>
<td>Managerial Economics</td>
</tr>
<tr>
<td>EIND 425</td>
<td>Technology Entrepreneurship</td>
</tr>
<tr>
<td>PSYX 360</td>
<td>Social Psychology</td>
</tr>
<tr>
<td>PSYX 461</td>
<td>Indust &amp; Organiz Psych</td>
</tr>
<tr>
<td>PSYX 481</td>
<td>Judgment &amp; Decision Making</td>
</tr>
<tr>
<td>SOCI 345</td>
<td>Sociology of Organizations</td>
</tr>
<tr>
<td>SOCI 370</td>
<td>Sociology of Globalization</td>
</tr>
</tbody>
</table>
Industrial and Management Systems Engineering

The mission of the undergraduate program in Industrial and Management Systems Engineering (IMSE) is to produce graduates well-grounded in industrial and management systems engineering knowledge and skills consistent with the land-grant mission of MSU. Graduates will be prepared to be productive citizens and contributors to the economic well-being of employers.

The educational objectives for the IMSE program are that Industrial and Management Systems Engineering graduates will:

1. Use industrial and management systems engineering tools and knowledge in their chosen career paths.
2. Employ effective communication.
3. Work in multidisciplinary professional teams.
4. Engage in life-long learning, including post-graduate education for some graduates.
5. Contribute to industry and society, including involvement in professional and other service activities.
6. Design, manage, improve, and integrate systems across a broad range of organizations.
7. Participate in ethical leadership in design and operational activities that contribute to their organization and community.

The undergraduate curriculum in Industrial and Management Systems Engineering (IMSE) includes mathematics, basic sciences, humanities, social sciences, engineering sciences, design, and communication courses distributed over a four-year period. An important feature of the program is to teach students to foster the ability to comprehend, define, and analyze problems; synthesize alternatives; and rationally choose appropriate solutions. This requires a broad technical education that motivates life-long learning to keep pace with technological and social changes.

Industrial and Management Systems Engineering is a broad engineering discipline. Since IMSEs are employed in every facet of American business and industry, they are "people-oriented problem solvers" who enjoy diversity in their assignments and careers. For example, IMSE alumni include plant managers, manufacturing engineers, teachers, hospital administrators, consultants, quality assurance managers and engineers, technical sales engineers, production supervisors, and department heads. Today IMSEs are active in all kinds of manufacturing, as well as in service operations such as hospitals, banks, airlines, transportation and distribution companies, retailers, utilities, and local, state, and federal governments.

IMSEs are qualified for this wide variety of careers because their education is unique: they are people-oriented and technically trained. IMSEs take the standard core of engineering courses, including two years of advanced math, to provide a background for understanding production, fabrication, assembly processes, etc., required to design systems for business and industry. All engineering curricula require graduates to meet accreditation standards in mathematics, basic science, engineering science, engineering design, as well as in humanities and social sciences. However, IMSEs are more knowledgeable of management functions in companies than are other engineering majors. An IMSE graduate is a technically trained, management-oriented man or woman who can solve problems by working with people.

The IMSE is an integrator of resources, people, material, and equipment. This is accomplished by designing systems so that the right people with the proper mix of skills, combined with the right quantities of equipment and materials, are available at the right time to produce a product or provide a service at a cost that will allow a profit to be made. Since these professionals frequently work on problem solving teams, the ability to communicate, coordinate, and work with others is essential. Because IMSEs design systems for producing products, specifying processes, or providing services, their expertise is applicable to many businesses and industries. Frequently, they become supervisors and managers of the same systems they design.

Today much is written about business process re-engineering. IMSE graduates are uniquely qualified to analyze a company's customer needs, relate those to products or services, and examine the flow of materials, processes, documentation, information, etc., that result in "re-engineering" the company to compete more effectively. World class companies must have systems that consistently provide on-time delivery of defect-free products (or services) that delight customers—and for a competitive price that allows the company to make a reasonable profit. Industrial and Management Systems Engineers are actively involved in designing these systems, integrating the resources required to make them function, and quite often managing them.

Graduate Program

Students who have graduated from a four-year degree program which has sharpened their mathematical and communication skills will greatly benefit by completing the Master of Science degree in Industrial & Management Engineering or the Doctor of Philosophy in Engineering with Industrial Engineering option. Emphases in Human Factors/Ergonomics, Service Engineering, Quality Management, and Systems Analysis and Modeling are available. Flexible guidelines permit broadening or customizing to meet career objectives. Further details may be found in the Graduate Catalog.

Student Performance and Retention Requirements

No further requirements apply in order to advance in the Industrial and Management Systems Engineering Program.

Freshman Year

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
<th>Fall</th>
<th>Spring</th>
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</thead>
<tbody>
<tr>
<td>COMX 111US</td>
<td>Introduction to Public Speaking</td>
<td>3</td>
<td></td>
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</tr>
<tr>
<td>EIND 101</td>
<td>Introduction to Industrial &amp; Management Systems Engineering</td>
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<tr>
<td>University Core Electives</td>
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<td>6</td>
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<tr>
<td>EMEC 103</td>
<td>CAE I-Engineering Graphics Communications</td>
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<td></td>
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<tr>
<td>M 171Q</td>
<td>Calculus I</td>
<td>4</td>
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<td>EIND 142</td>
<td>Introduction to Systems Engineering</td>
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<td>PHSX 220</td>
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<td>WRIT 101W</td>
<td>College Writing I</td>
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<td>M 172Q</td>
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Sophomore Year

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<td>Multivariable Calculus</td>
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<td>EGEN 201</td>
<td>Engineering Mechanics--Statics</td>
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<tr>
<td>PHSX 222</td>
<td>Physics II (w/ calculus)</td>
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<td>EMAT 251</td>
<td>Materials Structures and Prop</td>
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<td>University Core Elective</td>
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<tr>
<td>EIND 313</td>
<td>Work Design and Analysis</td>
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<tr>
<td>CSCI 111</td>
<td>Programming with Java I</td>
<td>3</td>
<td></td>
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<tr>
<td>M 221</td>
<td>Introduction to Linear Algebra</td>
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<td>EGEN 205</td>
<td>Mechanics of Mtls (equiv 305)</td>
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<td>ETME 215</td>
<td>Manufacturing Processes</td>
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Year Total: 17 16

Junior Year

<table>
<thead>
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<td>EIND 413</td>
<td>Ergonomics &amp; Human Factors Engineering</td>
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<td>EIND 300</td>
<td>Engineering Management &amp; Ethics</td>
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<td>EIND 354</td>
<td>Engineering Probability and Statistics I</td>
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<td>EIND 364</td>
<td>Principles of Operations Research I</td>
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<td>EIND 371</td>
<td>Introduction to Computer Integrated Manufacturing</td>
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<td>EIND 410</td>
<td>Interaction Design</td>
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<td>EGEN 310R</td>
<td>Multidisciplinary Engineering Design</td>
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<td>EGEN 325</td>
<td>Engineering Economic Analysis</td>
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<td>EIND 455</td>
<td>DOE for Engineers</td>
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</tr>
<tr>
<td>EIND 457</td>
<td>Regres &amp; Multivar Analysis</td>
<td>3</td>
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<tr>
<td>EIND 464</td>
<td>Prin of Operations Research II</td>
<td>3</td>
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<tr>
<td>EIND 458</td>
<td>Production &amp; Engineering Mgmt</td>
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Year Total: 15 17

Senior Year

<table>
<thead>
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<th>Course Title</th>
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<tbody>
<tr>
<td>EIND 442</td>
<td>Facility and Material Handling System Design</td>
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<td>EIND 434</td>
<td>Project and Engineering Management</td>
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<td>EIND 422</td>
<td>Introduction to Simulation</td>
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<td>Engineering Core Elective(^3)</td>
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<td>IMSE Cognate Elective(^2)</td>
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<tr>
<td>EIND 499R</td>
<td>Indus Engin Design Capstone</td>
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<tr>
<td>EIND 477</td>
<td>Quality Assurance</td>
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<td>EGEN 488</td>
<td>Fundamentals of Engineer Exam</td>
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<td>University Core Electives</td>
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<tr>
<td>IMSE Cognate Elective(^2)</td>
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</tbody>
</table>

Year Total: 15 15

Total Program Credits: 128

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1 Students exempt from MSU writing requirement may substitute WRIT 201, WRIT 221, UH201, UH202, or add 3 credits to their Industrial and Management Systems Engineering cognate.


3 Engineering Core Elective: Choose EIEE 250, EGEN 202, or EGEN 324.

A minimum of 128 credits is required for graduation; 42 of these credits must be in courses numbered 300 or above.

Materials Minor

Montana State University, Bozeman, offers a non-teaching minor in Materials Science & Engineering called the Minor in Materials. This minor provides courses from a variety of disciplines which are relevant to synergies of science and engineering in polymer, metallic, ceramic, hybrid, and composite materials for both structural and functional application. The minor requires a minimum of 32 credits comprised of 14 credits of required coursework (or equivalent) followed by 18 credits of elective coursework. EMAT 350 Engineering Materials is the cornerstone, foundational course for the Minor in Materials and is a required core class.

Students seeking the Minor in Materials must satisfy the core and additional course requirements, 32 credits total, as outlined below:

### Required Pre-requisite Courses

(credits not counted towards minor):

- M 171Q Calculus I
- M 172Q Calculus II
- PHSX 220 Physics I (w/ calculus)
- PHSX 222 Physics II (w/ calculus)
- CHMY 141 College Chemistry I

### Required Courses

(or equivalent courses as approved by the certifying officer):

- EMEC 250 Mechanical Engineering Materials 3
- EMAT 252 Materials Struct and Prop Lab 1
- EMAT 350 Engineering Materials 3
- EMEC 320 Thermodynamics I 3
- ETME 215 Manufacturing Processes 3
- ETME 217 Manufacturing Process Laboratory - Mechanical Engineering 1

These pre-requisite courses and required courses represent the core fundamentals of materials science and engineering which are applicable to students in the College of Engineering in addition to Physics and Chemistry. Students pursuing a BS in Engineering or the Physical Sciences will have to take 18 additional course credits (6 courses) out of the list below to obtain a Minor in Materials which may also serve as electives in the student’s major. Other courses may also be approved by the certifying officer with a written request detailing the merit of the course.

### Additional Courses

Choose six from the following:

- CHMY 371 Physical Chemistry-Quantum Chemistry and Spectroscopy I
- CHMY 373 Physical Chemistry - Kinetics and Thermodynamics
- CHMY 401 Advanced Inorganic Chemistry
- ECHM 424 Transport Analysis
- ECHM 452 Advanced Engineering Materials
- EMAT 460 Polymeric Materials
- EMAT 461 Principles of Tribology
- EMAT 462 Manufacturing of Composites
- EMAT 463 Composite Materials
- EMAT 550 Failure of Materials
- EMAT 552 Advanced Ceramics
- EMAT 553 Advanced Composite Materials
- EMEC 565 Smart Structures
- EMEC 444 Mech Behavior of Materials
- EMEC 465 Bio-inspired Engineering
- EMEC 467 Micro-Electromechanical Systems
- PHSX 441 Solid State Physics
- PHSX 442 Novel Mat for Physics/Engineer

Total Credits 32

* Course pre-requisites not included in the lists above do not count towards the 18 credits.
Mechanical Engineering

The specific mission of the undergraduate Mechanical Engineering (ME) program is to prepare students for successful mechanical engineering careers, responsible citizenship, and continued intellectual growth. The goal of the program is to produce graduates strong in fundamentals, applications, design, communication, and professional responsibility. The ME undergraduate program is accredited by the Engineering Accreditation Commission of ABET, 415 N. Charles Street, Baltimore, MD, 21201, or by telephone: (410) 347-7700. The educational objectives for the ME program follow.

Mechanical Engineering graduates will:

1. Undertake professional careers
2. Solve problems using engineering skills and methods
3. Regularly communicate using modern tools
4. Work productively in a team environment
5. Acquire new knowledge and skills

The undergraduate Mechanical Engineering program is principally oriented toward career preparation, providing students with the engineering and technical education appropriate to the challenges presented by today's technologically complex and difficult problems. The coursework in mechanical engineering provides four years of study in mathematics, basic sciences, university core subjects, and engineering topics. The overall curriculum provides an integrated educational experience directed toward the development of an ability to apply pertinent knowledge to the identification and solution of practical problems in mechanical engineering.

The profession of mechanical engineering is very broad, with practitioners employed in most areas of technological and industrial management endeavor. Examples of industrial employers which require mechanical engineering background are: process industries including pulp and paper, steel, aluminum, food, petroleum, chemicals and others; manufacturing industries including highway vehicles, instruments, airplanes, rockets and engines, toys, agricultural machinery, and many others; power plants including steam, nuclear, and hydroelectric plants; federal laboratories performing a wide variety of defense and non-defense related engineering design, analysis, and experimental work; and a wide variety of consulting work including heating, ventilating, and air conditioning system design, and forensic engineering. This brief sample gives a view of the wide spectrum of employment possibilities in mechanical engineering.

It is the mechanical engineer’s responsibility and challenge to conceive, plan, design, and perform analysis and testing related to devices, machines, and systems used by or manufactured by the employer. This work may include liaison with other engineers, engineering technologists, technicians, outside vendors, and departments within the company. Areas of responsibility following design and prototype testing may include direction of a manufacturing line.

It should be evident that career opportunities abound within this very wide array of employers and engineering activities. The job market for engineers often follows the nation’s economy in general. In spite of these natural fluctuations, however, it is expected that our nation will always depend on uses of technology for creating an improved standard of living and a more efficient industrial base to maintain and enhance international competitiveness. Therefore, we can expect that mechanical engineering graduates will have excellent employment opportunities.

Course requirements include mathematics, basic sciences (physics and chemistry), engineering design; arts, diversity, humanities and social sciences; and at least one year of engineering science. The program also includes engineering graphics, statistics, computer application, solid mechanics, materials science, manufacturing processes, thermodynamics, heat transfer, fluid mechanics, electronics, and design of structural, mechanical, and energy systems. Computing and computer applications are stressed throughout the curriculum. The program culminates with a capstone design experience in which the student is involved in a team that must create a solution to a real-world engineering design problem, and develop a working prototype. Often times these teams are multidisciplinary.

Graduate Program

Students who have completed a Bachelor of Science degree in engineering or closely related discipline may take graduate work leading to the Master of Science in Mechanical Engineering, Master of Engineering in Mechanical Engineering, or Doctor of Philosophy in Engineering with Mechanical Engineering or Engineering Mechanics options typical. Advanced degrees are necessary for university teaching and are increasingly important in industry, particularly in the areas of new product development and research. Further details may be found in the Graduate Catalog.

Freshman Year

<table>
<thead>
<tr>
<th>Course Requirements</th>
<th>Credits</th>
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**Fall**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
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<tbody>
<tr>
<td>M 171Q</td>
<td>Calculus I</td>
</tr>
<tr>
<td>EMEC 100</td>
<td>Introduction to Mechanical Engineering</td>
</tr>
<tr>
<td>EMEC 103</td>
<td>CAE I-Engineering Graphics Communications</td>
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<tr>
<td>University Core Electives</td>
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<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
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<tbody>
<tr>
<td>CHMY 141</td>
<td>College Chemistry I</td>
</tr>
<tr>
<td>WRIT 101W</td>
<td>College Writing I</td>
</tr>
<tr>
<td>M 172Q</td>
<td>Calculus II</td>
</tr>
<tr>
<td>PHSX 220</td>
<td>Physics I (w/ calculus)</td>
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**Year Total:** 16

**Spring**

<table>
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<tr>
<th>Course Code</th>
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</thead>
<tbody>
<tr>
<td>COMX 111US</td>
<td>Introduction to Public Speaking (formerly COM 110US)</td>
</tr>
<tr>
<td>or CLS 101US</td>
<td>Knowledge and Community</td>
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<tr>
<td>EMEC 305</td>
<td>Mechanics of Mtls (equiv 305)</td>
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<tr>
<td>M 273Q</td>
<td>Multivariable Calculus</td>
</tr>
<tr>
<td>PHSX 222</td>
<td>Physics II (w/ calculus)</td>
</tr>
<tr>
<td>EGEN 202</td>
<td>Engineering Mech--Dynamics</td>
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<tr>
<td>EGEN 205</td>
<td>Mechanics of Mtls (equiv 305)</td>
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<tr>
<td>M 274</td>
<td>Introduction to Differential Equation</td>
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<tr>
<td>ETME 215</td>
<td>Manufacturing Processes</td>
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<tr>
<td>ETME 217</td>
<td>Manufacturing Process Laboratory - Mechanical Engineering</td>
</tr>
<tr>
<td>EELE 250</td>
<td>Circuits, Devices and Motors</td>
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**Year Total:** 18

Sophomore Year

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<th>Course Code</th>
<th>Course Name</th>
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<tbody>
<tr>
<td>EGEN 201</td>
<td>Engineering Mechanics--Statics</td>
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<tr>
<td>EMEC 203</td>
<td>CAE II-Mechanical Engineering Computations</td>
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<td>EMEC 250</td>
<td>Mechanical Engineering Materials</td>
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<td>EMAT 252</td>
<td>Materials Struct and Prop Lab</td>
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<td>M 273Q</td>
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<td>Mechanics of Mtls (equiv 305)</td>
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<td>Introduction to Differential Equation</td>
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<td>Manufacturing Processes</td>
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<td>ETME 217</td>
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<td>EELE 250</td>
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**Year Total:** 17

Junior Year

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<tr>
<td>EGEN 335</td>
<td>Fluid Mechanics</td>
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<td>EMEC 303</td>
<td>CAE III-- Systems Analysis</td>
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<tr>
<td>EMEC 320</td>
<td>Thermodynamics I</td>
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<td>EMEC 341</td>
<td>Adv Mechanics of Materials</td>
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**Year Total:** 18
ELEN 350 - Applied Engineering Data Analysis 2
ELEN 321 - Thermodynamics II 3
ELEN 326 - Fundamentals of Heat Transfer 3
ELEN 342 - Mech Component Design 3
ELEN 360 - Measurement & Instrumentation 3
ELEN 361 - Measurement & Instrument Lab 1
EGEN 310R - Multidisciplinary Engineering Design 3

Year Total: 14 16

Senior Year

<table>
<thead>
<tr>
<th>Course</th>
<th>Fall Credits</th>
<th>Spring Credits</th>
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<tbody>
<tr>
<td>ELEN 489R - Mechanical Engineering Design Capstone I</td>
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</tr>
<tr>
<td>ELEN 425 - Advanced Thermal Systems</td>
<td>3</td>
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</tr>
<tr>
<td>ELEN 445 - Mechanical Vibrations</td>
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<tr>
<td>Professional Electives</td>
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<tr>
<td>ELEN 499R - Mech Eng Design Capstone II</td>
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<tr>
<td>EGEE 488 - Fundamentals of Engineer Exam</td>
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<td>ELEN 405 - Finite Element Analysis</td>
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<td>Total Program Credits:</td>
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</table>

Students cannot enroll in any course without successfully completing prerequisites and the co-requisite requirements to those prerequisite courses.

A minimum of 128 credits is required for graduation; 42 of these credits must be in courses numbered 300 and above.

**Mechanical Engineering Technology**

The mission of the Mechanical Engineering Technology (MET) program is to prepare students for successful Mechanical Engineering Technology careers, responsible citizenship, and continued professional growth. The MET program seeks to produce graduates with a good foundation in engineering fundamentals as well as one strong in applications, design, problem recognition and resolution, project management, communication, and professional and ethical responsibility. The MET undergraduate program is accredited by the Engineering Technology Accreditation Commission of ABET, 415 N. Charles Street, Baltimore, MD, 21201, or by telephone: (410) 347-7700. The educational objectives of the MET program follow.

The Mechanical Engineering Technology program strives to prepare graduates who:

- Successfully establish themselves as professionals within a diverse range of engineering technology activities
- Conduct themselves ethically in all activities
- Contribute to industry and society, through service activities and professional organizations
- Advance in their profession, maintain currency within the profession, and demonstrate leadership qualities

The undergraduate Mechanical Engineering Technology program is designed with an applications-oriented structure. Many of the technical science courses have an accompanying laboratory component providing hands-on activities, as well as emphasizing measurement, data collection and analysis, documentation, and written/oral report preparation/presentation.

The program aims to develop core competencies in engineering fundamentals (statics, strengths of materials, materials science, fluid dynamics, and electrical circuits), manufacturing applications (manufacturing processes, machining, welding, design for manufacturing and tooling, and quality assurance), mechanical design (computer-aided design, mechanisms, machine design, fluid power technology, measurement and test, etc.), and thermal sciences (thermodynamics, heat transfer, and heating, ventilation, and air conditioning). Extensive course work in the physical sciences and Mathematics is included.

Technical elective courses are chosen by the student in consultation with an academic advisor. Courses in the humanities and social sciences are also included. The overall curriculum is designed to provide the student with an ability to apply scientific and engineering knowledge and methods combined with technical skills in support of engineering activities.

Mechanical engineering technology (MET) is concerned with the application of scientific and engineering knowledge in support of engineering activities. Specifically, the mechanical engineering technologist provides the professional services needed in transforming the results of scientific endeavors into usable products and services. Students who choose a career in mechanical engineering technology may pursue any number of career paths including, but not limited to: machine and product design, product and system evaluation, research laboratory experimental support, prototype evaluation, plant operation and management, quality assurance, technical sales, manufacturing methods improvement, HVAC systems design and installation, project management, and energy exploration.

The mechanical engineering technologist’s mission is to make necessary analysis and plans to convert design drawings into finished products in the most efficient and safe manner. He or she is the professional who produces design drawings and sets up and operates manufacturing equipment, handles inspections, analyzes production problems, and manages the implementation of improvement activities and projects.

The demand for the engineering technologist in general, and mechanical engineering technologists in particular, has been strong for the past several years, and average starting salaries are very competitive; indications are that this trend will continue. MSU Mechanical Engineering Technology graduates are actively recruited, and many of our alumni hold positions of considerable responsibility in industry and government.

**Student Performance and Retention Requirements**

No further requirements apply in order to advance in the Mechanical Engineering Technology program.

**Freshman Year**

<table>
<thead>
<tr>
<th>Course</th>
<th>Fall Credits</th>
<th>Spring Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHMY 121IN - Introduction to General Chemistry</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>WRIT 101W - College Writing I</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>M 165Q - Calculus for Technology I</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>ETME 100 - Introduction to Mechanical Engineering Technology</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>University Core Electives</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>COMX 111US - Introduction to Public Speaking (formerly COM 110US)</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>or CLS 101US - Knowledge and Community or US 101US - First Year Seminar</td>
<td></td>
<td></td>
</tr>
<tr>
<td>M 166Q - Calculus for Technology II</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>ELEN 103 - CAE I-Engineering Graphics</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Communications</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
PHSX 205 - College Physics I  
University Core Electives  

Year Total: 17

**Sophomore Year**

<table>
<thead>
<tr>
<th>Fall Credits</th>
<th>Spring Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Business Elective *</td>
<td>3</td>
</tr>
<tr>
<td>EMEC 250 - Mechanical Engineering Materials</td>
<td>3</td>
</tr>
<tr>
<td>EMAT 252 - Materials Struct and Prop Lab</td>
<td>1</td>
</tr>
<tr>
<td>EGEN 203 - Applied Mechanics</td>
<td>3</td>
</tr>
<tr>
<td>ETME 202 - Mechanical Engineering Technology Computer Applications</td>
<td>1</td>
</tr>
<tr>
<td>PHSX 207 - College Physics II</td>
<td>4</td>
</tr>
<tr>
<td>EGEN 208 - Applied Strength of Materials</td>
<td>3</td>
</tr>
<tr>
<td>ETME 215 - Manufacturing Processes</td>
<td>3</td>
</tr>
<tr>
<td>ETME 216 - Manufacturing Process Laboratory - Mechanical Engineering Technology</td>
<td>1</td>
</tr>
<tr>
<td>EGEN 324 - Applied Thermodynamics</td>
<td>3</td>
</tr>
<tr>
<td>ETME 203 - Mechanical Design Graphics</td>
<td>3</td>
</tr>
<tr>
<td>EELE 250 - Circuits, Devices and Motors</td>
<td>4</td>
</tr>
</tbody>
</table>

Year Total: 15

**Junior Year**

<table>
<thead>
<tr>
<th>Fall Credits</th>
<th>Spring Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>EGEN 331 - Applied Mechanics of Fluids</td>
<td>3</td>
</tr>
<tr>
<td>EGEN 310R - Multidisciplinary Engineering Design</td>
<td>3</td>
</tr>
<tr>
<td>EGEN 350 - Applied Engineering Data Analysis</td>
<td>2</td>
</tr>
<tr>
<td>ETME 310 - Machining and Industrial Safety</td>
<td>3</td>
</tr>
<tr>
<td>ETME 340 - Mechanisms</td>
<td>4</td>
</tr>
<tr>
<td>ETME 360 - Measurements and Instrumentation Applications</td>
<td>3</td>
</tr>
<tr>
<td>ETME 303 - CAE Tools in Mechanical Design</td>
<td>3</td>
</tr>
<tr>
<td>ETME 321 - Applied Heat Transfer</td>
<td>3</td>
</tr>
<tr>
<td>ETME 311 - Joining Processes</td>
<td>3</td>
</tr>
<tr>
<td>ETME 341 - Machine Design</td>
<td>4</td>
</tr>
</tbody>
</table>

Year Total: 15

**Senior Year**

<table>
<thead>
<tr>
<th>Fall Credits</th>
<th>Spring Credits</th>
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</thead>
<tbody>
<tr>
<td>EGEN 325 - Engineering Economic Analysis or EGEN 330 - Business Fundamentals for Technical Professionals</td>
<td>3</td>
</tr>
<tr>
<td>ETME 422 - Principles of HVAC I</td>
<td>3</td>
</tr>
<tr>
<td>ETME 400 - Mechanical Engineering Technology Senior Seminar</td>
<td>1</td>
</tr>
<tr>
<td>ETME 489 - Capstone: Mechanical Engineering Technology Design I Professional Electives *</td>
<td>2</td>
</tr>
<tr>
<td>ETME 415 - Design for Manufacturing and Tooling</td>
<td>3</td>
</tr>
<tr>
<td>ETME 499R - Capstone: Mechanical Engineering Technology Design II</td>
<td>3</td>
</tr>
<tr>
<td>ETME 424 - Thermal Processes Lab</td>
<td>1</td>
</tr>
<tr>
<td>EGEN 488 - Fundamentals of Engineer Exam Professional Electives *</td>
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<tr>
<td>University Core Electives</td>
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</tr>
</tbody>
</table>

Year Total: 15

Total Program Credits: 126

* From approved elective list.

A minimum of 126 credits is required for graduation; 42 of these credits must be in courses numbered 300 and above.

**Mechatronics Minor (non-teaching)**

The College of Engineering offers a non-teaching minor in Mechatronics. The field of Mechatronics combines the principles of mechanical engineering with the principles of electronic instrumentation and computerized control. Mechatronics exploits the synergy of mechanical and electrical engineering to design unique and innovative electromechanical products, machines, robots, tools, and manufacturing processes.

The minor requires a minimum of 37 credits in specified subject areas: computer science, engineering mechanics, mechanical engineering, and electrical and computer engineering (see tables below).

**CpE Major**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>EGEN 201</td>
<td>Engineering Mechanics--Statics *</td>
</tr>
<tr>
<td>EGEN 202</td>
<td>Engineering Mech--Dynamics *</td>
</tr>
<tr>
<td>EGEN 205</td>
<td>Mechanics of Mtls (equiv 305) *</td>
</tr>
<tr>
<td>EMEC 103</td>
<td>CAE I-Engineering Graphics Communications</td>
</tr>
<tr>
<td>EMEC 320</td>
<td>Thermodynamics I *</td>
</tr>
<tr>
<td>EMEC 326</td>
<td>Fundamentals of Heat Transfer *</td>
</tr>
<tr>
<td>EELE 321</td>
<td>Intro To Feedback Controls *</td>
</tr>
</tbody>
</table>

Total for Minor (minimum) 20

Total for the BS degree with Minor (minimum) 139

* Indicates additional courses required for the minor that are not required for the major. Course may also satisfy a professional elective in the major.

**EE Major**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CSCI 111</td>
<td>Programming with Java I *</td>
</tr>
<tr>
<td>EGEN 201</td>
<td>Engineering Mechanics--Statics *</td>
</tr>
<tr>
<td>EGEN 202</td>
<td>Engineering Mech--Dynamics *</td>
</tr>
<tr>
<td>EGEN 205</td>
<td>Mechanics of Mtls (equiv 305) *</td>
</tr>
<tr>
<td>EMEC 103</td>
<td>CAE I-Engineering Graphics Communications</td>
</tr>
<tr>
<td>EMEC 320</td>
<td>Thermodynamics I *</td>
</tr>
<tr>
<td>EMEC 326</td>
<td>Fundamentals of Heat Transfer *</td>
</tr>
</tbody>
</table>

Total for Minor (minimum) 21

Total for the BS degree with Minor (minimum) 138

* Indicates additional courses required for the minor that are not required for the major. Course may also satisfy a professional elective in the major.

**ME Major**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CSCI 111</td>
<td>Programming with Java I **</td>
</tr>
<tr>
<td>CSCI 112</td>
<td>Programming with C I **</td>
</tr>
<tr>
<td>EELE 261</td>
<td>Intro To Logic Circuits **</td>
</tr>
<tr>
<td>EELE 321</td>
<td>Intro To Feedback Controls *</td>
</tr>
<tr>
<td>EELE 371</td>
<td>Microprocess HW and SW Systems *</td>
</tr>
</tbody>
</table>

* Indicates additional courses required for the minor that are not required for the major. Course may also satisfy a professional elective in the major.
**Military Science - Air Force ROTC**

The development and preparation of future Air Force officers is provided through the Air Force Reserve Officer Training Corps (AFROTC) program. AFROTC is a voluntary elective which offers a four-year, a three-year, and a two-year program. All credits offered by the department may be counted as general electives toward completion of the requirements in other curricula. Students completing the program attend Field Training between their sophomore and junior years. Students not pursuing a commission in the Air Force may still enroll in any of the academic classes. These students do not wear the uniform or attend leadership lab; however, course materials are still provided at no cost.

The Air Force ROTC program has three general parts or elements:

1. The General Military Course (GMC) consists of one hour per week of classroom instruction, two hours per week of physical fitness, and two hours per week of leadership lab. For non-scholarship students, there is no military obligation during the GMC. For GMC students, there is no obligation during the first year of the GMC. All students are furnished textbooks, uniforms, and equipment. The GMC is open to any student. Registration is the same as for other courses. Aptitude tests, physical fitness tests, and physical exams are given by the fall semester of the sophomore year for those who wish to compete for the Professional Officer Course or for a scholarship.

2. Field Training is scheduled during the summer months, normally between the sophomore and junior years. All Cadets must complete field training prior to entry into the POC. Cadets who wish to commission and are qualified will attend Field Training on an active Air Force base. Transportation to and from camp, meals and housing are furnished.

3. The two-year Professional Officer Course or POC (the advanced program) is designed to qualify designated cadets for a commission in the United States Air Force. The primary purpose of the Professional Officer Course is to provide education which will develop a knowledge of the Air Force, as well as skills and attitudes vital to the professional Air Force officer. Cadets practice communication techniques through cadet-led and cadet-centered seminars. The course consists of three hours of classroom instruction per week, two hours per week of physical fitness, and three hours per week of leadership lab. All cadets in the POC are contracted with the U.S. Air Force. If not on scholarship, the cadet will still receive the monthly stipend. Uniforms and course materials are furnished.

**Air Force ROTC College Scholarships**

Three to four-year scholarships are awarded to qualified, selected cadets. All scholarships cover full tuition, fees, and provide a yearly allowance for books. Scholarship recipients also receive a non-taxable subsistence allowance that increases each year from the Freshman through the Senior year. Numerous majors are recognized as five-year programs and are eligible for extended scholarship benefits. Prospective applicants are encouraged to contact the Department of Military Aerospace Studies anytime to discuss options available. The most current information is available at www.montana.edu/wwwair or http://afrotc.com.

**In College Scholarship Program**

The ICSP offers 2.5 to 3.5 year scholarships to qualified college freshmen and sophomores in any major. Apply through the Air Force ROTC detachment. Selections take place in the spring for students enrolled in Air Force ROTC and in July for students not enrolled in Air Force ROTC. Please visit http://afrotc.com for the most current information on ICSP opportunities.

**Active Duty Obligation**

Applying for an Air Force ROTC scholarship does not obligate a student in any way. Four-year scholarship recipients do not incur any obligation until the start of the sophomore year in college. There is no active duty obligation for enrolling in either the freshman or sophomore AFROTC courses. Students who complete the Air Force ROTC program and receive a commission incur a four-year active duty commitment. Flying officers serve additional commitments from the time they complete pilot training.

**Typical Four Year Course Progression**

<table>
<thead>
<tr>
<th>Freshman Year</th>
<th>Fall</th>
<th>Spring</th>
<th>Summer</th>
</tr>
</thead>
<tbody>
<tr>
<td>MAS 110 - Foundations of The Air Force I</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MAS 115 - Leadership Laboratory 115</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Courses in Major</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MAS 111 - Foundations of The Air Force II</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MAS 116 - Leadership Lab 116</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Courses in Major</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Year Total:</td>
<td>3</td>
<td>3</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Sophomore Year</th>
<th>Fall</th>
<th>Spring</th>
<th>Summer</th>
</tr>
</thead>
<tbody>
<tr>
<td>MAS 210 - The Employment of Air and Space Power I</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MAS 215 - Leadership Laboratory 215</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Courses in Major</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MAS 211 - The Employment of Air and Space Power II</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MAS 216 - Leadership Lab 216</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Courses in Major</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MAS 309 - Fld Training, 4 Week</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Year Total:</td>
<td>3</td>
<td>3</td>
<td>4</td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>Junior Year</th>
<th>Fall</th>
<th>Spring</th>
<th>Summer</th>
</tr>
</thead>
<tbody>
<tr>
<td>MAS 310 - Air Force Leadership and Management I</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MAS 315 - Leadership Laboratory 315</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Courses in Major</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MAS 311 - Air Force Leadership and Management II</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MAS 316 - Leadership Lab 316</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Courses in Major</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Year Total:</td>
<td>5</td>
<td>5</td>
<td></td>
</tr>
</tbody>
</table>
Students with no previous military experience, a summer introductory
Several options exist for students to enter the Two-Year Program. For
Simultaneous Membership Program.
Guard and Army Reserve college students that are participating in the
service to their credit. The two-year program is also available to National
The two-year program is designed for a student who did not take ROTC
what they have learned in the classroom, and apply their leadership skills.
Called the Leader Development and Assessment course. The Leader
Advanced Course students attend a fully-paid five-week training session
During the summer between the junior and senior years of college,
professional enrichment activities are available. All necessary ROTC
and leadership development. In addition, a variety of outside social and
such subjects as management principles, national defense, military history,
Metal Science courses, in addition to their regular major, MSU students
that complements an existing degree-producing program. By taking the
ROTC enhances a student’s education by providing unique leadership
have proven to make a significant impact in the graduate’s endeavors with
many large businesses and corporations actively seeking this qualification
potential for professional employees. Army ROTC provides leadership
experience.

The Four-Year Program
The four-year Army ROTC Program is divided into two parts called the
Basic Course and the Advanced Course.

The Basic Course is usually taken during the first two years and covers
such subjects as management principles, national defense, military history,
and leadership development. In addition, a variety of outside social and
professional enrichment activities are available. All necessary ROTC
uniforms and other essential materials are furnished at no cost. After
completing the Basic Course, selected students who have demonstrated the
potential to become an officer and who have met the physical, medical, and
scholastic standards are eligible to enroll in the Advanced Course.

The Advanced Course is taken during the final two years of college. It
includes instruction in organization and management, tactics, ethics,
professionalism and advanced leadership development.

During the summer between the junior and senior years of college,
Advanced Course students attend a fully-paid five-week training session
called the Leader Development and Assessment course. The Leader
Development and Assessment course gives students the chance to practice
what they have learned in the classroom, and apply their leadership skills.

The Two-Year Program
The two-year program is designed for a student who did not take ROTC
during their first two years of school, or for students who have prior military
service to their credit. The two-year program is also available to National
Guard and Army Reserve college students that are participating in the
Simultaneous Membership Program.

Several options exist for students to enter the Two-Year Program. For
students with no previous military experience, a summer introductory

military orientation session called the Leaders’ Training Course is most
often required. This is a fully-paid four-week course.

After successfully completing Leader’s Training Course, students who meet
all the necessary enrollment requirements continue in the Advanced Course.

Army ROTC Scholarships and Financial Assistance
Army ROTC scholarships for two, three and four years are awarded on a
competitive basis to the best qualified students who apply.

Four-year scholarships are awarded to students who will be entering college
as freshmen. Based on the availability of scholarships, three- and two-year
scholarships are awarded to students already enrolled in college.

Each scholarship covers tuition and fees, a specified amount for textbooks,
supplies and equipment, plus an allowance of $2,500 to $4,000 for every
year the scholarship is in effect.

Special consideration for an Army ROTC scholarship is given to students
pursuing degrees in nursing, engineering, the physical sciences, and other
technical skills in demand by the Army. Students who receive a scholarship
must earn an undergraduate degree in the field in which the scholarship is
awarded.

High Technology in Today’s Army
Today’s Army offers students the opportunity to learn valuable cutting-
edge technology skills. Army careers in such fields as aviation, advanced
electronics, laser technology, and computer programming are available to
students who can accept the challenge of working within a rapidly changing
technological environment. In the Army, students learn from experts and
gain first-hand experience working with some of the most sophisticated
equipment available.

Students who complete ROTC training and receive a degree in a high-tech
area can look forward to an important career experience in the Army and a
solid future in the world of rapidly expanding technology.

Minor in Military Studies

Choose four of the following: 6-8

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>MAS 110</td>
<td>Foundations of The Air Force I</td>
</tr>
<tr>
<td>MAS 111</td>
<td>Foundations of The Air Force II</td>
</tr>
<tr>
<td>MAS 210</td>
<td>The Employment of Air and Space Power I</td>
</tr>
<tr>
<td>MAS 211</td>
<td>The Employment of Air and Space Power II</td>
</tr>
<tr>
<td>MSL 101</td>
<td>Leadership and Personal Development</td>
</tr>
<tr>
<td>MSL 102</td>
<td>Intro to Tactical Leadership</td>
</tr>
<tr>
<td>MSL 201</td>
<td>Innovative Team Leadership</td>
</tr>
<tr>
<td>MSL 202</td>
<td>Found of Tactical Leadership</td>
</tr>
<tr>
<td>MAS 309</td>
<td>Fld Training, 4 Week ’</td>
</tr>
<tr>
<td>MSL 305</td>
<td>Leadership Dev Assess Course</td>
</tr>
</tbody>
</table>

Choose five of the following: 15

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>MAS 310</td>
<td>Air Force Leadership and Management I</td>
</tr>
<tr>
<td>MAS 311</td>
<td>Air Force Leadership and Management II</td>
</tr>
<tr>
<td>MAS 410</td>
<td>National Security Affairs/Preparation for Active Duty I</td>
</tr>
<tr>
<td>MAS 411</td>
<td>National Security Affairs/Preparation for Active Duty II</td>
</tr>
<tr>
<td>MSL 301</td>
<td>Adaptive Team Leadership</td>
</tr>
<tr>
<td>MSL 302</td>
<td>Applied Team Leadership</td>
</tr>
<tr>
<td>MSL 401</td>
<td>Adaptive Leadership</td>
</tr>
</tbody>
</table>
The College of Letters and Science, offering nearly 50 majors and 25 minors for undergraduates, is the largest and most diverse college at MSU. Its fifteen departments, representing the four areas of the humanities, natural sciences, mathematics and social sciences, share a commitment to helping students think critically and solve problems, communicate clearly, understand various disciplines and cultures, and develop the engagement that will make them life-long learners and leaders.

College of Letters and Science faculty members are well-known for their contributions to their fields, and have an impressive record for winning competitive national grants to support research and scholarship. Letters and Science undergraduates benefit from numerous opportunities to work side-by-side with faculty on original research and scholarship, an experience that is elsewhere often available only to graduate students.

The following baccalaureate degrees are offered in the College of Letters and Science:

- B.A. in American Studies (p. 179)
- B.A. in Asian Studies (p. 182)
- B.S. in Anthropology (p. 184)
- B.S. in Biological Sciences (p. 81)
- B.S. in Cell Biology and Neuroscience (p. 185)
- B.S. in Chemistry and Biochemistry (p. 187)
- B.S. in Earth Sciences (p. 191)
- B.S. in Economics (p. 204)
- B.A. in English (p. 205)
- B.A. in History (p. 208)
- B.A. in Liberal Studies (p. 216)
- B.S. in Mathematics (p. 222)
- B.S. in Microbiology (p. 226)
- B.A. in Modern Languages and Literatures (p. 233)
- B.A. in Philosophy (p. 240)
- B.S. in Physics (p. 242)
- B.A. in Political Science (p. 245)
- B.S. in Psychology (p. 249)
- B.A. in Religious Studies (p. 251)
- B.S. in Sociology (p. 252)

Non-degree program

- Pre-Medical/Pre-Health Professions (p. 249)
- Pre-Veterinary Program (p. 98)

In addition to various options within each degree, and minors in most of the areas listed above, the college administers the following minors:

- Minor in Astrobiology (p. 191)
- Minor in China Studies (p. 234)
- Minor in Genetics (p. 94)
- Minor in Global Studies (p. 220)
- Minor in Japan Studies (p. 236)
- Minor in Museum Studies (p. 214)
- Minor in Native American Studies (p. 239)
- Minor in Optics (p. 169)
- Minor in Water Resources (p. 197)
- Minor in Women’s, Gender, and Sexuality Studies (p. 253)

The selection of a minor provides students the opportunity to have a recognized second area of concentration.

American Studies

The American Studies program is designed to meet the needs of students, including non-traditional majors and lifelong learners, who want to pursue a flexible, multi-disciplinary curriculum in American Studies. Students explore the experiences and values of the people of the United States as embodied in their history, literature, art, and other forms of cultural expression. All students are required to choose one of three program focus areas: American Arts, American History, or American Literature.

Students must complete a minimum of 45 credits in the program after declaring themselves to be American Studies majors. Up to 12 credits required in a minor or in a second degree program may be applied toward the American Studies degree requirements. Courses taken to complete requirements in the American Studies program may also be used to satisfy University Core requirements.

For details about the American Studies degree, contact the Program Administrator, Cassandra Balent, at 406-994-4396 or cassandra.balent@montana.edu (scarlet.reierson@montana.edu), or check the American Studies website www.montana.edu/amst.

Foundation Courses

All students, regardless of program focus area, must complete the following courses:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>AMST 101D</td>
<td>Introduction to American Studies</td>
<td>3</td>
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<tr>
<td>LIT 110IH</td>
<td>Intro to Lit: Explorations in Literature</td>
<td>3</td>
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<tr>
<td>NASX 105D</td>
<td>Intro Native Amer Studies</td>
<td>3</td>
</tr>
<tr>
<td>PSCI 210IS</td>
<td>Introduction to American Government</td>
<td>3</td>
</tr>
</tbody>
</table>

Foreign Language Requirement and Study Abroad

Students are required to take the first two courses in a foreign language (8 credits) or to demonstrate equivalent competency. Additionally, to better understand how America is perceived in the world, students are encouraged (although not required) to spend at least one semester abroad at a Center for American Studies.

Capstone Experience

All students in the major take a common 4-credit capstone course in their final year (AMST 401 Seminar in American Studies). Students will work together in small groups to design solutions to contemporary issues in American society (e.g., immigration). Each small-group project will result in a scholarly product (typically a paper or presentation) that will serve as a measurable indication of the extent to which students have mastered the critical thinking, reading, writing, and oral communication skills that are the principal learning objectives of the program.
American Studies Courses (General and Focus Area Requirements)

With the exception of the foundation courses described above, all courses that apply to the American Studies requirements are listed below. This includes a general component, required of all focus areas, as well as the more specific requirements of the individual focus areas.

American Studies Courses - General Requirement

In consultation with their advisor, students will select 33 credits from the list of American Studies Courses (below). Courses used to satisfy this requirement cannot be used to satisfy other American Studies requirements, although they may count toward CORE 2.0. Students in the American Arts focus area may select no more than 12 credits from Art, Film and Photography, and Music. Students in the American History focus area may select no more than 12 credits from History. Students in the American Literature focus area may select no more than 12 credits from Literature. Regardless of their focus area, all students will complete the following:

- One (1) LIT course
- One (1) 300 or 400-level HSTA course
- One (1) NASX course

American Studies Courses

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>LIT 372</td>
<td>(Last offered Spring 2015)</td>
<td>3</td>
</tr>
<tr>
<td>LIT 431RH</td>
<td>Studies in Major Author/s</td>
<td>3</td>
</tr>
<tr>
<td>MOR 301</td>
<td>Museum Practices</td>
<td>3</td>
</tr>
<tr>
<td>MUSI 1301A</td>
<td>History of Jazz</td>
<td>3</td>
</tr>
<tr>
<td>NASX 205D</td>
<td>Native Americans in Contemporay Society</td>
<td>3</td>
</tr>
<tr>
<td>NASX 232D</td>
<td>MT Indians: Cultures, Histories, Current Issues</td>
<td>3</td>
</tr>
<tr>
<td>NASX 239</td>
<td>Native North American History through Art and Material Culture</td>
<td>3</td>
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<td>NASX 2801S</td>
<td>Native American Studies Research Theories and Methods</td>
<td>3</td>
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<td>NASX 304</td>
<td>Native American Beliefs and Philosophy</td>
<td>3</td>
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<tr>
<td>NASX 310</td>
<td>Native Cultures of North America</td>
<td>3</td>
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<td>NASX 340</td>
<td>Native American Literature</td>
<td>3</td>
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<tr>
<td>NASX 360</td>
<td>Native Americans and Cinema</td>
<td>3</td>
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<tr>
<td>NASX 430</td>
<td>American Indian Education</td>
<td>3</td>
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<td>NASX 476</td>
<td>American Indian Policy and Law</td>
<td>3</td>
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<tr>
<td>PHL 255D</td>
<td>Philosophy and Culture</td>
<td>3</td>
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<tr>
<td>PHL 328</td>
<td>Philosophy and Film</td>
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<td>PHL 354</td>
<td>Philosophy of Race</td>
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<tr>
<td>PHOT 113RA</td>
<td>Understanding Photography</td>
<td>3</td>
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<tr>
<td>PHOT 303</td>
<td>Early History of Photography</td>
<td>3</td>
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<tr>
<td>PHOT 304</td>
<td>Recent History of Photography</td>
<td>3</td>
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<tr>
<td>PSCI 214IS</td>
<td>Principles of Political Science</td>
<td>3</td>
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<tr>
<td>PSCI 306</td>
<td>Legislative Process</td>
<td>3</td>
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<tr>
<td>PSCI 346</td>
<td>American Presidency</td>
<td>3</td>
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<tr>
<td>PSCI 441</td>
<td>(Last offered Fall 2014)</td>
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<tr>
<td>PSCI 471</td>
<td>American Constitutional Law</td>
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<td>RLST 220H</td>
<td>Interpretations of American Religion</td>
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<tr>
<td>SOCI 101IS</td>
<td>Introduction to Sociology</td>
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<td>SOCI 320</td>
<td>Sociology of Religion</td>
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<td>SOCI 325</td>
<td>Social Stratification</td>
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<td>SOCI 326</td>
<td>Sociology of Gender</td>
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<td>SOCI 333</td>
<td>Sociology of Education</td>
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<td>SOCI 340</td>
<td>Social Movements</td>
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<td>SOCI 345</td>
<td>Sociology of Organizations</td>
<td>3</td>
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<td>SOCI 359</td>
<td>Crime, Justice and Media</td>
<td>3</td>
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<tr>
<td>SOCI 435</td>
<td>Law and Society</td>
<td>3</td>
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<tr>
<td>SOCI 436</td>
<td>Law and Inequality</td>
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<tr>
<td>SOCI 470</td>
<td>Environmental Sociology</td>
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<tr>
<td>WGSS 2011H</td>
<td>Intro to Feminist Theories</td>
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<tr>
<td>WGSS 301RH</td>
<td>Integrative Seminar in Women’s Studies</td>
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American Arts Focus Area (13 cr.)

This focus area explores the ways in which art, architecture, music, and film have shaped, and been influenced by, American values and behaviors. Students must complete the following:

AMST 202RA The Arts in America
MUSI 2031A American Popular Music
LIT 310 American Literature to 1900, or LIT 311 American Literature after 1900,
HSTA 1011H American History I, or HSTA 1021H American History II, or HSTA 160D Introduction to the Am West
### Freshman Year

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
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<th>Spring</th>
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<tbody>
<tr>
<td>WRIT 101W - College Writing I*</td>
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<td>AMST 101D - Introduction to American Studies</td>
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<td>University Core and Electives</td>
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<tr>
<td>NASX 105D - Intro Native Amer Studies</td>
<td>3</td>
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### Sophomore Year

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<th>Spring</th>
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<tbody>
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<td>HSTA 101IH - American History I or HSTA 102IH - American History II or HSTA 160D - Introduction to the Am West</td>
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<tr>
<td>MUSI 203IA - American Popular Music</td>
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<tr>
<td>University Core and Electives</td>
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<tr>
<td>AMST 202RA - The Arts in America or MUSI 203IA - American Popular Music</td>
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<tr>
<td>LIT 110IH - Intro to Lit: Explorations in Literature</td>
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### Junior Year

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<th>Course</th>
<th>Credits</th>
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<tbody>
<tr>
<td>HSTA 160D - Introduction to the Am West</td>
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<td>Focus Area requirements</td>
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<td>Electives</td>
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<tr>
<td>PSCI 210IS - Introduction to American Government</td>
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<tr>
<td>American Studies general requirements</td>
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<tr>
<td>Focus Area requirements</td>
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<td><strong>Year Total:</strong></td>
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### Senior Year

<table>
<thead>
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<th>Course</th>
<th>Credits</th>
<th>Fall</th>
<th>Spring</th>
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<tbody>
<tr>
<td>American Studies general requirements</td>
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<td>Focus Area requirements</td>
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<tr>
<td>Electives</td>
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<tr>
<td>AMST 401R - Seminar in American Studies</td>
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<td>American Studies general requirements</td>
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<tr>
<td>Electives</td>
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<tr>
<td><strong>Year Total:</strong></td>
<td>15</td>
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</table>

**Total Program Credits:** 120

A minimum of 42 credits must be in courses numbered 300 and above. In addition to AMST 401R, at least 9 credits must be in courses numbered 400 and above.

* Students have the option to take WRIT 101W in the spring semester and 3 additional university core electives in the fall semester.

### American History Focus Area (18 cr.)

Students will acquire a broad understanding of the major events and processes of American history, and of the ways in which modern American society has been shaped by its historical development. Students must complete the following:

- HSTA 101IH American History I
- HSTA 102IH American History II
- HSTA 160D Introduction to the Am West
- AMST 202RA The Arts in America, or MUSI 203IA American Popular Music: Reflections of Politics & Society
- LIT 310 American Literature to 1900, or LIT 311 American Literature after 1900
Bachelor of Arts in Asian Studies

Electives 5
Year Total: 15 15
Total Program Credits: 120

A minimum of 42 credits must be in courses numbered 300 and above. In addition to AMST 401R, at least 9 credits must be in courses numbered 400 and above.

* Students have the option to take WRIT 101W in the spring semester and 3 additional university core electives in the fall semester.

American Literature Focus Area (13 cr.)

This focus area will examine critical approaches to studying the American literary tradition, and its relationship to the major social and cultural movements of American history. Students must complete the following:

AMST 202RA The Arts in America, or MUSI 203IA American Popular Music: Reflections of Politics & Society
LIT 310 American Literature to 1900, LIT 311 American Literature after 1900, HSTA 101IH American History I, or HSTA 102IH American History II, or HSTA 160D Introduction to the Am West

Freshman Year

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
<th>Fall</th>
<th>Spring</th>
</tr>
</thead>
<tbody>
<tr>
<td>WRIT 101W - College Writing I*</td>
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<td>AMST 101D - Introduction to American Studies</td>
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<td>University Core and Electives</td>
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<tr>
<td>LIT 110IH - Intro to Lit: Explorations in Literature</td>
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Sophomore Year

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<tr>
<th>Course</th>
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<th>Spring</th>
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<tbody>
<tr>
<td>LIT 310 - American Literature to 1900</td>
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<td>or MUSI 203IA American Popular Music</td>
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Junior Year

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<th>Course</th>
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<th>Fall</th>
<th>Spring</th>
</tr>
</thead>
<tbody>
<tr>
<td>HSTA 101IH - American History I</td>
<td>4</td>
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<tr>
<td>or HSTA 102IH - American History II</td>
<td></td>
<td></td>
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<td>or HSTA 160D - Introduction to the Am West</td>
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<td>PSCI 210IS - Introduction to American Government</td>
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Senior Year

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<th>Course</th>
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<td>Electives</td>
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Total Program Credits: 120

A minimum of 42 credits must be in courses numbered 300 and above. In addition to AMST 401, at least 9 credits must be in courses numbered 400 and above.

* Students have the option to take WRIT 101W in the spring semester and 3 additional university core electives in the fall semester.

American Studies offers the degrees of Master of Arts and Doctor of Philosophy, with a special focus on the American West. Major fields include American Arts, American History, American Literature, American Pluralism, and Public History.

- Ph.D. of Philosophy in American Studies (p. 355)
- M.A. of Arts in American Studies (p. 356)

Bachelor of Arts in Asian Studies

In order to provide students with the skills needed in a globalized world that increasingly pivots on Asia, Montana State University offers an interdisciplinary Asian studies major. Besides taking core Asian studies courses, students can choose between a Japan Focus and China Focus.

Required Courses for Japan Focus

Core Asian Studies Requirements (take three of the following: 9-12 credits)

<table>
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<tr>
<th>Course Code</th>
<th>Course Title</th>
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<tbody>
<tr>
<td>ANTY 242D</td>
<td>Contemporary Japan</td>
</tr>
<tr>
<td>CHIN 130D</td>
<td>Historical and Literary Journey into Modern China</td>
</tr>
<tr>
<td>CHIN 211D</td>
<td>Chinese Culture &amp; Civilization</td>
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<tr>
<td>HSTR 140D</td>
<td>Modern Asia</td>
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<tr>
<td>HSTR 145D</td>
<td>Reinventing Japan</td>
</tr>
<tr>
<td>JPNS 150D</td>
<td>Japanese Culture &amp; Civ</td>
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<td>PHL 270</td>
<td>Philosophies of Asia</td>
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<tr>
<td>RLST 203D</td>
<td>Buddhist Traditions</td>
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Japan Focus

1. Japanese Language Requirement (16 credits)

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<td>JPNS 101</td>
<td>Elementary Japanese I</td>
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<tr>
<td>JPNS 102D</td>
<td>Elementary Japanese II</td>
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<td>JPNS 201D</td>
<td>Intermediate Japanese I</td>
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<td>JPNS 202D</td>
<td>Intermediate Japanese II</td>
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2. Japan Courses (take six courses of the following: 18 credits)

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<tr>
<td>ANTY 337</td>
<td>Sex, Gender, Sexuality Japan</td>
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<td>ANTY 343</td>
<td>Popular Culture - Japan</td>
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<tr>
<td>ANTY 441</td>
<td>Social Movements in Japan</td>
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<tr>
<td>ARTH 360</td>
<td>History of Asian Art and Architecture</td>
</tr>
<tr>
<td>GPHY 446</td>
<td>East Asia in the Global System</td>
</tr>
<tr>
<td>HSTR 340</td>
<td>Age of the Shoguns</td>
</tr>
</tbody>
</table>
HSTR 342  Japan’s Long 19th Century
HSTR 443  Gender in Asia
HSTR 444  Gender in Japan
HSTR 445  Environ, Health & Sci in Japan
JPNS 305  Japanese Adv Conversations
JPNS 320  Classical Japanese Literature
JPNS 321  Modern Japanese Literature
JPNS 325IH  Others in Japanese Lit/Culture
JPNS 340  Japanese Adv Reading & Grammar
JPNS 361IH  Japanese Text and Cinema

3. Japan Research Experience (3 credits):
   - ANTY 490R  Undergraduate Research and Instruction
   - ANTY 492  Independent Study
   - HSTA 490R  Undergraduate Research
   - HSTR 490R  Undergraduate Research
   - HSTR 499R  Sen Capstone: Hist Methodology
   - JPNS 450R  Sem: Japanese Lit and Culture
   - Other courses approved by a faculty advisor

University core and electives  71-74
Total Credits  120

Course Substitutions: Other appropriate courses, including those taken abroad, may be substituted with the approval of an Asian Studies Advisor.

Study Abroad: Montana State maintains active exchange programs with overseas universities, including ones throughout Asia. Students may spend an entire academic year abroad while paying Montana State tuition. Contact the Office of International Programs for more information.

Graduation Requirements: A minimum of 120 credits is required for graduation; 42 of these credits must be upper-division.

Asian Studies Minor

Required Courses for Asia Studies Minor
Core Asian Studies Requirements (take one of the following: 3-4 credits)
   - ANTY 242D  Contemporary Japan
   - CHIN 130D  Historical and Literary Journey into Modern China
   - CHIN 211D  Chinese Culture & Civilization
   - HSTR 140D  Modern Asia
   - HSTR 145D  Reinventing Japan
   - JPNS 150D  Japanese Culture & Civ
   - PHL 270  Philosophies of Asia
   - RLIST 203D  Buddhist Traditions

Asian Language Requirement (8 credits)
   - JPNS 101  Elementary Japanese I & JPNS 102D
   - OR
   - CHIN 101  Elementary Chinese I & CHIN 102D

Japan Courses (take two courses of the following: 6 credits)
   - ANTY 337  Sex, Gender, Sexuality Japan
   - ANTY 343  Popular Culture - Japan
   - ANTY 441  Social Movements in Japan
   - ARTH 360  History of Asian Art and Architecture
   - GPHY 446  East Asia in the Global System
   - HSTR 340  Age of the Shoguns
   - HSTR 342  Japan’s Long 19th Century
   - HSTR 443  Gender in Asia
   - HSTR 444  Gender in Japan
   - HSTR 445  Environ, Health & Sci in Japan
   - JPNS 305  Japanese Adv Conversations
   - JPNS 320  Classical Japanese Literature
Anthropology

Department of Sociology & Anthropology

Students earning a B.S. in anthropology obtain a broad, anthropological perspective on the study of humankind. As part of the curriculum, students are expected to become familiar with and understand the interrelationships among the diverse aspects of our humanity – both present and past. These include the biological evolution of our species, the adaptive advantage of human symbolic capacities and technological abilities, and the development of culture from earliest recognizable traces through the emergence of complex civilizations. Historical concerns include investigations of the diversity of human languages, the relationship between language and world view, the ethnography of speech practices, the cultural construction of the social and physical world, and the social and structural relationships that people use to make sense out of their daily activities. These concepts are introduced and applied through course offerings in the four sub-fields of anthropology: social/cultural anthropology, archaeology, evolutionary/biological anthropology, and linguistic anthropology. Students work closely with faculty to gain a well-grounded knowledge of anthropological theories and methods that allows them to pursue research in one or more sub-fields of study.

Anthropology is a diverse field that provides students with a solidly-grounded liberal arts education. At the same time it is a cornerstone for understanding issues of diversity in an increasingly global world. In order to gain the skills needed to pursue research, students will learn how to think critically, read in a discerning manner, formulate logical arguments, and write in a coherent fashion. The B.S. degree in Anthropology prepares students for graduate work in this discipline. Graduate degrees are typically required for professional participation in this field. In addition to professional employment as research scientists or college-level professors, anthropologists often find positions as consultants, teachers, museum curators, or as specialists in historic preservation. Equally, domestic and foreign assignments with international, federal, or state agencies and institutions, and jobs in private industry, are available. Anthropologists are also found in public service organizations, medical and public health programs, environmental organizations, non-governmental organizations, and in positions that require community organizing abilities or ethnographic and social survey research skills.

While students are not required to apply for formal admission to the anthropology program, students must obtain a grade of C- or better in all Anthropology courses in order to receive credit toward graduation. Before enrolling in 300 and 400 level ANTY courses, Anthropology majors must have completed the following university core courses: WRIT 101W, University Seminar, and Math Core. Students who enroll in anthropology courses without the required core or anthropology prerequisite(s) must obtain the permission of the instructor. Otherwise, those students will be required to withdraw from the course.

Academic advisors in anthropology work closely with each student to establish a viable educational plan. Ongoing interactions between students and advisors ensure that a student’s educational objectives are being met as she or he moves toward a degree.

Undergraduate Programs

- B.S. in Anthropology (p. 184)
- Anthropology Minor (non-teaching) (p. 184)

Anthropology Minor (Non-Teaching)

The Anthropology Minor is a non-teaching minor designed to encourage students from any discipline to explore the cross-cultural study of humankind in order to complement or supplement course work in their respective majors. The minor introduces students to the four subfields of anthropological study (evolutionary/biological anthropology, social/cultural anthropology, archaeology, and linguistics); it also allows students within the minor the flexibility to select among a range of advanced courses in prehistory, ethnography, theory, and topical domains relative to their particular interests. The curriculum stresses critical thinking, awareness of culture-specific meanings and values, consideration of the potential sustainability of various cultural adaptations, student involvement in the learning process, and opportunities for research. For graduation, students must have a C- or higher in all required and elective courses in the minor.

ANTY 215IS  Human Prehistory  3
or ANTY 212CS  Bones, Apes, and Ancestors

ANTY 225IS  Culture, Language, and Society  3
Anthropology Electives  15
At least 12 of the 15 electives must be from upper division courses numbered 300 and above.

Total Credits  21

The maximum number of Anthropology transfer credits that may be applied toward the minor is 9; additional transfer credits may be accepted as negotiated with your advisor.

B.S. in Anthropology

Freshman Year

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
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<tbody>
<tr>
<td>ANTY 101D - Anthropology and the Human Experience</td>
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<tr>
<td>WRIT 101W - College Writing I</td>
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</tr>
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<td>Choose one of the following:</td>
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<tr>
<td>SOCI 101IS - Introduction to Sociology</td>
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<tr>
<td>SOCI 150D - Social Difference</td>
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<tr>
<td>SOCI 201D - Social Problems</td>
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</tr>
<tr>
<td>University Core Seminar</td>
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<tr>
<td>Math Core</td>
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Sophomore Year

<table>
<thead>
<tr>
<th>Course</th>
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<tbody>
<tr>
<td>ANTY 215IS - Human Prehistory</td>
<td>3</td>
</tr>
</tbody>
</table>
ANTY 225IS - Culture, Language, and Society 3
PHL 236Q - Logic 3
SOCI 202 - Social Statistics 3
or STAT 216Q - Introduction to Statistics
University Core and Electives 18
Year Total: 30

Senior Year Credits
ANTY 313 - Biological Anthropology 3
ANTY 472 - Descriptive Linguistics 3
or ANTY 473 - Language & Culture
ANTY 300-400--Archaeology elective 3
Choose one of the following: 3
PHL 345 - Philosophy of Science
HSTR 417 - Early Modern Science
HSTR 419 - Modern Science
ANTY 300-400--Cultural Anthropology Elective 3
ANTY 300-400--Elective 3
ANTY 200-400--Elective 3
University Core and Electives 12
Year Total: 33

Total Program Credits: 120

Anthropology majors must complete one of the following sequences of courses.

Sequence A
A minor approved by the student’s advisor 18

Sequence B
Design an array of supporting coursework to complement your course of study in Anthropology. 18

Departmental Honors: Students may graduate with Departmental Honors if they meet the following requirements: GPA of 3.5 or higher and complete an undergraduate thesis in Anthropology.

For Anthropology majors, the maximum number of Anthropology transfer credits accepted is 18. Major requirements include 21 elective Anthropology credits of which 18 must be upper division (300 and above) and no more than 6 credits of ANTY 490R or ANTY 492 combined can count toward fulfillment of the elective credits.

For graduation in Anthropology students must have a grade of C- or higher in all Anthropology courses. A minimum of 120 credits is required for graduation; 42 of these credits must be in courses numbered 300 and above.

Cell Biology and Neuroscience

The department participates in MSU’s Genetics Minor and recommends this minor to students particularly interested in genetics.

Note: MSU’s programs in the biological sciences are distributed across multiple departments. MSU does not have a single Department of Biology. For additional options see Biological Sciences (p. 81) at MSU.

Department of Cell Biology and Neuroscience

The Department of Cell Biology and Neuroscience offers a B.S. in Cell Biology and Neuroscience with an option in Biomedical Sciences and a minor in Genetics.

Pre-medicine, Pre-dentistry, Pre-Physician Assistant, and Pre-optometry

Students may prepare for admission to medical, dental, optometry, physician assistant and many other health profession and graduate schools by following the option in Biomedical Sciences in the Department of Cell Biology and Neuroscience. The Department of Cell Biology and Neuroscience provides advising on matters pertaining to the biomedical sciences curriculum. Advising on matters pertaining to admission to professional schools is provided by the Health Professions Advising Office.

Requirements for Admission to Upper Division Courses in Biology

For admission to upper division (numbered 300 and above) courses taught by the Department of Cell Biology and Neuroscience, students must have completed at least 30 total university credits with a cumulative GPA of at least 2.75.

Grade Requirements for Fulfillment of Degree Options

In order to graduate with a B.S. in the department, students must earn a grade of C- or better for every course required for the specific option, including courses taken to fulfill required elective credits.

Graduation In Absentia

Some professional programs accept students before their degree requirements are completed. It is often possible to transfer credits from the first year of professional school to MSU to graduate in absentia. The mechanics involve sending an official transcript for the first year of professional school to the MSU academic advisor. The student then writes a letter to the MSU Registrar explaining which credits transfer and how they fulfill the degree requirements. The student then registers in absentia at MSU for the semester in which the B.S. degree will be awarded.

Undergraduate Programs

• Biomedical Sciences Option (p. 186)

Undergraduate Minor

• Genetics Minor (Non-Teaching) (p. 94)

The Department of Cell Biology and Neuroscience offers exciting opportunities to work with nationally and internationally recognized faculty on a wide range of research topics, including cognitive neuroscience, neurophysiology, developmental biology, cell biology and biophysics. It is the goal of the faculty to prepare our students for successful careers in academic research, government, and/or the biotechnology industry. Successful applicants to the program will have already established a commitment to excellence through academic achievements and prior research experience.

We offer Ph.D. or M.S. degrees in Neuroscience or Biological Science to our graduate students. The Ph.D. Degree Program is designed for students who are committed to a scientific research career and are willing to commit an average of 5 to 6 years in pursuit of the training that is necessary to qualify for this degree. Prospective students must secure a faculty sponsor prior to applying for admission.

The M.S. degree is for students who wish to increase their knowledge base in basic research through an intensive 2- to 3-year training period. Students must identify a faculty sponsor prior to submitting an application to the CBN Graduate Program.
• Master of Science in Biological Sciences (p. 358)
• Master of Science in Neuroscience (p. 358)
• Doctor of Philosophy in Biological Sciences (p. 358)
• Doctor of Philosophy in Neuroscience (p. 358)

How to apply:

1) Prior to applying, all prospective graduate students need to secure a faculty sponsor. Contact CBN faculty to arrange the sponsorship.
2) After arranging the sponsorship, sign the form here (http://www.montana.edu/cbn/documents/Form.pdf) and send it to the CBN graduate coordinator: bnoudoost@montana.edu

Please:
- Do not contact any of CBN faculty regarding the process. Only contact them regarding the funding and sponsorship. Direct your questions regarding to the process to bnoudoost@montana.edu
- Do not proceed with the online application prior to submitting the above form to bnoudoost@montana.edu.

**Biomedical Sciences Option**

The curriculum of the biomedical sciences option provides a strong background for students who plan on a career in medicine or other health profession. This option is also for students that are interested in a biomedical sciences career in research or teaching in cell biology, molecular biology, developmental biology, or neuroscience. The curriculum provides the opportunity to take the courses necessary to make a competitive application to health profession school, graduate school or to obtain a technical position. The curriculum has sufficient breadth to introduce the student to a wide range of disciplines, but is flexible enough so that students can focus, in their last two years, on areas of specific interest. Students interested in a career in a health science profession should consult the Health Professions Advising Office for information regarding admission to professional schools.

Employment opportunities, especially at the technical level, are available with a B.S. in Cell Biology and Neuroscience. However, this curriculum is designed to better prepare students for professional or graduate training. The biomedical sciences curriculum is designed to allow the students to take basic courses in physical sciences while tailoring the courses in life sciences to meet their personal objectives and interests. This is done by allowing 24 of the required credits in Biology to be elective credits in life sciences; biology, biochemistry, microbiology, or other appropriate fields. Advanced students are strongly encouraged to enroll in undergraduate research. This provides an opportunity to gain valuable experience in biomedical research which is extremely useful for both an appreciation of the research effort required in graduate school and for gaining experience in technical methods for a technical position.

**Freshman Year**

<table>
<thead>
<tr>
<th>Course</th>
<th>Fall Credits</th>
<th>Spring Credits</th>
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<tbody>
<tr>
<td>BIOH 185 - Integrated Physiology I</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>CHMY 141 - College Chemistry I</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>STAT 216Q - Introduction to Statistics</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>WRIT 101W - College Writing I</td>
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<td>University Core and Electives</td>
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<tr>
<td>BIOB 260 - Cellular and Molecular Biology</td>
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<td></td>
</tr>
<tr>
<td>CHMY 143 - College Chemistry II</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>M 161Q - Survey of Calculus</td>
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<td></td>
</tr>
<tr>
<td>CLS 101US - Knowledge and Community</td>
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<td></td>
</tr>
<tr>
<td>Year Total:</td>
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<td>15</td>
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**Sophomore Year**

<table>
<thead>
<tr>
<th>Course</th>
<th>Fall Credits</th>
<th>Spring Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOH 313 - Neurophysiology</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>CHMY 321 - Organic Chemistry I</td>
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<tr>
<td>PHSX 205 - College Physics I</td>
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<td></td>
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<tr>
<td>University Core and Electives</td>
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<tr>
<td>BIOH 320 - Biomedical Genetics</td>
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<tr>
<td>CHMY 323 - Organic Chemistry II</td>
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<td>PHSX 207 - College Physics II</td>
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<td>University Core and Electives</td>
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**Junior Year**

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<thead>
<tr>
<th>Course</th>
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<th>Spring Credits</th>
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<tbody>
<tr>
<td>BCH 380 - Biochemistry</td>
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</tr>
<tr>
<td>WRIT 201 - College Writing II</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>or WRIT 221 - Intermediate Tech Writing</td>
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<td>University Core and Electives</td>
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</tr>
<tr>
<td>BIOB 425 - Adv Cell &amp; Molecular Biology</td>
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<td></td>
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<tr>
<td>BIOB 420 - Evolution</td>
<td>3</td>
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**Senior Year**

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<td>BIOB 499 - Senior Thesis/Capstone</td>
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<td>University Core and Elective</td>
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**Total Program Credits:** 120

**Additional Requirements**

A minimum of 24 additional elective credits in the life sciences must be completed, most typically from courses in Cell Biology & Neuroscience, Microbiology and Immunology, and Biochemistry. Of these 24 credits, at least 18 must be upper division. No more than 6 credits of research can be applied toward these 24 elective credits. See the department office for a full list of approved electives.

Examples of elective courses include, but are not limited to:

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
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<tbody>
<tr>
<td>BIOB 410 - Immunology</td>
<td>3</td>
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<tr>
<td>BIOB 476R - Gene Construction</td>
<td>4</td>
</tr>
<tr>
<td>BIOH 201 - Hum Anatomy &amp; Physiology I</td>
<td>5</td>
</tr>
<tr>
<td>BIOH 211 - Hum Anatomy &amp; Physiology II</td>
<td>4</td>
</tr>
<tr>
<td>BIOH 309 - Human Neuroanatomy</td>
<td>4</td>
</tr>
<tr>
<td>BIOH 323 - Human Developmental Biology</td>
<td>4</td>
</tr>
<tr>
<td>BIOH 395 - Human Pathophysiology</td>
<td>3</td>
</tr>
<tr>
<td>BIOH 411 - Adv Human Anatomy</td>
<td>4</td>
</tr>
<tr>
<td>BIOH 422 - Genes and Cancer</td>
<td>3</td>
</tr>
<tr>
<td>BIOH 425 - Sensory Neuropsychology</td>
<td>3</td>
</tr>
<tr>
<td>BIOH 435 - Cognitive Neuroscience</td>
<td>3</td>
</tr>
<tr>
<td>BIOH 440 - Neuroscience of Mental Illness</td>
<td>3</td>
</tr>
<tr>
<td>BIOH 445 - Intro Pharmacology</td>
<td>3</td>
</tr>
<tr>
<td>BIOH 455 - Molecular Medicine</td>
<td>3</td>
</tr>
<tr>
<td>BIOH 465R - Gene Expression Lab: From Genes to Proteins to Cells</td>
<td>3</td>
</tr>
<tr>
<td>BIOI 409 - Advanced Human Torso Anatomy</td>
<td>4</td>
</tr>
</tbody>
</table>
Chemistry and Biochemistry

Note: MSU’s programs in the biological sciences are distributed across multiple departments. MSU does not have a single Department of Biology. For additional options see Biological Sciences at MSU.

Department of Chemistry and Biochemistry

The Department of Chemistry and Biochemistry offers programs that are certified by the American Chemical Society and that emphasize modern areas in chemistry and biochemistry at both the undergraduate and graduate levels. The curriculum for the Bachelor of Science degree in chemistry provides basic education in chemistry with sufficient breadth and flexibility to allow students to enter a variety of chemistry-related careers. Several curricular options are available, each of which is career- and employment-directed. Employment opportunities are extensive. For example, at least 36 percent of the research and development workforce in the United States have degrees in chemistry, more than any other discipline. The different options allow the student to emphasize his or her personal choices in course selection.

All of the options emphasize current aspects of chemistry and biochemistry with particular attention given to instrumentation, modern concepts and methods, and use of computers to help solve chemical problems. Participation in undergraduate research within an active research group in the department is an important and rewarding part of the overall program. A wide range of fundamental research programs are ongoing in all major areas of chemistry: analytical, biochemistry, inorganic, organic and physical.

The Department of Chemistry and Biochemistry participates in several instructional and research programs of an interdisciplinary nature. These include nanomaterials, optical technology, thermal biology, biofilm engineering, computer modeling of proteins and nucleic acids, and the WWAMI medical education program. The department has active graduate programs leading to the degrees of Master of Science and Doctor of Philosophy. These degrees may be obtained in either chemistry or biochemistry.

The department encourages majors in allied fields to consider either a chemistry or a biochemistry minor.

Chemistry (Professional) Option

This option includes a central core of chemistry courses that, together with technical electives, allows the students to prepare for careers in chemistry or related fields such as medicine, patent law, chemical industry, or science writing. Students interested in the more quantitative and physical aspects of chemistry may wish to include additional mathematics and/or physics courses. Students electing this option will be well prepared both for graduate study and for immediate employment in industry, government, or business.

Biochemistry Option

This option includes a core of chemistry, biochemistry, and biology courses for students interested in the molecular nature of biological materials and life processes. A broad choice of biological science electives allow the students to prepare for careers in human, animal, plant, or microbial biochemistry. Trained biochemical scientists are in demand for research and teaching in universities and for research and development work in chemical, pharmaceutical, and bio-technical industries, in medical laboratories, and in state and federal governments. Students who complete the curriculum satisfactorily will be prepared to assume responsible professional positions or undertake graduate level work in the life sciences. The curriculum also provides an excellent preparation for medical, dental, or veterinary school.

Teaching Option

This option is designed to prepare prospective teachers of chemistry at the secondary level. It provides a thorough background in the basic fields of chemistry and an acquaintance with aspects of chemistry in society that are essential to the practicing teacher of chemistry. The chemistry teaching option qualifies graduates to teach secondary school chemistry. Employment opportunities will be enhanced by obtaining a second area of certification, usually a teaching minor. Obtaining a teaching major, a teaching minor, and certification will require more than 120 credits.

Chemistry/Biochemistry Minors (Non-teaching)

A minor in either chemistry or biochemistry is offered for students with other majors who wish to receive formal acknowledgement for taking a core of intermediate-level chemistry and/or biochemistry courses. The minor is designed to strengthen the students’ opportunities for admission to graduate school or medical, dental, veterinary, or pharmacy school, or for industrial employment.

Undergraduate Programs

- Chemistry (Professional) Option (p. 189)
- Biochemistry Option (p. 188)
- Teaching Option (p. 190)

Undergraduate Minors

- Astrobiology Minor (Non-Teaching) (p. 191)
- Biochemistry Minor (Non-Teaching) (p. 191)
- Chemistry Minor (Non-Teaching) (p. 191)

The Department of Chemistry and Biochemistry offers research-oriented programs culminating in the Doctor of Philosophy degree. The faculty in the department have expertise in a broad range of specialty areas including synthesis, structure, spectroscopy, and mechanism. In each of these fields, the strength of MSU Chemistry and Biochemistry Department has been recognized at the international level. MSU is a growing and dynamic university of 16,000 students. MSU is rapidly increasing in research prominence and is now ranked among the nation’s 100 leading research universities by the Carnegie Foundation. The Department of Chemistry and Biochemistry has the largest and best-funded doctoral program on campus. Our doctoral students receive world-class mentoring in a spectacular northern Rocky Mountain setting and graduate to superb career opportunities.

Graduate programs in chemistry and biochemistry are designed to provide students with a solid and broad foundation on which to base their careers. An appropriate combination of coursework and independent investigation is planned with individual faculty advisors. In consultation with their graduate advisor, graduate students can tailor their program to their own needs and interests. We believe that at the conclusion of their graduate education at Montana State University, students should have a professional command of the fundamentals of their disciplines. We cultivate the ability to think independently and to critically analyze scientific problems that span disciplinary boundaries. A high level of creativity and originality in research is expected of candidates for the Ph.D.

Degrees Offered

- M.S. in Chemistry (p. 360)
- M.S. in Biochemistry (p. 360)
- Ph.D. in Chemistry (p. 361)
- Ph.D. in Biochemistry (p. 361)
Biochemistry Option

Freshman Year

<table>
<thead>
<tr>
<th>Course</th>
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<th>Spring</th>
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<tbody>
<tr>
<td>BCH 194 - Seminar/Workshop</td>
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<tr>
<td>CHMY 141 - College Chemistry I or CHMY 151 - Honors College Chemistry I</td>
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<td>4</td>
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<tr>
<td>STAT 216Q - Introduction to Statistics</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>University Core and Electives</td>
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<tr>
<td>BCH 294 - Seminar/Workshop</td>
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<tr>
<td>BIOC 260 - Cellular and Molecular Biology</td>
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<td>Please take one of the following:</td>
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<td>CHMY 143 - College Chemistry II or CHMY 153 - Honors College Chemistry II</td>
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<td>M 161Q - Survey of Calculus1</td>
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Sophomore Year

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<tr>
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Junior Year

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<td>CHMY 371 - Physical Chemistry-Quantum Chemistry and Spectroscopy I &amp; CHMY 372 - Physical Chemistry Laboratory I &amp; CHMY 373 - Physical Chemistry - Kinetics and Thermodynamics</td>
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<td>CHMY 490R - Undergraduate Research3</td>
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Senior Year

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Total Program Credits: 120

1 Instead of taking M 161Q students can choose to take a full year of calculus by taking M 165Q and M 166Q (Calculus for Technology I and II) or M 171Q and M 172Q (Calculus I and II). Note: M 171Q, M 172Q, and M 273Q must be taken in order to take the full year of Physical Chemistry (CHMY 371, CHMY 372 and CHMY 373) in junior year (see footnote 2).

2 Students should consider taking the full year of Physical Chemistry sequence (CHMY 371 and CHMY 372 in the fall and CHMY 373 in the spring) instead of the one-semester overview, particularly if planning to go to graduate school. As noted in footnote 1, this sequence requires more calculus as prerequisite coursework.

3 Six (6) credits of Undergraduate Research BICH 490R are tabulated. Students are encouraged to fulfill additional credits of research.

4 A minimum of 18 credits of physical and biological science electives are required.

5 BICH 499 (Senior Year) is required for majors who are writing a thesis for Departmental Honors consideration.

All students are encouraged to take a 200 level English writing course. Please note that this course would be in addition to the core requirement.

A minimum of 120 credits is required for graduation; 42 of these credits must be in courses numbered 300 and above.

Acceptable Physical and Biological Sciences Electives Include

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Acceptable Physical and Biological Science Electives Include

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### Chemistry (Professional) Option

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</tr>
</tbody>
</table>

### Total Program Credits: 120

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1. CHMY 421 is only offered in the fall semester of odd numbered years. Plan to take one of these classes in your junior year and one of these classes in your senior year.
2. Six (6) credits of CHMY 490R are tabulated. Students are encouraged to fulfill additional credits of research.
3. CHMY 499 (Senior year) is required for majors who are writing a thesis for Departmental Honors consideration.
4. A minimum of 9 credits of physical science electives are required.

A computer science (CS) course is highly recommended. A minimum of 120 credits is required for graduation; 42 of these credits must be in courses numbered 300 and above. All students are encouraged to take a 200 level English writing course. Please note that this course would be in addition to the core requirement.
Acceptable Physical Science Electives Include

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BCH 442</td>
<td>Metabolic Regulation</td>
<td>3</td>
</tr>
<tr>
<td>BCH 444R</td>
<td>Biochemistry &amp; Molecular Biology Methods</td>
<td>3</td>
</tr>
<tr>
<td>CHMY 350</td>
<td>Astrobiology</td>
<td>3</td>
</tr>
<tr>
<td>CHMY 515</td>
<td>Structure and Bonding in Inorganic Chemistry</td>
<td>3</td>
</tr>
<tr>
<td>CHMY 516</td>
<td>Mechanisms and Dynamics in Inorganic Chemistry</td>
<td>3</td>
</tr>
<tr>
<td>CHMY 523</td>
<td>Organic Reaction Mechanisms</td>
<td>3</td>
</tr>
<tr>
<td>CHMY 524</td>
<td>Mass Spectrometry</td>
<td>3</td>
</tr>
<tr>
<td>CHMY 526</td>
<td>Adv Protein NMR Spectroscopy</td>
<td>3</td>
</tr>
<tr>
<td>CHMY 533</td>
<td>Physical Organic Chemistry</td>
<td>3</td>
</tr>
<tr>
<td>CHMY 535</td>
<td>Reagent Chemistry</td>
<td>3</td>
</tr>
<tr>
<td>CHMY 540</td>
<td>Organic Synthesis</td>
<td>3</td>
</tr>
<tr>
<td>CHMY 551</td>
<td>Organic Structure Elucidation</td>
<td>3</td>
</tr>
<tr>
<td>CHMY 554</td>
<td>Organometallic Chemistry</td>
<td>3</td>
</tr>
<tr>
<td>CHMY 557</td>
<td>Quantum Mechanics</td>
<td>3</td>
</tr>
<tr>
<td>CHMY 558</td>
<td>Classical &amp; Stat Thermodynamic</td>
<td>3</td>
</tr>
<tr>
<td>CHMY 559</td>
<td>Kinetics &amp; Dynamics</td>
<td>3</td>
</tr>
<tr>
<td>M 221</td>
<td>Introduction to Linear Algebra</td>
<td>3</td>
</tr>
<tr>
<td>M 274</td>
<td>Introduction to Differential Equation</td>
<td>4</td>
</tr>
<tr>
<td>M 333</td>
<td>Linear Algebra</td>
<td>3</td>
</tr>
<tr>
<td>PHSX 224</td>
<td>Physics III</td>
<td>4</td>
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<tr>
<td>PHSX 320</td>
<td>Classical Mechanics</td>
<td>4</td>
</tr>
<tr>
<td>PHSX 423</td>
<td>Electricity and Magnetism I</td>
<td>3</td>
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</table>

Teaching Option

Freshman Year

Please take one of the following:

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHMY 141</td>
<td>College Chemistry I</td>
<td>4</td>
</tr>
<tr>
<td>or CHMY 151</td>
<td>Honors College Chemistry I</td>
<td></td>
</tr>
<tr>
<td>CHMY 194</td>
<td>Seminar/Workshop</td>
<td>1</td>
</tr>
<tr>
<td>FCS 101IS</td>
<td>Indiv and Fam Dev: Lifespan</td>
<td>3</td>
</tr>
<tr>
<td>M 151Q</td>
<td>Precalculus</td>
<td>4</td>
</tr>
<tr>
<td>University and Core Electives</td>
<td>3</td>
<td></td>
</tr>
</tbody>
</table>

Please take one of the following:

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHMY 143</td>
<td>College Chemistry II</td>
<td>4</td>
</tr>
<tr>
<td>or CHMY 153</td>
<td>Honors College Chemistry II</td>
<td></td>
</tr>
<tr>
<td>CHMY 294</td>
<td>Seminar/Workshop</td>
<td>1</td>
</tr>
<tr>
<td>EDU 202</td>
<td>Early Field Experience</td>
<td>1</td>
</tr>
<tr>
<td>EDU 223IS</td>
<td>Educ Psych and Adolescent Dev</td>
<td>3</td>
</tr>
<tr>
<td>M 161Q</td>
<td>Survey of Calculus</td>
<td>4</td>
</tr>
<tr>
<td>University Core and Electives</td>
<td>3</td>
<td></td>
</tr>
</tbody>
</table>

Year Total: 15 16

Sophomore Year

Please take one of the following:

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>BIOB 160</td>
<td>Principles of Living Systems</td>
<td>4</td>
</tr>
<tr>
<td>or BIOB 260</td>
<td>Cellular and Molecular Biology</td>
<td></td>
</tr>
<tr>
<td>Please take one of the following:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CHMY 321</td>
<td>Organic Chemistry I</td>
<td>4</td>
</tr>
<tr>
<td>or CHMY 331</td>
<td>Honors Organic Chemistry I</td>
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</tr>
<tr>
<td>EDU 211D</td>
<td>Multicultural Education</td>
<td>3</td>
</tr>
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</table>

Please take one of the following:

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHSX 205</td>
<td>College Physics I</td>
<td>4</td>
</tr>
<tr>
<td>or PHSX 220</td>
<td>Physics I (w/ calculus)</td>
<td></td>
</tr>
<tr>
<td>CHMY 311</td>
<td>Fundamental Analytical Chem</td>
<td>4</td>
</tr>
</tbody>
</table>

Please take one of the following:

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHMY 323</td>
<td>Organic Chemistry II</td>
<td>4</td>
</tr>
<tr>
<td>or CHMY 333</td>
<td>Honors Organic Chemistry II</td>
<td></td>
</tr>
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</table>

Please take one of the following:

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>PHSX 207</td>
<td>College Physics II</td>
<td>4</td>
</tr>
<tr>
<td>or PHSX 222</td>
<td>Physics II (w/ calculus)</td>
<td></td>
</tr>
<tr>
<td>EDU 370</td>
<td>Integrating Tech into Educ</td>
<td>2</td>
</tr>
<tr>
<td>University and Core Electives</td>
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Year Total: 14 14

Junior Year

<table>
<thead>
<tr>
<th>Course</th>
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<tbody>
<tr>
<td>BCH 441</td>
<td>Biochemistry of Macromolecules</td>
<td>3</td>
</tr>
<tr>
<td>BCH 490R</td>
<td>Undergraduate Research</td>
<td>2</td>
</tr>
<tr>
<td>or CHMY 490R</td>
<td>Undergraduate Research</td>
<td></td>
</tr>
<tr>
<td>CHMY 361</td>
<td>Elements of Physical Chemistry</td>
<td>4</td>
</tr>
<tr>
<td>CHMY 362</td>
<td>Elements of Physical Chemistry Lab</td>
<td>1</td>
</tr>
<tr>
<td>CHMY 394</td>
<td>Seminar/Workshop</td>
<td>1</td>
</tr>
<tr>
<td>or BCH 394</td>
<td>Seminar/Workshop</td>
<td></td>
</tr>
<tr>
<td>EDU 382</td>
<td>Assessmt, Curric, Instructn</td>
<td>3</td>
</tr>
<tr>
<td>BCH 490R</td>
<td>Undergraduate Research</td>
<td>2</td>
</tr>
<tr>
<td>or CHMY 490R</td>
<td>Undergraduate Research</td>
<td></td>
</tr>
<tr>
<td>CHMY 494</td>
<td>Seminar/Workshop</td>
<td>1</td>
</tr>
<tr>
<td>or BCH 494</td>
<td>Seminar/Workshop</td>
<td></td>
</tr>
<tr>
<td>University Core and Electives</td>
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<td></td>
</tr>
<tr>
<td>Biochemical and Chemical Electives</td>
<td>6</td>
<td></td>
</tr>
</tbody>
</table>

Year Total: 15 17

Senior Year

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chemical and Biochemical Electives</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>EDSP 306</td>
<td>Exceptional Learners</td>
<td>3</td>
</tr>
<tr>
<td>EDU 395</td>
<td>Practicum</td>
<td>3</td>
</tr>
<tr>
<td>EDU 497</td>
<td>Methods</td>
<td>3</td>
</tr>
<tr>
<td>University Core and Electives</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>EDU 408</td>
<td>Professional Issues: K-12</td>
<td>2</td>
</tr>
<tr>
<td>EDU 495</td>
<td>Student Teaching</td>
<td>12</td>
</tr>
<tr>
<td>Year Total:</td>
<td>15 14</td>
<td></td>
</tr>
</tbody>
</table>

Total Program Credits: 120

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1. Six (6) credits of CHMY 490R are tabulated. Students are encouraged to fulfill additional credits of research.
2. A minimum of 9 credits of chemical and biochemical electives are required.
3. CHMY 499 (Senior Year) is required for majors who are writing a thesis for Departmental Honors consideration.

A minimum of 120 credits is required for graduation; 42 of these credits must be in courses numbered 300 and above. The Chemistry Teaching option certifies graduates to be qualified to teach secondary school chemistry. Employment opportunities will be enhanced by obtaining a second area of certification, usually a teaching minor. Obtaining a teaching major, a teaching minor and certification will require more than 120 credits.
Acceptable Chemical and Biochemical Electives

Include:

- CHMY 350 Astrobiology 3
- CHMY 401 Advanced Inorganic Chemistry 3
- CHMY 417 Synthetic Chemistry 3
- CHMY 421 Advanced Instrument Analysis 3
- BCH 442 Metabolic Regulation 3
- BCH 444R Biochemistry & Molecular Biology Methods 3

Astrobiology Minor (Non-Teaching)

The Astrobiology Minor is designed to educate students in this interdisciplinary field covering the varied scientific disciplines that contribute to our general understanding of life, the origin of life, the past history of life on Earth, possible futures for life on Earth, and the possible existence of life on other planetary environments. The principal goal of the minor is to develop students' literacy in astrobiology so they can critically evaluate claims related to this field that they encounter well after their college education has ended.

Required Courses

- ASTR 110IN Introduction to Astronomy: Mysteries of the Sky 3
- or ASTR 371 Solar System Astronomy
- or ASTR 373 Stars, Galaxies, and the Universe
- or BIOB 170IN Principles of Biological Diversity 4
- or BIOB 260 Cellular and Molecular Biology
- or BIOB 160 Principles of Living Systems
- ERTH 101IN Earth System Sciences 4
- CHMY 141 College Chemistry I 3-4
- or CHMY 121IN Introduction to General Chemistry
- or CHMY 102CS Applying Chemistry to Society
- or GEO 211 Earth History and Evolution 3
- or PHL 278CS Origins of Life 3
- CHMY 350 Astrobiology 3
- Choose one upper division elective from the following rubrics: 3-4
  - BIOL 3xx
  - CHMY 3xx
  - PHYS 3xx

Elective Courses

Choose 6 credits from the following:

- ASTR 371 Solar System Astronomy
- ASTR 373 Stars, Galaxies, and the Universe
- BCH 380 Biochemistry
- BCH 441 Biochemistry of Macromolecules
- BCH 442 Metabolic Regulation
- BIOB 375 General Genetics
- BIOB 420 Evolution
- BIOE 370 General Ecology (equiv to 270)
- BIOM 360 General Microbiology
- ERTH 505 Geomicrobiology
- HSTR 207CS Sci & Tech in World History
- HSTR 282CS Darwinian Revolution
- HSTR 417 Early Modern Science
- HSTR 419 Modern Science
- PHL 242CS Science/Psuedo Science & Subjectivity
- PHL 345 Philosophy of Science
- RLT 402 Natural/Unnatural/Supernatural

Total Credits 32-34

Biochemistry Minor (Non-Teaching)

- BCH 441 Biochemistry of Macromolecules 3
- BCH 442 Metabolic Regulation 3
- BCH 444R Biochemistry & Molecular Biology Methods 3
- CHMY 141 College Chemistry I 4
- or CHMY 151 Honors College Chemistry I
- CHMY 143 College Chemistry II 4
- or CHMY 153 Honors College Chemistry II
- CHMY 321 Organic Chemistry I 4
- or CHMY 331 Honors Organic Chemistry I
- CHMY 323 Organic Chemistry II 4
- or CHMY 333 Honors Organic Chemistry II
- Any BCH/CHMY course 301 or higher, except BCH 380 or BCH/CHMY 490, 492, 494 and 499 3

Total Credits 28

Chemistry Minor (Non-Teaching)

Required Course

- CHMY 141 College Chemistry I 4
- or CHMY 151 Honors College Chemistry I
- CHMY 143 College Chemistry II 4
- or CHMY 153 Honors College Chemistry II
- CHMY 321 Organic Chemistry I 4
- or CHMY 331 Honors Organic Chemistry I
- CHMY 323 Organic Chemistry II 4
- or CHMY 333 Honors Organic Chemistry II
- Take one of the following sequences: 5-7
  - CHMY 361 Elements of Physical Chemistry
  & CHMY 362 and Elements of Physical Chemistry Lab
  - CHMY 371 Physical Chemistry-Quantum Chemistry and
  & CHMY 373 Spectroscopy I
  & CHMY 372 and Physical Chemistry - Kinetics and
  Thermodynamics
  - ERTH 505 Geomicrobiology
  - HSTR 207CS Sci & Tech in World History
  - HSTR 282CS Darwinian Revolution
  - HSTR 417 Early Modern Science
  - HSTR 419 Modern Science
  - PHL 242CS Science/Psuedo Science & Subjectivity
- Any BCH/CHMY courses 301 or higher, except CHMY/BCH 490, 492, 494 & 499 9

Total Credits 30-32

Earth Sciences

The department offers a Bachelor of Science in Earth Sciences degree which may be earned in any one of five options (Geography, Geographic Information Science/Planning, Geology, Paleontology, and Snow science). Each option tabulated below requires courses from within the Department of Earth Sciences and courses outside the department. Some of the courses fulfill both departmental requirements and University Core Curriculum requirements. Academic minors are offered in Spatial Analysis/GIS (p. 193), Water Resources (p. 197) and Earth Science Teaching (p. 133). The TEPP form is available at www.montana.edu/fieldplacement/TEPPForms/TEPPMinors2010-12/EarthScienceMinor10-12.pdf.
The department also offers a Master of Science Degree and Doctor of Philosophy in Earth Sciences. Thesis and course work for these graduate degrees usually emphasize some aspect of geology, geography, or geobiology with specific course and research plans approved by a graduate committee. The department collaborates with the interdisciplinary Master of Science in Land Rehabilitation, the Ph.D. Program in Ecology and Environmental Science www.montana.edu/ees/, and with the Big Sky Institute.

Undergraduate Research Participation
Research opportunities are available to undergraduate students who demonstrate the interest and ability. Senior-level students may enroll in ERTH 490R (Undergraduate Research), which provides the opportunity to participate in a research project under the guidance of a faculty member. Successful completion of ERTH 490R credits requires that the student write a senior thesis report and orally present and defend the results in a public forum, such as an annual conference of a professional society. Collaborative opportunities exist with the university’s Undergraduate Scholars Program.

Departmental Honors in Earth Sciences
The Department of Earth Sciences awards Departmental Honors at graduation to students who demonstrate exceptional undergraduate performance through the following criteria:

1. a minimum 3.5 grade-point average (GPA) in the major;
2. a minimum 3.0 GPA overall;
3. completion of at least 4 credits of undergraduate research with a grade of "B" or better; and
4. completion of a Senior Thesis (ERTH 490R)—written, bound, and orally presented and defended by the last day of classes prior to graduation.

Undergraduate Programs
- Geography Option (p. 193)
- Geology Option (p. 194)
- GIS/Planning Option (p. 192)
- Paleontology Option (p. 195)
- Snow Science Option (p. 196)

Undergraduate Minors
- Earth Science Teaching (p. 133)
- GIS Minor (Non-Teaching) (p. 193)
- Water Resources Minor (Non-Teaching) (p. 197)

Earth Sciences offers M.S. and Ph.D. degrees in Earth Sciences (Geography, Geology, and Geobiology content areas). We stress independent research with some supporting course work. Our expertise spans most of the subfields of Earth Sciences. Our Geography faculty includes specialties including historical and cultural geography, settlement geography, resource geography (energy and water), economic geography, planning, bioclimatology, applications of GIS and snow science. The interests of our Geology faculty include composition and structure of the crust, quantitative geomorphology, sedimentation and stratigraphy. Our Geobiology faculty have research interests in vertebrate palaeontology, palaeoecology, biogeography, paleoclimatology, and geomicrobiology. Our program strengths are in basin analysis and energy resources, dinosaur paleontology, geography of the northern Rocky Mountains, architecture and composition of the lithosphere, snow science and cryospheric processes, and climate change.

Degree Offered
- M.S. in Earth Sciences (p. 362)
- M.S. in Land Rehabilitation (p. 286) (Interdisciplinary degree)
- Ph.D. in Earth Sciences (p. 362)

GIS/Planning Option
The GIS (Geographic Information Science)/Planning Option in the Department of Earth Sciences is designed to offer students a mix of technical skills and academic training that prepares them for careers in local, state, and federal planning as well as opportunities in private consulting firms that are involved in the planning process. The GIS/Planning Option recognizes the growing importance of Geographic Information Systems and Earth Science in our society and how these analytic tools are applied in a wide variety of settings. The GIS/Planning Option takes advantage of excellent GIS facilities, lab space, expertise, and software available on campus and allows students to learn in an active hands-on environment. Students are prepared as map makers (cartographers) spatial analysts, and planners. The Department of Earth Sciences has connections with various local, state, and federal planning agencies within Montana and throughout the West. As part of their training, students may also be able to take advantage of internship opportunities as a way to further prepare for a wide variety of professional careers within the fields of planning and resource management. The optimal degree for employment and advancement in the GIS/Planning area is the Master’s Degree, and this undergraduate option is an excellent preparatory degree for graduate study. Some students interested in college teaching or advanced research may require a Ph.D. degree.

At the Freshman and Sophomore level, students take introductory courses in physical and human geography, GIS and cartography, statistics, intermediate technical writing, and computer aided design (CAD). In addition, courses in economics and political science lay the foundation for understanding the broader context of the planning process. As juniors and seniors, students complete an advanced 2-course sequence in GIS/Spacial Analysis (GPHY 384/GPHY 484R) and take skills-related coursework in Remote Sensing and in GPS technologies. Focused electives include courses in geographical planning, urban and economic geography, tourism and recreational planning, and in the politics of development. Students also complete basic coursework in soils, geomorphology and weather and climate because these variables are critical in the planning process. Additional electives are available in advanced classes in geography, earth science, ecology, natural resources, water resources, and statistics allow students to specialize in areas of particular interest and develop their own emphases in subjects related to the geospatial sciences and the planning process. All students take the GIS Capstone course (GPHY 484R) which emphasizes independent study in the geospatial sciences through a semester project.

Courses Required in Department

<table>
<thead>
<tr>
<th>Undergraduate Year</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Freshman Year</td>
<td></td>
</tr>
<tr>
<td>ERTH 101IN - Earth System Sciences</td>
<td>4</td>
</tr>
<tr>
<td>ERTH 102CS - Topics in Earth Sciences</td>
<td>1</td>
</tr>
<tr>
<td>GPHY 121D - Human Geography</td>
<td>3</td>
</tr>
<tr>
<td>GPHY 141D - Geography of World Regions</td>
<td>3</td>
</tr>
<tr>
<td>ECNS 101IS - Economic Way of Thinking</td>
<td>3</td>
</tr>
<tr>
<td>MART 145RA - Web Design</td>
<td>3</td>
</tr>
<tr>
<td>WRIT 101W - College Writing I</td>
<td>3</td>
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<td>University Core, Prerequisites and Electives</td>
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<tr>
<td>Total:</td>
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<table>
<thead>
<tr>
<th>Sophomore Year</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>GPHY 284 - Intro to GIS Science &amp; Cartog</td>
<td>3</td>
</tr>
<tr>
<td>ENSC 245IN - Soils</td>
<td>3</td>
</tr>
<tr>
<td>PSCI 210IS - Introduction to American Government</td>
<td>3</td>
</tr>
<tr>
<td>CSCI 111 - Programming with Java I</td>
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</tbody>
</table>
Take EITHER: 3-6
   STAT 216Q - Introduction to Statistics
   & STAT 217Q - Intermediate Statistical Concepts
   OR
   STAT 332 - Statistics for Scientists and Engineers
Take ONE of the following: 3
   WRIT 201 - College Writing II
   WRIT 221 - Intermediate Tech Writing
Take ONE of the following: 3
   DDSN 114 - Introduction to CAD
   SRVY 230 - Intro to Srvyg for Engineers
University Core, Prerequisites and Electives 5-8
Year Total: 30

Junior Year Credits
ERTH 303 - Weather and Climate 3
ERTH 307 - Principles of Geomorphology 4
GPHY 384 - Adv GIS and Spatial Analysis 3
GPHY 365 - Geographical Planning 3
GPHY 357 - GPS Fund/App in Mapping 3
GPHY 429R - Applied Remote Sensing 3
Take TWO of the following: 6
   GPHY 321 - Urban Geography
   GPHY 322 - Economic Geography
   GPHY 445 - Adv. Regional Geography
   PSCI 423 - Politics of Development
University Core, Prerequisites and Electives 5
Year Total: 30

Senior Year Credits
GPHY 484R - Applied GIS & Spatial Analysis 3
Take SIX of the following: 18
   BIOE 370 - General Ecology (equiv to 270)
   BIOE 375 - Ecological Responses to Climate Change
   BIOE 416 - Alpine Ecology
   NRSM 421 - Holistic Thought/Mgmt
   NRSM 430 - Natural Resource Law
   NRSM 453 - Habitat Inventory and Analysis
   NRSM 455 - Riparian Ecology & Management
   GPHY 411 - Biogeography
   GPHY 441R - Mountain Geography
   GPHY 457 - Adv GPS Mapping for GIS
   GPHY 461 - Tourism Planning
   ERTH 432R - Surface Water Resources
   STAT 411 - Methods for Data Analysis I
   STAT 412 - Methods for Data Analysis II
   STAT 436 - Introduction to Time Series Analysis
   STAT 446 - Sampling
   CSCI 440 - Database Systems
   SRVY 375 - Analytic Photogrammetry and Remote Sensing
University Core, Prerequisites and Electives 8-9
Year Total: 30
Total Program Credits: 120

* Students are required to take 3 credits of ERTH 102CS to fulfill department requirements as well as Core 2.0

Note: A minimum of 120 credits is required for graduation; 42 of these credits must be in courses numbered 300 or above.

Geographic Information Science (GIS) Minor (Non-Teaching)

The GIS (Geographic Information Science) Minor in the Department of Earth Sciences recognizes the growing importance of Geographic Information Systems and Science in our society and how these analytic tools are used in a wide variety of disciplines. The GIS Minor takes advantage of excellent GIS facilities, lab space, expertise, and software available on campus and allows students to learn in an active hands-on environment.

The GIS Minor is rooted in a core of 5 courses that include concepts in cartography, spatial data principles, spatial data modeling, spatial analysis/synthesis/modeling, GPS mapping, and remote sensing. Focused electives allow students to explore topics in related disciplines including statistics, surveying, and computer aided design.

Not Available to Geography Majors

GPHY 284 Intro to GIS Science & Cartog 3
GPHY 384 Adv GIS and Spatial Analysis 3
GPHY 484R Applied GIS & Spatial Analysis 3
GPHY 357 GPS Fund/App in Mapping 3
GPHY 426 Remote Sensing 3
Take ONE of the following: 3
   STAT 217Q Intermediate Statistical Concepts
   STAT 332 Statistics for Scientists and Engineers
Take TWO of the following: 5
   SRVY 230 Intro to Srvyg for Engineers
   DDSN 114 Introduction to CAD
   STAT 408 Statistical Computing and Graphical Analysis
   STAT 446 Sampling
   CSCI 440 Database Systems
   SRVY 375 Analytic Photogrammetry and Remote Sensing
   GPHY 429R Applied Remote Sensing
   GPHY 457 Adv GPS Mapping for GIS
   GPHY 492 Independent Study
Total Credits 23

Note: A C- minimum is required in all curriculum courses to graduate by Regents’ policy. This includes electives in the curriculum.

Geography Option

The Geography Option offers students a liberal university education with an emphasis in geography. The Geography option provides a general education as well as the more specialized knowledge and skills necessary to pursue many career objectives. Geographers find professional opportunities in urban and land use planning as well as spatial analysis in the public and private sectors, analysis of regions, resource and environmental management, as well as the application of geographical skills in map making (cartography), remote sensing, and geographic information science (GIS). Geography also offers an outstanding background for more advanced education in environmental law, international business, resource planning, and other specialized graduate school opportunities. Students may enhance their employment opportunities with a Master’s degree, or a Ph.D. if college teaching or advanced research positions are of interest.

The student, in consultation with an advisor, is given the opportunity to develop a program to meet his or her own particular interests and
needs through a series of core geography courses and an emphasis in physical or human geography or an approved minor. The Geography Option introduces students to lower division course work in world regional, physical, and human geography. These courses emphasize the importance of spatial relationships, the global distributions of physical and cultural phenomena, the complex interplay between natural and human systems, and the factors contributing to the evolution of the earth’s varied landscapes. In addition, advanced skills courses and a capstone course prepare the student to apply their training in a variety of jobs and/or graduate school. Some courses listed below are offered alternate years. A student’s course sequence may differ from that shown depending upon the date the student enters the program and the availability of courses.

### Freshman Year

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ERTH 101IN - Earth System Sciences</td>
<td>4</td>
</tr>
<tr>
<td>ERTH 102CS - Topics in Earth Sciences*</td>
<td>1</td>
</tr>
<tr>
<td>GPHY 141D - Geography of World Regions</td>
<td>3</td>
</tr>
<tr>
<td>University Core and Electives</td>
<td>20</td>
</tr>
<tr>
<td><strong>Year Total:</strong></td>
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</table>

### Sophomore Year

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>GPHY 121D - Human Geography</td>
<td>3</td>
</tr>
<tr>
<td>GPHY 284 - Intro to GIS Science &amp; Cartog</td>
<td>3</td>
</tr>
<tr>
<td>STAT 216Q - Introduction to Statistics</td>
<td>3</td>
</tr>
<tr>
<td>STAT 217Q - Intermediate Statistical Concepts</td>
<td>3</td>
</tr>
<tr>
<td>One Year Modern Lang</td>
<td>8</td>
</tr>
<tr>
<td>University Core and Electives</td>
<td>10</td>
</tr>
<tr>
<td><strong>Year Total:</strong></td>
<td>30</td>
</tr>
</tbody>
</table>

### Junior Year

- and Senior Year
- GPHY 384 - Adv GIS and Spatial Analysis
- ERTH 303 - Weather and Climate
- Capstone Course
- Take the following in the senior year:
  - GPHY 425 - Geographic Thought
  - Choose five courses from the following and one methods course
    - or four courses from the following and two methods courses:
      - ERTH 307 - Principles of Geomorphology
      - ERTH 450R - Snow Dynamics and Accumulation
      - GPHY 411 - Biogeography
      - ERTH 484 - Quaternary Environment
      - GPHY 325 - Cultural Geography
      - GPHY 321 - Urban Geography
      - GPHY 322 - Economic Geography
      - GPHY 365 - Geographical Planning
      - GPHY 431 - Historical Geography
      - GPHY 461 - Tourism Planning
      - GPHY 441R - Mountain Geography
      - GPHY 446 - East Asia in the Global System
      - GPHY 445 - Adv. Regional Geography

### Methods Courses

- GPHY 484R - Applied GIS & Spatial Analysis
- GPHY 426 - Remote Sensing
- GPHY 357 - GPS Fund/App in Mapping
- GPHY 429R - Applied Remote Sensing
- STAT 411 - Methods for Data Analysis I
- **Selected minor or minor emphasis**

### University Core and Electives

- **Year Total:** 60
- **Total Program Credits:** 120

\* Students are required to take 3 credits of ERTH 102CS to fulfill department requirements as well as Core 2.0

\** Students, in consultation with their Earth Science advisor, must also select a minor from a minor tabulated in the catalog OR one of the emphases listed below.

### Human Geography Emphasis

Choose 12 credits from the following:

- ANTY 101D - Anthropology and the Human Experience
- PSCI 210IS - Introduction to American Government
- SOC1 101S - Introduction to Sociology
- ECNS 101IS - Economic Way of Thinking
- ECNS 202 - Principles of Macroeconomics
- ERTH 212RN - Yellowstone: Scientific Lab
- Take an additional 9 credits of Advisor-approved upper division electives

The advisor-approved upper division electives (minimum 9 credits) will be selected from course offerings in Anthropology, Economics, History, Native American Studies, Political Science, Sociology, as well as Earth Science, Geology, and Geography (1 course only from within the department). The courses used here cannot be used to fulfill the other course requirements in the Geography Option.

### Physical Geography Emphasis

- BIOL 170IN - Principles of Biological Diversity
- CHMY 121IN - Introduction to General Chemistry
- GEO 105IN - Oceanography
- ENSC 245IN - Soils
- ERTH 212RN - Yellowstone: Scientific Lab
- Take an additional 9 credits of Advisor-approved upper division electives

The advisor-approved upper division courses (minimum 9 credits) will be selected from course offerings in Animal and Range Science, Biology, Civil Engineering, Entomology, and Land Resources and Environmental Sciences, as well as Earth Science, Geology, and Geography (1 course only from within the department). The courses used here cannot be used to fulfill the other course requirements in the Geography Option.

A minimum of 120 credits is required for graduation; 42 of these credits must be in courses numbered 300 and above.

### Geology Option

The Geology Option is a degree program designed for students who are motivated to apply the principles of chemistry, physics and mathematics to the study of the Earth’s surface and interior. There are outstanding opportunities for employment in the public and private sectors in fields such as petroleum geology, mining geology, seismology (including earthquake and volcanic risk assessment), hydrology (surface and ground water) natural-hazard geology, environmental clean-up and containment of environmental hazards, mitigation of future environmental problems related to development, preservation of water resources (both surface and ground water), and the study of the processes of climate change and global warming. The optimal degree for employment and advancement in the geological sciences in the private sector is the Master’s Degree, and the undergraduate Geology Option is an excellent preparatory degree for
graduate study. Some students interested in college teaching or advanced research may require a Ph.D. degree. In the Geology Option, students are given the opportunity to learn in the world-class natural laboratory that surrounds Bozeman. Course work progresses from core courses that all students must take (Earth System Science, Topics in Earth Science, Earth History and Evolution, Earth Materials, Weather and Climate, Geomorphology, Mineralogy, Sedimentation and Stratigraphy, Structural Geology, Global Tectonics, Sedimentary Petrology, two geographic information science (GIS) courses, and Field Geology (a summer capstone course)). Also included are a variety of elective courses in geology, paleontology, hydrology, and remote sensing. These courses prepare the student for a variety of jobs and/or graduate school.

### Freshman Year

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHMY 141</td>
<td>College Chemistry I</td>
<td>4</td>
</tr>
<tr>
<td>CHMY 143</td>
<td>College Chemistry II</td>
<td>4</td>
</tr>
<tr>
<td>ERTH 101IN</td>
<td>Earth System Sciences</td>
<td>4</td>
</tr>
<tr>
<td>or ERTH 201IN</td>
<td>Honors Earth System Science</td>
<td>4</td>
</tr>
</tbody>
</table>

### Sophomore Year

#### Credits

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ERTH 102CS</td>
<td>Topics in Earth Sciences</td>
<td>1</td>
</tr>
<tr>
<td>GEO 211</td>
<td>Earth History and Evolution</td>
<td>3</td>
</tr>
<tr>
<td>M 171Q</td>
<td>Calculus I</td>
<td>4</td>
</tr>
<tr>
<td>M 172Q</td>
<td>Calculus II</td>
<td>4</td>
</tr>
</tbody>
</table>

### Year Total:

30

### University Core and Electives

30

### Junior Year

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ERTH 303</td>
<td>Weather and Climate</td>
<td>3</td>
</tr>
<tr>
<td>ERTH 307</td>
<td>Principles of Geomorphology</td>
<td>4</td>
</tr>
<tr>
<td>GEO 302</td>
<td>Mineralogy and Optical Mineral</td>
<td>4</td>
</tr>
<tr>
<td>GEO 309</td>
<td>Sedimentation and Stratigraphy</td>
<td>4</td>
</tr>
<tr>
<td>GEO 315</td>
<td>Structural Geology</td>
<td>4</td>
</tr>
<tr>
<td>STAT 332</td>
<td>Statistics for Scientists and Engineers</td>
<td>3</td>
</tr>
</tbody>
</table>

### Year Total:

30

### Senior Year

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>GEO 429R</td>
<td>Field Geology</td>
<td>6</td>
</tr>
<tr>
<td>GEO 433</td>
<td>Global Tectonics</td>
<td>3</td>
</tr>
<tr>
<td>GEO 448</td>
<td>Sedimentary Petrology</td>
<td>3</td>
</tr>
<tr>
<td>GEO 449</td>
<td>Metamorphic Petrology</td>
<td>3</td>
</tr>
<tr>
<td>or GEO 450</td>
<td>Igneous Petrology</td>
<td>3</td>
</tr>
</tbody>
</table>

Take at least three of the following:

- ERTH 450R - Snow Dynamics and Accumulation
- ERTH 484 - Quaternary Environment
- ERTH 494 - Seminar
- GEO 310 - Invertebrate Paleontology
- GEO 411 - Vertebrate Paleontology
- GEO 417 - Vertebrate Paleontology
- GEO 440 - Volcanology
- GEO 445 - Glacial Geology

### Pallontology Option

The paleontology option focuses on understanding fossils within their geologic context, while Montana’s geology provides the opportunity for hands-on fieldwork. The paleontology option in the Department of Earth Sciences is designed for those students who have a strong interest in either invertebrate or vertebrate fossils (evolution, biology of ancient organisms, the environment in which the organism lived, and the changes the fossil has undergone since death). Students who study paleontology find employment with colleges and universities (e.g., teaching paleontology, earth sciences, comparative anatomy), natural history museums (e.g., fossil preparation, collection, curation, exhibit design, education), as scientific illustrators, writers, paleontology consultants for energy resource companies, and resource specialists for local, state, and federal land-management agencies or parks. Because students who study this option are trained in core geology courses, employment may be found in areas outside paleontology that require geologic expertise. Graduate training beyond the bachelor’s degree is recommended for those seeking careers in the paleontology (normally a master’s degree) or in teaching and/or research (typically a doctorate). This option combines training in geology and paleontology. The paleontology option builds on courses that form the core of the traditional geology option, while providing strong background in paleontology through four required courses (in addition to the paleontology field course) and two elective courses. All of the paleontology courses offered through the department provide upper division credits. These courses prepare the student for a variety of jobs and/or graduate school. Internships and summer field research experience are available to some students.

#### Freshman Year

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHMY 141</td>
<td>College Chemistry I</td>
<td>4</td>
</tr>
<tr>
<td>CHMY 143</td>
<td>College Chemistry II</td>
<td>4</td>
</tr>
<tr>
<td>ERTH 101IN</td>
<td>Earth System Sciences</td>
<td>4</td>
</tr>
<tr>
<td>or ERTH 201IN</td>
<td>Honors Earth System Science</td>
<td>4</td>
</tr>
</tbody>
</table>

### Notes:

1. Students are required to take 3 credits of ERTH 102CS to fulfill department requirements as well as Core 2.0
2. GEO 429R Should be taken SUMMER of either Junior or Senior year.
3. You must take ONE of either GEO 449 OR GEO 450.
4. Note: Can be repeated, but can only be counted once (each) as a Geology elective.

A grade of C- is required in all courses in this curriculum to graduate by Regents’ policy. This includes electives in this curriculum.

A minimum of 120 credits is required for graduation; 42 of these credits must be in courses numbered 300 and above.

### Paleontology Option

#### Credits

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>GEO 490R</td>
<td>Undergraduate Research</td>
<td>4</td>
</tr>
<tr>
<td>GEO 491</td>
<td>Special Topics</td>
<td>4</td>
</tr>
<tr>
<td>GEO 492</td>
<td>Independent Study</td>
<td>4</td>
</tr>
<tr>
<td>GEO 498</td>
<td>Internship</td>
<td>4</td>
</tr>
</tbody>
</table>

One course from the following can be counted as an elective:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>GPHY 357</td>
<td>GPS Fund/App in Mapping</td>
<td>3</td>
</tr>
<tr>
<td>GPHY 426</td>
<td>Remote Sensing</td>
<td>3</td>
</tr>
<tr>
<td>GPHY 484R</td>
<td>Applied GIS &amp; Spatial Analysis</td>
<td>3</td>
</tr>
</tbody>
</table>

University Core and Electives: 21

**Total Program Credits:** 120

The paleontology option builds on courses that form the core of the traditional geology option, while providing strong background in paleontology through four required courses (in addition to the paleontology field course) and two elective courses. All of the paleontology courses offered through the department provide upper division credits. These courses prepare the student for a variety of jobs and/or graduate school. Internships and summer field research experience are available to some students.
**Upper Division Paleontology Course Electives**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOB 170IN</td>
<td>Principles of Biological Diversity</td>
<td>4</td>
</tr>
<tr>
<td>GEO 208IN</td>
<td>Earth Materials</td>
<td>3</td>
</tr>
<tr>
<td>GPHY 284</td>
<td>Intro to GIS Science &amp; Cartog</td>
<td>3</td>
</tr>
<tr>
<td>GPHY 384</td>
<td>Adv GIS and Spatial Analysis</td>
<td>3</td>
</tr>
<tr>
<td>PHSX 205</td>
<td>College Physics I</td>
<td>4</td>
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<tr>
<td>PHSX 207</td>
<td>College Physics II</td>
<td>4</td>
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</tbody>
</table>

Year Total: 30

**Sophomore Year**

**Credits**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>GPHY 411</td>
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<tr>
<td>GEO 498</td>
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<tr>
<td>GEO 492</td>
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<tr>
<td>GEO 491</td>
<td></td>
<td></td>
</tr>
<tr>
<td>GEO 490R</td>
<td></td>
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<tr>
<td>GEO 450</td>
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<tr>
<td>GEO 449</td>
<td></td>
<td></td>
</tr>
<tr>
<td>GEO 413</td>
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<td></td>
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<tr>
<td>ERTH 494</td>
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</tr>
<tr>
<td>ERTH 492</td>
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<tr>
<td>ERTH 491</td>
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<tr>
<td>ERTH 490R</td>
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<td></td>
</tr>
<tr>
<td>University Core and Electives</td>
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</tbody>
</table>

Year Total: 30

**Junior Year**

**Credits**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>GEO 419</td>
<td>Field Paleontology***</td>
<td>2</td>
</tr>
<tr>
<td>GEO 433</td>
<td>Global Tectonics</td>
<td>3</td>
</tr>
<tr>
<td>GEO 448</td>
<td>Sedimentary Petrology</td>
<td>3</td>
</tr>
<tr>
<td>University Core and Electives</td>
<td></td>
<td>8</td>
</tr>
</tbody>
</table>

Year Total: 30

**Senior Year**

**Credits**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>GEO 429R</td>
<td>Field Geology**</td>
<td>6</td>
</tr>
<tr>
<td>Note:** GEO 429R Should be taken SUMMER of either Junior or Senior year. * Taken during summer of Sophomore or Junior year</td>
<td></td>
<td></td>
</tr>
<tr>
<td>GEO 433</td>
<td>Global Tectonics</td>
<td>3</td>
</tr>
<tr>
<td>GEO 448</td>
<td>Sedimentary Petrology</td>
<td>4</td>
</tr>
<tr>
<td>University Core and Electives</td>
<td></td>
<td>18</td>
</tr>
</tbody>
</table>

Year Total: 30

Total Program Credits: 120

**Snow Science Option**

The snow program in the Department of Earth Sciences provides a foundation for understanding the distribution of snow (geography), mechanics of snow (physics, engineering), composition of snow (chemistry), variability of snow (statistics), and ecological effects of snow (ecology, hydrology). It is also one of the best pre-professional programs in the world for those who want to carry their interests in snow into a professional career. Employment ranges from ski patrol, director of snow safety, avalanche-center employee, snow scientist with a federal agency, or consulting in the area of land use planning, transportation engineering, or avalanche protection.

The optimal degree for employment and advancement in snow science is the Master’s Degree. Some students interested in college teaching or advanced research may require a Ph.D. degree. The snow science option is an excellent preparatory degree both for employment and for advanced graduate studies.

In the Snow Science Option, students progress through a broad-based core of courses that includes introductory geology and geography, calculus, chemistry, physics, weather and climate, geomorphology, glacial geology, and mountain geography. In addition to the core of snow science courses, students focus on snow geography, snow mechanics, or snow statistics. Snow geography examines spatial analysis of factors important to snow distribution, snow hydrology, snow melt, and the analysis of factors which influence the spatial distribution of snow or snow avalanche factors. Snow mechanics prepares the student to study the mechanics of snow as it relates to transportation, avalanche release, and the impact of snow on buildings (loading and avalanche impact forces), as well as snow metamorphism and snow strength. The snow statistics emphasis prepares the student to apply statistical techniques to questions about spatial and temporal variability of snow properties such as strength, depth, grain size, grain type, water content, and fracture initiation. The capstone course is snow dynamics and accumulation. Students are strongly encouraged to consider a graduate degree in snow science to prepare for professional jobs, but such training is not always required.

**Courses Required in Department**

**Freshman Year**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ERTH 101IN</td>
<td>Earth System Sciences</td>
<td>4</td>
</tr>
<tr>
<td>ERTH 102CS</td>
<td>Topics in Earth Sciences*</td>
<td>1</td>
</tr>
<tr>
<td>GPHY 141D</td>
<td>Geography of World Regions</td>
<td>3</td>
</tr>
<tr>
<td>M 171Q</td>
<td>Calculus I</td>
<td>4</td>
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<tr>
<td>M 172Q</td>
<td>Calculus II</td>
<td>4</td>
</tr>
<tr>
<td>University Core and Electives</td>
<td></td>
<td>12</td>
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</tbody>
</table>

Year Total: 30

**Sophomore Year**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHMY 141</td>
<td>College Chemistry I</td>
<td>4</td>
</tr>
<tr>
<td>CHMY 143</td>
<td>College Chemistry II</td>
<td>4</td>
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</tbody>
</table>

**Elective Courses**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOO 310</td>
<td>Comparative Vertebrate Anatomy</td>
<td>4</td>
</tr>
<tr>
<td>ERTH 484</td>
<td>Quaternary Environment</td>
<td>3</td>
</tr>
<tr>
<td>ERTH 494</td>
<td>Seminar</td>
<td>1</td>
</tr>
<tr>
<td>GEO 312</td>
<td>Dinosaur Paleontology</td>
<td>3</td>
</tr>
<tr>
<td>GEO 413</td>
<td>Macroevolution/Fossil Record</td>
<td>3</td>
</tr>
<tr>
<td>GEO 449</td>
<td>Metamorphic Petrology</td>
<td>3</td>
</tr>
<tr>
<td>GEO 450</td>
<td>Igneous Petrology</td>
<td>3</td>
</tr>
<tr>
<td>GEO 490R</td>
<td>Undergraduate Research</td>
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<td>GEO 491</td>
<td>Special Topics</td>
<td>3</td>
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<tr>
<td>GEO 492</td>
<td>Independent Study</td>
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<td>GEO 498</td>
<td>Internship</td>
<td>3</td>
</tr>
<tr>
<td>GPHY 411</td>
<td>Biogeography</td>
<td>3</td>
</tr>
<tr>
<td>GPHY 357</td>
<td>GPS Fund/App in Mapping</td>
<td>3</td>
</tr>
</tbody>
</table>

**Note:**

Only GEO 491 courses that cover a specific paleontology topic are applicable.

A C- minimum is required in all curriculum courses to graduate by Regents’ policy. This includes electives in the curriculum.

A minimum of 120 credits is required for graduation; 42 of these credits must be in courses numbered 300 or above.
Select one of the following areas of Emphasis:

**Snow Geography, Snow Mechanics, Snow Statistics**

### Snow Geography Emphasis

- BIOB 170IN: Principles of Biological Diversity 4
- GPHY 284: Intro to GIS Science & Cartog 3
- STAT 332: Statistics for Scientists and Engineers * 3
- GPHY 384: Adv GIS and Spatial Analysis 3
- GPHY 411: Biogeography 3
- GPHY 484R: Applied GIS & Spatial Analysis 3
- GPHY 461: Tourism Planning 3
- ENSC 444: Watershed Hydrology 3
- STAT 446: Sampling 3

**Total Credits: 34**

* Students with a grade less than B in calculus might consider taking STAT 216Q and STAT 217Q rather than STAT 332.

### Snow Mechanics Emphasis

- EGEN 350: Applied Engr Data Analysis 2
- M 273Q: Multivariable Calculus 4
- M 274: Introduction to Differential Equation 4
- EGEN 201: Engineering Mechanics–Statics 3
- EGEN 202: Engineering Mech–Dynamics 3
- EGEN 205: Mechanics of Mtls (equiv 305) 3
- EGEN 335: Fluid Mechanics 3
- EGEN 435: Fluid Dynamics 3
- ECIV 312: Structures I 3
- ECIV 320: Geotechnical Engineering 3
- ECIV 331: Engineering Hydrology 2
- ECIV 332: Engineering Hydraulics 2

**Total Credits: 36**

### Snow Statistics Emphasis

- M 221: Introduction to Linear Algebra 3
- GPHY 284: Intro to GIS Science & Cartog 3
- GPHY 384: Adv GIS and Spatial Analysis 3
- GPHY 365: Geographical Planning 3
- or GPHY 484R: Applied GIS & Spatial Analysis 3
- ENSC 444: Watershed Hydrology 3
- ENSC 445: Watershed Analysis 3
- STAT 446: Sampling 3
- STAT 411: Methods for Data Analysis I 3
- STAT 431: Nonparametric Statistics 3
- or STAT 412: Methods for Data Analysis II 3
- STAT 436: Introduction to Time Series Analysis 3
- STAT 437: Introduction to Applied Multivariate Analysis 3
- GPHY 490R: Undergraduate Research 3
- or GEO 499: Senior Thesis/Capstone 3

**Total Credits: 36**

### Notes:

- The Snow Statistics Emphasis meets the requirements for a Statistics Minor. Statistics is integral to snow science and students with an interest in numerical analysis are encouraged to take this option.
- A C- is required in all curriculum courses to graduate by Regents' policy. This includes electives in this curriculum.
- A minimum of 120 credits is required for graduation; 42 of these credits must be in courses numbered 300 or above.
- All offerings are dependent upon available staffing.

### Water Resources Minor (Non-Teaching)

The Water Resources Minor is designed to encourage a student from any discipline to explore water resources beyond course work in their major. As a result, the minor includes courses from the College of Agriculture, the College of Engineering, and the College of Letters and Science. The minor is administered by the Water Resources Committee (WRM) under the guidance of the Montana Institute on Ecosystems. Any committee member may serve as an advisor for the minor (see list of Faculty Advisors below).

The chair of the committee, IoE Director, serves as the certifying officer and signs the Application for a Non-Teaching Minor after approved and forwarded by departmental advisors.

This minor requires a minimum of 21 credits. The courses are grouped into basic and applied sciences and social sciences courses. Students are expected to create a diverse program, with the guidance of their faculty advisor, using courses from both the science and social science areas. No more than 12 credits may be used to simultaneously fulfill Water Resources Minor requirements, University Core and the student’s major. At least 9 credits must be unique to the minor. The student’s minor advisor must certify that the 12-credit restriction is not exceeded. Course substitutions are allowed only by appeal to and approval by the WRM advisor and must be sent to the committee chair. The written appeal should identify the substitution and present a brief rationale.

For more information, please visit the Water Resources Minor website (http://www.montana.edu/water-resources-minor).
Required Courses

<table>
<thead>
<tr>
<th>Course</th>
<th>Description</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENSC 272CS</td>
<td>Water Resources (classroom in Fall, online in Spring)</td>
<td>3</td>
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</tbody>
</table>

Choose one of the following: 3

<table>
<thead>
<tr>
<th>Course</th>
<th>Description</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>ENSC 498</td>
<td>Internship</td>
<td></td>
</tr>
<tr>
<td>GPHY 498</td>
<td>Internship</td>
<td></td>
</tr>
<tr>
<td>ECIV 498</td>
<td>Internship</td>
<td></td>
</tr>
<tr>
<td>PSCI 498</td>
<td>Internship</td>
<td></td>
</tr>
</tbody>
</table>

Restricted Electives
Take 15 credits; at least one from each subject area

Basic Science Courses

<table>
<thead>
<tr>
<th>Course</th>
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<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOE 428</td>
<td>Freshwater Ecology</td>
<td>3</td>
</tr>
<tr>
<td>BIOM 360</td>
<td>General Microbiology</td>
<td>5</td>
</tr>
<tr>
<td>BIOM 415</td>
<td>Microbial Diversity, Ecology, and Evolution</td>
<td>3</td>
</tr>
<tr>
<td>BIOM 452</td>
<td>Soil &amp; Environmental Microbiology</td>
<td>3</td>
</tr>
<tr>
<td>CHMY 311</td>
<td>Fundamental Analytical Chem</td>
<td>4</td>
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<tr>
<td>EENV 434</td>
<td>Groundwater Supply/Remediation</td>
<td>3</td>
</tr>
<tr>
<td>ENSC 444</td>
<td>Watershed Hydrology</td>
<td>3</td>
</tr>
<tr>
<td>ENSC 445</td>
<td>Watershed Analysis</td>
<td>3</td>
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<tr>
<td>ENSC 454</td>
<td>Landscape Pedology</td>
<td>3</td>
</tr>
<tr>
<td>ENSC 465</td>
<td>Environmental Biophysics</td>
<td>3</td>
</tr>
<tr>
<td>ENSC 468</td>
<td>Ecosystem Biogeochemistry</td>
<td>3</td>
</tr>
<tr>
<td>ERTH 303</td>
<td>Weather and Climate</td>
<td>3</td>
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<tr>
<td>ERTH 307</td>
<td>Principles of Geomorphology</td>
<td>4</td>
</tr>
<tr>
<td>ERTH 450R</td>
<td>Snow Dynamics and Accumulation</td>
<td>4</td>
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</table>

Applied Science Courses

<table>
<thead>
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<tr>
<td>ECIV 331</td>
<td>Engineering Hydrology</td>
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<td>EENV 340</td>
<td>Princ of Envir Engineering</td>
<td>3</td>
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<td>EENV 441</td>
<td>Natural Treatment Systems</td>
<td>3</td>
</tr>
<tr>
<td>ENSC 453</td>
<td>Environmental Biogeochemistry</td>
<td>3</td>
</tr>
<tr>
<td>ENSC 407</td>
<td>Environmental Risk Assessment</td>
<td>3</td>
</tr>
<tr>
<td>ENSC 448</td>
<td>Stream Restoration Ecology</td>
<td>3</td>
</tr>
<tr>
<td>ENSC 461</td>
<td>Restoration Ecology</td>
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</tr>
<tr>
<td>GPHY 384</td>
<td>Adv GIS and Spatial Analysis</td>
<td>3</td>
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<tr>
<td>GPHY 426</td>
<td>Remote Sensing</td>
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<tr>
<td>GPHY 429R</td>
<td>Applied Remote Sensing</td>
<td>3</td>
</tr>
<tr>
<td>GPHY 457</td>
<td>Adv GPS Mapping for GIS</td>
<td>3</td>
</tr>
<tr>
<td>GPHY 484R</td>
<td>Applied GIS &amp; Spatial Analysis</td>
<td>3</td>
</tr>
<tr>
<td>NRSM 455</td>
<td>Riparian Ecology &amp; Management</td>
<td>3</td>
</tr>
<tr>
<td>WILD 301</td>
<td>Princ of Fish &amp; Wildlife Mgmt</td>
<td>3</td>
</tr>
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</table>

Social Science Courses

<table>
<thead>
<tr>
<th>Course</th>
<th>Description</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECNS 332</td>
<td>Econ of Natural Resources</td>
<td>3</td>
</tr>
<tr>
<td>ECNS 432R</td>
<td>Benefit-Cost Analysis</td>
<td>3</td>
</tr>
<tr>
<td>HSTA 470</td>
<td>American Environmental History</td>
<td>3</td>
</tr>
<tr>
<td>NRSM 421</td>
<td>Holistic Thought/Mgmt</td>
<td>4</td>
</tr>
<tr>
<td>NRSM 430</td>
<td>Natural Resource Law</td>
<td>3</td>
</tr>
<tr>
<td>PSCI 362</td>
<td>Natural Resource Policy</td>
<td>3</td>
</tr>
<tr>
<td>SOCI 470</td>
<td>Environmental Sociology</td>
<td>3</td>
</tr>
</tbody>
</table>

Any 290, 490, 291, 491, 292 or 492 course(s) related to water may be used in the minor

Note: A C- minimum is required in all curriculum courses to graduate by Regents’ policy. This includes electives in the curriculum. All students are responsible for meeting prerequisites for upper division courses.

Water Resources Minor Faculty Advisors

- Joel Cahoon - Civil Engineering
- Wyatt Cross - Ecology
- Jordy Hendrikx - Earth Sciences
- Jerry Johnson - Political Science
- Clayton Marlow - Animal & Range Sciences
- Jamie McEvoy - Earth Sciences
- Tom McMahon - Ecology
- Rob Payn - Land Resources and Environmental Sciences
- Paul Stoy - Land Resources and Environmental Sciences
- Paul Sturman - Center for Biofilm Engineering
- Cathy Whitlock, Chair - IoE/Earth Sciences

Ecology

Note: MSU's programs in the biological sciences are distributed across multiple departments. MSU does not have a single Department of Biology. For additional options see Biological Sciences at MSU.

Department of Ecology

The Department of Ecology offers a Bachelor of Science in Biological Sciences which emphasizes a solid grounding in biology and the fundamental sciences, and which allows students to specialize within four options: Organismal Biology, Fish and Wildlife Ecology and Management, Conservation Biology and Ecology, and Biology Teaching. Organismal Biology emphasizes the basics sciences of zoology and botany; Fish and Wildlife Ecology and Management and Conservation Biology and Ecology emphasize the application of knowledge to the conservation of the biota and natural resources; Biology Teaching prepares students for career as a high school biology teacher.

Many positions for professional biologists require a graduate degree. The degree options are intended to provide the solid knowledge and skills required of all college graduates as well as the prerequisite educational background for graduate programs.

Students interested in secondary school biology teaching and Montana state certification must fulfill the Biology Teaching option which includes the professional education courses as well as a solid biology and basic science core; a teaching minor or second area of certification is recommended.

Requirements for Admission to Upper Division Courses in Biology

For admission to upper division (numbered 300 or higher) Biology (BIOB, BIOE, BIOO) and Fish and Wildlife Management (WILD) courses, students must have completed at least 45 total university credits with a cumulative GPA of at least 2.5 for all courses and have also earned a “C-” or better for any prerequisite courses. Limited exceptions may be made by consent of instructor. Any student who obtains enrollment in an upper division biology course without satisfying these requirements will be required to withdraw from the course.

Grade Requirements

To graduate with a B.S. in Biological Sciences, students must earn a grade of “C-” or better for every course required for the specific option (Conservation Biology and Ecology, Fish and Wildlife Ecology and Management, Organismal Biology, and Biology Teaching), including courses taken to fulfill required biology elective credits, all required courses in non-biology rubrics, and all upper division courses.

Note: A C- minimum is required in all curriculum courses to graduate by Regents’ policy. This includes electives in the curriculum. All students are responsible for meeting prerequisites for upper division courses.
Undergraduate Programs
All students will earn a B.S. in Biological Sciences with at least one of the following options or concentrations to be completed.
- Conservation Biology and Ecology (p. 200)
- Fish and Wildlife Ecology and Management (p. 202)
- Organismal Biology (p. 203)
- Biology Teaching (p. 199)

Undergraduate Minors
- Astrobiology Minor (Non-Teaching) (p. 191)
- Genetics Minor (Non-Teaching) (p. 94)

The graduate degree programs offered in the Department of Ecology provide opportunities for students to pursue M.S. and/or Ph.D. degrees in various disciplines under the guidance of faculty. Graduate students may conduct research on a diversity of topics pertaining to their individual areas of interest: terrestrial and aquatic ecology, fish and wildlife management, evolutionary biology, quantitative ecology, and conservation biology. Both Master’s and Ph.D. degrees require a thesis or dissertation and a research publication.

Degrees Offered
- M.S. in Biological Sciences (p. 363)
- M.S. in Fish and Wildlife Management (p. 364)
- Ph.D. in Fish and Wildlife Biology (p. 365)
- Ph.D. in Biological Sciences (p. 364)
- Ph.D. in Ecology and Environmental Sciences (p. 364) (interdisciplinary)

Astrobiology Minor (Non-Teaching)
The Astrobiology Minor is designed to educate students in this interdisciplinary field covering the varied scientific disciplines that contribute to our general understanding of life, the origin of life, the past history of life on Earth, possible futures for life on Earth, and the possible existence of life on other planetary environments. The principal goal of the minor is to develop students’ literacy in astrobiology so they can critically evaluate claims related to this field that they encounter well after their college education has ended.

Required Courses
<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASTR 110IN</td>
<td>Introduction to Astronomy: Mysteries of the Sky</td>
<td>3</td>
</tr>
<tr>
<td>or ASTR 371</td>
<td>Solar System Astronomy</td>
<td>4</td>
</tr>
<tr>
<td>or ASTR 373</td>
<td>Stars, Galaxies, and the Universe</td>
<td>4</td>
</tr>
<tr>
<td>BIOB 170IN</td>
<td>Principles of Biological Diversity</td>
<td>3</td>
</tr>
<tr>
<td>or BIOB 260</td>
<td>Cellular and Molecular Biology</td>
<td>3</td>
</tr>
<tr>
<td>or BIOB 160</td>
<td>Principles of Living Systems</td>
<td>3</td>
</tr>
<tr>
<td>ERTH 101IN</td>
<td>Earth System Sciences</td>
<td>3</td>
</tr>
<tr>
<td>CHMY 141</td>
<td>College Chemistry I</td>
<td>3-4</td>
</tr>
<tr>
<td>or CHMY 121IN</td>
<td>Introduction to General Chemistry</td>
<td>3-4</td>
</tr>
<tr>
<td>or CHMY 102CS</td>
<td>Applying Chemistry to Society</td>
<td>3-4</td>
</tr>
<tr>
<td>GEO 211</td>
<td>Earth History and Evolution</td>
<td>3</td>
</tr>
<tr>
<td>PHL 278CS</td>
<td>Origins of Life</td>
<td>3</td>
</tr>
<tr>
<td>CHMY 350</td>
<td>Astrobiology</td>
<td>3</td>
</tr>
<tr>
<td>Choose one upper division elective from the following rubrics:</td>
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<td></td>
</tr>
<tr>
<td>BIOL 3xx</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CHMY 3xx</td>
<td></td>
<td></td>
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</tbody>
</table>

Elective Courses
Choose 6 credits from the following:
- ASTR 371 Solar System Astronomy
- ASTR 373 Stars, Galaxies, and the Universe
- BCH 380 Biochemistry
- BCH 441 Biochemistry of Macromolecules
- BCH 442 Metabolic Regulation
- BIOB 375 General Genetics
- BIOB 420 Evolution
- BIOE 370 General Ecology (equiv to 270)
- BIOM 360 General Microbiology
- ERTH 505 Geomicrobiology
- HSTR 207CS Sci and Tech in World History
- HSTR 282CS Darwinian Revolution
- HSTR 417 Early Modern Science
- HSTR 419 Modern Science
- PHL 242CS Scnc/Pseudo Scnc & Subjectivity
- PHL 345 Philosophy of Science
- RLST 402 Natural/Unnatural/Supernatural

Total Credits 32-34

Biology Teaching Option
The Biology Teaching Option certifies graduates to be qualified to teach secondary school biology. It is similar to the Organismal Biology Option, but includes professional preparation courses required for state teacher certification. Since the Biology Teaching Option includes 40 credits of biology courses, it is an extended major and the State of Montana does not require a teaching minor. However, employment opportunities will be enhanced by obtaining a second area of certification, usually a teaching minor (listed under College of Education, Health and Human Development). Obtaining a Biology Teaching major, a teaching minor, and certification will require more than eight semesters.

The Biology Teaching Option includes 40 credits of Biology (28-30 credits of basic biology courses, plus 11-12 biology elective credits), supporting Chemistry, Physics, and Mathematics courses, 18 credits in the university Core 2.0, 24 credits of professional preparation, and Student Teaching. Biology electives must include 8 credits of advisor-approved upper division credits in biological sciences.

In order to become a licensed teacher, students must be admitted into the Teacher Education Program. The requirements for admission are:

1. a cumulative grade-point average of at least 2.75
2. a 2.75 grade-point average in the teaching major, minor, with no grade below a “C” in any of these areas
3. a current background check completed as outlined by Sec. 20-4-110 of the MCA
4. proof of liability insurance

Freshman Year

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
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<tbody>
<tr>
<td>BIOB 170IN - Principles of Biological Diversity</td>
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</tr>
<tr>
<td>CHMY 141 - College Chemistry I</td>
<td>4</td>
</tr>
<tr>
<td>WRTT 101W - College Writing I</td>
<td>3</td>
</tr>
<tr>
<td>M 161IQ - Survey of Calculus</td>
<td>4</td>
</tr>
<tr>
<td>or M 171Q - Calculus I</td>
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University Core and Electives 0-3
## Conservation Biology and Ecology Option

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Fall Credits</th>
<th>Spring Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOE 103CS</td>
<td>Environmental Science and Society</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>BIOE 170IN</td>
<td>Principles of Biological Diversity</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>CHMY 141</td>
<td>College Chemistry I</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>COMX 111US</td>
<td>Introduction to Public Speaking or CLS 101US</td>
<td>3</td>
<td></td>
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<tr>
<td>University Core and Electives</td>
<td></td>
<td>1-4</td>
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<td>Year Total:</td>
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<td>15-18</td>
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## Sophomore Year

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<thead>
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<tbody>
<tr>
<td>CHM 211</td>
<td>Elements of Organic Chemistry</td>
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<tr>
<td>PHSX 205</td>
<td>College Physics I</td>
<td>4</td>
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<tr>
<td>EDU 202</td>
<td>Early Field Experience</td>
<td>1</td>
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<td>EDU 211D</td>
<td>Multicultural Education</td>
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<td>University Core and Electives</td>
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<td>2-5</td>
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<tr>
<td>BCH 380</td>
<td>Biochemistry</td>
<td>5</td>
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<td>Choose one of the following:</td>
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<tr>
<td>BIOM 103IN</td>
<td>Unseen Universe: Microbes</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>BIOM 360</td>
<td>General Microbiology</td>
<td>3</td>
<td></td>
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<tr>
<td>PHSX 207</td>
<td>College Physics II</td>
<td>4</td>
<td></td>
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<tr>
<td>EDU 223IS</td>
<td>Educ Psych and Adolescent Dev</td>
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<td>University Core and Electives</td>
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## Junior Year

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</thead>
<tbody>
<tr>
<td>BIOB 375</td>
<td>General Genetics or BIOB 377 - Practical Genetics</td>
<td>3</td>
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<tr>
<td>BIOO 412</td>
<td>Animal Physiology or BIOO 433 - Plant Physiology</td>
<td>3</td>
<td></td>
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<tr>
<td>EDU 382</td>
<td>Assessmt, Curric, Instructn</td>
<td>3</td>
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<td>BIOB 318</td>
<td>Biometry or STAT 216Q - Introduction to Statistics</td>
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<tr>
<td>University Core and Electives</td>
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<td>3-6</td>
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<tr>
<td>BIOE 370</td>
<td>General Ecology (equiv to 270)</td>
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<tr>
<td>BIOE 420</td>
<td>Evolution</td>
<td>3</td>
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<tr>
<td>BIOE 499</td>
<td>Senior Thesis/Capstone</td>
<td>2</td>
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<tr>
<td>EDU 370</td>
<td>Integrating Tech into Educ</td>
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<td>University Core and Electives</td>
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<td>5-6</td>
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## Senior Year

<table>
<thead>
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<th>Course Title</th>
<th>Fall Credits</th>
<th>Spring Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOE 408</td>
<td>Rocky Mountain Vegetation or BIOE 416 - Alpine Ecology</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>EDU 497</td>
<td>Methods</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>EDU 395</td>
<td>Practicum</td>
<td>3</td>
<td></td>
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<tr>
<td>EDSP 306</td>
<td>Exceptional Learners</td>
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<tr>
<td>Upper Division Biology Elective</td>
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<tr>
<td>University Core and Electives</td>
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<td>EDU 495</td>
<td>Student Teaching</td>
<td>12</td>
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<td>EDU 408</td>
<td>Professional Issues: K-12</td>
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<tr>
<td>PRAXIS exam</td>
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</tr>
<tr>
<td>Year Total:</td>
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<td>14</td>
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</table>

Total Program Credits: 120

* Must be taken in assigned semester

University requirements for graduation also must be completed, including university core requirements and a minimum of 120 total credits of which 42 must be in courses numbered 300 and above.

## Requirements for Admission to Upper Division Courses in Biology

For admission to upper division (numbered 300 or higher) Biology (BIOE, BIOE, BIOO, BIOM) and Fish and Wildlife Management (WILD) courses, students must have completed at least 45 total university credits with a cumulative GPA of at least 2.5 for all courses and have also earned a "C-" or better for any prerequisite courses. Limited exceptions may be made by consent of instructor. Any student who obtains enrollment in an upper division biology course without satisfying these requirements will be required to withdraw from the course.

## Conservation Biology and Ecology Option

The Conservation Biology and Ecology option will give students a clear understanding of the ways that natural and human-related processes affect species, communities, and ecosystems, and relate this knowledge to its broad societal context. This option provides students with strong preparation for graduate study which is necessary for most jobs in Ecology and Conservation Biology. The defining characteristics of the degree include:

- Understanding natural and human-related processes that affect populations, species, communities, and ecosystems
- Understanding methods to quantify and mitigate effects on populations, species, communities and ecosystems
- Strong emphasis on background in basic biology
- Required grounding in courses on physical environment & human dimensions of conservation, including economics, law, history and social science
- High standards for statistical knowledge
- Emphasis on classes in written and spoken communication

## Freshman Year

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Fall Credits</th>
<th>Spring Credits</th>
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</thead>
<tbody>
<tr>
<td>BIOE 103CS</td>
<td>Environmental Science and Society</td>
<td>3</td>
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<tr>
<td>BIOB 170IN</td>
<td>Principles of Biological Diversity</td>
<td>4</td>
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</tr>
<tr>
<td>CHMY 141</td>
<td>College Chemistry I</td>
<td>4</td>
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<tr>
<td>COMX 111US</td>
<td>Introduction to Public Speaking or CLS 101US</td>
<td>3</td>
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<td>University Core and Electives</td>
<td></td>
<td>0-3</td>
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<tr>
<td>Year Total:</td>
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<td>15-18</td>
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## Sophomore Year

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
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<tbody>
<tr>
<td>PHSX 205</td>
<td>College Physics I</td>
<td>4</td>
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<tr>
<td>M 161Q</td>
<td>Survey of Calculus</td>
<td>4</td>
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<tr>
<td>WRIT 101W</td>
<td>College Writing I</td>
<td>3</td>
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<tr>
<td>BIOE 160</td>
<td>Principles of Living Systems (Chem pre-req)</td>
<td>4</td>
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<td>University CORE and Additional Electives</td>
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<td>15-18</td>
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<table>
<thead>
<tr>
<th>Course Code</th>
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<tr>
<td>PHL 236Q</td>
<td>Logic</td>
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<td>STAT 216Q</td>
<td>Introduction to Statistics</td>
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<tr>
<td>CHMY 143</td>
<td>College Chemistry II</td>
<td>4</td>
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<tr>
<td>ENSC 110</td>
<td>Lnd Res Environ Sciences</td>
<td>3</td>
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</tr>
<tr>
<td>WRIT 201</td>
<td>College Writing II</td>
<td>3</td>
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</tr>
</tbody>
</table>

* Must be taken in assigned semester
A minimum of six (6) credits of electives must be taken in the social sciences, including subjects such as economics, sociology, political science, history, philosophy, or language. It is acceptable to select electives broadly or to focus them in one area. The intention is to develop a better understanding of the ways that conservation biology and ecology are related to broader issues in society, and to develop additional areas of expertise that are useful in the formulation and implementation of conservation policy. If any of the courses selected have the IS suffix, they will simultaneously satisfy a requirement of the University CORE. Classes may be lower or upper division.

**Suggested Electives for the Conservation Biology and Ecology Option**

University requirements for graduation also must be completed, including university core requirements and a minimum of 120 total credits of which 42 must be in courses numbered 300 and above. The classes listed above satisfy university core requirements except that you must also take one class each for the Diversity, Arts and Humanities requirements (courses with suffixes of D, A and H). Some of the suggested electives meet these core requirements. The curriculum above completes 37-41 credits numbered 300 and above (including 6 credits in the Social Sciences elective block.). You have some flexibility in the classes that you select to fill your Junior and Senior years. It is intended that you use these credits to develop strength in an area of emphasis that matches your interests and goals. We recommend that you consult the list of suggested electives below and speak to your advisor.

**Ecology and Evolution:**
- BIOE 405  Behavioral and Evolutionary Ecology  3
- BIOE 408  Rocky Mountain Vegetation  2
- BIOM 415  Microbial Diversity, Ecology, and Evolution  3
- BIOE 428  Freshwater Ecology  3
- BBOO 435  Plant Systematics  3
- BIOE 484  Population Genetics (not currently offered)  3

**Environmental Science:**
- ENSC 245IN  Soils  3
- ENSC 272CS  Water Resources  3
- ENSC 355  Environmental Biogeochemistry  3
- ENSC 410R  Biodiversity Methods  3
- ENSC 448  Stream Restoration Ecology  3
- ENSC 465  Environmental Biophysics  3
- ENSC 468  Ecosystem Biogeochem  3

**Fish & Wildlife Management:**
- WILD 301  Princ of Fish & Wildlife Mgmt  3

**Geography and Earth Science:**
- ERTH 212RN  Yellowstone: Scientific Lab  4
- ERTH 303  Weather and Climate  3
- GPHY 284  Intro to GIS Science & Cartog  3
- GPHY 411  Biogeography  3
- GPHY 426  Remote Sensing (consent of instructor or junior standing)  3

**Statistics:**
- STAT 412  Methods for Data Analysis II  3

**Social Sciences:**
- ECNS 317  Economic Development  3

**Requirements for Admission to Upper Division Courses in Biology**

For admission to upper division (numbered 300 or higher) Biology (BIOB, BIOE, BBOO) and Fish and Wildlife Management (WILD) courses,
students must have completed at least 45 total university credits with a cumulative GPA of at least 2.5 for all courses and have also earned a "C-" or better for any prerequisite courses. Limited exceptions may be made by consent of instructor. Any student who obtains enrollment in an upper division biology course without satisfying these requirements will be required to withdraw from the course.

**Fish and Wildlife Ecology and Management Option**

<table>
<thead>
<tr>
<th>Freshman Year</th>
<th>Credits</th>
<th>Fall</th>
<th>Spring</th>
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</thead>
<tbody>
<tr>
<td>WILD 201 - Intro to Fish and Wildlife</td>
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<tr>
<td>BIOE 103CS - Environmental Science and Society</td>
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<tr>
<td>COMX 111US - Introduction to Public Speaking (Recommended (formerly COM 110US))</td>
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<tr>
<td>CLS 101US - Knowledge and Community</td>
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</tr>
<tr>
<td>BIOC 170IN - Principles of Biological Diversity</td>
<td>4</td>
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<tr>
<td>University Core and Electives</td>
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<tr>
<td>CHMY 121IN - Introduction to General Chemistry</td>
<td>4</td>
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<tr>
<td>BIOC 230 - Identification of Seed Plants</td>
<td>4</td>
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<tr>
<td>WRIT 101W - College Writing I (Semester assigned)</td>
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<td>University Core and Electives</td>
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<th>Sophomore Year</th>
<th>Credits</th>
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<th>Spring</th>
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<tbody>
<tr>
<td>BIOC 160 - Principles of Living Systems</td>
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<tr>
<td>BIOC 310 - Comparative Vertebrate Anatomy</td>
<td>4</td>
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<tr>
<td>Choose one of the following:</td>
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<tr>
<td>ERTH 101IN - Earth System Sciences</td>
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<tr>
<td>ENSC 245IN - Soils</td>
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<td></td>
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<tr>
<td>ENSC 272CS - Water Resources (Recommended)</td>
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<tr>
<td>GPHY 284 - Intro to GIS Science &amp; Cartog (Recommended)</td>
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<td>University Core and Electives</td>
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<tr>
<td>CHMY 123 - Introduction of Organic Chemistry and Biochemistry</td>
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<td>M 161Q - Survey of Calculus</td>
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<td>or M 171Q - Calculus I</td>
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<th>Junior Year</th>
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<tr>
<td>BIOC 412 - Animal Physiology</td>
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<td>BIOC 318 - Biometry</td>
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<tr>
<td>or STAT 216Q - Introduction to Statistics</td>
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<tr>
<td>WRIT 201 - College Writing II</td>
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<td>University Core and Electives</td>
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<tr>
<td>WILD 301 - Princ of Fish &amp; Wildlife Mgmt</td>
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<tr>
<td>BIOC 375 - General Genetics</td>
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<tr>
<td>or BIOC 377 - Practical Genetics</td>
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<tr>
<td>BIOE 370 - General Ecology (equiv to 270)</td>
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<td>University Core and Electives</td>
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<tr>
<th>Senior Year</th>
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<tbody>
<tr>
<td>Choose two of the following:</td>
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<tr>
<td>BIOC 475 - Mammalogy (Fall only)</td>
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<tr>
<td>BIOC 470 - Ornithology (Spring only)</td>
<td></td>
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<tr>
<td>BIOC 415 - Ichthyology (Spring only)</td>
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<tr>
<td>Choose one of the following:</td>
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<tr>
<td>BIOC 480 - Conservation Genetics (Fall only)</td>
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<tr>
<td>BIOC 405 - Behavioral and Evolutionary Ecology (Spring only)</td>
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<tr>
<td>BIOC 440R - Conservation Biology (Fall only)</td>
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<tr>
<td>BIOC 445 - Macrosystems ecology: Linking plants, animals, and ecosystems across scales (Spring only)</td>
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<td>Faculty advisor may approve an alternative course</td>
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<td>Choose one of the following pairs:</td>
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<tr>
<td>BIOC 408 - Rocky Mountain Vegetation &amp; BIOC 455 - Plant Ecology</td>
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<td>BIOC 428 - Freshwater Ecology &amp; BIOC 427RN - Research in Freshwater Ecology</td>
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<td>BIOC 420 - Evolution</td>
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<td>WILD 401RN - Fish and Wildlife Capstone</td>
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<td>Choose two of the following:</td>
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<tr>
<td>BIOC 470 - Ornithology (Spring only)</td>
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<tr>
<td>BIOC 475 - Mammalogy (Fall only)</td>
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<tr>
<td>BIOC 415 - Ichthyology (Spring only)</td>
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<tr>
<td>BIOC 405 - Behavioral and Evolutionary Ecology (Spring only)</td>
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<td>BIOC 440R - Conservation Biology (Fall only)</td>
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<td>BIOC 445 - Macrosystems ecology: Linking plants, animals, and ecosystems across scales (Spring only)</td>
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Total Program Credits: 120

* Depending on first letter of the student's last name. Students are told at Orientation when to take WRIT 101W.

A minimum of 120 credits is required for graduation; at least 42 of these credits must be in courses numbered 300 and above. The curriculum includes 35-39 credits numbered 300 and above, so an additional three to five credits must be selected. Additional upper division electives must be taken in biology, fish and wildlife, or a related field (ANSC, NRSM, ENSC, GPHY, and STAT). Students should consult with their advisor about the appropriateness of potential upper division electives taken outside the Biology set or WILD rubrics. This curriculum satisfies all except 12 credits of the University Core Requirements. Students are expected to be
aware of all requirements for graduation and to ensure that they meet these requirements.

Requirements for Admission to Upper Division Courses in Biology
For admission to upper division (numbered 300 or higher) Biology (BIOB, BIOE, BIOO) and Fish and Wildlife Management (WILD) courses, students must have completed at least 45 total university credits with a cumulative GPA of at least 2.5 for all courses and have also earned a "C-") or better for any prerequisite courses. Limited exceptions may be made by consent of instructor. Any student who obtains enrollment in an upper division biology course without satisfying these requirements will be required to withdraw from the course. Specific courses may have additional prerequisites.

Genetics Minor
Genetics is a fundamental topic in biology and an important component of many biological disciplines. Montana State University offers a wide variety of genetics courses taught by faculty in five departments (Animal and Range Science, Cell Biology and Neuroscience, Ecology, Microbiology and Immunology, and Plant Sciences and Plant Pathology). A Genetics Minor is available to students majoring in these departments.

In order to earn a Genetics Minor, a student must take 13 units of required courses and 15 units of elective courses (see below) and must earn a grade of at least C- in every course. Students interested in this minor should consult the genetics advisor within each department to decide whether the Genetics Minor is appropriate for them and to help select specific courses. Course requirements for the Genetics Minor are consistent across all departments.

Requirements for Admission to Upper Division Courses in Biology
For admission to upper division (numbered 300 or higher) Biology (BIOB, BIOE, BIOO, BIOM) and Fish and Wildlife Management (WILD) courses, students must have completed at least 45 total university credits with a cumulative GPA of at least 2.5 for all courses and have also earned a "C-" or better for any prerequisite courses. Limited exceptions may be made by consent of instructor. Any student who obtains enrollment in an upper division biology course without satisfying these requirements will be required to withdraw from the course. Specific courses may have additional prerequisites.

Organismal Biology Option

<table>
<thead>
<tr>
<th>Freshman Year</th>
<th>Credits</th>
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<tbody>
<tr>
<td>BIOB 170IN - Principles of Biological Diversity</td>
<td>4</td>
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<tr>
<td>CHMY 141 - College Chemistry I (Completed Level 3 math pre-req)</td>
<td>4</td>
</tr>
<tr>
<td>COMX 111US - Introduction to Public Speaking (formerly COM 110US)</td>
<td>3</td>
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<tr>
<td>or CLS 101US - Knowledge and Community</td>
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<td>University Core and Electives, or Math pre-reqs</td>
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<tr>
<td>BIOB 160 - Principles of Living Systems</td>
<td>4</td>
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<tr>
<td>CHMY 143 - College Chemistry II</td>
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</tr>
<tr>
<td>WRIT 101W - College Writing I</td>
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<tr>
<td>University Core and Electives</td>
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</tr>
<tr>
<td>Year Total:</td>
<td>15-17</td>
</tr>
<tr>
<td>Sophomore Year</td>
<td>Credits</td>
</tr>
<tr>
<td>M 161Q - Survey of Calculus</td>
<td>4</td>
</tr>
<tr>
<td>PHSX 205 - College Physics I</td>
<td>4</td>
</tr>
<tr>
<td>or PHSX 220 - Physics I (w/ calculus)</td>
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<tr>
<td>BIOB 318 - Biometry</td>
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<tr>
<td>or STAT 216Q - Introduction to Statistics</td>
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<tr>
<td>CHMY 211 - Elements of Organic Chemistry</td>
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<td>Year Total:</td>
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<tr>
<td>Junior Year</td>
<td>Credits</td>
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<td>BIOB 375 - General Genetics</td>
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<td>University Core and Electives</td>
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<td>BIOE 370 - General Ecology (equiv to 270)</td>
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<td>BIOB 420 - Evolution</td>
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<table>
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<th>Required Courses</th>
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<tbody>
<tr>
<td>BIOC 160 - Principles of Living Systems</td>
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<tr>
<td>or BIOC 260 - Cellular and Molecular Biology</td>
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<tr>
<td>BIOC 276 - General Genetics</td>
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<tr>
<td>or BIOL 331 - Biomedical Genetics</td>
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<tr>
<td>BIOL 480 - Conservation Genetics</td>
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<tr>
<td>or BIOL 484 - Population Genetics</td>
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<tr>
<td>STAT 216Q - Introduction to Statistics</td>
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<tr>
<td>or BIOL 318 - Biometry</td>
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<thead>
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<th>Elective Courses</th>
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<tr>
<td>or PHSX 220 - Physics I (w/ calculus)</td>
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<tr>
<td>BIOC 318 - Biometry</td>
</tr>
<tr>
<td>or STAT 216Q - Introduction to Statistics</td>
</tr>
<tr>
<td>CHMY 211 - Elements of Organic Chemistry</td>
</tr>
<tr>
<td>or CHMY 321 - Organic Chemistry I</td>
</tr>
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<td>University Core and Electives</td>
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<td>Sophomore Year</td>
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<td>or CHMY 321 - Organic Chemistry I</td>
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<tr>
<td>Junior Year</td>
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<tr>
<td>BIOC 375 - General Genetics</td>
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<td>University Core and Electives</td>
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<tr>
<td>BIOE 370 - General Ecology (equiv to 270)</td>
</tr>
<tr>
<td>BIOC 420 - Evolution</td>
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</table>
with this objective, requirements are specified largely in terms of broad university education with particular emphasis on economics. In keeping with this objective, requirements are specified largely in terms of broad

university education with particular emphasis on economics. In keeping
with this objective, requirements are specified largely in terms of broad

university education with particular emphasis on economics. In keeping
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university education with particular emphasis on economics. In keeping
with this objective, requirements are specified largely in terms of broad

The Bachelor of Science degree in economics stresses the use of economics as a means of understanding current economic activities and problems and their relationship to our social environment. Economics is the study of critical decision-making behavior. It is a mode of thinking and reasoning with widespread application. The skills that employers value most highly are the ability to think critically and carefully, the ability to learn new skills and the ability to solve problems. Some vocations may require very specific skills (for example, knowledge of a particular computer software package). However, skill requirements change over time. The need for people who can think, learn and solve problems is timeless. Economics hones these time-honored abilities.

The objective of the program is to provide the student with a liberal university education with particular emphasis on economics. In keeping with this objective, requirements are specified largely in terms of broad

1 Depending on first letter of your last name. Students are told at Orientation when to take WRIT 101W.
2 Additional Required Biology Electives

A minimum of 20 credits of Biology electives also must be completed from courses in BIOB, BIOE, BIOO, ANSC, NRSM, WILD, BCH (UD only), BIOM (except BIOM 497). At least 16 of these credits must be in upper division courses numbered 300 and above. Credits must be for regularly scheduled courses, except that up to 4 total credits of undergraduate research in Biology (BIOE 499R, BIOE 492) and up to 2 credits of Biology Teaching (BIOB 497) may be included. Up to 6 credits of certain courses in basic biological sciences from departments other than these may be included, with the prior approval of the advisor and Organismal Biology Certifying Officer before the course is taken.

University requirements for graduation also must be completed, including university core requirements and a minimum of 120 total credits of which at least 42 credits must be in courses numbered 300 and above. Depending on courses selected, the curriculum includes 32 to 38 credits numbered 300 and above, so an additional 4-10 credits may need to be selected.

Requirements for Admission to Upper Division Courses in Biology

For admission to upper division (numbered 300 or higher) Biology (BIOB, BIOE, BIOO) and Fish and Wildlife Management (WILD) courses, students must have completed at least 45 total university credits with a cumulative GPA of at least 2.5 for all courses and have also earned a C- or better for any prerequisite courses. Limited exceptions may be made by consent of instructor. Any student who obtains enrollment in an upper division biology course without satisfying these requirements will be required to withdraw from the course. Specific courses may have additional prerequisites.

Economics

Department of Agricultural Economics &

Economics

The Bachelor of Science degree in economics stresses the use of economics as a means of understanding current economic activities and problems and their relationship to our social environment. Economics is the study of critical decision-making behavior. It is a mode of thinking and reasoning with widespread application. The skills that employers value most highly are the ability to think critically and carefully, the ability to learn new skills and the ability to solve problems. Some vocations may require very specific skills (for example, knowledge of a particular computer software package). However, skill requirements change over time. The need for people who can think, learn and solve problems is timeless. Economics hones these time-honored abilities.

The objective of the program is to provide the student with a liberal university education with particular emphasis on economics. In keeping with this objective, requirements are specified largely in terms of broad

subject areas rather than designation of particular courses. The student, with the help of the advisor, is given the opportunity to develop a program to meet his or her own particular needs and interests. With this freedom, however, comes the responsibility of building an overall program that is both cohesive and academically sound. The program focuses on teaching students to think, to use logic and reason, and to organize their thoughts in order to solve problems rather than simply memorize and recite the subject matter. The courses also focus on instilling in students a desire to learn, so that they will leave our courses prepared and eager for lifelong learning.

The economics program, with its flexibility, offers the opportunity to acquire a general university education and the necessary background and preparation for many career objectives. Economics majors pursue a wide variety of careers after graduation. Students with a bachelor’s degree in economics are often employed in the financial, retailing, and industrial sectors of the economy. Economics majors also work in such diverse fields as actuarial science, elementary and secondary education, journalism, investment banking, securities analysis, corporate finance, insurance, law, politics, and environmental regulation, as well as in government and academia. Graduate schools regard a degree in economics as excellent preparation for advanced work toward a degree in law as well as a Ph.D. in a number of social science fields such as economics, international relations, public policy, and political science. Economics is also an excellent undergraduate major for students seeking an MBA. What can be done with an education in economics is unlimited!

Undergraduate Programs

• Economics (p. 204)

Undergraduate Minors

• Economics Minor (Non-Teaching) (p. 205)

Our Master of Science degree in Applied Economics encourages students to develop and apply their skills in economic analysis and examine a wide array of economic and political issues. Learning takes place through coursework in economic theory, quantitative methods and econometrics, through collaborative work with departmental faculty, and through an intensive research thesis that addresses an important economic issue selected by the student.

Degree Offered

• M.S. in Applied Economics (p. 284)

Economics

Freshman Year

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>COM 110US -</td>
<td></td>
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</tr>
<tr>
<td>ECNS 101IS -</td>
<td>Economic Way of Thinking*</td>
<td>3</td>
</tr>
<tr>
<td>ECNS 202 -</td>
<td>Principles of Macroeconomics*</td>
<td>3</td>
</tr>
<tr>
<td>WRIT 101W -</td>
<td>College Writing I</td>
<td>3</td>
</tr>
<tr>
<td>M 161Q -</td>
<td>Survey of Calculus</td>
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<tr>
<td>or M 171Q -</td>
<td>Calculus I</td>
<td>4</td>
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Sophomore Year

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<td>ACTG 201 -</td>
<td>Principles of Financial Acct</td>
<td>3</td>
</tr>
<tr>
<td>ECNS 204IS -</td>
<td>Microeconomics*</td>
<td>3</td>
</tr>
<tr>
<td>WRIT 201 -</td>
<td>College Writing II</td>
<td>3</td>
</tr>
<tr>
<td>STAT 216Q -</td>
<td>Introduction to Statistics</td>
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<td>30</td>
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Junior Year

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
</table>

and Senior Year
A student must receive a grade of C- or better in all courses required for the Economics Minor (Non-Teaching)
courses numbered 300 and above.

A minimum of 120 credits is required for graduation; 42 credits must be in communication. Twelve communication credits are required for graduation.

Graduation Requirements
Economics students must receive a grade of C or better in each of the following courses: ECNS 101IS, ECNS 202, ECNS 204IS, ECNS 301, ECNS 303, and M 161Q or M 171Q (or their equivalents) to meet departmental graduation requirements. All other courses counting toward departmental requirements must be graded C- or better. Thirty-three (33) economics credits are needed to graduate. Twelve communication credits are required for graduation.

A minimum of 120 credits is required for graduation; 42 credits must be in courses numbered 300 and above.

Economics Minor (Non-Teaching)
A student must receive a grade of C- or better in all courses required for the minor.

Economics Requirements

Economics 301 - Intermediate Micro with Calc 3
Economics 303 - Intermediate Macro with Calc 3
Economics 432R - Benefit-Cost Analysis 3
or Economics 403R - Intro to Econometrics

Courses numbered 300 and above are required, excluding seminars, 490's/492's.

NOTE: ECNS 25IS (4 credits) may be substituted for the 3 course sequence ECNS 101IS, ECNS 202, and ECNS 204IS.

Students completing a double major with economics as one of the majors are only required to meet their University Core or Social Science requirements.

Students completing a double major with finance and economics as the two majors may use ECNS 313 Money and Banking as an elective in the economic major.

Entrance to the Economics Program
Program entrance requirements are that a student must

1. have a cumulative GPA of at least 2.50 and received a grade of C or better in each of the following courses: ECNS 101IS, ECNS 202, ECNS 204IS, and M 161Q or M 171Q (or their equivalents), OR

2. be an incoming transfer student or of freshman standing.

Graduation Requirements
Economics students must receive a grade of C or better in each of the following courses: ECNS 101IS, ECNS 202, ECNS 204IS, ECNS 301, ECNS 303, and M 161Q or M 171Q (or their equivalents) to meet departmental graduation requirements. All other courses counting toward departmental requirements must be graded C- or better. Thirty-three (33) economics credits are needed to graduate. Twelve communication credits are required for graduation.

A minimum of 120 credits is required for graduation; 42 credits must be in courses numbered 300 and above.

Economics Minor (Non-Teaching)
A student must receive a grade of C- or better in all courses required for the minor.

Economics Requirements

Economics 301 - Intermediate Micro with Calc 3
Economics 303 - Intermediate Macro with Calc 3
Economics 432R - Benefit-Cost Analysis 3

Courses numbered 300 and above are required, excluding seminars, 490's/492's.

NOTE: ECNS 25IS (4 credits) may be substituted for the 3 course sequence ECNS 101IS, ECNS 202, and ECNS 204IS.

Students completing a double major with economics as one of the majors are only required to meet their University Core or Social Science requirements. However, Agricultural Business students seeking a non-teaching minor in Economics must complete an additional 9 credits at the 300 level or above in AGBE/ECNS electives over and above all requirements for graduation with a major in Agricultural Business.

1 “P” grades may be accepted at the discretion of the department only for courses transferred from outside the Montana State University System.

2 NOTE: ECNS 251IS Honors Economics (4 credits) may be substituted for the three-course sequence: ECNS 101IS, ECNS 202, and ECNS 204IS.

3 May include one and only one ECNS 300 level course being utilized to satisfy a student’s major requirements. However, Agricultural Business students seeking a non-teaching minor in Economics must complete an additional 9 credits at the 300 level or above in AGBE/ECNS electives over and above all requirements for graduation with a major in Agricultural Business.

English

The curriculum leading to the Bachelor of Arts in English provides the student three options: 1) the literature option for students who wish to specialize in the study of literature, especially those preparing for a broad range of careers including graduate study in English or related fields; and 2) the writing option for students who wish to specialize in the study and production of expository and creative writing and rhetoric, in preparation for professional writing careers or graduate study; and 3) the English teaching option for students wishing to specialize in the study of literature, language, and composition as preparation for certification for secondary school teaching.

There are many professional opportunities open to English graduates. In addition to teaching, professional schools (law and business, for example) consider the B.A. in English to be excellent preparation. The study of
literature and effective writing is also useful in the areas of corporate management, personnel work, finance, consulting, journalism and public relations, Intermediate Tech Writing and editing, and many other fields, as various industries continue to seek people who are literate and articulate.

In addition to these programs for its majors, the Department of English offers many courses that satisfy University core requirements.

Students desiring to obtain the B.A. in English will choose one of the following options. Those seeking endorsement as teaching majors will follow the teaching option. In order to graduate, students must earn a grade of "C-" or above in every course required for the English major except the Teaching option which requires a grade of "C" or above.

Undergraduate Programs
- Literature Option (p. 206)
- Teaching Option (p. 206)
- Writing Option (p. 207)

Undergraduate Minors
- Writing (Non-Teaching) (p. 208)
- Literature (Non-Teaching) (p. 208)

Graduate Program
- M.A. English (p. 365)

Literature Option
This option is designed for students wishing to specialize in the study of literature as preparation for graduate work or for general education.

Required English Courses
Take all: 9
- LIT 201 Intro to Literary Studies
- LIT 300 Literary Criticism
- LIT 494RH Seminar: Research Issues

National Literature Courses
Choose four from the following: 12
- LIT 310 American Literature to 1900
- LIT 311 American Literature after 1900
- LIT 320 Advanced British Literature I (Formerly LIT 324)
- LIT 321 Advanced British Literature II (Formerly LIT 325)
- LIT 322 Advanced British Literature III (Formerly LIT 326)

Six Literature Electives
Any LIT course not counted elsewhere may be used in this category: 18
- LIT 110IH Intro to Lit: Explorations in Literature
- LIT 214D Regional Literature
- LIT 169IH Literature as Popular Culture
- LIT 202CS The Environmental Imagination
- LIT 203IH Great Books
- LIT 240 The Bible as Literature
- LIT 285D Mythologies
- LIT 308 Multicultural Literature
- LIT 335 Women and Literature

Writing or Language Course
Choose one from the following 200-400 level Writing or Language courses (excluding WRIT 101W and WRIT 205): 3
- CRWR 240 Introduction to Creative Writing
- CRWR 340 Intermediate Creative Writing Workshop
- CRWR 437 Topics in Craft and Genre
- CRWR 440 Advanced Creative Writing Workshop
- ENGL 450 Rhetoric and Composition
- LING 210IH Intro to Language/Linguistics
- LING 238 Structure and Function of Language
- LING 338 Language and English Education
- WRIT 201 College Writing II
- WRIT 221 Intermediate Tech Writing
- WRIT 326 Advanced Writing
- WRIT 371 Digital Rhetorics and Multimodal Writing
- WRIT 372 Science Writing for Popular Non-Fiction
- WRIT 373 News and Pub Relations Writing
- WRIT 374 Magazine Editing
- WRIT 376 Public Rhetorics and Writing
- WRIT 429 Professional Writing

Total English credits required: 42 (30 of which must be upper division)

Total credits required for graduation: 120

Upper-Division credits required: 42

CORE 2.0 requirements (p. 63):

27-30

Teaching Option
This option is designed for students wishing to prepare for secondary school teaching. Employment opportunities may be enhanced if students also obtain a second area of certification, usually a teaching minor. Obtaining a minor in addition to the English major will require more than eight semesters.

Freshman Year
- EDU 202 - Early Field Experience 1
- FCS 101S - Indiv and Fam Dev: Lifespan 3
- LIT 201 - Intro to Literary Studies 3
- WRIT 101W - College Writing I 3

Choose one of the following: 3
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>LIT 203IH</td>
<td>Great Books</td>
</tr>
<tr>
<td>LIT 202CS</td>
<td>The Environmental Imagination</td>
</tr>
<tr>
<td>LIT 240</td>
<td>The Bible as Literature</td>
</tr>
</tbody>
</table>

University Core and Electives: 16 credits

Year Total: 29 credits

**Sophomore Year**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>WRIT 201</td>
<td>College Writing II</td>
<td>3</td>
</tr>
<tr>
<td>LING 238</td>
<td>Structure and Function of Language</td>
<td>3</td>
</tr>
<tr>
<td>EDU 211D</td>
<td>Multicultural Education</td>
<td>3</td>
</tr>
<tr>
<td>EDU 223IS</td>
<td>Ed Psych and Adolescent Dev</td>
<td>3</td>
</tr>
<tr>
<td>LIT 300</td>
<td>Literary Criticism</td>
<td>3</td>
</tr>
</tbody>
</table>

Choose three of the following: 9 credits

- LIT 310 - American Literature to 1900
- LIT 311 - American Literature after 1900
- LIT 320 - Advanced British Literature I (Formerly LIT 324)
- LIT 321 - Advanced British Literature II (Formerly LIT 325)
- LIT 322 - Advanced British Literature III (Formerly LIT 326)

University Core and Electives: 9 credits

Year Total: 33 credits

**Junior Year**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>EDU 370</td>
<td>Integrating Tech into Educ</td>
<td>2</td>
</tr>
<tr>
<td>EDU 382</td>
<td>Assessmt, Curric, Instructn</td>
<td>3</td>
</tr>
<tr>
<td>EDU 395</td>
<td>Practicum</td>
<td>3</td>
</tr>
<tr>
<td>EDU 497</td>
<td>Methods</td>
<td>3</td>
</tr>
<tr>
<td>LING 338</td>
<td>Language and English Education</td>
<td>3</td>
</tr>
<tr>
<td>ENGL 339</td>
<td>Teaching Writing in Secondary School</td>
<td>3</td>
</tr>
<tr>
<td>ENGL 445</td>
<td>Teaching Reading and Literature</td>
<td>3</td>
</tr>
</tbody>
</table>

Choose one of the following: 3 credits

- LIT 285D - Mythologies
- LIT 308 - Multicultural Literature
- LIT 335 - Women and Literature
- LIT 382 - Literature for Children and Adolescents
- LIT 440 - Studies in World Literature

University Core and Electives: 9 credits

Year Total: 32 credits

**Senior Year**

Choose two of the following: 6 credits

- LIT 214D - Regional Literature
- LIT 437 - Studies in Literary Genres
- LIT 431 - Studies in Major Author/s
- LIT 438 - Studies in Literary Topics
- LIT 473RH - Studies in Shakespeare

Choose one of the following: 3 credits

- ENGL 450 - Rhetoric and Composition
- CRWR 340 - Intermediate Creative Writing Workshop
- CRWR 440 - Advanced Creative Writing Workshop
- WRIT 326 - Advanced Writing
- WRIT 429 - Professional Writing

Choose two of the following: 10-12 credits

- EDU 408 - Professional Issues: K-12
- EDU 495 - Student Teaching
- ENGL 461R - Issues in English Education
- EDSP 306 - Exceptional Learners

Year Total: 27-29 credits

Total Program Credits: 120 credits

A minimum of 120 credits is required for graduation; 42 of these credits must be in courses numbered 300 and above. Students must receive a grade of "C" or better in all required courses.

**Writing Option**

This option is designed for students wishing to specialize in the study of writing and rhetoric as preparation for graduate study, professional practice, or liberal education.

**Required English Courses**

Take all: 24 credits

- WRIT 205 Intro to Writing Studies
- WRIT 326 Advanced Writing
- WRIT 371 Digital Rhetorics and Multimodal Writing
- WRIT 376 Public Rhetorics and Writing
- CRWR 340 Intermediate Creative Writing Workshop
- ENGL 450 Rhetoric and Composition
- WRIT 494RH Seminar: Writing Research and Publications
- WRIT 498 Internship

**Four Writing Electives**

Choose four from the following: 12 credits

- CRWR 240 Introduction to Creative Writing
- CRWR 440 Advanced Creative Writing Workshop
- ENGL 339 Teaching Writing in Secondary School
- LING 210IH Intro to Language/Linguistics
- LING 238 Structure and Function of Language
- LING 338 Language and English Education
- WRIT 201 College Writing II
- WRIT 221 Intermediate Tech Writing
- WRIT 372 Science Writing for Popular Non-Fiction
- WRIT 373 News and Pub Relations Writing
- WRIT 374 Magazine Editing
- WRIT 429 Professional Writing

**200 Level Literature Elective**

Choose one of the following (excluding LIT 201): 3 credits

- LIT 214D Regional Literature
- LIT 202CS The Environmental Imagination
- LIT 203IH Great Books
- LIT 240 The Bible as Literature
- LIT 285D Mythologies

**Three Literature Electives**

Choose three 200-400 level LIT courses not counted elsewhere (excluding LIT 201): 9 credits

- LIT 214D Regional Literature
- LIT 202CS The Environmental Imagination
- LIT 203IH Great Books
- LIT 240 The Bible as Literature
- LIT 285D Mythologies
- LIT 300 Literary Criticism
- LIT 308 Multicultural Literature
English Minor: Literature (Non-Teaching)

LIT 310  American Literature to 1900
LIT 311  American Literature after 1900
LIT 320  Advanced British Literature I (Formerly LIT 324)
LIT 321  Advanced British Literature II (Formerly LIT 325)
LIT 322  Advanced British Literature III (Formerly LIT 326)
LIT 335  Women and Literature
LIT 382  Literature for Children and Adolescents
LIT 437  Studies in Literary Genres
LIT 431  Studies in Major Author/s
LIT 438  Studies in Literary Topics
LIT 440  Studies in World Literature
LIT 473RH  Studies in Shakespeare

Total English credits required: 48
Total credits required for graduation: 120
Upper-Division credits required: 42

CORE 2.0 requirements:  (p. 63)

27-30

WRIT 101W credits count for the Core Foundations written requirement. These credits are not counted as part of the total English Major, Writing Option.

English Minor: Literature (Non-Teaching)

LIT 201  Intro to Literary Studies 3
or
LIT 110IH  Intro to Lit: Explorations in Literature 3
Choose six of the following (minimum three upper division): 18
LIT 203IH  Great Books
LIT 169IH  Literature as Popular Culture
LIT 202CS  The Environmental Imagination
LIT 214D  Regional Literature
LIT 240  The Bible as Literature
LIT 285D  Mythologies
LIT 300  Literary Criticism
LIT 308  Multicultural Literature
LIT 310  American Literature to 1900
LIT 311  American Literature after 1900
LIT 320  Advanced British Literature I (Formerly LIT 324)
LIT 321  Advanced British Literature II (Formerly LIT 325)
LIT 322  Advanced British Literature III (Formerly LIT 326)
LIT 335  Women and Literature
LIT 382  Literature for Children and Adolescents
LIT 431  Studies in Major Author/s
LIT 437  Studies in Literary Genres
LIT 438  Studies in Literary Topics
LIT 440  Studies in World Literature
LIT 473RH  Studies in Shakespeare

Note: LIT 201 and LIT 110IH can both be taken, with one as an elective

Total Credits 21

Students must receive a grade of a "C-" or better in all required courses. The minimum number of credits for a non-teaching minor is twenty-one, with none of those being upper-division credits.

English Minor: Writing (Non-Teaching)

Choose seven of the following:  21

CRWR 240  Introduction to Creative Writing
CRWR 340  Intermediate Creative Writing Workshop
CRWR 440  Advanced Creative Writing Workshop
ENGL 339  Teaching Writing in Secondary School
ENGL 450  Rhetoric and Composition
LING 210IH  Intro to Language/Linguistics
LING 238  Structure and Function of Language
LING 338  Language and English Education
WRIT 201  College Writing II
WRIT 221  Intermediate Tech Writing
WRIT 326  Advanced Writing
WRIT 371  Digital Rhetorics and Multimodal Writing
WRIT 372  Science Writing for Popular Non-Fiction
WRIT 373  News and Pub Relations Writing
WRIT 374  Magazine Editing
WRIT 376  Public Rhetorics and Writing
WRIT 429  Professional Writing
WRIT 498  Internship

Total Credits 21

Students must receive a grade of "C-" or better in all required courses. The minimum number of credits for a non-teaching minor is twenty-one, with none of those being upper-division credits.

History

The curriculum leading to the Bachelor of Arts in History allows students to specialize in the study of the American west, U.S. history, environmental history, and the history of science and technology. The history degree also provides an analytical gateway to areas beyond the United States, with courses of advanced study related to South Asia, East Asia, Latin America, Europe, and the ancient world. Internships at historical societies, museums, and Yellowstone National Park are also an important part of the educational experience and are strongly encouraged by the department.

A degree in history prepares students for teaching, graduate studies, public resource management, government service, law school, journalism, and other career opportunities that require critical thinking and clarity of communication. Students participate in original research projects and student-centered learning activities; they learn to read and analyze primary texts, as well as secondary literature, and to write thoughtfully about them. Students learn to create knowledge by thinking creatively and basing their ideas in the empirical authority inherent in careful examination of historical documents.

At all levels of the curriculum, the history degree provides students with the tools to think rigorously, to research and thereby generate knowledge empirically, and to articulate their thoughts coherently. In consultation with an advisor, students may select from a range of fields of concentration that are consistent with his or her interests and educational objectives.
The department encourages students to engage in the Departmental Honors Option. This option has the following requirements:

1. Students must have a minimum 3.5 grade-point average in their major and a 3.0 GPA overall.
2. Students must present an acceptable, bound senior thesis and an oral defense of the thesis.

Qualified students may enroll in the honors option through their departmental advisors.

Undergraduate Programs
- History Option (p. 210)
- History Teaching Option (p. 211)
- Science, the Environment, Technology, and Society (SETS) Option (p. 215)
- Japan Studies Option (p. 213)

Undergraduate Minors
- History Minor (Non-Teaching) (p. 209)
- History Minor (Teaching) (p. 134)
- Museum Studies Minor (Non-Teaching) (p. 214)
- Japan Studies Minor (Non-Teaching) (p. 213)
- Latin American and Latino Studies Minor (Non-Teaching) (p. 214)

The Department of History and Philosophy is dedicated to providing quality education in History for two graduate degree programs, the MA and the PhD. The Department offers concentrated training in three particular areas: the history of science, technology, and society; environmental history; and the history of the American West and Montana. While the degrees offered by the Department are grounded in American history, the faculty is committed to familiarizing students with World history, critical theoretical concerns, the history of women in a multi-cultural context, and to encouraging students to think about the history of the United States in a global context.

Degree Offered
- MA in History (p. 366)
- PhD in History (p. 366)

History Minor (Non-Teaching)
Choose one of the following: 3-4
- HSTR 101IH Western Civilization I
- HSTR 102IH Western Civilization II
- HSTR 282CS Darwinian Revolution
Choose two of the following: 6-8
- HSTR 130D Latin American History
- HSTR 135D The Modern Middle East
- HSTR 140D Modern Asia
- HSTR 145D Reinventing Japan
- HSTR 160D Modern World History
- HSTR 205CS The World Environment
- HSTR 207CS Sci and Tech in World History
Choose one of the following: 4
- HSTA 101IH American History I
- HSTA 102IH American History II
- HSTA 160D Introduction to the Am West
Choose three courses to complete 9 credits from the following: 9
- HSTA 311 Early America
- HSTA 316 American Civil War Era
- HSTA 318 Origins of Modern America: From the Civil War to WWII
- HSTA 322 Am History: WWII to Present
- HSTA 406 McCarthy/Ike/Truman
- HSTA 407 Gender in US & Canadian West
- HSTA 408 Gender in America
- HSTA 409 Food in America
- HSTA 412H American Thought and Culture
- HSTA 416 Race and Class in America
- HSTA 450 History of American Indians
- HSTA 460 Montana and the West
- HSTA 464 Trans-Mississippi West
- HSTA 468 History of Yellowstone
- HSTA 470 American Environmental History
- HSTA 482 History of American Technology
- HSTA 490R Undergraduate Research
- HSTA 491 Special Topics
- HSTA 492 Independent Study
- HSTR 302 Ancient Greece
- HSTR 304 Ancient Rome
- HSTR 322 19th Century Europe
- HSTR 324 20th Century Europe
- HSTR 330 History of Mexico
- HSTR 340 Age of the Shoguns
- HSTR 342 Japan’s Long 19th Century
- HSTR 345 Modern China
- HSTR 346 Modern India
- HSTR 350 Modern Britain
- HSTR 353 Modern France
- HSTR 359 Russia to 1917
- HSTR 362 Modern Germany
- HSTR 366 Middle East/20th Century
- HSTR 372 The World at War
- HSTR 375 Eurasian Borderlands
- HSTR 376 Twentieth Century War
- HSTR 407 Soviet Union: Rise & Fall
- HSTR 415 Gender and Technology
- HSTR 417 Early Modern Science
- HSTR 419 Modern Science
- HSTR 423 European Intellectual History
- HSTR 425 Mapping the World
- HSTR 430 Latin Amer Soc History
- HSTR 431 Race in Latin America
- HSTR 433 Latin American Perspectives
- HSTR 434 Gender in Latin America
- HSTR 436 Armed Conflict Mod Lat Am
- HSTR 443 Gender in Asia
- HSTR 444 Gender in Japan
- HSTR 445 Environ, Health & Sci in Japan
- HSTR 446 Science and Medicine in China
- HSTR 468 The Making of Modern Turkey
- HSTR 482 Animal Histories
History Option

Freshman Year
Choose one of the following: 3-4
- HSTR 101IH - Western Civilization I
- HSTR 102IH - Western Civilization II
- HSTR 282CS - Darwinian Revolution
Choose one of the following: 4
- HSTA 101IH - American History I
- HSTA 102IH - American History II
- HSTA 160D - Introduction to the Am West
- AMST 101D - Introduction to American Studies
One Year Modern Language 6
University Core and Electives 14
Year Total: 28

Sophomore Year
Choose two of the following: 6-8
- HSTR 130D - Latin American History
- HSTR 135D - The Modern Middle East
- HSTR 140D - Modern Asia
- HSTR 145D - Reinventing Japan
- HSTR 160D - Modern World History
- HSTR 205CS - The World Environment
- HSTR 207CS - Sci and Tech in World History
- HSTR 232D - Religion in Latin America
- RLST 110D - Religion, Conflict & Politics
Choose one of the following: 3
- HSTA 311 - Early America
- HSTA 316 - American Civil War Era
- HSTA 318 - Origins of Modern America: From the Civil War to WWII
- HSTR 322 - Am History: WWII to Present
- HSTA 406 - McCarthy/Ike/Truman
- HSTA 407 - Gender in US & Canadian West
- HSTA 408 - Gender in America
- HSTA 409 - Food in America
- HSTA 412IH - American Thought and Culture
- HSTA 416 - Race and Class in America
- HSTA 460 - Montana and the West
- HSTA 464 - Trans-Mississippi West
- HSTA 468 - History of Yellowstone
- HSTA 470 - American Environmental History

Junior Year
Choose one of the following: 3
- HSTR 302 - Ancient Greece
- HSTR 304 - Ancient Rome
- HSTR 322 - 19th Century Europe
- HSTR 324 - 20th Century Europe
- HSTR 350 - Modern Britain
- HSTR 353 - Modern France
- HSTR 359 - Russia to 1917
- HSTR 362 - Modern Germany
- HSTR 372 - The World at War
- HSTR 376 - Twentieth Century War
- HSTR 407 - Soviet Union: Rise & Fall
- HSTR 419 - Modern Science
- HSTR 423 - European Intellectual History
- HSTR 425 - Mapping the World
Choose two of the following: 6
- HSTR 330 - History of Mexico
- HSTR 340 - Age of the Shoguns
- HSTR 342 - Japan’s Long 19th Century
- HSTR 345 - Modern China
- HSTR 346 - Modern India
- HSTR 359 - Russia to 1917
- HSTR 366 - Middle East/20th Century
- HSTR 372 - The World at War
- HSTR 375 - Eurasian Borderlands
- HSTR 407 - Soviet Union: Rise & Fall
- HSTR 425 - Mapping the World
- HSTR 430 - Latin Amer Soc History
- HSTR 431 - Race in Latin America
- HSTR 432 - Colonial Latin America
- HSTR 433 - Latin American Perspectives
- HSTR 434 - Gender in Latin America
- HSTR 436 - Armed Conflict Mod Lat Am
- HSTR 443 - Gender in Asia
- HSTR 444 - Gender in Japan
- HSTR 445 - Environ, Health & Sci in Japan
- HSTR 446 - Science and Medicine in China
- HSTR 468 - The Making of Modern Turkey
- HSTR 482 - Animal Histories
- HSTR 484 - World Environmental History
- SPNS 430 - Latin Amer Perspectives
University Core and Electives 21
Year Total: 30

Senior Year
Choose five of the following electives, excluding courses taken to fulfill above requirements: 15
- HSTA 311 - Early America
- HSTA 316 - American Civil War Era

Total Credits 22-25

The minimum number of credits for a non-teaching minor is twenty-one, with nine of those being upper-division credits.
HSTA 318 - Origins of Modern America: From the Civil War to WWII
HSTA 322 - Am History: WWII to Present
HSTA 406 - McCarthy/Ike/Truman
HSTA 407 - Gender in US & Canadian West
HSTA 408 - Gender in America
HSTA 409 - Food in America
HSTA 412IH - American Thought and Culture
HSTA 416 - Montana and the West
HSTA 464 - Trans-Mississippi West
HSTA 468 - History of Yellowstone
HSTA 470 - American Environmental History
HSTA 482 - History of American Technology
HSTA 490R - Undergraduate Research
HSTA 491 - Special Topics
HSTA 492 - Independent Study
HSTA 498 - Internship
HSTR 302 - Ancient Greece
HSTR 304 - Ancient Rome
HSTR 322 - 19th Century Europe
HSTR 324 - 20th Century Europe
HSTR 330 - History of Mexico
HSTR 340 - Age of the Shoguns
HSTR 342 - Japan's Long 19th Century
HSTR 345 - Modern China
HSTR 346 - Modern India
HSTR 350 - Modern Britain
HSTR 353 - Modern France
HSTR 359 - Russia to 1917
HSTR 362 - Modern Germany
HSTR 366 - Middle East/20th Century
HSTR 372 - The World at War
HSTR 375 - Eurasian Borderlands
HSTR 376 - Twentieth Century War
HSTR 407 - Soviet Union: Rise & Fall
HSTR 415 - Gender and Technology
HSTR 417 - Early Modern Science
HSTR 419 - Modern Science
HSTR 423 - European Intellectual History
HSTR 425 - Mapping the World
HSTR 430 - Latin Amer Soc History
HSTR 431 - Race in Latin America
HSTR 432 - Colonial Latin America
HSTR 433 - Latin American Perspectives
HSTR 434 - Gender in Latin America
HSTR 436 - Armed Conflict Mod Lat Am
HSTR 443 - Gender in Asia
HSTR 444 - Gender in Japan
HSTR 445 - Environ, Health & Sci in Japan
HSTR 446 - Science and Medicine in China
HSTR 468 - The Making of Modern Turkey
HSTR 482 - Animal Histories
HSTR 484 - World Environmental History
HSTR 486 - Museum History

HSTR 490R - Undergraduate Research
HSTR 491 - Special Topics
HSTR 492 - Independent Study
HSTR 498 - Internship
NASX 450 - History of American Indians
SPNS 430 - Latin Amer Perspectives

University Core and Electives

| Year Total: | 33 |
| Total Program Credits: | 120 |

* Three of the five history electives from the electives list constitute the student’s Field of Concentration. Fields of Concentration include Environmental History, History of Race & Gender, History of Science & Technology, Asian History, Latin American History, European History, U.S. History, History of the American West, Cultural & Intellectual History. Courses taken in the electives area cannot overlap with courses taken to fulfill the World Regions requirement.

A minimum of 120 credits is required for graduation; 42 of these credits must be in courses numbered 300 and above. Students must receive a grade of C- or better in all required courses.

### History Teaching Option

#### Freshman Year

<table>
<thead>
<tr>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CLS 101US - Knowledge and Community</td>
</tr>
<tr>
<td>WRIT 101W - College Writing I</td>
</tr>
<tr>
<td>PCS 101S - Indiv and Fam Dev: Lifespan</td>
</tr>
<tr>
<td>EDU 202 - Early Field Experience</td>
</tr>
</tbody>
</table>

Choose two of the following: 7-8

<table>
<thead>
<tr>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>HSTA 101IH - American History I</td>
</tr>
<tr>
<td>HSTA 102IH - American History II</td>
</tr>
<tr>
<td>HSTA 160D - Introduction to the Am West</td>
</tr>
<tr>
<td>AMST 101D - Introduction to American Studies</td>
</tr>
</tbody>
</table>

Choose two of the following: 7-8

<table>
<thead>
<tr>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>HSTR 101IH - Western Civilization I</td>
</tr>
<tr>
<td>HSTR 102IH - Western Civilization II</td>
</tr>
<tr>
<td>HSTR 282CS - Darwinian Revolution</td>
</tr>
</tbody>
</table>

University Core and Electives

| Year Total: | 32 |

#### Sophomore Year

<table>
<thead>
<tr>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>EDU 223IS - Educ Psych and Adolescent Dev</td>
</tr>
<tr>
<td>EDU 382 - Assessmt, Curric, Instructn</td>
</tr>
<tr>
<td>EDU 211D - Multicultural Education</td>
</tr>
</tbody>
</table>

Choose two of the following: 8

<table>
<thead>
<tr>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>HSTR 130D - Latin American History</td>
</tr>
<tr>
<td>HSTR 135D - The Modern Middle East</td>
</tr>
<tr>
<td>HSTR 140D - Modern Asia</td>
</tr>
<tr>
<td>HSTR 145D - Reinventing Japan</td>
</tr>
<tr>
<td>HSTR 160D - Modern World History</td>
</tr>
<tr>
<td>HSTR 205CS - The World Environment</td>
</tr>
<tr>
<td>HSTR 207CS - Sci and Tech in World History</td>
</tr>
<tr>
<td>RLST 110D - Religion, Conflict &amp; Politics</td>
</tr>
</tbody>
</table>

Choose one of the following: 3

<table>
<thead>
<tr>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>HSTA 311 - Early America</td>
</tr>
<tr>
<td>HSTA 316 - American Civil War Era</td>
</tr>
</tbody>
</table>
History Teaching Option

HSTA 318 - Origins of Modern America: From the Civil War to WWII
HSTA 322 - Am History: WWII to Present
HSTA 406 - McCarthy/Ike/Truman
HSTA 407 - Gender in US & Canadian West
HSTA 408 - Gender in America
HSTA 409 - Food in America
HSTA 412IH - American Thought and Culture
HSTA 416 - Race and Class in America
HSTA 460 - Montana and the West
HSTA 464 - Trans-Mississippi West
HSTA 470 - American Environmental History
HSTA 482 - History of American Technology
NASX 450 - History of American Indians

University Core and Electives 10
Year Total: 28

Junior Year Credits
EDU 395 - Practicum 3
EDU 370 - Integrating Tech into Educ 2
EDU 497 - Methods 3
GPHY 141D - Geography of World Regions 3
EDSP 306 - Exceptional Learners 3
Choose one of the following: 3
HSTR 302 - Ancient Greece
HSTR 304 - Ancient Rome
HSTR 322 - 19th Century Europe
HSTR 324 - 20th Century Europe
HSTR 350 - Modern Britain
HSTR 353 - Modern France
HSTR 359 - Russia to 1917
HSTR 362 - Modern Germany
HSTR 372 - The World at War
HSTR 376 - Twentieth Century War
HSTR 407 - Soviet Union: Rise & Fall
HSTR 419 - Modern Science
HSTR 423 - European Intellectual History
HSTR 425 - Mapping the World
Choose two of the following: 6
HSTR 330 - History of Mexico
HSTR 340 - Age of the Shoguns
HSTR 342 - Japan’s Long 19th Century
HSTR 345 - Modern China
HSTR 346 - Modern India
HSTR 350 - Modern Britain
HSTR 353 - Modern France
HSTR 359 - Russia to 1917
HSTR 362 - Modern Germany
HSTR 366 - Middle East/20th Century
HSTR 372 - The World at War
HSTR 375 - Eurasian Borderlands
HSTR 376 - Twentieth Century War
HSTR 407 - Soviet Union: Rise & Fall
HSTR 425 - Mapping the World
HSTR 430 - Latin Amer Soc History
HSTR 431 - Race in Latin America
HSTR 432 - Colonial Latin America
HSTR 433 - Latin American Perspectives
HSTR 434 - Gender in Latin America
HSTR 436 - Armed Conflict Mod Lat Am
HSTR 443 - Gender in Asia

HSTR 444 - Gender in Japan
HSTR 445 - Environ, Health & Sci in Japan
HSTR 468 - The Making of Modern Turkey
HSTR 484 - World Environmental History

University Core and Electives 9
Year Total: 33

Senior Year Credits
EDU 495 - Student Teaching 12
EDU 408 - Professional Issues: K-12 2
HSTR 499R - Sen Capstone: Hist Methodology 3
Choose four of the following, excluding courses that were taken to fulfill requirements above: 12
HSTA 311 - Early America
HSTA 316 - American Civil War Era
HSTA 318 - Origins of Modern America: From the Civil War to WWII
HSTA 322 - Am History: WWII to Present
HSTA 406 - McCarthy/Ike/Truman
HSTA 407 - Gender in US & Canadian West
HSTA 408 - Gender in America
HSTA 409 - Food in America
HSTA 412IH - American Thought and Culture
HSTA 416 - Race and Class in America
HSTA 460 - Montana and the West
HSTA 464 - Trans-Mississippi West
HSTA 468 - History of Yellowstone
HSTA 470 - American Environmental History
HSTA 482 - History of American Technology
HSTR 302 - Ancient Greece
HSTR 304 - Ancient Rome
HSTR 322 - 19th Century Europe
HSTR 324 - 20th Century Europe
HSTR 330 - History of Mexico
HSTR 340 - Age of the Shoguns
HSTR 342 - Japan’s Long 19th Century
HSTR 345 - Modern China
HSTR 346 - Modern India
HSTR 350 - Modern Britain
HSTR 353 - Modern France
HSTR 359 - Russia to 1917
HSTR 362 - Modern Germany
HSTR 366 - Middle East/20th Century
HSTR 372 - The World at War
HSTR 375 - Eurasian Borderlands
HSTR 376 - Twentieth Century War
HSTR 407 - Soviet Union: Rise & Fall
HSTR 417 - Early Modern Science
HSTR 419 - Modern Science
HSTR 423 - European Intellectual History
HSTR 425 - Mapping the World
HSTR 430 - Latin Amer Soc History
HSTR 431 - Race in Latin America
HSTR 432 - Colonial Latin America
HSTR 433 - Latin American Perspectives
Japan Studies Minor (Non-Teaching)

The Japan Studies Program offers a non-teaching, interdisciplinary minor in Japan Studies through the Department of History and Philosophy and the Department of Modern Languages and Literatures. The Program's mission is to provide students with the skills and understanding they need to succeed in Japanese contexts. The minor requires basic Japanese language proficiency and a broad knowledge of Japanese history, literature, and civilization. It includes 8 credits in Japanese language training, 12 credits in elective course work, and a 3-credit capstone course, for a total of 23 credits.

In order to receive the minor, students must successfully complete the following course work:

- JPNS 101 Elementary Japanese I 4
- JPNS 102D Elementary Japanese II 4
- Choose four of the following: 12
  - ANTY 242D Contemporary Japan
  - ANTY 252IS Mysteries of the Past
  - ANTY 337 Sex, Gender, Sexuality Japan
  - ANTY 343 Popular Culture - Japan
  - HSTR 140D Modern Asia
  - HSTR 145D Reinventing Japan
  - HSTR 340 Age of the Shoguns
  - HSTR 342 Japan’s Long 19th Century
  - HSTR 444 Gender in Japan
  - HSTR 445 Environ, Health & Sci in Japan
  - JPNS 150D Japanese Culture & Civ
  - JPNS 201D Intermediate Japanese I
  - JPNS 202D Intermediate Japanese II
  - JPNS 305 Japanese Adv Conversations
  - JPNS 320 Classical Japanese Literature
  - JPNS 321 Modern Japanese Literature
  - JPNS 340 Japanese Adv Reading & Grammar

Choose one of the following Capstone Courses: 3
- ANTY 490R Undergraduate Research and Instruction
- ANTY 492 Independent Study
- HSTA 490R Undergraduate Research
- HSTA 492 Independent Study
- HSTR 490R Undergraduate Research
- HSTR 492 Independent Study
- JPNS 450R Sem: Japanese Lit and Culture

Total Credits: 23

Not all courses may be taken in the same department. At least six credits must be upper division (numbered 300 or above). Other appropriate courses, including those taken abroad, may be substituted with the approval of the Director of Japan Studies.

Japan Studies Option

The Japan Studies major offers a curriculum that investigates Japanese history, culture, and language in an interdisciplinary setting and that encourages students to study abroad in Japan at partner universities. Areas of coursework include Japanese spoken and written language, pre-modern and modern Japanese literature, conventional and animated film studies, early modern and modern Japanese history, Japanese anthropology, and the history of Japanese science, technology, and environment.

Students may choose an area of specialization during their coursework such as in literature or history, but all students will be required to take three years or 22 credits of Japanese language. Japanese language skills are at the heart of meaningful exchange and interaction with Japanese people. Through this demanding curriculum, students will acquire the highly specialized skills needed to succeed in Japan or in Japanese contexts, whether pursuing careers in business, academia, or science. The Japan Studies major also trains students in useful liberal arts methodologies, such as critical thinking, stylistically sound writing, and the clear, public articulation of complex ideas. During their senior year, students are required to complete a "capstone" research project which focuses on student designed and executed projects. The capstone project may be a significant research assignment in an upper-division Japan Studies course or it may be independent study with a Japan Studies faculty member.

Freshman Year

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CLS 101US</td>
<td>Knowledge and Community</td>
<td>3</td>
</tr>
<tr>
<td>WRIT 101W</td>
<td>College Writing I</td>
<td>3</td>
</tr>
<tr>
<td>Math Core</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>HSTR 145D</td>
<td>Reinventing Japan</td>
<td>4</td>
</tr>
<tr>
<td>JPNS 101</td>
<td>Elementary Japanese I</td>
<td>4</td>
</tr>
<tr>
<td>JPNS 102D</td>
<td>Elementary Japanese II</td>
<td>4</td>
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<td>University Core and Electives</td>
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<td></td>
</tr>
<tr>
<td>Year Total:</td>
<td></td>
<td>30</td>
</tr>
</tbody>
</table>

Sophomore Year

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>JPNS 201D</td>
<td>Intermediate Japanese I</td>
<td>4</td>
</tr>
<tr>
<td>JPNS 202D</td>
<td>Intermediate Japanese II</td>
<td>4</td>
</tr>
<tr>
<td>ANTY 242D</td>
<td>Contemporary Japan</td>
<td>3</td>
</tr>
<tr>
<td>Choose one of the following:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ARTH 360</td>
<td>History of Asian Art and Architecture</td>
<td>3</td>
</tr>
<tr>
<td>HSTR 140D</td>
<td>Modern Asia</td>
<td>4</td>
</tr>
<tr>
<td>HSTR 345</td>
<td>Modern China</td>
<td>4</td>
</tr>
<tr>
<td>HSTR 346</td>
<td>Modern India</td>
<td>4</td>
</tr>
<tr>
<td>HSTR 443</td>
<td>Gender in Asia</td>
<td>3</td>
</tr>
<tr>
<td>Year Total:</td>
<td></td>
<td>30</td>
</tr>
</tbody>
</table>
Latin American and Latino Studies Minor (Non-Teaching)

A Latin American and Latino Studies minor (LALS) is available to provide students interested in Latin American and Latino history and language with valuable interdisciplinary skills. Because this is an interdisciplinary program, students will enroll in courses in History and Philosophy and Modern Languages. Courses in Sociology and Anthropology, as well as other departments with relevant course content, will also be allowed for credit subject to approval by the program coordinator. This minor will complement majors for students pursuing graduate school and professional programs in agriculture, engineering, history, literature, political science, sociology, international business, and more. The minor will also strengthen the skill-sets of students who wish to become more competitive in the Spanish speaking job market, either abroad or in the United States. A minor in LALS will prepare students for the close relationship developing between Latin American and the United States in trade agreements, the growing immigrant laborers, and the expansion of Latin American and Latino communities in the United States with significant political and economic power.

The equivalent of four semesters of Spanish language is required. Students with prior experience in Spanish language may have some requirements waived. Students interested in the LALS minor should consult with the Modern Language Department immediately upon their decision to fulfill the minor so that they can ascertain the language requirements that are appropriate for them.

Required Courses
- SPNS 101 Elementary Spanish I
- SPNS 102D Elementary Spanish II
- SPNS 201D Intermediate Spanish I
- SPNS 202D Intermediate Spanish II
- HSTR 130D Latin American History

Elective Courses
Choose four from the following for a minimum of 9 credits in junior and senior level courses (300 and 400 level):
- HSTR 330 History of Mexico
- HSTR 430 Latin Amer Soc History
- HSTR 431 Race in Latin America
- HSTR 434 Gender in Latin America
- SPNS 330 Modern Cultures Latin America
- SPNS 332 Contemp Latin Amer Literature
- SPNS 335IH Travel in Latin Am Lit & Film
- SPNS 361 Latin American Text and Cinema
- SPNS 416 Latin America: Culture and Revolution

Total Credits: 28

Not all elective courses may be taken in the same department.

Museum Studies Minor (Non-Teaching)

Museum Studies Minor
To understand the cultural significance of museums and to explore contemporary museum practices, Montana State University-Bozeman offers an interdisciplinary minor in Museum Studies that is administered through the Department of History and Philosophy. The Museum Studies minor offers students in many disciplines the opportunity to learn about the role of museums in advancing public education and academic research, to

Latin American and Latino Studies Minor (Non-Teaching)

The Japan Studies Option requires 47 credits in Japan-related courses. Not all of the four upper-division Japan Studies electives can be from the same department. Students must have a total of at least 120 credits to graduate; of those, 42 credits must be in upper-division courses (300 level or higher). With the expressed consent of the program director, the following courses may be substituted by similar courses taken in Japan under student-exchange programs:

HSTR 446 - Science and Medicine in China
PHL 270 - Philosophies of Asia
RLST 202D - Hindu Traditions
RLST 203D - Buddhist Traditions

University Core and Electives 15-16
Year Total: 29-31
Junior Year Credits

JPNS 305 - Japanese Adv Conversations 3
Choose four of the following:
- ANTY 337 - Sex, Gender, Sexuality Japan
- ANTY 343 - Popular Culture - Japan
- HSTR 340 - Age of the Shoguns
- HSTR 342 - Japan’s Long 19th Century
- HSTR 444 - Gender in Japan
- HSTR 445 - Environ, Health & Sci in Japan
- JPNS 320 - Classical Japanese Literature
- JPNS 321 - Modern Japanese Literature
- JPNS 361IH - Japanese Text and Cinema
- NASX 450 - History of American Indians

University Core and Electives 18
Year Total: 27
Senior Year Credits

Choose one of the following:
- ANTY 490R - Undergraduate Research and Instruction
- ANTY 492 - Independent Study
- HSTR 492 - Independent Study (Choose two of the following)
- HSTR 490R - Undergraduate Research 1-6
- JPNS 450R - Sem: Japanese Lit and Culture

University Core and Electives 15
Year Total: 19-24
Total Program Credits: 120

The Japan Studies Option requires 47 credits in Japan-related courses. Not all of the four upper-division Japan Studies electives can be from the same department. Students must have a total of at least 120 credits to graduate; of those, 42 credits must be in upper-division courses (300 level or higher). With the expressed consent of the program director, the following courses may be substituted by similar courses taken in Japan under student-exchange programs:

ARTh 360 - History of Asian Art and Architecture 3
HSTR 140D - Modern Asia 4
HSTR 345 - Modern China 3
HSTR 346 - Modern India 3
HSTR 443 - Gender in Asia 3
JPNS 101 - Elementary Japanese I 4
JPNS 102D - Elementary Japanese II 4
PHL 270 - Philosophies of Asia 3
RLST 202D - Hindu Traditions 3
RLST 203D - Buddhist Traditions 3

Students must receive a grade of C- or better in all required courses.
Moreover, students are required to become knowledgeable about one or more areas of science, technology, environmental studies, or public policy, as the department believes such literacy is an important part of a land-grant institution liberal arts education. Students will therefore be required to take at least 12 credits in an appropriate science, social science or engineering discipline. Finally, a capstone is required for all students; each will complete an original research paper synthesizing their scientific, technological, and humanistic knowledge.

### SETS Option

#### Freshman Option

**Credits** | **Year Total:** | **Sophomore Option** | **Credits**
--- | --- | --- | ---
Choose two of the following: | 6-8 | Choose one of the following: | 3
- HSTA 101IH - American History I | | - HSTR 207CS - Sci and Tech in World History |
- HSTA 160D - Introduction to the Am West | | - HSTR 282CS - Darwinian Revolution |
- AMST 101D - Introduction to American Studies | | - PHL 205CS - Other Animals |
- HSTR 101IH - Western Civilization I | | - PHL 242CS - Snc/Pseudo Snc & Subjectivity |
- HSTR 102IH - Western Civilization II | | Choose an approved Science/Technology/Social Science course, consult with a SETS advisor |
- HSTR 130D - Latin American History | | 3-4
- HSTR 135D - The Modern Middle East | | One Year Modern Language. The student may elect to take an additional nine credits of upper-division history courses instead of one-year modern language requirement. |
- HSTR 140D - Modern Asia | | University Core and Electives | 11
- HSTR 145D - Reinventing Japan | | Year Total: | 28-30
- PHL 101IH - Intro Phil:Reason and Reality | | Sophomore Year | Credits |
or PHL 110IH - Intro Ethics:Good and Evil | 3 | RLST 100D - Intro to the Study of Religion |
- University Core and Electives | 19 | or RLST 110D - Religion, Conflict & Politics |
| | 28-30 | |

#### Senior Year

**Credits** | **Year Total:** | **Senior Year** | **Credits**
--- | --- | --- | ---
Choose one of the following: | 3 | Choose a Museum Studies Minor |
- HSTR 207CS - Sci and Tech in World History | | |
- HSTR 282CS - Darwinian Revolution | | |
- PHL 205CS - Other Animals | | |
- PHL 242CS - Snc/Pseudo Snc & Subjectivity | | |
- Choose an approved Science/Technology/Social Science course, consult with a SETS advisor | 3-4 | |
- One Year Modern Language. The student may elect to take an additional nine credits of upper-division history courses instead of one-year modern language requirement. | 6 |
- University Core and Electives | 11 |
- Year Total: | 28-30 |

#### Junior Year

**Credits** | **Year Total:** | **Junior Year** | **Credits**
--- | --- | --- | ---
Choose one of the following: | 3 | Choose a Museum Studies Minor |
- PHL 303 - Approaches to Epistemology | | |
- PHL 321 - Philosophy & Biomedical Ethics | | |
- PHL 322 - Philosophy & Environmental Ethics | | |
- PHL 353 - Philosophy and Technology | | |
- PHL 354 - Philosophy of Race | | |
- RLST 402 - Natural/Unnatural/Supernatural | | |
- RLST 326 - Topics in Religion | | |
- Choose an approved Science/Technology/Social Science course, consult with a SETS advisor | 6 |
- University Core and Electives | 21 |
- Year Total: | 30 |
Liberal Studies

Senior Year

Choose six of the following:

HSTA 412IH - American Thought and Culture
HSTR 417 - Early Modern Science
HSTR 419 - Modern Science
HSTR 445 - Environ, Health & Sci in Japan
HSTR 446 - Science and Medicine in China
HSTA 468 - History of Yellowstone
HSTA 470 - American Environmental History
HSTA 482 - History of American Technology
HSTR 482 - Animal Histories
HSTR 484 - World Environmental History
HSTR 486 - Museum History

Choose an approved Science/Technology/Social Science course--consult with a SETS advisor.

Choose one of the following:

HST 490R - Undergraduate Research
HSTR 499R - Sen Capstone: Hist Methodology
PHL 490R - Undergraduate Research
RLST 490R - Undergraduate Research

University Core and Electives

Year Total: 30-31

Total Program Credits: 120

Approved Science/Technology/Social Sciences Courses for SETS Option

In addition to satisfying the university core science requirements, students, only after consultation with their academic advisor, are required to take 12 credits of science in one science or engineering or social science or public policy discipline. One of these courses must be at the 300 or 400 level.

A minimum of 120 credits is required for graduation; 42 of these credits must be in courses numbered 300 and above. Students must receive a grade of C- or better in all required courses.

Liberal Studies

The Liberal Studies degree offers an interdisciplinary approach to a well-rounded education which emphasizes reading, reasoning, and communication skills in addition to substantive knowledge that will allow graduates to thrive in a broad range of career contexts and to pursue lifelong learning.

All students are required to choose one of three program options, either the Quaternity option (also available online) which offers the more traditional broad-based liberal arts education, or a cross-disciplinary cluster of thematically related courses (option II), which currently includes the Environmental Studies and the Global and Multicultural Studies options. Courses that are used to satisfy one degree requirement cannot be used to satisfy another. Students must complete a minimum of 45 credits in the program after declaring themselves to be Liberal Studies majors.

For details about the Liberal Studies degree, contact the College of Letters and Science by calling 406-994-7805, sending e-mail to liberalstudies@montana.edu, or checking the liberal studies website at www.montana.edu/lstdegree.

Liberal Studies Seminars

All students in Liberal Studies, regardless of option, are encouraged to take a series of integrative seminars (LS 101US and LS 301) or other LS seminars. These seminars are designed to provide a sense of academic community, improved critical thinking and communication skills, and a better understanding of the factual knowledge and theoretical foundations of the disciplines encompassed by the arts, humanities, natural sciences, and social sciences.

Integrative Studies Requirement

Students are required to take 4 courses (minimum of 12 credits) in addition to the university’s Core curriculum, one course each in arts, humanities, natural science, and social sciences.

Foreign Language Requirement

Students in the Quaternity option are to complete the first two courses in a foreign language or to demonstrate equivalent competency. Students in the Global and Multicultural option are to complete the first three courses in a foreign language or to demonstrate equivalent competency.

Capstone Experience

All students in the major take a common 4-credit capstone course in their final year. Students must have completed their foreign language requirement before taking the capstone course. Students work individually or in small groups to design solutions to contemporary public policy issues (e.g., overpopulation). Each project results in a scholarly product (typically a paper and a presentation) that serves as a tangible and measurable indication of the extent to which students have mastered the critical thinking, reading, writing, and oral communication skills that are the principal learning objectives of the program.

Undergraduate Programs

Environmental Studies Option (p. 216)
Global and Multicultural Studies Option (p. 218)
Quaternity Option (p. 220)

Undergraduate Minors

Global Studies Minor (p. 220)

Environmental Studies Option

This option is designed for students interested in developing a broad understanding of environmental issues from scientific and public policy perspectives. In addition to some common foundations courses (BIOB 170IN, ERTH 101IN, GPHY 121D, STAT 216Q, and PHL 322 or HSTA 470), students select 21 credits each from approved list of science and public policy courses. Twelve credits of science and of public policy must be upper division courses (300 or 400 level). Proposed substitutions must be submitted in writing to the Program Director.

Freshman Year

<table>
<thead>
<tr>
<th>Course</th>
<th>Fall</th>
<th>Credits</th>
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<tbody>
<tr>
<td>LS 101US - Ways of Knowing</td>
<td>3</td>
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<tr>
<td>WRIT 101W - College Writing I</td>
<td>3</td>
<td></td>
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<tr>
<td>BIOB 170IN - Principles of Biological Diversity</td>
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<tr>
<td>Electives</td>
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<tr>
<td>ERTH 101IN - Earth System Sciences</td>
<td>4</td>
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<tr>
<td>GPHY 121D - Human Geography</td>
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<tr>
<td>Public Policy Electives (see below)</td>
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Sophomore Year

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<tr>
<th>Course</th>
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<tbody>
<tr>
<td>LS 301 - Integrative Seminar</td>
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</table>
Integrative Studies: 6
Public Policy Electives (see below): 3
University Core: 3
Electives: 3
STAT 216Q - Introduction to Statistics: 3
Integrative Studies: 6
Natural Science Electives (see below): 3
University Core: 3
Year Total: 16

**Junior Year**

<table>
<thead>
<tr>
<th>Credits</th>
<th>Fall</th>
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<tbody>
<tr>
<td>1</td>
<td>LS 301 - Integrative Seminar</td>
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<tr>
<td>3</td>
<td>PHL 322 - Philosophy &amp; Environmental Ethics</td>
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<td>3</td>
<td>Natural Science Electives (see below)</td>
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<td>3</td>
<td>Public Policy Electives (see below)</td>
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<td>3</td>
<td>University Core</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Electives</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Natural Science Electives (see below)</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Public Policy Electives (see below)</td>
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**Senior Year**

<table>
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<th>Credits</th>
<th>Fall</th>
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<tbody>
<tr>
<td>1</td>
<td>LS 301 - Integrative Seminar</td>
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<td>3</td>
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<td>LS 401 - Senior Project</td>
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Per MSU requirements for the degree, a minimum of 42 credits must be in courses numbered 300 and above. In addition to LS 401, at least 15 credits must be in courses that apply to the Liberal Studies degree and are numbered 300 and above.

**Natural Sciences Electives to be chosen from**

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<tr>
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<tr>
<td>ANSC 491</td>
<td>Special Topics</td>
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<tr>
<td>BIOB 420</td>
<td>Evolution</td>
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<tr>
<td>BIOE 103CS</td>
<td>Environmental Science and Society</td>
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</tr>
<tr>
<td>BIOE 370</td>
<td>General Ecology (equiv to 270)</td>
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<tr>
<td>BIOE 405</td>
<td>Behavioral and Evolutionary Ecology</td>
<td>3</td>
</tr>
<tr>
<td>BIOE 416</td>
<td>Alpine Ecology</td>
<td>3</td>
</tr>
<tr>
<td>BIOE 417</td>
<td>Yellowstone Wildlife Ecology</td>
<td>3</td>
</tr>
<tr>
<td>BIOE 439</td>
<td>Stream Ecology</td>
<td>3</td>
</tr>
<tr>
<td>BIOE 440R</td>
<td>Conservation Biology</td>
<td>3</td>
</tr>
<tr>
<td>BIOO 162CS</td>
<td>Insects and Human Society</td>
<td>3</td>
</tr>
<tr>
<td>BIOO 220</td>
<td>General Botany</td>
<td>3</td>
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<tr>
<td>CHMY 143</td>
<td>College Chemistry II</td>
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<tr>
<td>CHMY 153</td>
<td>Honors College Chemistry II</td>
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<tr>
<td>ENSC 110</td>
<td>Land Res Environ Sciences</td>
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<tr>
<td>ENSC 245IN</td>
<td>Soils</td>
<td>3</td>
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<tr>
<td>ENSC 272CS</td>
<td>Water Resources</td>
<td>3</td>
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<tr>
<td>ENSC 444</td>
<td>Watershed Hydrology</td>
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<td>ENSC 454</td>
<td>Landscape Pedology</td>
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<tr>
<td>ENSC 460</td>
<td>Soil Remediation</td>
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<td>ENSC 461</td>
<td>Restoration Ecology</td>
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<tr>
<td>ERTH 212RN</td>
<td>Yellowstone: Scientific Lab</td>
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<td>ERTH 305</td>
<td>Weather and Climate</td>
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<tr>
<td>ERTH 307</td>
<td>Principles of Geomorphology</td>
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<tr>
<td>ERTH 432R</td>
<td>Surface Water Resources</td>
<td>3</td>
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<td>GEO 103CS</td>
<td>Intro to Environmental Geology</td>
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<tr>
<td>GEO 105IN</td>
<td>Oceanography</td>
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<td>GEO 420</td>
<td>Hydrogeology</td>
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<td>GPHY 411</td>
<td>Biogeography</td>
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<tr>
<td>GPHY 426</td>
<td>Remote Sensing</td>
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<td>GPHY 441R</td>
<td>Mountain Geography</td>
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<tr>
<td>HORT 105</td>
<td>Miracle Growing</td>
<td>3</td>
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<tr>
<td>HORT 345</td>
<td>Market Gardening</td>
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<tr>
<td>NRSM 101</td>
<td>Natural Resource Conservation</td>
<td>3</td>
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<tr>
<td>NRSM 102</td>
<td>Montana Range Plants</td>
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<td>NRSM 240</td>
<td>Natural Resource Ecology</td>
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<tr>
<td>NRSM 330</td>
<td>Fire Ecology and Mgmt</td>
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<tr>
<td>NRSM 353</td>
<td>Grazing Ecology and Management</td>
<td>3</td>
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<tr>
<td>NRSM 455</td>
<td>Riparian Ecology &amp; Management</td>
<td>3</td>
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<tr>
<td>UNIV 125CS</td>
<td>Microbes in the Environment</td>
<td>3</td>
</tr>
<tr>
<td>WILD 201</td>
<td>Intro to Fish and Wildlife</td>
<td>1</td>
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<tr>
<td>WILD 438</td>
<td>Wildlife Habitat Ecology</td>
<td>3</td>
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</table>

Up to 12 credits required in a minor or in a second degree program may be applied toward the Natural Science and Public Policy electives.

**Public Policy electives to be chosen from**

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>AGBE 210IS</td>
<td>Economics of Ag Business</td>
<td>3</td>
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<tr>
<td>AGBE 337</td>
<td>Agricultural Law</td>
<td>3</td>
</tr>
<tr>
<td>AGSC 465R</td>
<td>Health, Agriculture, Poverty</td>
<td>4</td>
</tr>
<tr>
<td>BMGT 406</td>
<td>Negotiation/Dispute Resolution</td>
<td>3</td>
</tr>
<tr>
<td>BMGT 473</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>ECHM 205CS</td>
<td>Energy and Sustainability</td>
<td>3</td>
</tr>
<tr>
<td>ECNS 101IS</td>
<td>Economic Way of Thinking</td>
<td>3</td>
</tr>
<tr>
<td>ECNS 132</td>
<td>Econ &amp; the Environment</td>
<td>3</td>
</tr>
<tr>
<td>ECNS 317</td>
<td>Economic Development</td>
<td>3</td>
</tr>
<tr>
<td>ECNS 332</td>
<td>Econ of Natural Resources</td>
<td>3</td>
</tr>
<tr>
<td>GPHY 141D</td>
<td>Geography of World Regions</td>
<td>3</td>
</tr>
<tr>
<td>GPHY 284</td>
<td>Intro to GIS Science &amp; Cartog</td>
<td>3</td>
</tr>
<tr>
<td>GPHY 321</td>
<td>Urban Geography</td>
<td>3</td>
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<tr>
<td>GPHY 322</td>
<td>Economic Geography</td>
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<tr>
<td>GPHY 365</td>
<td>Geographical Planning</td>
<td>3</td>
</tr>
<tr>
<td>GPHY 384</td>
<td>Adv GIS and Spatial Analysis</td>
<td>3</td>
</tr>
<tr>
<td>GPHY 461</td>
<td>Tourism Planning</td>
<td>3</td>
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<tr>
<td>HSTA 468</td>
<td>History of Yellowstone</td>
<td>3</td>
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<tr>
<td>HSTA 470</td>
<td>American Environmental History</td>
<td>3</td>
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<tr>
<td>HSTR 484</td>
<td>World Environmental History</td>
<td>3</td>
</tr>
<tr>
<td>NRSM 421</td>
<td>Holistic Thought/Mgmt</td>
<td>4</td>
</tr>
<tr>
<td>NRSM 430</td>
<td>Natural Resource Law</td>
<td>3</td>
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<tr>
<td>PS CI 210IS</td>
<td>Introduction to American Government</td>
<td>3</td>
</tr>
<tr>
<td>PS CI 306</td>
<td>Legislative Process</td>
<td>3</td>
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</table>
Global and Multicultural Studies Option

The Global and Multicultural option offers students a broad perspective on international and American cultural, ethnic, and gender issues spanning a wide range of disciplines. Students will select 27 credits (18 of which need to be 300 or 400 level) to provide deeper understanding of that region or field of study. In addition, students are required to achieve competence, at an intermediate level, in a foreign language appropriate to their field of area studies. Studies in this option are encouraged to study abroad in a region appropriate to their field of area studies. Credits earned abroad may, with the approval of the Program Director, be substituted for global/multicultural courses numbered 300 and above.

Per MSU requirements for the degree, a minimum of 42 credits must be in courses numbered 300 and above.

Global and multicultural electives to be chosen from:

<table>
<thead>
<tr>
<th>Course</th>
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<tbody>
<tr>
<td>AGSC 465R</td>
<td>Health, Agriculture, Poverty</td>
</tr>
<tr>
<td>ANTY 101D</td>
<td>Anthropology and the Human Experience</td>
</tr>
<tr>
<td>ANTY 225IS</td>
<td>Culture, Language, and Society</td>
</tr>
<tr>
<td>ARCH 221</td>
<td>World Architecture: Modern to Contemporary</td>
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<tr>
<td>ARCH 322IA</td>
<td>World Architecture I</td>
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<td>ARCH 323IA</td>
<td>World Architecture II</td>
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<td>ARTH 462</td>
<td>Islamic Art And Architecture</td>
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<td>BGEN 242D</td>
<td>Intro to Int’l Business</td>
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<td>BGEN 245D</td>
<td>Cultural Dimensions of International Business</td>
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<td>International Management</td>
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<td>International Marketing</td>
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<td>ECNS 314</td>
<td>International Economics</td>
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<td>ECNS 317</td>
<td>Economic Development</td>
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<td>EDU 211D</td>
<td>Multicultural Education</td>
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<tr>
<td>GPHY 121D</td>
<td>Human Geography</td>
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<td>GPHY 141D</td>
<td>Geography of World Regions</td>
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<td>GPHY 325</td>
<td>Cultural Geography</td>
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<td>HSTA 416</td>
<td>Race and Class in America</td>
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<tr>
<td>HSTR 135D</td>
<td>The Modern Middle East</td>
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<tr>
<td>HSTR 160D</td>
<td>Modern World History</td>
</tr>
<tr>
<td>HSTR 366</td>
<td>Middle East/20th Century</td>
</tr>
<tr>
<td>HSTR 468</td>
<td>The Making of Modern Turkey</td>
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<tr>
<td>HSTR 484</td>
<td>World Environmental History</td>
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<td>LIT 214D</td>
<td>Regional Literature</td>
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<td>LIT 285D</td>
<td>Mythologies</td>
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<td>LIT 308</td>
<td>Multicultural Literature</td>
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<tr>
<td>LIT 440</td>
<td>Studies in World Literature</td>
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<tr>
<td>ML 100H</td>
<td>Intro to World Cultures</td>
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<td>MUSI 3071A</td>
<td>World Music</td>
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<td>PHL 110H</td>
<td>Intro Ethics;Good and Evil</td>
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<td>PHL 255D</td>
<td>Philosophy and Culture</td>
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<td>PHL 308</td>
<td>Language and the World</td>
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<td>PHL 354</td>
<td>Philosophy of Race</td>
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<td>PSCI 230D</td>
<td>Introduction to International Relations</td>
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<td>PSCI 331</td>
<td>International Relations Theory</td>
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Europe

PSCI 434 International Law 3
PSCI 436 Politics of Food & Hunger 3
PSCI 437 International Political Econ 3
PSCI 439 International Human Rights 3
RLST 100D Intro to the Study of Religion 3
RLST 110D Religion, Conflict & Politics 4
RLST 402 Natural/Unnatural/Supernatural 3
RLST 410 What is Religion? 3
SOCI 344 Sociology of Race & Ethnicity 3
SOCI 358 Crime and Inequality 3
SOCI 370 Sociology of Globalization 3
SOCI 373 Sociology of Indigenous People 3
SOCI 434 Sociology of Human Sexuality 3
SOCI 436 Law and Inequality 3

With consent of the program director, courses from the Area Studies categories below, excluding Europe, may be applied as Global and Multicultural Electives.

Area studies electives to be selected from courses on one of the following areas

Asia

ANTY 242D Contemporary Japan 3
ANTY 337 Sex, Gender, Sexuality Japan 3
ANTY 338 Contemporary Pacific Societies 3
ANTY 343 Popular Culture - Japan 3
ANTY 441 Social Movements in Japan 3
ARTH 360 History of Asian Art and Architecture 3
CHIN 130D Historical and Literary Journey into Modern China 3
CHIN 320IH History of Chinese Cinema 3
GPHY 446 East Asia in the Global System 3
HSTR 140D Modern Asia 4
HSTR 145D Reinventing Japan 4
HSTR 340 Age of the Shoguns 3
HSTR 342 Japan’s Long 19th Century 3
HSTR 345 Modern China 3
HSTR 346 Modern India 3
HSTR 443 Gender in Asia 3
HSTR 444 Gender in Japan 3
HSTR 445 Environ, Health & Sci in Japan 3
HSTR 446 Science and Medicine in China 3
JPNS 150D Japanese Culture & Civ 3
JPNS 320 Classical Japanese Literature 3
JPNS 321 Modern Japanese Literature 3
JPNS 361IH Japanese Text and Cinema 3
PHL 270 Philosophies of Asia 3
RLST 202D Hindu Traditions 3
RLST 203D Buddhist Traditions 3

Europe

ARTH 200IA Art of World Civilization I 4
ARTH 201IA Art of World Civilization II 4
FRCH 306IH French: From Reflection to Rev 3
GRMN 303IH Issues of German Cinema 3
GRMN 360IH German Myths 3
HSTR 101IH Western Civilization I 4
HSTR 102IH Western Civilization II 4
HSTR 322 19th Century Europe 3
HSTR 324 20th Century Europe 3
HSTR 350 Modern Britain 3
HSTR 353 Modern France 3
HSTR 359 Russia to 1917 3
HSTR 362 Modern Germany 3
HSTR 372 The World at War 3
HSTR 423 European Intellectual History 3
LIT 320 Advanced British Literature I (Formerly LIT 324) 3
LIT 321 Advanced British Literature II (Formerly LIT 325) 3
LIT 322 Advanced British Literature III (Formerly LIT 326) 3
LIT 473RH Studies in Shakespeare 3
MUSI 211IA Masterworks in Music 3
PHL 361RH Hist of Philo/Ancient/Medieval 3
PHL 362 History of Philosophy: Modern 3
PHL 383 Reason and Revolution 3
PSCI 356 Classical Political Thought 3

Latin America

HSTR 130D Latin American History 4
HSTR 232D Religion in Latin America 3
HSTR 330 History of Mexico 3
HSTR 430 Latin Amer Soc History 3
HSTR 431 Race in Latin America 3
HSTR 432 Colonial Latin America 3
HSTR 434 Gender in Latin America 3
SOCI 368 Latino Immigration 3
SPNS 330 Modern Cultures Latin America 3
SPNS 332 Contemp Latin Amer Literature 3
SPNS 335IH Travel in Latin Am Lit & Film 3
SPNS 362 Hispanic Poetry 3
SPNS 416 Latin America: Culture and Revolution 3
SPNS 430 Latin Amer Perspectives 3

Native American Studies

ANTY 332 Native North America 3
NASX 205D Native Americans in Contemporary Society 3
NASX 105D Intro Native Amer Studies 3
NASX 232D MT Indians: Cultures, Histories, Current Issues 3
NASX 239 Native North American History through Art and Material Culture 3
NASX 280IS Native American Studies Research Theories and Methods 3
NASX 304 Native American Beliefs and Philosophy 3
NASX 310 Native Cultures of North America 3
NASX 340 Native American Literature 3
NASX 360 Native Americans and Cinema 3
NASX 405 Gender Issues in Native American Studies 3
NASX 415 Native Food Systems 3
NASX 430 American Indian Education 3
The Liberal Studies Quaternity option is a student-centered option that aims at exploring four different, but interconnected concepts of knowledge—thinking, feeling, intuition, and sensation—which are derived from the complex interaction of mythos (story, fable, imagination) and logos (truth, fact, reality). Students in the Quaternity option are expected to approach and to integrate all of their courses through this epistemological lens, and to demonstrate that they have done so through writing assignments in the Liberal Studies seminars and other course assignments.

In addition to the integrative seminars, university core, and the liberal studies requirements, students in Quaternity require a foreign language (8 cr.) and an additional 4 courses (12 cr.) in each area of the Quaternity: arts, humanities, natural science or Mathematics, and social sciences. At least six credits in each area of Quaternity must be upper division (300 or 400 level).

Freshman Year

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<th>Credits</th>
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<td>WRIT 101W - College Writing I</td>
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<td>Modern Language</td>
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Sophomore Year

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<tr>
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<tr>
<td>Integrative Studies - Natural Sciences</td>
<td>3</td>
</tr>
<tr>
<td>Integrative Studies - Social Science</td>
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<tr>
<td>University Core</td>
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<tr>
<td>Integrative Studies - Fine Arts</td>
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Junior Year

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Senior Year

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Total Program Credits: 120

* Up to 6 credits required in a minor or in a second degree program may be applied toward the Global & Multicultural and Area Studies electives.

Per MSU requirements for the degree, a minimum of 42 credits must be in courses numbered 300 and above.

Global Studies Minor

Advisor Approved Study abroad Coursework | 6

Capstone Seminar

14 Credits of International Course Work
9 Credits must be upper division (300-400 level).

<table>
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<tbody>
<tr>
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<td>AGBE 315 - Ag in a Global Context</td>
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<td>AGBE 321 - Economics of Ag Marketing</td>
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<tr>
<td>ANTY 101D - Anthropology and the Human Experience</td>
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<tr>
<td>ANTY 225IS - Culture, Language, and Society</td>
</tr>
<tr>
<td>ANTY 343 - Popular Culture - Japan</td>
</tr>
<tr>
<td>ANTY 441 - Social Movements in Japan</td>
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</table>
Mathematics Option

The mathematics option prepares students for graduate work in mathematics. The core of the program is built around three years of analysis, as well as courses in abstract and linear algebra. The program is flexible enough to accommodate students who wish to prepare for employment in business, industry, or government as analysts or specialists in the area of scientific computing. The core mathematics curriculum taken in conjunction with a secondary emphasis in other subject matter areas will prepare a student for employment as an analyst or computational specialist in those areas.

Applied Mathematics Option

Applied mathematicians learn to describe physical phenomena using deterministic models. These models are applicable to the biological and physical sciences and the student is trained to use differential equations, mathematical analysis and computational science to draw insights into various exciting fields.

Applied mathematics is primarily designed to prepare graduates for employment in business, industry, and government. However, an appropriate choice of electives can ensure the student a solid preparation for graduate work in mathematics, statistics, or scientific computing. The program demonstrates the utility of mathematics to solve problems arising in real industrial applications. Graduates will be qualified for professional careers in computational applications of mathematics, statistics, and other related fields.

Mathematics Teaching Option

The teaching option in the mathematics curriculum is designed specifically to prepare students to teach mathematics at the middle school and high school levels. The program includes the mathematics courses for a teaching major and the necessary courses in education which qualify the student for school levels. The program includes the mathematics courses for a teaching major and the necessary courses in education which qualify the student for teacher's licensure.

Students are encouraged to pursue a teaching minor in an additional area and should contact an advisor for details.

Statistics Option

Statisticians are trained in principles of quantitative reasoning. They learn how to discover patterns in data, how to display data, how to construct mathematical models for data, and how to detect biases and uncertainties in data summaries or models. They are trained to design and analyze observational studies, surveys, and scientific experiments. The computer is an essential tool for statistical work.

Statisticians are in demand; successful students should find that job opportunities are excellent. Although positions are available nationwide, the best employment opportunities are found in urban areas, industrial sites, and centers of government. The statistics option prepares students for such positions or for entry into a graduate program in statistics.

Undergraduate Programs

- Mathematics Option (p. 224)
- Applied Mathematics Option (p. 223)
- Statistics Option (p. 226)
- Mathematics Teaching Option (p. 225)

Undergraduate Minors

- Mathematics Minor (Non-Teaching) (p. 223)
- Mathematics Teaching Minor (p. 134)
- Statistics Minor (Non-Teaching) (p. 225)
## Department of Mathematical Sciences

### Degrees Offered
- M.S. in Mathematics (p. 367)
- M.S. in Mathematics (Mathematics Education Option) (p. 387)
- M.S. in Statistics (p. 368)
- Ph.D. in Mathematics (p. 369)
- Ph.D. in Mathematics (Mathematics Education Emphasis) (p. 370)
- Ph.D. in Statistics (p. 371)
- Graduate Certificate in Applied Statistics (p. 367)

### Applied Mathematics Option

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<td>Calculus I</td>
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<td>Honors Calculus I</td>
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<tr>
<td>M 172Q</td>
<td>Calculus II</td>
<td>4</td>
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<td>or M 182Q</td>
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<tr>
<td>M 221</td>
<td>Introduction to Linear Algebra</td>
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</tr>
<tr>
<td>M 242</td>
<td>Methods of Proof</td>
<td>3</td>
</tr>
<tr>
<td>M 273Q</td>
<td>Multivariable Calculus</td>
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<tr>
<td>or M 283Q</td>
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<td>M 274</td>
<td>Introduction to Differential Equation</td>
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<tr>
<td>or M 284</td>
<td>Honors Introduction to Differential Equations</td>
<td>3</td>
</tr>
<tr>
<td>M 348</td>
<td>Techniques of Applied Math I</td>
<td>3</td>
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<td>M 349</td>
<td>Techniques of Applied Mathematics II</td>
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<td>Software Applications in Mathematics</td>
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<td>Numerical Linear Algebra &amp; Optimization</td>
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<td>M 442</td>
<td>Numerical Solution of Differential Equations</td>
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<td>STAT 332</td>
<td>Statistics for Scientists and Engineers</td>
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Choose four from the following math or statistics electives: 

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<th>Course Code</th>
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<td>M 333</td>
<td>Linear Algebra</td>
<td>3</td>
</tr>
<tr>
<td>M 383</td>
<td>Introduction to Analysis I</td>
<td>3</td>
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<td>M 384</td>
<td>Introduction to Analysis II</td>
<td>3</td>
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<tr>
<td>M 431</td>
<td>Abstract Algebra I</td>
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<td>Applied Mathematics I</td>
<td>3</td>
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<td>M 451</td>
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<td>M 455</td>
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<td>Introduction to Complex Analysis</td>
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<td>Probability Theory</td>
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</table>

** Total Credits: ** 64

* Six of these 12 credits must be from M 430, M 450, M 451, M 454, M 455.

** PHSX 220, PHSX 222, and PHSX 224 are required. However, with the agreement of the student’s advisor, PHSX 224 may be replaced by PHSX 301, or both PHSX 222 and PHSX 224 may be replaced by a two-course sequence in another mathematical application area.

A minimum of 120 credits is required for graduation; 42 of these credits must be in courses numbered 300 and above. Core 2.0 must be completed for graduation.

### Freshman Year

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<td>Calculus I</td>
<td>4</td>
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<td>or M 181Q</td>
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### Sophomore Year

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<tr>
<td>M 273Q</td>
<td>Multivariable Calculus</td>
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<tr>
<td>or M 283Q</td>
<td>Honors Multivariable Calculus</td>
<td></td>
</tr>
<tr>
<td>M 274</td>
<td>Introduction to Differential Equation</td>
<td>3</td>
</tr>
<tr>
<td>or M 284</td>
<td>Honors Introduction to Differential Equations</td>
<td>3</td>
</tr>
<tr>
<td>M 348</td>
<td>Techniques of Applied Math I</td>
<td>3</td>
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<td>M 349</td>
<td>Techniques of Applied Mathematics II</td>
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<tr>
<td>M 386R</td>
<td>Software Applications in Mathematics</td>
<td>3</td>
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<tr>
<td>M 441</td>
<td>Numerical Linear Algebra &amp; Optimization</td>
<td>3</td>
</tr>
<tr>
<td>M 442</td>
<td>Numerical Solution of Differential Equations</td>
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<tr>
<td>STAT 332</td>
<td>Statistics for Scientists and Engineers</td>
<td>3</td>
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<tbody>
<tr>
<td>M 330</td>
<td>History of Mathematics</td>
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<tr>
<td>M 454</td>
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<tr>
<td>M 455</td>
<td>Introduction to Dynamical Systems II</td>
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<td>Probability Theory</td>
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** Total Credits: ** 64

### Junior Year

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<td>Software Applications in Mathematics</td>
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<td>M 441</td>
<td>Numerical Linear Algebra &amp; Optimization</td>
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** Total Credits: ** 15

### Senior Year

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<td>M 442</td>
<td>Numerical Solution of Differential Equations</td>
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** Total Credits: ** 15

** Total Program Credits: ** 120

### Mathematics Minor (Non-Teaching)

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<td>4</td>
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</tbody>
</table>
Mathematics Option

M 172Q  Calculus II  4
M 221  Introduction to Linear Algebra  3
M 273Q  Multivariable Calculus  4
M 274  Introduction to Differential Equation  4

Choose three courses from the following:  9
M 330  History of Mathematics
M 333  Linear Algebra
M 348  Techniques of Applied Math I
M 349  Techniques of Applied Mathematics II
M 383  Introduction to Analysis I
M 384  Introduction to Analysis II
M 386R  Software Applications in Mathematics
M 430  Mathematical Biology
M 431  Abstract Algebra I
M 441  Numerical Linear Algebra & Optimization
M 450  Numerical Solution of Differential Equations
M 451  Applied Mathematics I
M 454  Introduction of Dynamical Systems I
M 455  Introduction of Dynamical Systems II

Total Credits  28

Freshman Year

Fall  Credits  Spring

CLS 101US - Knowledge and Community  3
M 171Q - Calculus I  4
or M 181Q - Honors Calculus I
M 172Q - Calculus II  4
or M 182Q - Honors Calculus II
PHSX 220 - Physics I (w/ calculus)  4
University and Core Electives  4
WRIT 101W - College Writing I  3
M 172Q - Calculus II  4
or M 182Q - Honors Calculus II
PHSX 222 - Physics II (w/ calculus)  4
University Core and Electives  4
Year Total:  15  15

Sophomore Year

Fall  Credits  Spring

M 242 - Methods of Proof  3
M 273Q - Multivariable Calculus  4
or M 283Q - Honors Multivariable Calculus
M 221 - Introduction to Linear Algebra  3
M 242 - Methods of Proof  3
M 273Q - Multivariable Calculus  4
or M 283Q - Honors Multivariable Calculus
M 274 - Introduction to Differential Equation  4
or M 284 - Honors Introduction to Differential Equations
M 333 - Linear Algebra  3
M 383 - Introduction to Analysis I  3
M 384 - Introduction to Analysis II  3
M 431 - Abstract Algebra I  3
STAT 332 - Statistics for Scientists and Engineers  3
University Core and Electives  4
Year Total:  15  14

Junior Year

Fall  Credits  Spring

M 333 - Linear Algebra  3
M 383 - Introduction to Analysis I  3
Math or Stat Elect (See List Above)  3
University Core and Electives  6
M 384 - Introduction to Analysis II  3
Math or Stat Elect (See List Above)  3
University Core and Electives  9
Year Total:  15  15

Senior Year

Fall  Credits  Spring

Math or Stat Elect (See List Above)  6
University Core and Electives  9
M 431 - Abstract Algebra I  3
Math or Stat Elect (See List Above) 3
University Core and Electives 10
Year Total: 15 16
Total Program Credits: 120

Mathematics Teaching Option
Single Subject Endorsement (p. 225)
M 171Q  Calculus I 4
M 172Q  Calculus II 4
M 221  Introduction to Linear Algebra 3
M 242  Methods of Proof 3
M 273Q  Multivariable Calculus 4
M 274  Introduction to Differential Equation 4
M 328  Higher Math for Sec Teachers 3
M 329  Modern Geometry 3
M 428  Mathematical Modeling for Teachers 3
STAT 216Q  Introduction to Statistics 3
STAT 217Q  Intermediate Statistical Concepts 3
PHSX 205  College Physics I 4
or PHSX 220  Physics I (w/ calculus) 4
FCS 101IS  Indiv and Fam Dev: Lifespan 3
or EDEC 160  Early Childhood through Adolescent Development 3
EDSP 306  Exceptional Learners 3
EDU 202  Early Field Experience 1
EDU 211D  Multicultural Education 3
EDU 223IS  Educ Psych and Adolescent Dev 3
EDU 370  Integrating Tech into Educ 2
EDU 372  Assessmt, Curric, Instructn 3
EDU 395  Practicum 3
EDU 408  Professional Issues: K-12 2
EDU 497  Methods 3
EDU 497R  Methods: 5-8 Mathematics 3
EDU 495  Student Teaching 12

Nine credits of electives are required. These credits may be chosen from any mathematics or statistics course numbered 300 or above.

Single Subject Endorsement
Freshman Year Credits
EDU 101US - Teaching and Learning Fall 3
or CLS 101US - Knowledge and Community Spring
or COM 110US - Knowledge and Community
or LS 101US - Ways of Knowing
or UH 201US - Texts & Critics: Knowledge
or UH 301US - Texts and Critics II
or US 101US - First Year Seminar
or US 121US - ED, SOC, Issues, Digital Age
FCS 101IS - Indiv and Fam Dev: Lifespan 3
or EDEC 160 - Early Childhood through Adolescent Development 3
M 171Q - Calculus I 4
University and Core Electives 5
EDU 202 - Early Field Experience 1
WRIT 101W - College Writing I
M 172Q - Calculus II 4
PHSX 205 - College Physics I 4
University Core and Electives 3
Year Total: 15 15
Sophomore Year Credits
EDU 223IS - Educ Psych and Adolescent Dev Fall 3
EDU 370 - Integrating Tech into Educ Spring 2
M 221 - Introduction to Linear Algebra 3
M 273Q - Multivariable Calculus 4
STAT 216Q - Introduction to Statistics 3
EDU 211D - Multicultural Education 3
EDU 223IS - Educ Psych and Adolescent Dev 4
M 242 - Methods of Proof 3
STAT 217Q - Intermediate Statistical Concepts 3
University Core and Electives 3
Year Total: 15 16
Junior Year Credits
EDU 382 - Assessmt, Curric, Instructn Fall 3
M 328 - Higher Math for Sec Teachers Spring 3
Math/Stat(300+)
University Core and Electives 6
EDU 497R - Methods: 5-8 Mathematics 3
EDSP 306 - Exceptional Learners 3
M 329 - Modern Geometry 3
Math/Stat(300+)
University Core and Electives 3
Year Total: 15 16
Senior Year Credits
EDU 395 - Practicum Fall 3
M 428 - Mathematical Modeling for Teachers Spring 3
EDU 497 - Methods 3
Math/Stat(300+)
University Core and Electives 3
EDU 408 - Professional Issues: K-12 2
EDU 495 - Student Teaching 12
Year Total: 15 14
Total Program Credits: 120

Statistics Minor (Non-Teaching)
Choose one of the following
STAT 217Q  Intermediate Statistical Concepts 3-4
STAT 332  Statistics for Scientists and Engineers
Choose one of the following 3 Mathematics courses 3-4
M 161Q  Survey of Calculus
M 165Q  Calculus for Technology I
M 171Q  Calculus I
STAT 411  Methods for Data Analysis I 3
STAT 412  Methods for Data Analysis II 3
Choose nine additional credits of STAT (408 or higher) 9
Total Credits 21-22
# Statistics Option

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>M 171Q</td>
<td>Calculus I</td>
<td>4</td>
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<tr>
<td>M 172Q</td>
<td>Calculus II</td>
<td>4</td>
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<tr>
<td>M 221</td>
<td>Introduction to Linear Algebra</td>
<td>3</td>
</tr>
<tr>
<td>M 242</td>
<td>Methods of Proof</td>
<td>3</td>
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<tr>
<td>M 273Q</td>
<td>Multivariable Calculus</td>
<td>4</td>
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<tr>
<td>M 333</td>
<td>Linear Algebra</td>
<td>3</td>
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<tr>
<td>or M 441</td>
<td>Numerical Linear Algebra &amp; Optimization</td>
<td></td>
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<tr>
<td>STAT 217Q</td>
<td>Intermediate Statistical Concepts (Preferred and requires STAT 216Q as a prerequisite)</td>
<td>3</td>
</tr>
<tr>
<td>or STAT 332</td>
<td>Statistics for Scientists and Engineers</td>
<td></td>
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<tr>
<td>STAT 408</td>
<td>Statistical Computing and Graphical Analysis</td>
<td>3</td>
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<tr>
<td>STAT 411</td>
<td>Methods for Data Analysis I</td>
<td>3</td>
</tr>
<tr>
<td>STAT 412</td>
<td>Methods for Data Analysis II</td>
<td>3</td>
</tr>
<tr>
<td>STAT 421</td>
<td>Probability Theory</td>
<td>3</td>
</tr>
<tr>
<td>STAT 422</td>
<td>Mathematical Statistics</td>
<td>3</td>
</tr>
<tr>
<td>STAT 441</td>
<td>Experimental Design</td>
<td>3</td>
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<tr>
<td>STAT 446</td>
<td>Sampling</td>
<td>3</td>
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<td></td>
<td>Choose four from the following:</td>
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<tr>
<td>STAT 431</td>
<td>Nonparametric Statistics</td>
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<tr>
<td>STAT 436</td>
<td>Introduction to Time Series Analysis</td>
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</tr>
<tr>
<td>STAT 437</td>
<td>Introduction to Applied Multivariate Analysis</td>
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<tr>
<td>STAT 439</td>
<td>Introduction to Categorical Data Analysis</td>
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<tr>
<td>STAT 448</td>
<td>Mixed Effects Models</td>
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<tr>
<td>STAT 490R</td>
<td>Undergraduate Research</td>
<td></td>
</tr>
<tr>
<td>STAT 491</td>
<td>Special Topics</td>
<td></td>
</tr>
</tbody>
</table>

Other courses approved by an advisor may be substitutes. At least one science must have a lab.

**Total Credits:** 57

A minimum of 120 credits is required for graduation; 42 of these credits must be in courses numbered 300 and above. Core 2.0 must be completed for graduation. The following is a typical program of study:

## Freshman Year

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>CLS 101US - Knowledge and Community or COMX 111US - Introduction to Public Speaking</td>
<td>3</td>
</tr>
<tr>
<td>M 171Q - Calculus I</td>
<td>4</td>
</tr>
<tr>
<td>University Core and Electives</td>
<td>8</td>
</tr>
<tr>
<td>WRIT 101W - College Writing I</td>
<td>3</td>
</tr>
<tr>
<td>M 172Q - Calculus II</td>
<td>4</td>
</tr>
<tr>
<td>University Core and Electives</td>
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</tr>
<tr>
<td>Year Total:</td>
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## Sophomore Year

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>M 273Q - Multivariable Calculus</td>
<td>4</td>
</tr>
<tr>
<td>M 242 - Methods of Proof</td>
<td>3</td>
</tr>
<tr>
<td>STAT 217Q - Intermediate Statistical Concepts or STAT 332 - Statistics for Scientists and Engineers</td>
<td>3</td>
</tr>
<tr>
<td>Science Electives</td>
<td>4</td>
</tr>
<tr>
<td>M 221 - Introduction to Linear Algebra</td>
<td>3</td>
</tr>
<tr>
<td>STAT 408 - Statistical Computing and Graphical Analysis</td>
<td>3</td>
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</table>

**Junior Year**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>STAT 411 - Methods for Data Analysis I</td>
<td>3</td>
</tr>
<tr>
<td>STAT 446 - Sampling</td>
<td>3</td>
</tr>
<tr>
<td>Science Electives</td>
<td>3</td>
</tr>
<tr>
<td>University Core and Electives</td>
<td>3</td>
</tr>
<tr>
<td>STAT 412 - Methods for Data Analysis II</td>
<td>3</td>
</tr>
<tr>
<td>STAT 441 - Experimental Design</td>
<td>3</td>
</tr>
<tr>
<td>Science Electives</td>
<td>3</td>
</tr>
<tr>
<td>University Core and Electives</td>
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<tr>
<td>Year Total:</td>
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</table>

## Senior Year

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
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<tbody>
<tr>
<td>STAT 421 - Probability Theory</td>
<td>3</td>
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<tr>
<td>Math or Stat Elect (See List Above)</td>
<td>6</td>
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<tr>
<td>University Core and Electives</td>
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</tr>
<tr>
<td>STAT 422 - Mathematical Statistics</td>
<td>3</td>
</tr>
<tr>
<td>Math or Stat Elect (See List Above)</td>
<td>6</td>
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<tr>
<td>University Core and Electives</td>
<td>6</td>
</tr>
<tr>
<td>Year Total:</td>
<td>15</td>
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</tbody>
</table>

**Total Program Credits:** 120

### Actuary Profession Bound Students

Actuary profession-bound students are advised to take STAT 421 and STAT 422 during the junior year in order to be prepared for the actuarial exams given during the senior year. For further guidance, see the Actuary Advisor in the Dept. of Mathematical Sciences, 2-214 Wilson Hall.

### Microbiology and Immunology

*Note: MSU’s programs in the biological sciences are distributed across multiple departments. MSU does not have a single Department of Biology. For additional options see Biological Sciences (p. 81) at MSU.*

#### Department of Microbiology and Immunology

Programs are designed to prepare students for careers in microbiology with emphasis in medical microbiology, immunology, molecular biology, virology, microbial physiology, microbial ecology, microbial genetics, and environmental microbiology. The Microbiology curriculum has two options: Microbiology (with various tracks) and Medical Laboratory Science. There is also a Biotechnology curriculum with a Microbial Systems option. Some courses in these options require additional course fees.

#### Microbiology Option

In this option, students obtain a thorough education in the fields of medical, ecological, physiological, and environmental microbiology, immunology, virology, and molecular biology. This curriculum is excellent preparation for:

- graduate study in microbiology and other fields of the biological sciences
• medical, dental, and other professional schools
• careers in industry, university, institute, and government laboratories

There are several tracks a student can choose within this option to tailor their studies to their interests. These include the Microbiology Track, the Pre-Medical Track, the Pre-Veterinary Track, the Environmental Track, and the Environmental Health Track.

**Medical Laboratory Science Option**

This option is designed to prepare students for careers in Clinical Laboratory Science. Students develop competence in a range of medically-oriented fields including immunology, medical bacteriology, virology, parasitology, hematology, mycology, and chemistry. Foundations in molecular biology and statistics are also emphasized.

The Department of Microbiology and Immunology has two plans for students seeking a career in Medical Laboratory Science (MLS), Plan "A" and Plan "B."

Plan A (3+1) allows students to attend classes at MSU for three years and apply for an internship the fourth year with an affiliated MLS program. The Montana Medical Laboratory Science Training Program is located at MSU and meets the professional standards and is approved by the National Accrediting Agency for Clinical Laboratory Sciences, 5600 N. River Rd., Suite 720, Rosemont IL 60018-5119, (773) 714-8880. MSU also has an affiliation agreement with the Sacred Heart School of Medical Technology in Spokane and Health One Alliance School of Medical Technology, Denver. Students with a 2.5 GPA or greater who are accepted will spend their fourth year in this program. Upon completion of the one-year internship, students receive a BS degree in Microbiology from MSU and take a national examination through the American Society for Clinical Pathologists or the National Certification Agency. They will then be qualified to practice as a Medical Laboratory Scientist.

Plan B is for students who wish to attend for four complete years at MSU and then independently seek an approved hospital training program in MLS for a one-year internship. Once training is complete, they will also be qualified to take a national registry exam and become certified as an MLS. This certification qualifies them for graduate education and careers in:

- clinical analysis (microbiology, hematology, chemistry, and immunohematology)
- medical research
- industry (product development, sales, maintenance of equipment, etc)
- public health laboratories
- health care administration

**Microbiology Minor (Non-Teaching)**

A Microbiology minor is available to provide interested students with an understanding of the microbial basis of health and disease and environmental microbiology. Eligibility for a minor in Microbiology requires 29 credits in Microbiology and supporting subjects. This minor will complement other majors for those pursuing graduate school and professional programs in medical, dental, veterinary, ecological, industrial, pharmaceutical and related areas. The minor will also strengthen the background of science majors who wish to become more competitive in the job market.

**Genetics Minor**

Genetics is one of the fundamental disciplines that supports the field of biology. The departments that contribute to genetics teaching and research collaborated to develop the Genetics Minor to provide students with a focused experience in microbial, plant and animal genetics, and to permit exploration of specialties ranging from bioinformatics through molecular, evolutionary and quantitative genetics. The Genetics Minor is available in the departments of Animal and Range Sciences, Cell Biology and Neurosciences, Computer Science, Ecology, Microbiology and Immunology, and Plant Sciences and Plant Pathology. Each participating department has a certifying officer for the Genetics Minor to help students decide whether this option is appropriate.

Standards for the Genetics Minor are consistent across all participating departments: a student must receive a grade of C- or better in all courses required for the minor. In consultation with the Genetics Advisor, the student will select a minimum of 16 credits from the list of elective courses.

**Undergraduate Research Participation**

An undergraduate research program, available to students who demonstrate an interest and ability, is open to non-majors as well as majors in Microbiology. The aim of this program is to foster increased creativity, imagination, inquisitiveness, and independence.

**Departmental Honors in Microbiology**

When appropriate, majors should consider the opportunities afforded by the departmental honors program. This program has the following components:

- A minimum 3.5 grade-point average (GPA) in Microbiology, 3.0 GPA overall
- A minimum of four credits of undergraduate research credit
- An acceptable, bound senior thesis, and an oral defense of the thesis

Participation in a Microbiology seminar (BIOM 494) during the senior year is the required capstone course for graduation. As many as two BIOM 494 seminars (1 credit each) may be applied toward graduation when taken in the junior or senior years. A detailed description of the microbiology program is available from the department.

**Undergraduate Programs**

- Microbiology Option: Microbiology Track (p. 231)
- Microbiology Option: Pre-Medical Track (p. 232)
- Microbiology Option: Pre-Veterinary Track (p. 232)
- Microbiology Option: Environmental Microbiology Track (p. 230)
- Microbiology Option: Environmental Health Track (p. 229)
- Medical Laboratory Science Option (p. 228)

**Undergraduate Minors**

- Genetics Minor (Non-Teaching) (p. 94)
- Microbiology Minor (Non-Teaching) (p. 229)

The Department of Microbiology and Immunology (MBI) conducts one of the premier infectious disease research programs in the Northwest, as demonstrated by the success of our faculty in competing nationally for extramural grant funding and publishing high-impact papers. Research funding comes from a range of sources such as the National Institutes of Health, US Department of Agriculture, National Science Foundation and the Montana Agricultural Experimental Station among others. Over the past five years, MBI averaged over $6 million for annual research expenditures. MBI is also home to an NIH Center of Biomedical Research Excellence in Zoonotic and Emerging Infectious Diseases, which provides substantial core facilities and training opportunities for junior investigators. MBI is housed in a state-of-the-art facility with core laboratories for flow cytometry, cell biology, and molecular sciences, as well as pathogen containment facilities for small (BSL-3) and large animal research (ABSIL-2). Instrumentation suites house equipment for DNA sequencing, genomic analysis, flow cytometry and cell sorting, and confocal microscopy.
Graduate Programs
• M.S. in Microbiology and Immunology (Plan A) (p. 288)
• M.S. in Microbiology and Immunology (Plan B) (p. 289)
• Ph.D. in Microbiology and Immunology (p. 289)

Medical Laboratory Science Option
• Plan A (p. 228)
• Plan B (p. 229)

Plan A

Freshman Year

<table>
<thead>
<tr>
<th>Course</th>
<th>Fall</th>
<th>Credits</th>
<th>Spring</th>
<th>Credits</th>
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<tbody>
<tr>
<td>BIOM 101 - Careers in Microbiology</td>
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<td>CHMY 141 - College Chemistry I</td>
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<td>CHMY 143 - College Chemistry II</td>
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<tr>
<td>BIOB 160 - Principles of Living Systems</td>
<td>4</td>
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<td>BIOH 201 - Hum Anatomy &amp; Physiology I</td>
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Sophomore Year

<table>
<thead>
<tr>
<th>Course</th>
<th>Fall</th>
<th>Credits</th>
<th>Spring</th>
<th>Credits</th>
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<tbody>
<tr>
<td>CHMY 211 - Elements of Organic Chemistry</td>
<td>5</td>
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<tr>
<td>BIOH 211 - Hum Anatomy &amp; Physiology II</td>
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<tr>
<td>BCH 380 - Biochemistry</td>
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<td>BIOM 360 - General Microbiology</td>
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<td>STAT 216Q - Introduction to Statistics</td>
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<tr>
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Junior Year

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<th>Credits</th>
<th>Spring</th>
<th>Credits</th>
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<tr>
<td>BIOM 494 - Seminar/Workshop (two semesters)</td>
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<td>or BIOM 497 - Educational Methods: Microbiology</td>
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<td>BIOM 410 - Microbial Genetics</td>
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<td>or BIOM 450 - Microbial Physiology</td>
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<td>BIOH 406 - Hematology Laboratory</td>
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<td>BIOB 410 - Immunology</td>
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<td>BIOM 435 - Virology</td>
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<td>or BIOM 400 - Medical Microbiology</td>
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<td>BIOH 405 - Hematology</td>
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<td>BIOM 410 - Microbial Genetics</td>
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<td>or BIOM 450 - Microbial Physiology</td>
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<td>BIOM 431 - Medical Bacteriology</td>
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<td>BIOM 432 - Med Bacteriology Lab</td>
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<td>BIOM 441 - Eukaryotic Pathogens</td>
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<td>16</td>
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Total Program Credits: 91

Senior Professional Year Medical Laboratory Science - Plan A
Students with a 2.5 GPA or higher can apply for a senior year of professional training. They will obtain a degree in Microbiology/Medical Laboratory Science option from MSU-Bozeman. Total credits for graduation are 128; 42 of these credits must be in courses numbered 300 and above, and 32 of those credits must be in the distributed University Core. Note: Additional credits are required for this option because students take an additional summer session of courses. This additional semester is necessary because it meets the professional standards and is approved by the National Accrediting Agency for Clinical Laboratory Sciences, 5600 N. River Rd., Suite 720, Rosemont IL 60018-5119; (773) 714-8880.

Courses for Montana Medical Laboratory Science (MMLS) Training Program

If student attends the Montana Medical Laboratory Science Training Program:

<table>
<thead>
<tr>
<th>Course</th>
<th>Fall</th>
<th>Credits</th>
<th>Spring</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOH 476 - Clinical Microbiology II</td>
<td>3</td>
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<tr>
<td>BIOH 477 - Clinical Chemistry and Urinalysis II</td>
<td>3</td>
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<tr>
<td>BIOH 478 - Clinic Immunohematology II</td>
<td>2</td>
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<tr>
<td>BIOH 479 - Clinical Immunology/Serology</td>
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<td>BIOH 473 - Laboratory Practice II</td>
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<td>BIOH 474 - Clinical Hematology II</td>
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<td>BIOH 475 - Clinical Hemostasis</td>
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<tr>
<td>BIOH 482 - Laboratory Practice III</td>
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<td>BIOH 484 - Clinical Hematology III</td>
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<td>BIOH 486 - Clinical Microbiology III and Molecular Diagnostics</td>
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<td>BIOH 487 - Clinical Chemistry III</td>
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<td>BIOH 488 - Clinical Immunohematology</td>
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<td>BIOH 489 - Laboratory Management</td>
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<td>BIOH 464 - Clinical Hematology and Body Fluids</td>
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<td>BIOH 466 - Clin Microbiology I</td>
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<td>BIOH 467 - Clinical Chemistry I</td>
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<td>BIOH 468 - Clinical Immunohematology I</td>
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<td>BIOH 469 - Essentials of Clinical Lab Practice</td>
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<td>Total Program Credits:</td>
<td>37</td>
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If student is accepted and attends Sacred Heart Medical Center (Spokane) or Colorado Center for MLS (Denver) for their Senior Professional Year:

<table>
<thead>
<tr>
<th>Course</th>
<th>Fall</th>
<th>Credits</th>
<th>Spring</th>
<th>Credits</th>
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<tbody>
<tr>
<td>BIOH 470 - Summer Clinical Laboratory (12 credits)</td>
<td>12-13</td>
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<tr>
<td>Clinical Immunohematology I; Clinical Chemistry Theory; Clinical Laboratory I; Clinical Hemostasis; Clinical Microscopy and Urinalysis; Clinical Body Fluids; Clinical Immunohematology Theory; Clinical Microbiology Theory and Laboratory)</td>
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<tr>
<td>BIOH 471 - Professional Training I (Fall Semester (Training Site) - 13 credits. Clinical Immunohematology II; Clinical Chemistry I; Clinical Hematology I; Clinical Laboratory II; Clinical Microbiology I; Clinical Laboratory III; Clinical Immunology; Medical Mycology)</td>
<td>12-13</td>
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</table>
BIOH 472  Professional Training II (Spring Semester (Training Site) - 12 credits. Financial and Quality Management of the Clinical Laboratory; Clinical Chemistry II; Clinical Immunohematology III; Clinical Microbiology II; Clinical Hematology II)  12-13

Suggested Electives for Plan A
- BIOM 405  Host-Associated Microbiomes  4
- BIOM 430  Applied and Environmental Microbiology  4
- or BIOM 415  Microbial Diversity, Ecology, and Evolution
- BIOM 425  Toxicology: Science of Poisons  3
- BIOM 455R  Research Mthds in Microbiology  4

Plan B

Freshman Year
- CHMY 141 - College Chemistry I  4
- STAT 216Q - Introduction to Statistics  3
- BIOM 101 - Careers in Microbiology  1
- University Core and Electives  7
- CHMY 143 - College Chemistry II  4
- BIOB 160 - Principles of Living Systems  4
- University Core and Electives  7
- Year Total:  15

Sophomore Year
- BIOM 360 - General Microbiology  5
- CHMY 211 - Elements of Organic Chemistry  5
- BIOH 201 - Hum Anatomy & Physiology I  5
- University Core and Electives  0
- PHSX 205 - College Physics I  4
- BIOH 211 - Hum Anatomy & Physiology II  4
- BCH 380 - Biochemistry  5
- University Core and Electives  2
- Year Total:  15

Junior Year
- BIOH 405 - Hematology  3
- BIOH 406 - Hematology Laboratory  1
- BIO 410 - Immunology  3
- University Core and Electives  8
- BIOM 432 - Med Bacteriology Lab  2
- BIOM 431 - Medical Bacteriology  3
- University Core and Electives  10
- Year Total:  15

Senior Year
- BIOM 494 - Seminar/Workshop (two semesters)  2
- or BIOM 497 - Educational Methods: Microbiology
- BIOM 450 - Microbial Physiology  3
- University Core and Electives  10
- BIOM 410 - Microbial Genetics  3
- BIOM 425 - Toxicology: Science of Poisons  3
- BIOM 441 - Eukaryotic Pathogens  4
- University Core and Electives  3-5
- Year Total:  15
- Total Program Credits:  120

Suggested Electives for Plan B
- BIOM 405  Host-Associated Microbiomes  4
- BIOM 427  General Parasitology  3
- BIOM 430  Applied and Environmental Microbiology  4
- or BIOM 415  Microbial Diversity, Ecology, and Evolution
- BIOM 435  Virology  3
- or BIOM 400  Medical Microbiology
- BIOM 455R  Research Mthds in Microbiology  4

Microbiology Minor (Non-Teaching)
- BIOM 103IN  Unseen Universe: Microbes  3
- or BIOM 250  Microbiology for Health Sciences: Infectious Diseases
- BIOB 160  Principles of Living Systems  4
- or BIOB 260  Cellular and Molecular Biology
- BIOM 360  General Microbiology Pre-req BIOM 160, CHMY 141 & 143  5

Microbiology Electives (need 13 cr. from list below)  13
- BIOM 400  Medical Microbiology  3
- BIOM 405  Host-Associated Microbiomes  4
- BIOM 410  Microbial Genetics  3
- BIOM 415  Microbial Diversity, Ecology, and Evolution  3
- BIOM 421  Concepts of Plant Pathology  3
- BIOM 423  Mycology  3
- BIOM 425  Toxicology: Science of Poisons  3
- BIOM 427  General Parasitology  3
- BIOM 430  Applied and Environmental Microbiology  4
- BIOM 431  Medical Bacteriology  3
- BIOM 432  Med Bacteriology Lab  2
- BIOM 435  Virology  3
- BIOM 441  Eukaryotic Pathogens  4
- BIOM 450  Microbial Physiology  3
- BIOM 452  Soil & Environmntl Microbiology  3
- BIOM 455R  Research Mthds in Microbiology  4
- BIOM 490R  Undergraduate Research  3
- BIOB 410  Immunology  3
- BIOB 428  Molecular Evolution  3
- BIOH 405  Hematology  3
- BIOH 406  Hematology Laboratory  1
- BIOH 422  Genes and Cancer  3

Microbiology electives must be numbered 280 and above. A minimum of 9 credits total must be in courses numbered 300 and above. A maximum of 2 Undergraduate Research credits can be applied to the minor.

Microbiology Option: Environmental Health Track

Freshman Year
- CHMY 141 - College Chemistry I  4
- BIOM 101 - Careers in Microbiology  1
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<td>SOCI 101IS</td>
<td>Introduction to Sociology</td>
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<tr>
<td>BIOB 160</td>
<td>Principles of Living Systems</td>
<td>4</td>
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<tr>
<td>or BIOB 260</td>
<td>Cellular and Molecular Biology</td>
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<tr>
<td>CHMY 143</td>
<td>College Chemistry II</td>
<td>4</td>
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<td>M 161Q</td>
<td>Survey of Calculus</td>
<td>4</td>
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<tr>
<td>University Core and Electives</td>
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<td></td>
<td><strong>Year Total:</strong></td>
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<tr>
<td></td>
<td><strong>Sophomore Year</strong></td>
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<tr>
<td>CHMY 321</td>
<td>Organic Chemistry I</td>
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<tr>
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<td>Hum Anatomy &amp; Physiology I</td>
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<td>Organic Chemistry II</td>
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<tr>
<td>BIOH 211</td>
<td>Hum Anatomy &amp; Physiology II</td>
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<td>BIOM 360</td>
<td>General Microbiology</td>
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<tr>
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<td><strong>Year Total:</strong></td>
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<tr>
<td></td>
<td><strong>Junior Year</strong></td>
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<tr>
<td>BIOO 262IN</td>
<td>Introduction to Entomology</td>
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<td>PHSX 205</td>
<td>College Physics I</td>
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<tr>
<td>STAT 216Q</td>
<td>Introduction to Statistics</td>
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<tr>
<td>BCH 380</td>
<td>Biochemistry</td>
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<tr>
<td>BIOM 431</td>
<td>Medical Bacteriology</td>
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<td>BIOM 432</td>
<td>Med Bacteriology Lab</td>
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<td>PHSX 207</td>
<td>College Physics II</td>
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<td></td>
<td><strong>Senior Year</strong></td>
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<tr>
<td>BIOM 494</td>
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<tr>
<td>BIOB 410</td>
<td>Immunology</td>
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<td>BIOM 450</td>
<td>Microbial Physiology</td>
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<td>BIOM 494</td>
<td>Seminar/Workshop</td>
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<tr>
<td>BIOM 430</td>
<td>Applied and Environmental Microbiology</td>
<td>4</td>
</tr>
<tr>
<td>or BIOM 415</td>
<td>Microbial Diversity, Ecology, and Evolution</td>
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<tr>
<td>BIOM 410</td>
<td>Microbial Genetics</td>
<td>3</td>
</tr>
<tr>
<td>BIOM 441</td>
<td>Eukaryotic Pathogens</td>
<td>4</td>
</tr>
<tr>
<td>BIOM 452</td>
<td>Soil &amp; Environment Microbiology</td>
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<td><strong>Total Program Credits:</strong></td>
<td><strong>120</strong></td>
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</table>

**Suggested Electives**

An elective course may be a substitute for a required course following discussion with an advisor and if prerequisites are met or can be waived.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>BIOM 405</td>
<td>Host-Associated Microbiomes</td>
<td>4</td>
</tr>
<tr>
<td>BIOM 425</td>
<td>Toxicology: Science of Poisons</td>
<td>3</td>
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<tr>
<td>BIOM 435</td>
<td>Virology</td>
<td>3</td>
</tr>
<tr>
<td>BIOB 428</td>
<td>Molecular Evolution</td>
<td>3</td>
</tr>
<tr>
<td>BIOM 455R</td>
<td>Research Methds in Microbiology</td>
<td>4</td>
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<tr>
<td>ENSC 245IN</td>
<td>Soils</td>
<td>3</td>
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<tr>
<td>ENSC 272CS</td>
<td>Water Resources</td>
<td>3</td>
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<tr>
<td>ENSC 460</td>
<td>Soil Remediation</td>
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<td>ENSC 461</td>
<td>Restoration Ecology</td>
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<tr>
<td>EENV 445</td>
<td>Hazardous Waste Treatment</td>
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<td>EENV 447</td>
<td>Hazardous Waste Management</td>
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<tr>
<td>SFBS 146</td>
<td>Introduction to Sustainable Food and Bioenergy Systems</td>
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<td>NUTR 226</td>
<td>Food Fundamentals</td>
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<td>NUTR 227</td>
<td>Food Fundamentals Lab</td>
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A minimum of 120 credits is required for graduation; 42 of these credits must be in courses numbered 300 and above.

**Microbiology Option: Environmental Microbiology Track**

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<thead>
<tr>
<th>Freshman Year</th>
<th>Credits</th>
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<tbody>
<tr>
<td>BIOB 160</td>
<td>Principles of Living Systems</td>
</tr>
<tr>
<td>CHMY 141</td>
<td>College Chemistry I</td>
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<tr>
<td>or CHMY 151</td>
<td>Honors College Chemistry I</td>
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<td>CHMY 143</td>
<td>College Chemistry II</td>
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<td>or CHMY 153</td>
<td>Honors College Chemistry II</td>
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<td>Math requirements</td>
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<td>M 165Q</td>
<td>Calculus for Technology I</td>
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<td>or M 171Q</td>
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<tr>
<td>M 166Q</td>
<td>Calculus for Technology II</td>
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<td>or M 172Q</td>
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<td>For other Plans:</td>
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<td>M 161Q</td>
<td>Survey of Calculus</td>
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<tr>
<td>&amp; BIOB 318</td>
<td>Biometry</td>
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<td><strong>Sophomore Year</strong></td>
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<tr>
<td>CHMY 321</td>
<td>Organic Chemistry I</td>
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<td>or CHMY 331</td>
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<td>CHMY 323</td>
<td>Organic Chemistry II</td>
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<td>or CHMY 333</td>
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<td>BIOM 360</td>
<td>General Microbiology</td>
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<td>Choose one of the following sequences:</td>
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<td>PHSX 205</td>
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<td>or PHSX 220</td>
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<td>or PHSX 222</td>
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<td>BIOL 370</td>
<td>General Ecology (equiv to 270)</td>
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<td>For Bioinformatics Plan: (TBA)</td>
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<td>For Ag &amp; Bioremediation Plan</td>
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<td>ENSC 245IN</td>
<td>Soils</td>
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### Montana State University

**Montana State University**

**Junior Year**

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<td>BIOM 410</td>
<td>Microbial Genetics</td>
<td>3</td>
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<td>BIOM 430</td>
<td>Applied and Environmental Microbiology</td>
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**Senior Year**

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<tr>
<td>BIOM 450</td>
<td>Microbial Physiology</td>
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<tr>
<td>BIOM 494 - Seminar/Workshop (take twice for two credits)</td>
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<td>Choose one of the following sequences:</td>
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<tr>
<td>BIOM 455R - Research Methods in Microbiology</td>
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<tr>
<td>BIOM 425 - Microbial Diversity, Ecology, and Evolution</td>
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<tr>
<td>BIOM 420 - Evolution</td>
<td></td>
<td>3</td>
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<tr>
<td>For Bioinformatics Plan</td>
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</tr>
<tr>
<td>BCH 441 - Biochemistry of Macromolecules</td>
<td></td>
<td>3</td>
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<tr>
<td>BIOM 455R - Research Methods in Microbiology</td>
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<td>BCH 444R - Biochemistry &amp; Molecular Biology Methods</td>
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<td>BIOL 428 - Molecular Evolution</td>
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<td>For Ag &amp; Bioremediation Plan</td>
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<td>BIOM 452 - Soil &amp; Environmental Microbiology</td>
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<td>BIOM 421 - Concepts of Plant Pathology</td>
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<td>AGSC 450 - Plant Disease Control</td>
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<td>ENSC 353 - Environmental Biogeochemistry</td>
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<td>ENSC 460 - Soil Remediation</td>
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<td>BIOM 423 - Mycology</td>
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<td>3</td>
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**Total Program Credits:**

**117**

A minimum of 120 credits is required for graduation; 42 of these credits must be in courses numbered 300 and above.

### Microbiology Option: Microbiology Track

**Freshman Year**

<table>
<thead>
<tr>
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<th>Course Title</th>
<th>Credits</th>
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<tbody>
<tr>
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<td>Principles of Living Systems</td>
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<tr>
<td>or BIOL 260 - Cellular and Molecular Biology</td>
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<tr>
<td>CHMY 141</td>
<td>College Chemistry I</td>
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<tr>
<td>or CHMY 151 - Honors College Chemistry I</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CHMY 143</td>
<td>College Chemistry II</td>
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<tr>
<td>or CHMY 153 - Honors College Chemistry II</td>
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<tr>
<td>Math Requirements*</td>
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<td>University Core and Electives (see list below)</td>
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<td><strong>Year Total:</strong></td>
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**Sophomore Year**

<table>
<thead>
<tr>
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<th>Course Title</th>
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<tbody>
<tr>
<td>CHMY 321</td>
<td>Organic Chemistry I</td>
<td>4</td>
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<tr>
<td>CHMY 323</td>
<td>Organic Chemistry II</td>
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<td>or CHMY 333 - Honors Organic Chemistry II</td>
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<tr>
<td>BIOM 360 - General Microbiology</td>
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<td>5</td>
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<tr>
<td>PHSX 205 - College Physics I</td>
<td></td>
<td>4</td>
</tr>
<tr>
<td>or PHSX 220 - Physics I (w/ calculus)</td>
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<td></td>
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<tr>
<td>PHSX 207 - College Physics II</td>
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<td>4</td>
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<tr>
<td>or PHSX 222 - Physics II (w/ calculus)</td>
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<td>Microbiology Electives**</td>
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<tr>
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**Senior Year**

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<th>Course Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>BIOL 450 - Seminar/Workshop (take two semesters)</td>
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<td>2</td>
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<tr>
<td>BIOM 450 - Microbial Physiology</td>
<td></td>
<td>3</td>
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<tr>
<td>BIOM 410 - Microbial Genetics</td>
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<tr>
<td><strong>Year Total:</strong></td>
<td></td>
<td><strong>30</strong></td>
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</table>

**Total Program Credits:**

**120**

### Math Requirements *

Choose one of the following sequences:

- M 161Q & BIOB 318 - Survey of Calculus and Biometry
- or STAT 216Q - Introduction to Statistics
- M 171Q & M 172Q - Calculus I and II
- M 181Q & M 182Q - Honors Calculus I and II
- M 165Q & M 166Q - Calculus for Technology I and II

### Microbiology Electives **

A minimum of 25 credits of additional Microbiology courses, some of which are listed below.

- BIOM 101 - Careers in Microbiology (1 cr)
- BIOM 400 - Medical Microbiology (3 cr)
- BIOM 405 - Host-Associated Microbiomes (4 cr)
- BIOM 425 - Toxicology: Science of Poisons (3 cr)
- BIOM 427 - General Parasitology (4 cr)
- BIOM 431 - Medical Bacteriology (3 cr)
- BIOM 432 - Med Bacteriology Lab (2 cr)
- BIOM 435 - Virology (3 cr)
- BIOM 441 - Eukaryotic Pathogens (4 cr)
- BIOM 455R - Research Methods in Microbiology (4 cr)
- BIOM 490R - Undergraduate Research (4 cr max for MB electives)
- BIOM 497 - Educational Methods: Microbiology (2 cr)
- BIOL 410 - Immunology (3 cr)
- BIOL 412 - Hybridomas (2 cr)
- BIOL 413 - Flow Cytometry (1 cr)
- BIOL 414 - Advanced Microscopy (1 cr)
Microbiology Option: Pre-Medical Track

Other suggested courses
One course may be used toward the 25 credits of Microbiology electives.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOH 201</td>
<td>Hum Anatomy &amp; Physiology I</td>
<td>5</td>
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<tr>
<td>BIOH 211</td>
<td>Hum Anatomy &amp; Physiology II</td>
<td>4</td>
</tr>
<tr>
<td>BIOB 375</td>
<td>General Genetics</td>
<td>3</td>
</tr>
<tr>
<td>BIOB 424</td>
<td>Ethical Practice of Science</td>
<td>3</td>
</tr>
<tr>
<td>WRIT 221</td>
<td>Intermediate Tech Writing</td>
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</table>

A minimum of 120 credits is required for graduation; 42 of those credits must be in courses numbered 300 and above.

Microbiology Option: Pre-Medical Track

**Freshman Year**

<table>
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<tr>
<th>Course Code</th>
<th>Course Title</th>
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</thead>
<tbody>
<tr>
<td>BIOH 185 - Integrated Physiology I</td>
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<tr>
<td>CHMY 141 - College Chemistry I</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>CHMY 143 - College Chemistry II</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>M 161Q - Survey of Calculus</td>
<td>4</td>
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</table>

University Core and Electives: 10

Year Total: 30

**Sophomore Year**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>BIOB 260 - Cellular and Molecular Biology</td>
<td>4</td>
<td></td>
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<tr>
<td>CHMY 321 - Organic Chemistry I</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>CHMY 323 - Organic Chemistry II</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>BIOH 201 - Hum Anatomy &amp; Physiology I</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>BIOH 211 - Hum Anatomy &amp; Physiology II</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>STAT 216Q - Introduction to Statistics</td>
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</table>

University Core and Electives: 6

Year Total: 30

**Junior Year**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>BIOB 410 - Immunology (F)</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>BIOB 375 - General Genetics (F)</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>BCH 380 - Biochemistry (F)</td>
<td>5</td>
<td></td>
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<tr>
<td>BCH 441 and BCH 442</td>
<td>4</td>
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<tr>
<td>PHSX 205 - College Physics I (F)</td>
<td>4</td>
<td></td>
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<tr>
<td>PHSX 207 - College Physics II (S)</td>
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University Core and Electives: 11

Year Total: 30

**Senior Year**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>BIOB 450 - Microbial Physiology (F)</td>
<td>3</td>
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</tr>
<tr>
<td>BIOB 494 - Seminar/Workshop (take twice F and S)</td>
<td>2</td>
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<tr>
<td>BIOM 410 - Microbial Genetics (S)</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>BIOM 400 - Medical Microbiology (S)</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>BIOM 405 - Host-Associated Microbiomes (F)</td>
<td>4</td>
<td></td>
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<tr>
<td>or BIOM 430 - Applied and Environmental Microbiology</td>
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</tbody>
</table>

University Core and Electives: 15

Year Total: 30

Total Program Credits: 120

**Electives (you need 13 credits)**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>BIOM 425</td>
<td>Toxicology: Science of Poisons (S)</td>
<td>3</td>
</tr>
<tr>
<td>BIOM 435</td>
<td>Virology (F)</td>
<td>3</td>
</tr>
<tr>
<td>BIOM 432</td>
<td>Med Bacteriology Lab (S)</td>
<td>2</td>
</tr>
<tr>
<td>BIOM 441</td>
<td>Eukaryotic Pathogens (S)</td>
<td>4</td>
</tr>
<tr>
<td>BIOH 405</td>
<td>Hematology (F)</td>
<td>3</td>
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<tr>
<td>BIOM 490R</td>
<td>Undergraduate Research (F,S)</td>
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**Electives: Other (One of the following can be substituted for a Microbiology Elective)**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>BIOH 313</td>
<td>Neuropathology (F)</td>
<td>3</td>
</tr>
<tr>
<td>BIOH 323</td>
<td>Human Developmental Biology (S)</td>
<td>4</td>
</tr>
<tr>
<td>BIOB 420</td>
<td>Evolution (S)</td>
<td>3</td>
</tr>
<tr>
<td>BIOM 425</td>
<td>Adv Cell &amp; Molecular Biology (S)</td>
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</table>

Recommended University Core & Electives

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>SOCI 101IS</td>
<td>Introduction to Sociology (F,S)</td>
<td>3</td>
</tr>
<tr>
<td>PSYX 100IS</td>
<td>Intro to Psychology (F,S,Su)</td>
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</table>

A minimum of 120 credits is required for graduation; 42 of those credits must be in courses numbered 300 and above.

Microbiology Option: Pre-Veterinary Track

Department of Microbiology and Immunology

**Pre-veterinary Curriculum**

**Freshman Year**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>BIOB 170IN - Principles of Biological Diversity</td>
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<td>CHMY 141 - College Chemistry I</td>
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<tr>
<td>University Core and Electives</td>
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Year Total: 18

**Sophomore Year**

<table>
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<tr>
<th>Course Code</th>
<th>Course Title</th>
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<tbody>
<tr>
<td>BIOB 260 - Cellular and Molecular Biology</td>
<td>4</td>
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<tr>
<td>CHMY 211 - Elements of Organic Chemistry</td>
<td>4</td>
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<tr>
<td>University Core and Electives</td>
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Year Total: 14

**Senior Year**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
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<tbody>
<tr>
<td>BIOB 375 - General Genetics (F)</td>
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<tr>
<td>ANSC 265 - Anatomy and Physiology of Domestic Animals - Lecture</td>
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<td>ANSC 266 - Anatomy and Physiology of Domestic Animals - Lab</td>
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<td>BCH 380 - Biochemistry</td>
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<td>BIOM 360 - General Microbiology</td>
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<tr>
<td>Year</td>
<td>Credits</td>
<td>Fall</td>
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<td>--------------</td>
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<tr>
<td><strong>Junior Year</strong></td>
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<tr>
<td>BIOM 427 - General Parasitology</td>
<td>4</td>
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<tr>
<td>IMID 475 - Preveterinary Internship</td>
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<td>PHSX 205 - College Physics I</td>
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<tr>
<td>Restricted elective and University Core</td>
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<td>PHSX 207 - College Physics II</td>
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<td>Choose one of the following:</td>
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<tr>
<td>ANSC 322 - Principles of Animal Breeding and Genetics</td>
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<td>BIOB 375 - General Genetics</td>
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<td>BIOM 410 - Microbial Genetics</td>
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<tr>
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<tr>
<td>Choose one of the following:</td>
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<tr>
<td>BIOM 450 - Microbial Physiology</td>
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<tr>
<td>BIVO 412 - Animal Physiology</td>
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<tr>
<td>Choose one of the following:</td>
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<tr>
<td>BIOM 415 - Microbial Diversity, Ecology, and Evolution</td>
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<tr>
<td>BIOM 430 - Applied and Environmental Microbiology</td>
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<tr>
<td>Restricted Upper Division Microbiology Electives 6 credits</td>
<td>3</td>
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<tr>
<td>BIOB 410 - Immunology</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>BIOM 431 - Medical Bacteriology</td>
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<td></td>
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<tr>
<td>BIOM 432 - Med Bacteriology Lab</td>
<td></td>
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<tr>
<td>BIOM 435 - Virology</td>
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<tr>
<td>BIOM 441 - Eukaryotic Pathogens</td>
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<tr>
<td>Directed Upper Division Electives 12 credits</td>
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<tr>
<td>ANSC 320 - Animal Nutrition</td>
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<tr>
<td>ANSC 321 - Physiology of Animal Reproduction</td>
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<tr>
<td>ANSC 337 - Disease of Domestic Livestock</td>
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<td>EQUUS 327 - Equine Lameness</td>
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<td>EQUUS 347 - Equine Form to Function</td>
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<td>EQUUS 423 - Equine Nutrition</td>
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<td>EQUUS 430 - Horse Management</td>
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<td>BIOM 494 - Seminar/Workshop</td>
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<tr>
<td>BIOB 410 - Immunology</td>
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<tr>
<td>BIOM 431 - Medical Bacteriology</td>
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<tr>
<td>BIOM 432 - Med Bacteriology Lab</td>
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<td></td>
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</tr>
<tr>
<td>BIOM 435 - Virology</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BIOM 441 - Eukaryotic Pathogens</td>
<td></td>
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<td>Directed Upper Division Electives 12 credits</td>
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<tr>
<td>EQUUS 347 - Equine Form to Function</td>
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<td></td>
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<tr>
<td>EQUUS 423 - Equine Nutrition</td>
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</tbody>
</table>

**Total Program Credits:** 120

### Modern Languages and Literatures

The Department of Modern Languages and Literatures offers a full range of courses for students interested in language, culture, and literature. Students without prior language study who are interested in the literature and culture of French-, German-, Japanese-, and Spanish-speaking peoples may choose elective credits from a variety of courses taught in English. The study of foreign cultures, languages, and literatures is an integral part of a basic education and an essential component of one’s university training. It provides students with the knowledge to better understand their own language and culture and to function intelligently as members of a multicultural society.

In addition to providing opportunities for students to participate in MSU-sponsored study abroad programs, the department offers advice concerning the role of language study in career planning. Foreign languages are used by interpreters, translators, and teachers. Language proficiency also enhances employment opportunities. With almost any “marketable” skill plus a foreign language, the chances of finding an interesting job are improved considerably. Foreign language training is a critically important skill for careers in business and commerce, secretarial/clerical positions, health care, government service, social services, and agriculture.

The department offers undergraduate options in French, German, Japanese, and Spanish. For most languages, lower division courses are designed to help students acquire a strong Intermediate level of proficiency. Upper division courses strengthen Intermediate level skills and develop Advanced level functions through the study of culture (literature, history, art, etc.). For students interested in teaching, K-12 teaching options are offered in French, German, and Spanish.

The Department also offers interdisciplinary majors and minors in Asian Studies and Latin American and Latino Studies, and a minor in Chinese Studies.

### Language & Cultural Studies and Area Studies Programs

#### Majors
- French and Francophone Studies Option (p. 235)
- German Studies Option (p. 235)
- Latin American and Latino Studies Option (p. 237)
- Hispanic Studies Option (p. 236)

#### Minors
- China Studies Minor (p. 234)
- French and Francophone Studies Minor (p. 235)
- German Studies Minor (p. 235)
- Japan Studies Minor (p. 236)
- Hispanic Studies Minor (p. 236)
- Latin American and Latino Studies Minor (p. 237)

### Language Teaching Programs

#### Majors

- French and Francophone Studies Option (p. 235)
- German Studies Option (p. 235)
- Latin American and Latino Studies Option (p. 237)
- Hispanic Studies Option (p. 236)
- Japan Studies Minor (p. 236)
- Chinese Studies Minor (p. 234)
- Japanese Studies Minor (p. 235)
• French K-12 Teaching Option (p. 234)
• German K-12 Teaching Option (p. 235)
• Spanish K-12 Teaching Option (p. 238)

Minors

• French Teaching Minor (p. 133)
• German Teaching Minor (p. 134)
• Spanish Teaching Minor (p. 135)

This curriculum leads to the baccalaureate degree in Modern Languages - French, German, Japan Studies, and Spanish, with additional options in Teaching. Students with previous language training will take either an AP exam or a CLEP exam to place at the appropriate level. Courses taught in English may count toward the language major or minor with the consent of the advisor.

To be certified for graduation in a major option or a minor in the Department of Modern Languages and Literatures, students must take one-half of the required MLL upper division credits in the department. Students who have already completed a degree at another university and are seeking teaching certification from MSU may be required to take some additional course work in the language as determined by the language advisor. In addition, the department will not accept grades lower than "C" (2.0) or P in any of the upper division courses required for the degree. (Note: Department-approved study-abroad credits are considered to be the equivalent of resident credits.)

Students with native or near-native ability in a given language may only enroll in courses for credit which have been approved by the appropriate language section.

China Studies Minor

The Department of Modern Languages and Literatures offers a minor in China Studies (Chinese language and culture). The program’s mission is to provide students with the language skill and cultural understanding they need to succeed in Chinese contexts. This program is not designed for teacher certification. The minor requires basic Chinese language proficiency and a broad knowledge of Chinese history, literature, and culture. A total of 28 credits of coursework is required, including 16 credits in Chinese language, and 12 credits of non-language China-related courses, 9 credits of which are at the upper division level. In addition, as many as 9 credits may be taken from courses on China in other departments. In order to receive the minor, students must successfully complete the following course work:

<table>
<thead>
<tr>
<th>Language Courses</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHIN 101 Elementary I</td>
<td>4</td>
</tr>
<tr>
<td>CHIN 102D Elementary II</td>
<td>4</td>
</tr>
<tr>
<td>CHIN 201D Intermediate I</td>
<td>4</td>
</tr>
<tr>
<td>CHIN 202D Intermediate II</td>
<td>4</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Non-language Courses</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHIN 130D Historical and Literary Journey into Modern China</td>
<td>3</td>
</tr>
<tr>
<td>CHIN 211D Chinese Culture &amp; Civilization</td>
<td>3</td>
</tr>
<tr>
<td>RLST 203D Buddhist Traditions</td>
<td>3</td>
</tr>
<tr>
<td>ANTY 225IS Culture, Language, and Society</td>
<td>3</td>
</tr>
<tr>
<td>HSTR 140D Modern Asia</td>
<td>3</td>
</tr>
</tbody>
</table>

Choose three of the following:

<table>
<thead>
<tr>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ARTH 360 History of Asian Art and Architecture</td>
</tr>
<tr>
<td>CHIN 320H History of Chinese Cinema</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>HSTR 345 Modern China</th>
</tr>
</thead>
<tbody>
<tr>
<td>HSTR 443 Gender in Asia</td>
</tr>
<tr>
<td>HSTR 446 Science and Medicine in China</td>
</tr>
<tr>
<td>ML 491 Special Topics (Asian Civilization: on-line only)</td>
</tr>
<tr>
<td>ML 490R Undergraduate Research **</td>
</tr>
<tr>
<td>or ML 492 Independent Study</td>
</tr>
</tbody>
</table>

** Total Credits 28

** Students who are on the Chinese Government Scholarship or other scholarship to study in China will receive 3 credits of ML 490R or ML 492. We highly recommend students who are pursuing a China Studies minor to spend a short period of time in China. In the summer program, 3 credits of Chinese language and 3 credits of Chinese culture can be earned.

French K-12 Teaching Option

Students with a teaching option should file with the Department of Education in the sophomore year to establish their program of study. These students will be required to pass a language proficiency test approved by the Modern Languages department in order to qualify for student teaching.

<table>
<thead>
<tr>
<th>Freshman Year</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>FRCH 101 - Elementary French I</td>
<td>3</td>
</tr>
<tr>
<td>FRCH 102D - Elementary French II</td>
<td>3</td>
</tr>
<tr>
<td>EDU 202 - Early Field Experience</td>
<td>1</td>
</tr>
<tr>
<td>FCS 101IS - Indiv and Fam Dev: Lifespan*</td>
<td>3</td>
</tr>
<tr>
<td>EDU 222IS - Educ Psych &amp; Child Development or EDU 223IS - Educ Psych and Adolescent Dev</td>
<td>3</td>
</tr>
</tbody>
</table>

University Core and Electives 15 (EDU 101US is recommended for teaching majors to fulfill a Core requirement)

Year Total: 30

<table>
<thead>
<tr>
<th>Sophomore Year</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>FRCH 201D - Intermediate French I</td>
<td>3</td>
</tr>
<tr>
<td>FRCH 202D - Intermediate French II</td>
<td>3</td>
</tr>
<tr>
<td>EDU 211D - Multicultural Education</td>
<td>3</td>
</tr>
<tr>
<td>EDU 370 - Integrating Tech into Educ</td>
<td>2</td>
</tr>
</tbody>
</table>

University Core and Electives 19

Year Total: 30

<table>
<thead>
<tr>
<th>Junior and Senior Year</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>EDU 382 - Assessmt, Curric, Instructn</td>
<td>3</td>
</tr>
<tr>
<td>EDU 395 - Practicum</td>
<td>3</td>
</tr>
<tr>
<td>EDU 408 - Professional Issues: K-12</td>
<td>2</td>
</tr>
<tr>
<td>EDU 496 - Methods: K-12 Modern Languages</td>
<td>4</td>
</tr>
<tr>
<td>EDU 495 - Student Teaching</td>
<td>6</td>
</tr>
<tr>
<td>EDU 495 - Student Teaching K-8</td>
<td>6</td>
</tr>
<tr>
<td>EDSP 306 - Exceptional Learners</td>
<td>3</td>
</tr>
<tr>
<td>FRCH 490R - Undergraduate Research</td>
<td>3</td>
</tr>
</tbody>
</table>

Take 25 additional upper division FRCH credits. (ML 344 and ML 492 may be counted toward this upper division requirement.)

University Core and Electives 5

Year Total: 60

Total Program Credits: 120
FCS 101IS (3 cr.) must be taken prior to or concurrently with EDU 222IS or EDU 223IS. (Take either EDU 222IS or EDU 223IS depending upon your preference for an elementary or secondary focus.)

A minimum of 120 credits is required for graduation; 42 of these credits must be in courses numbered 300 and above. Majors are encouraged to take more than the minimum 40 credits in the department.

**French Minor**

- **Freshman Year**
  - Credits
  - FRCH 101 - Elementary French I: 3
  - FRCH 102D - Elementary French II: 3
  - University Core and Electives: 24
  - Year Total: 30

- **Sophomore Year**
  - Credits
  - FRCH 201D - Intermediate French I: 3
  - FRCH 202D - Intermediate French II: 3
  - Year Total: 6

- **Junior and Senior Year**
  - Credits
  - Take 15 additional upper division FRCH credits. ML 344 and ML 492 may be counted toward this upper division course requirement.
  - Year Total: 15

Total Program Credits: 27

**French and Francophone Studies Option**

- **Freshman Year**
  - Credits
  - FRCH 101 - Elementary French I: 3
  - FRCH 102D - Elementary French II: 3
  - University Core and Electives: 24
  - Year Total: 30

- **Sophomore Year**
  - Credits
  - FRCH 201D - Intermediate French I: 3
  - FRCH 202D - Intermediate French II: 3
  - Year Total: 6

- **Junior and Senior Year**
  - Credits
  - Take 28 elective FRCH credits. ML 100, ML 344, and ML 492 may be counted toward this requirement.
  - University Core and Electives: 29
  - Year Total: 60

Total Program Credits: 120

* FCS 101IS (3 cr.) must be taken prior to or concurrently with EDU 222IS or EDU 223IS. (Take either EDU 222IS or EDU 223IS depending upon your preference for an elementary or secondary focus.)

A minimum of 120 credits is required for graduation; 42 of these credits must be in courses numbered 300 and above. Majors are encouraged to take more than the minimum 40 credits in the department.

**German K-12 Teaching Option**

Students with a teaching option should file with the Department of Education in the sophomore year to establish their program of study. These students will be required to pass a language proficiency test approved by the Modern Languages department in order to qualify for student teaching.

- **Freshman Year**
  - Credits
  - GRMN 101 - Elementary German I: 3
  - GRMN 102D - Elementary German II: 3
  - EDU 202 - Early Field Experience: 1

Total Program Credits: 120

* FCS 101IS (3 cr.) must be taken prior to or concurrently with EDU 222IS or EDU 223IS. (Take either EDU 222IS or EDU 223IS depending upon your preference for an elementary or secondary focus.)

A minimum of 120 credits is required for graduation; 42 of these credits must be in courses numbered 300 and above. Majors are encouraged to take more than the minimum 40 credits in the department.

**German Minor**

- **Freshman Year**
  - Credits
  - GRMN 101 - Elementary German I: 3
  - GRMN 102D - Elementary German II: 3
  - Year Total: 6

- **Sophomore Year**
  - Credits
  - GRMN 201D - Intermediate German I: 3
  - GRMN 202D - Intermediate German II: 3
  - Year Total: 6

- **Junior and Senior Year**
  - Credits
  - GRMN 301 - Oral and Written Expression I:
  - or GRMN 302 - Oral and Written Expression II:
  - Take 12 additional upper division GRMN credits (4 courses):
  - Year Total: 15

Total Program Credits: 27

**German Studies Option**

- **Freshman Year**
  - Credits
  - GRMN 101 - Elementary German I: 3
Hispanic Studies Minor

GRMN 102D - Elementary German II 3
University Core and Electives 24
Year Total: 30

Sophomore Year
GRMN 201D - Intermediate German I 3
GRMN 202D - Intermediate German II 3
University Core and Electives 24
Year Total: 30

Junior and Senior Year
Take 27 additional GRMN credits. ML100, ML344, and ML490 may be counted toward this requirement.
GRMN 450R - Sem: German Lit and Culture 3
University Core and Electives 30
Year Total: 60

Total Program Credits: 120

A minimum of 120 credits is required for graduation; 42 of these credits must be in courses numbered 300 and above.

Hispanic Studies Option

Freshman Year
SPNS 101 - Elementary Spanish I 3
SPNS 102D - Elementary Spanish II 3
Year Total: 6

Sophomore Year
SPNS 201D - Intermediate Spanish I 3
SPNS 202D - Intermediate Spanish II 3
Year Total: 6

Junior and Senior Year
Take 5 courses (15 credits) of SPNS electives.
Year Total: 15

Total Program Credits: 27

Choose one of the following Capstone Courses: 3
ANTY 490R Undergraduate Research and Instruction
ANTY 492 Independent Study
HSTA 490R Undergraduate Research
HSTA 492 Independent Study
HSTR 490R Undergraduate Research
HSTR 492 Independent Study
JPNS 450R Sem: Japanese Lit and Culture
ML 490R Undergraduate Research
ML 492 Independent Study

Total Credits: 23-26

Not all courses may be taken in the same department. At least six credits must be upper division (numbered 300 or above). Other appropriate courses, including those taken abroad, may be substituted with the approval of the Director of Japan Studies.

Japan Studies Minor

The Japan Studies Program offers a non-teaching, interdisciplinary minor in Japan Studies through the Department on History and Philosophy and the Department of Modern Languages and Literatures. The Program’s mission is to provide students with the skills and understanding they need to succeed in Japanese contexts. This program is not designed for teacher certification. The minor requires basic Japanese language proficiency and a broad knowledge of Japanese history, literature, and civilization. It includes 8 credits in Japanese language training, 12 credits in elective course work, and a 3-credit capstone course, for a total of 23 credits.

In order to receive the minor, students must successfully complete the following course work:

Required
JPNS 101 Elementary Japanese I 4
JPNS 102D Elementary Japanese II 4
Choose four of the following: 12-15
ANTY 242D Contemporary Japan
ANTY 337 Sex, Gender, Sexuality Japan
ANTY 343 Popular Culture - Japan
HSTR 145D Reinventing Japan
HSTR 340 Age of the Shoguns
HSTR 342 Japan’s Long 19th Century
HSTR 444 Gender in Japan
HSTR 445 Environ, Health & Sci in Japan
JPNS 150D Japanese Culture & Civ
JPNS 201D Intermediate Japanese I
JPNS 202D Intermediate Japanese II
JPNS 305 Japanese Adv Conversations
JPNS 320 Classical Japanese Literature
JPNS 321 Modern Japanese Literature
JPNS 325IH Others in Japanese Lit/Culture
JPNS 340 Japanese Adv Reading & Grammar
JPNS 361IH Japanese Text and Cinema

Total Credits: 23-26

Not all courses may be taken in the same department. At least six credits must be upper division (numbered 300 or above). Other appropriate courses, including those taken abroad, may be substituted with the approval of the Director of Japan Studies.
Latin American & Latino Studies Option

The Latin American and Latino Studies (LALS) major provides students interested in Latin American and Latino history, culture, and language with valuable interdisciplinary skills. Because this is an interdisciplinary program, students will enroll in courses in Modern Languages & Literatures and History & Philosophy. Students may also take courses with relevant content from other departments such as Sociology & Anthropology, Political Science, and Women’s, Gender, and Sexuality Studies. The LALS major complements other fields of study: health care, government, agriculture, engineering, history, literature, political science, sociology, international business, and more. The major strengthens the skill-sets of students who wish to become more competitive in the Spanish-speaking job market, both in Latin America and in the United States. A major in LALS will prepare students for the close relationship developing between Latin American and the United States in trade agreements, the growing number of immigrant laborers, and the expansion of Latino communities in the United States with significant political and economic power.

The equivalent of four semesters of Spanish language is required. Students with prior experience in Spanish language or heritage speakers may have some requirements waived. Students interested in the LALS major should consult with LALS faculty in the Department of Modern Languages & Literatures immediately upon their decision to fulfill the major so that they can ascertain the language requirements that are appropriate for them.

Required Courses

Language Requirements (15 credits)

Students must demonstrate proficiency in a language (other than English) spoken in Latin America by completing one of the following:

- Coursework. Successfully complete the equivalent of two years of college language classes plus one advanced grammar or writing course.
- Placement Exam. Score must be equivalent to coursework level described above.
- Experience to be approved by LALS advisor.

Some examples of languages include Spanish, Portuguese, Nahuatl, Quechua, Creole, and Garifuna.

Foundation courses (4 credits)

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>HSTR 130D</td>
<td>Latin American History</td>
</tr>
</tbody>
</table>

Area Requirements (24 credits)

6 credits must be in HSTR and 6 credits in SPNS. The other 12 credits may come from courses in the list below or from courses with relevant content from any other field or combination of fields approved by an LALS faculty adviser.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPNS 250</td>
<td>Spanish for Healthcare Prof</td>
</tr>
<tr>
<td>SPNS 329</td>
<td>Early Cultures of Latin America</td>
</tr>
<tr>
<td>SPNS 330</td>
<td>Modern Cultures Latin America</td>
</tr>
<tr>
<td>SPNS 332</td>
<td>Contemp Latin Amer Literature</td>
</tr>
<tr>
<td>SPNS 335H</td>
<td>Travel in Latin Am Lit &amp; Film</td>
</tr>
<tr>
<td>SPNS 350</td>
<td>US Latino Cultures</td>
</tr>
<tr>
<td>SPNS 351</td>
<td>US Latino Literature</td>
</tr>
<tr>
<td>SPNS 352H</td>
<td>US Latino Text and Cinema</td>
</tr>
<tr>
<td>SPNS 361</td>
<td>Latin American Text and Cinema</td>
</tr>
<tr>
<td>SPNS 371</td>
<td>Latin America in Focus</td>
</tr>
<tr>
<td>SPNS 416</td>
<td>Latin America: Culture and Revolution</td>
</tr>
<tr>
<td>SPNS 430</td>
<td>Latin Amer Perspectives</td>
</tr>
<tr>
<td>SPNS 445</td>
<td>Hispanic Caribbean: Cuba, Puerto Rico, Dominican Republic</td>
</tr>
<tr>
<td>HSTR 430</td>
<td>Latin Amer Soc History</td>
</tr>
<tr>
<td>HSTR 431</td>
<td>Race in Latin America</td>
</tr>
<tr>
<td>HSTR 432</td>
<td>Colonial Latin America</td>
</tr>
<tr>
<td>HSTR 433</td>
<td>Latin American Perspectives</td>
</tr>
<tr>
<td>HSTR 434</td>
<td>Gender in Latin America</td>
</tr>
<tr>
<td>HSTR 436</td>
<td>Armed Conflict Mod Lat Am</td>
</tr>
<tr>
<td>HSTR 438</td>
<td>Human Rights in Latin America</td>
</tr>
<tr>
<td>PSCI 423</td>
<td>Politics of Development</td>
</tr>
<tr>
<td>SOCI 485</td>
<td>Political Sociology</td>
</tr>
</tbody>
</table>

Research Requirement (3 credits)

Choose one (must focus on Latin American or Latino Studies theme):

- SPNS 470R Sem: Hispanic Literature
- ML 490R Undergraduate Research
- HSTR 490R Undergraduate Research

Experiential Learning (1-3 cr)

Choose one:

- SPNS X93: Service Learning: Experience Latin America Today
- ML 492 Independent Study (Teaching Spanish in the Gallatin Valley Public Schools)

Las Tias youth center in León, Nicaragua
Health entity/organization in León, Nicaragua

Other opportunity approved by LALS advisor

Summary of Requirements

<table>
<thead>
<tr>
<th>Total credits: 47-49</th>
</tr>
</thead>
<tbody>
<tr>
<td>Language requirements: 15</td>
</tr>
<tr>
<td>Foundation course: 4</td>
</tr>
<tr>
<td>Area requirements: 24</td>
</tr>
<tr>
<td>Research: 3</td>
</tr>
<tr>
<td>Experiential Learning: 1-3</td>
</tr>
</tbody>
</table>

Latin American and Latino Studies Minor

A Latin American and Latino Studies minor (LALS) is available to provide students interested in Latin American and Latino history and language with valuable interdisciplinary skills. Because this is an interdisciplinary program, students will enroll in courses in History & Philosophy and Modern Languages & Literatures. Courses in Sociology & Anthropology, as well as other departments with relevant course content, will also be allowed for credit subject to approval by the program coordinator. This minor will complement majors for students pursuing graduate school and professional programs in agriculture, engineering, history, literature, political science, sociology, international business, and more. The minor will also strengthen the skill-sets of students who wish to become more competitive in the Spanish speaking job market, either abroad or in the United States. A minor in LALS will prepare students for the close relationship developing between Latin American and the United States in trade agreements, the growing immigrant laborers, and the expansion of Latin American and Latino communities in the United States with significant political and economic power. This program is not designed for teacher certification.

Those wishing to declare a minor in Latin American and Latino Studies must submit an “Application for a Non-teaching Minor” to the Registrar’s...
Office by the end of the semester one year prior to the semester of completion.

The equivalent of four semesters of Spanish language is required. Students with prior experience in Spanish language may have some requirements waived. Students interested in the LALS minor should consult with the Department of Modern Languages & Literatures immediately upon their decision to fulfill the minor so that they can ascertain the language requirements that are appropriate for them.

**Required Courses**

**Required courses**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPNS 101</td>
<td>Elementary Spanish I</td>
<td>3</td>
</tr>
<tr>
<td>SPNS 102D</td>
<td>Intermediate Spanish II</td>
<td>3</td>
</tr>
<tr>
<td>SPNS 201D</td>
<td>Intermediate Spanish I</td>
<td>3</td>
</tr>
<tr>
<td>SPNS 202D</td>
<td>Intermediate Spanish II</td>
<td>3</td>
</tr>
<tr>
<td>HSTR 130D</td>
<td>Latin American History</td>
<td>4</td>
</tr>
</tbody>
</table>

Note: Coursework in another language spoken in Latin America (excluding English) will also be accepted.

**Elective Courses**

Select 4 courses from at least two different disciplines (SPNS, FSOI, HSTR, etc.):

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPNS 329</td>
<td>Early Cultures of Latin America</td>
</tr>
<tr>
<td>SPNS 330</td>
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<td>Armed Conflict Mod Lat Am</td>
</tr>
<tr>
<td>SOCI 368</td>
<td>Latino Immigration</td>
</tr>
<tr>
<td>SOCI 370</td>
<td>Sociology of Globalization</td>
</tr>
<tr>
<td>SOCI 485</td>
<td>Political Sociology</td>
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<tr>
<td>PSCI 423</td>
<td>Politics of Development</td>
</tr>
</tbody>
</table>

**Freshman Year**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPNS 101</td>
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<td>Educ Psych &amp; Child Development</td>
<td>3</td>
</tr>
<tr>
<td>or EDU 223IS</td>
<td>Educ Psych and Adolescent Dev</td>
<td></td>
</tr>
<tr>
<td>University Core and Electives (EDU 101US is recommended for teaching majors to fulfill a Core requirement)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Year Total:</td>
<td></td>
<td>30</td>
</tr>
</tbody>
</table>

**Sophomore Year**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPNS 201D</td>
<td>Intermediate Spanish I</td>
<td>3</td>
</tr>
<tr>
<td>SPNS 202D</td>
<td>Intermediate Spanish II</td>
<td>3</td>
</tr>
<tr>
<td>EDU 211D</td>
<td>Multicultural Education</td>
<td>3</td>
</tr>
<tr>
<td>EDU 370</td>
<td>Integrating Tech into Educ</td>
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<td>University Core and Electives</td>
<td>19</td>
<td></td>
</tr>
<tr>
<td>Year Total:</td>
<td>30</td>
<td></td>
</tr>
</tbody>
</table>

**Junior and Senior Year**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>EDU 382</td>
<td>Assessmt, Curric, Instructn</td>
<td>3</td>
</tr>
<tr>
<td>EDU 395</td>
<td>Practicum</td>
<td>3</td>
</tr>
<tr>
<td>EDU 408</td>
<td>Professional Issues: K-12</td>
<td>2</td>
</tr>
<tr>
<td>EDU 496</td>
<td>Methods: K-12 Modern Languages</td>
<td>4</td>
</tr>
<tr>
<td>EDU 495</td>
<td>Student Teaching</td>
<td>6</td>
</tr>
<tr>
<td>EDU 495</td>
<td>Student Teaching K-8</td>
<td>6</td>
</tr>
<tr>
<td>EDSP 306</td>
<td>Exceptional Learners</td>
<td>3</td>
</tr>
<tr>
<td>SPNS 470R</td>
<td>Sem: Hispanic Literature</td>
<td>3</td>
</tr>
<tr>
<td>Take 25 credits of SPNS courses. (ML 344 and ML 497 may count toward this elective requirement.)</td>
<td>25</td>
<td></td>
</tr>
<tr>
<td>University Core and Electives</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Year Total:</td>
<td>60</td>
<td></td>
</tr>
</tbody>
</table>

**Total Program Credits:** 120

* FCS 101IS (3 cr.) must be taken prior to or concurrently with EDU 222IS or EDU 223IS. (Take either EDU 222IS or EDU 223IS depending upon your preference for an elementary or secondary focus.)

A minimum of 120 credits is required for graduation; 42 of these credits must be in courses numbered 300 and above. Majors are encouraged to take more than the minimum 40 credits required in the department.

**Native American Studies**

P.O. Box 172340
Bozeman, MT 59717-2340
406-994-3881 Email: nas@montana.edu
Location: 2-179 Wilson Hall

Montana State University has an American Indian enrollment of approximately 560 students. There is an active American Indian Student Council (AIC) as well as chapter of the American Indian Science and Engineering Society (AISES) and the Society of American Indian Graduate Students (SAIGS). NAS houses the Native American Student Center and the American Indian and Alaska Native Student Support Services office, with staff providing Native students with academic advising, counseling, and mentoring. The Student Center offers tutorial assistance, telephone and fax access, and a computer lab.

Native American Studies offers an interdisciplinary program of study in American Indian culture and history, policy and law, community affairs, education, and other related areas through a non-teaching minor

Not all elective courses may be taken in the same department. A total of 9 credits must be at the 300 or 400 level. This list may expand as other disciplines develop courses that contain a substantial Latin American or Latino component. Upcoming SPNS courses include “Chicanos and the Southwest,” “Indigenismo,” “Borges,” and “Service Learning: Experience Latin American Today.”

**Spanish K-12 Teaching Option**

Students with a teaching option should file with the Department of Education in the sophomore year to establish their program of study. Students will be required to pass a language proficiency test approved by the Modern Languages department in order to qualify for student teaching.
in Native American Studies, an online graduate certificate in Native American Studies, a Master of Arts in Native American Studies, as well as opportunities for all MSU undergraduate students to gain a multicultural perspective in meeting the university’s core curriculum requirements.

Research and Creative Activity
The Department takes pride in the scholarship of its faculty. In 2000 the Department established its endowed Katz Family Chair in Native American Studies. The scholarship and service offered by the holders of the Chair enhances the Department’s efforts to provide first class scholarship on behalf of Native peoples and the university. Over the year faculty members have consistently published in professional journals, delivered papers at national and international meetings, held symposia at MSU; and, by invitation, chaired and participated in panels at national professional association conferences.

Consistent with its service commitment to Montana’s tribal communities, much of the faculty’s research and creative activity responds to the educational, cultural, and economic development needs of Native Americans. In addition to scholarly research, faculty members have devoted much time and energy to developing new programs and finding external funding sources for those programs. During the past decade, the Department has received more than $5 million in federal, state, and private grants for programs which include graduate fellowships, tribal college development projects, international student exchanges, pre-college engineering and business programs, and national and international cultural development programs.

Service
The Department firmly maintains that Montana State University must be responsive to Indian communities in addressing tribally-identified educational, cultural, and economic development needs. Accordingly, the Department has directed much of its public service activity to Montana’s Indian communities. In doing so, Department faculty members have established close working relationships with tribal and intertribal groups as well as with national Indian offices and organizations.

Upon request, faculty members have also provided technical assistance in the areas of adult, vocational, and community college development, needs assessments, proposal writing, and program evaluations.

Utilizing the resources of the university to assist in the development of Montana’s seven tribally-controlled community colleges has been a major goal of the Department. For example, the Department has administered projects to provide graduate-level training to tribal college faculty, to provide in-service training and technical assistance, and to conduct significant research in areas of importance to the tribal colleges.

In addition, faculty members have presented continuing education workshops on Montana reservations, evaluated reservation cultural and education programs, and provided other public service. Faculty members have also, by invitation, read proposals for the U.S. Office of Education, the National Endowment for the Humanities, the National Institute of Education, and the National Science Foundation.

American Indian Student Programs and Services
In addition to the traditional functions of an academic department, Native American Studies places a high priority on providing student support programs and services, reflecting a strong commitment to Indian student retention and success. The student who decides to attend MSU will find a University-wide commitment manifested by a varied and extensive support system which is unequaled in the Great Plains region.

Further Information
For further information regarding the program, contact Native American Studies at (406) 994-3881 or e-mail Francesca Pine at francesca.pine@montana.edu. Also see the university home page (http://www.montana.edu) or the home page for Native American Studies (http://www.montana.edu/wwwnas).

Undergraduate Minor
- Native American Studies Minor (Non-Teaching) (p. 239)

Montana State University has an American Indian enrollment of approximately 560 students. There is an active American Indian Student Council (AIC) as well as chapter of the American Indian Science and Engineering Society (AISES) and the Society of American Indian Graduate Students (SAIGS). NAS houses the Native American Student Center and the American Indian and Alaska Native Student Support Services office, with staff providing Native students with academic advising, counseling, and mentoring. The Student Center offers tutorial assistance, telephone and fax access, and a computer lab.

Graduate Programs
- M.A. in Native American Studies (p. 373)
- Online certificate in Native American Studies (p. 389)

Native American Studies Minor (Non-Teaching)
The minor in Native American Studies is designed to enhance the student’s major area of study, offering interdisciplinary program for Indian and non-Indian students who wish to concentrate in the study of Native American life or who are preparing for careers in tribal affairs.

Students who declare a minor in Native American Studies must complete 21 credits as outlined below:

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>NASX 105D</td>
<td>Intro Native Amer Studies</td>
<td>3</td>
</tr>
<tr>
<td>NASX 232D</td>
<td>MT Indians: Cultures, Histories, Current Issues</td>
<td>3</td>
</tr>
<tr>
<td>NASX 476</td>
<td>American Indian Policy and Law</td>
<td>3</td>
</tr>
<tr>
<td>NASX Electives</td>
<td></td>
<td>12</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>21</td>
</tr>
</tbody>
</table>

At least 9 credits must be in upper division courses (300 and 400 level), and at least 10 credits must be earned at Montana State University. Electives are to be selected in consultation with the minor adviser. NASX 490R Undergraduate Research, NASX 492 Independent Study and/or NASX 498 Internship/Cooperative Educ may be included among the electives. However, no more than four (4) semester credits (equivalent quarter hours or combination of semester and quarter hours) of NASX 492 Independent Study and/or NASX 290R Undergraduate Research/NASX 490R Undergraduate Research and no more than four (4) semester credits of NASX 498 Internship/Cooperative Educ may be included in the minor program. Transfer credits or credits earned in related courses offered in other departments may be included in the student’s program, upon approval of NAS departmental certifying officer.

Any student wishing to declare a minor in Native American Studies must file a "Curriculum & Catalog Changes" form and an "Application for a Non-teaching Minor" form with the Registrar’s Office a minimum of two terms prior to graduation. Please come to the Department of Native American studies to meet with a minor adviser to complete this form.
**FROM "CORE 2.0"**

Graduates of Montana State University face an ever changing and increasingly complex world. An understanding of and sensitivity to other cultural perspectives prepares them to function in the global community and creates a campus climate that is conducive to academic growth for all students. Diversity courses address the study of identities (e.g. race, class, gender, sexual orientation, ability, etc.), societies, nations, or national languages and cultures.

Students choose from the following:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>NASX 105D</td>
<td>Intro Native Amer Studies</td>
<td>3</td>
</tr>
<tr>
<td>NASX 205D</td>
<td>Native Americans in Contemporay Society</td>
<td>3</td>
</tr>
<tr>
<td>NASX 232D</td>
<td>MT Indians: Cultures, Histories, Current Issues</td>
<td>3</td>
</tr>
<tr>
<td>NASX 239</td>
<td>Native North American History through Art and Material Culture</td>
<td>3</td>
</tr>
<tr>
<td>NASX 290R</td>
<td>Undergraduate Research</td>
<td>1-8</td>
</tr>
<tr>
<td>NASX 292</td>
<td>Independent Study</td>
<td>1-3</td>
</tr>
<tr>
<td>NASX 294R</td>
<td>Seminar/Workshop</td>
<td>1-2</td>
</tr>
<tr>
<td>NASX 304</td>
<td>Native American Beliefs and Philosophy</td>
<td>3</td>
</tr>
<tr>
<td>NASX 310</td>
<td>Native Cultures of North America</td>
<td>3</td>
</tr>
<tr>
<td>NASX 340</td>
<td>Native American Literature</td>
<td>3</td>
</tr>
<tr>
<td>NASX 360</td>
<td>Native Americans and Cinema</td>
<td>3</td>
</tr>
<tr>
<td>NASX 405</td>
<td>Gender Issues in Native American Studies</td>
<td>3</td>
</tr>
<tr>
<td>NASX 415</td>
<td>Native Food Systems</td>
<td>3</td>
</tr>
<tr>
<td>NASX 430</td>
<td>American Indian Education</td>
<td>3</td>
</tr>
<tr>
<td>NASX 440</td>
<td>Montana Indian Literature</td>
<td>3</td>
</tr>
<tr>
<td>NASX 450</td>
<td>History of American Indians</td>
<td>3</td>
</tr>
<tr>
<td>NASX 476</td>
<td>American Indian Policy and Law</td>
<td>3</td>
</tr>
<tr>
<td>NASX 490R</td>
<td>Undergraduate Research</td>
<td>1-6</td>
</tr>
<tr>
<td>NASX 490Z</td>
<td>Undergraduate Research</td>
<td>1-6</td>
</tr>
<tr>
<td>NASX 491</td>
<td>Special Topics</td>
<td>1-4</td>
</tr>
<tr>
<td>NASX 492</td>
<td>Independent Study</td>
<td>1-3</td>
</tr>
<tr>
<td>NASX 494</td>
<td>Seminar</td>
<td>1</td>
</tr>
<tr>
<td>NASX 498</td>
<td>Internship/Cooperative Educ</td>
<td>2-12</td>
</tr>
</tbody>
</table>

**Further Information**

For further information regarding the program, contact Native American Studies at (406) 994-3881 or e-mail Francesca Pine at francesca.pine@montana.edu. Also see the university home page (http://www.montana.edu) or the home page for Native American Studies (http://www.montana.edu/wwwnas).

**Philosophy**

Philosophy is concerned with the underlying assumptions and broad implications of human knowledge and values. The curriculum in philosophy contains a wide range of courses that explore diverse topics through the writings of important philosophers of the past and present. Emphasis is placed on understanding different solutions to questions about such topics as the role of emotion in film, the moral questions surrounding medicine and bioethics, the importance of the environment and animals, the origin of life, the nature of consciousness, etc., and on analyzing and criticizing them.

The Bachelor of Art in Philosophy has traditionally served as a basis for further study in philosophy, law, religion, or related fields. It may also be used as background training for government, business, writing, information management, or any field that depends upon a strong liberal arts education.

The department has traditionally encouraged taking a double major and has restricted the number of required courses in philosophy so that this may be possible.

The department also encourages students to engage in independent study through the departmental honors option. This option has the following requirements:

1. Students must have a minimum 3.5 grade-point average in their major and a 3.0 GPA overall.
2. Students must present an acceptable, bound senior thesis, and an oral defense of the thesis.

Students may attain 3-6 undergraduate independent study credits while working for their thesis. Qualified students may enroll in the honors option through their departmental advisors.

**Undergraduate Programs**

- Philosophy Option (p. 241)
- Philosophy and Religion Option (p. 241)

**Undergraduate Minors**

- Astrobiology Minor (Non Teaching) (p. 191)
- Philosophy Minor (Non-Teaching) (p. 240)

The Department of History, Philosophy and Religious studies currently offers no Graduate Studies in Philosophy.

**Philosophy Minor (Non-Teaching)**

The minimum number of credits required for a non-teaching minor is twenty-one, with nine of those being upper-division credits.

**Required**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHL 236Q</td>
<td>Logic</td>
<td>3</td>
</tr>
</tbody>
</table>

Choose at least one of the following (both are recommended):

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHL 361RH</td>
<td>Hist of Philo:Ancient/Medieval</td>
<td></td>
</tr>
<tr>
<td>PHL 362</td>
<td>History of Philosophy: Modern</td>
<td></td>
</tr>
</tbody>
</table>

Take at least two of the following: 3

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHL 303</td>
<td>Approaches to Epistemology</td>
<td></td>
</tr>
<tr>
<td>PHL 304</td>
<td>Metaphysics</td>
<td></td>
</tr>
<tr>
<td>PHL 308</td>
<td>Language and the World</td>
<td></td>
</tr>
<tr>
<td>PHL 310</td>
<td>Moral Theory</td>
<td></td>
</tr>
<tr>
<td>PHL 312</td>
<td>Contemporary Moral Problems</td>
<td></td>
</tr>
<tr>
<td>PHL 321</td>
<td>Philosophy &amp; Biomedical Ethics</td>
<td></td>
</tr>
<tr>
<td>PHL 322</td>
<td>Philosophy &amp; Enviromntl Ethics</td>
<td></td>
</tr>
<tr>
<td>PHL 327</td>
<td>Aesthetics and the Arts</td>
<td></td>
</tr>
<tr>
<td>PHL 350RH</td>
<td>State, Community &amp; Individual</td>
<td></td>
</tr>
<tr>
<td>PHL 351</td>
<td>Philosophy and Feminism</td>
<td></td>
</tr>
<tr>
<td>PHL 345</td>
<td>Philosophy of Science</td>
<td></td>
</tr>
<tr>
<td>PHL 365</td>
<td>Phil of Mind and Consciousness</td>
<td></td>
</tr>
<tr>
<td>PHL 370</td>
<td>Philosophy of Religion</td>
<td></td>
</tr>
<tr>
<td>PHL 385</td>
<td>Existentialism and After</td>
<td></td>
</tr>
</tbody>
</table>

9 credits of additional Philosophy Electives, three credits of which must be upper division.

**Total Credits**

12
Philosophy Option

Freshman Year  Credits
CLS 101US - Knowledge and Community  3
WRIT 101W - College Writing I  3
Intro to Philosophy - choose one of the following  3
PHL 101IH - Intro Phil:Reason and Reality
PHL 103D - Philosophy and Popular Culture
PHL 110IH - Intro Ethics:Good and Evil
PHL 205CS - Other Animals
PHL 255D - Philosophy and Culture
PHL 270 - Philosophies of Asia
PHL 278CS - Origins of Life
University Core and Electives  21
Year Total:  30

Sophomore Year  Credits
PHL 236Q - Logic  3
One Year Modern Language*  8
Choose one of the following in political philosophy/aesthetic:  3
PHL 327 - Aesthetics and the Arts
PHL 328 - Philosophy and Film
PHL 350RH - State, Community & Individual
PHL 351 - Philosophy and Feminism
PHL 353 - Philosophy and Technology
PHL 354 - Philosophy of Race
University Core and Electives  16
Year Total:  30

Junior Year  Credits
PHL 361RH - Hist of Philo:Ancient/Medieval  3
PHL 362 - History of Philosophy: Modern  3
PHL 370 - Philosophy of Religion  3
Choose one of the following in ethics:
PHL 310 - Moral Theory
PHL 312 - Contemporary Moral Problems
PHL 321 - Philosophy & Biomedical Ethics
PHL 322 - Philosophy & Environmntl Ethics
Choose one of the following 300-level or 400-level Religious Studies:
RLST 321 - Religion and Gender
RLST 325 - Religion and Literature
RLST 326 - Topics in Religion
RLST 330 - Religion of Ancient Egypt
RLST 332 - Archaeology & Religion
RLST 402 - Natural/Unnatural/Supernatural
RLST 405 - Text and Image
RLST 407 - Violence & Religion
RLST 410 - What is Religion?
University Core and Electives  18
Year Total:  30

Senior Year  Credits
PHL 494 - Seminar  3
PHL 494 - Seminar  3
Choose one of the following in metaphysics/epistemology:  3
PHL 303 - Approaches to Epistemology
PHL 304 - Metaphysics
PHL 305 - Contemporary Philosophy
PHL 308 - Language and the World  3
PHL 345 - Philosophy of Science
or PHL 365 - Phil of Mind and Consciousness
University Core and Electives  9
PHL electives, upper division  6
Year Total:  30
Total Program Credits:  120

A minimum of 120 credits is required for graduation; 42 of these credits must be in courses numbered 300 and above. Students must receive a grade of C- or better in all required courses.

* The 1 year language requirement will be waived for students who COMPLETE a second major or double degree.

Philosophy and Religion Option

Freshman Year  Credits
CLS 101US - Knowledge and Community  3
WRIT 101W - College Writing I  3
University Core and Electives  24
Year Total:  30

Sophomore Year  Credits
PHL 236Q - Logic  3
One Year Modern Language*  8
RLST 202D - Hindu Traditions
or RLST 203D - Buddhist Traditions
Choose one of the following:  3
RLST 204IH - Intro to the Hebrew Bible
RLST 205IH - Introduction to New Testament
RLST 206IH - Origins of God
RLST 207IH - Myth and Belief
University Core and Electives  13
Year Total:  30

Junior Year  Credits
PHL 361RH - Hist of Philo:Ancient/Medieval  3
PHL 362 - History of Philosophy: Modern  3
PHL 370 - Philosophy of Religion  3
Choose one of the following in ethics:
PHL 312 - Contemporary Moral Problems
PHL 310 - Moral Theory
PHL 321 - Philosophy & Biomedical Ethics
PHL 322 - Philosophy & Environmntl Ethics
Choose one of the following 300-level or 400-level Religious Studies:
RLST 321 - Religion and Gender
RLST 325 - Religion and Literature
RLST 326 - Topics in Religion
RLST 330 - Religion of Ancient Egypt
RLST 332 - Archaeology & Religion
RLST 402 - Natural/Unnatural/Supernatural
RLST 405 - Text and Image
RLST 407 - Violence & Religion
RLST 410 - What is Religion?
University Core and Electives  18
Year Total:  30

Senior Year  Credits
PHL 494 - Seminar  3
PHL 494 - Seminar  3
Choose one of the following in metaphysics/epistemology:  3
PHL 303 - Approaches to Epistemology
PHL 304 - Metaphysics
PHL 305 - Contemporary Philosophy
PHL 308 - Language and the World  3
PHL 345 - Philosophy of Science
PHL 365 - Phil of Mind and Consciousness  3
PHL 370 - Philosophy of Religion  3

A minimum of 120 credits is required for graduation; 42 of these credits must be in courses numbered 300 and above. Students must receive a grade of C- or better in all required courses.
Choose one of the following 300 level or 400-level Religious Studies courses:

- RLST 321 - Religion and Gender
- RLST 325 - Religion and Literature
- RLST 326 - Topics in Religion
- RLST 330 - Religion of Ancient Egypt
- RLST 332 - Archaeology & Religion
- RLST 402 - Natural/Unnatural/Supernatural
- RLST 405 - Text and Image
- RLST 407 - Violence & Religion
- RLST 410 - What is Religion?

University Core and Electives: 18

Year Total: 39

Total Program Credits: 129

A minimum of 120 credits is required for graduation: 42 of these credits must be in courses numbered 300 and above. Students must receive a grade of C- or better in all required courses.

* The 1 year language requirement will be waived for students who COMPLETE a second major or double degree.

**Physics Curriculum**

The physics curriculum is designed with considerable flexibility in order to accommodate the variety of interests, plans, and needs of majors. At the same time, it provides a broad and thorough understanding of the fundamental ideas and concepts related to the physical world surrounding us. Using this broad base, which stresses fundamentals, undergraduates may enter graduate school in one of the pure or applied sciences or one of the non-sciences such as education, business administration, law, journalism, or philosophy. They may also choose to go directly into jobs in education, industry, government, or business.

The Department of Physics offers several undergraduate degree options, as well as Master of Science and Doctor of Philosophy degrees. The faculty in all research groups are strongly committed to enriching the undergraduate experience by providing opportunities for undergraduates to fully participate in cutting-edge research projects working alongside faculty and graduate students.

An overview of the physics department can be found at physics.montana.edu

**Professional Option**

Intended primarily as preparation for graduate work in one of the physical sciences or for those who desire a career in the physical sciences, the professional option provides a sound background in the fundamentals of physics and mathematics.

**Interdisciplinary Option**

This option requires a minimum of 16 credits in the declared area and is designed for those students who desire a firm background in mathematics and physics coupled with a concentration in another discipline. Example declared areas are chemistry, biology, computer science, engineering, environmental studies, pre-law, pre-med, business, marketing, material science, optics, or technical writing. Each student will work out a specific coordinated program with their physics advisor and an advisor in the declared area. The 16 credits of coursework in the declared area must be 100 level or higher and approved by the student’s physics advisor. Courses at the 100 level will be approved as needed to allow the student to obtain the appropriate prerequisites for 200 and higher level courses in the declared area.

**Teaching Option**

This option is intended primarily as preparation for secondary school teachers. Teaching options require a teaching minor from the list under the Department of Education. However, the only teaching minor that can be completed within 128 credits is Mathematics. Please contact the department advisor for specifics on other options.

**Physics Minor (Non-teaching)**

The physics minor is designed to provide students with a fundamental background in physics and mathematics, strengthening analytic and problem solving skills, which can be applied to multiple disciplines.

**Optics Minor (Non-teaching)**

The undergraduate non-teaching minor in optics provides a core set of knowledge and skills necessary to participate in the rapidly growing opportunities in optical science and engineering. Requirements include courses in optics, electrical engineering and physics, as well as electives chosen to match the interests and needs of each student.

Students pursuing the BS in Physics Professional Option or the BS in Physics Interdisciplinary Option can earn the Optics Minor with no extra credits by carefully selecting physics electives, by taking EELE 482 as one of their university or declared area electives, and by completing optics-related research (PHSX 490R and PHSX 499R) as their required senior project.

**Materials Minor (Non-teaching)**

Montana State University, Bozeman, offers a non-teaching minor in Materials Science & Engineering called the Minor in Materials. This minor provides courses from a variety of disciplines which are relevant to synergies of science and engineering in polymer, metallic, ceramic, hybrid, and composite materials for both structural and functional application. The minor requires a minimum of 32 credits comprised of 14 credits of required coursework (or equivalent) followed by 18 credits of elective coursework.

**Research Opportunities**

Research programs in the Department of Physics are currently focused in several areas: optical science and laser technology, condensed matter physics, gravitational physics, astrophysics, solar physics, and science education. The MSU Gravity Group studies extreme astrophysical phenomena, such as the inspiral and merger of black holes and neutron stars, to further our understanding of astrophysics and fundamental physics. Our programs in astrophysics and relativity are directed toward a fundamental understanding of the behavior of matter and energy on the astrophysical scale. Our solar physics group studies phenomena such as solar flares and prominences associated with the star nearest us, the sun. Our research in the physics of lasers and condensed matter systems - such as magnetic and dielectric materials, semiconductor and metal surfaces and thin films, microwave photonic devices, laser materials and superconducting solids - enlarges the knowledge base on which future advances in technology are founded. Our research in science education aims to improve the understanding of how students can best learn science in the schools, colleges, and universities. All of the Department’s research activities enhance our instructional programs by involving undergraduate students in capstone research problems and techniques at the frontiers of physical knowledge. Faculty working with the most advanced techniques on current topics carry their research experience into the classrooms at all levels.

Our research groups foster interactions among the faculty, undergraduate and graduate students, research scientists, visiting scientists, and other departments and centers. Our research facilities at the Engineering and
Physical Science (EPS) Building include state-of-the-art laboratories and equipment. External collaborations bring national and international experts to the department and open opportunities for research to be conducted at other world-class laboratories around the globe. On-campus, interdisciplinary research include collaborations with the departments of Chemistry and Biochemistry, Electrical and Computer Engineering, Mechanical Engineering, and several research centers and institutes on campus including the Space Science and Engineering Laboratory (SSEL), the Imaging and Chemical Analysis Laboratory (ICAL), Montana Space Grant Consortium (MSGC), the Optical Technology Center (OptToC), and the Spectrum Lab and interdisciplinary academic programs, such as Material Science and Optics and Photonics undergraduate and graduate degree programs. Research collaborations with local industries are numerous and actively pursued. For more information on each research program, click here (http://www.physics.montana.edu/research/resgroups.htm).

Undergraduate Research Participation

An integral component of all undergraduate major programs in physics is participation in undergraduate research. Based on student interest, the faculty work closely with students in identifying and addressing important problems in particular sub-fields. Completion of a minimum of 2 credits of undergraduate research/creative activity (PHSX 490R) is required prior to taking the capstone course PHSX 499R. Some students extend this experience beyond the minimum and work in research labs throughout their undergraduate program, including summers. Students from other majors who demonstrate interest and ability are also welcome to participate in undergraduate research in physics.

Senior Project

Students in the professional and interdisciplinary options will complete senior projects that integrate their physics knowledge and problem solving skills with research/creative activities. The senior project is designed to give a student the opportunity to develop skills that are necessary for work in a professional scientific environment by integrating their physics knowledge and problem solving skills with research/creative activities. For this activity, the student must enroll in a minimum of 2 credits of undergraduate research/creative activity (PHSX 490R). The results of this senior project are generally the basis for the presentation given in the capstone course PHSX 499R.

The senior project will be based on a collaboration of a student with a mentor on a project that: is of interest to the student, is either experimental or theoretical in nature, has a defined objective, and is primarily based on the student’s own work. Usually these senior projects are based on research guided by one of the faculty in the Physics Department; however, there are several other options available to the student for these senior projects. Other options include, but are not limited to, research projects done by the student in other departments at Montana State University, research projects done by the student at other institutions which may occur during a student exchange program or on a summer intern program, and independent research/creative activity done by the student under the guidance of the student’s faculty advisor.

Capstone Experience

Students in the professional and interdisciplinary options will present the results of their senior project in oral and written forms in the capstone course PHSX 499R.

The capstone experience for those in the Physics Teaching Option is EDU 495 - Student Teaching. Each student will submit a written report from the supervising teacher and a written self-assessment.

Departmental Honors in Physics

When appropriate, majors should consider the opportunities afforded by the departmental honors program. This program has the following requirements:

1. A minimum 3.5 grade-point average (GPA) in physics; 3.0 GPA overall.
2. A minimum of four credits of undergraduate research credit.
4. Participation in a physics seminar for one semester in either the junior or senior year.

A detailed description of the program is available from the department.

Undergraduate and Graduates Courses

- Physics (PHSX) Courses (p. 527)
- Physics-Astronomy (ASTR) Courses (p. 424)

Undergraduate Programs

- Professional Option (p. 245)
- Interdisciplinary Option (p. 243)
- Physics Teaching Option (p. 244)

Undergraduate Minor

- Physics Minor (Non-Teaching) (p. 244)
- Optics Minor (Non-Teaching) (p. 169)
- Materials Minor (Non-Teaching) (p. 173)

Graduate Programs

The Physics Department offers a Master of Science (M.S.) degree in physics and a Doctor of Philosophy (Ph.D.) degree in physics.

Information concerning the physics graduate program can be found at Physics Graduate Programs (p. 375)

Interdisciplinary Option

<table>
<thead>
<tr>
<th>Freshman Year</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>PHSX 240 - Honors Gen &amp; Mod Phys I</td>
<td>4</td>
</tr>
<tr>
<td>M 181Q - Honors Calculus I (Recommended)</td>
<td>4</td>
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<tr>
<td>or M 171Q - Calculus I</td>
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<tr>
<td>University Core and Electives</td>
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<tr>
<td>PHSX 242 - Honors Gen &amp; Mod Phys II</td>
<td>4</td>
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<tr>
<td>M 182Q - Honors Calculus II (Recommended)</td>
<td>4</td>
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<tr>
<td>or M 172Q - Calculus II</td>
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<tr>
<td>Biol, Chem, or Earth Science Electives</td>
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<thead>
<tr>
<th>Sophomore Year</th>
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<tr>
<td>PHSX 200 - Research Programs in Physics</td>
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</tr>
<tr>
<td>PHSX 224 - Physics III</td>
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<tr>
<td>M 283Q - Honors Multivariable Calculus (Recommended) or M 273Q - Multivariable Calculus</td>
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<td>PHSX 261 - Laboratory Electronics I</td>
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<td>PHSX 262 - Laboratory Electronics II</td>
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Physics Minor (Non-Teaching)

- PHSX 240 - Honors Gen & Mod Phys I (Recommended) 4
  or PHSX 220 - Physics I (w/ calculus)
- PHSX 242 - Honors Gen & Mod Phys II (Recommended) 4
  or PHSX 222 - Physics II (w/ calculus)
- PHSX 224 - Physics III 4
- PHSX 301 - Intro Theoretical Physics 3
- PHSX 343 - Modern Physics 3
  or PHSX 320 - Classical Mechanics

Physics Teaching Option

**Freshman Year**

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<td>or PHSX 220 - Physics I (w/ calculus)</td>
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<td>M 181Q - Honors Calculus I (Recommended)</td>
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<td>or M 171Q - Calculus I</td>
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**Sophomore Year**

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<td>PHSX 242 - Honors Gen &amp; Mod Phys II</td>
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<tr>
<td>M 182Q - Honors Calculus II (Recommended)</td>
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<tr>
<td>or M 172Q - Calculus II</td>
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**Junior Year**

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<th>Course</th>
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<tr>
<td>M 328 - Higher Math for Sec Teachers</td>
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<td>PHSX 320 - Classical Mechanics</td>
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<td>PHSX 343 - Modern Physics</td>
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<tr>
<td>or ASTR 371 - Solar System Astronomy</td>
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<td>or ASTR 373 - Stars, Galaxies, and the Universe</td>
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**Senior Year**

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<th>Course</th>
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University Core and Electives 3
Year Total: 17 17

<table>
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<th>Professional Option</th>
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<th>Spring</th>
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<td>Freshman Year</td>
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<tr>
<td>PHSX 240 - Honors Gen &amp; Mod Phys I*</td>
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<td>M 181Q - Honors Calculus I (Recommended)</td>
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<td>University Core and Electives</td>
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<td>PHSX 242 - Honors Gen &amp; Mod Phys II*</td>
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<td>M 182Q - Honors Calculus II (Recommended)</td>
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<tr>
<td>or M 172Q - Calculus II</td>
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<td>Biol, Chem, or Earth Science Electives</td>
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<th>Spring</th>
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<tbody>
<tr>
<td>PHSX 200 - Research Programs in Physics</td>
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<td>PHSX 224 - Physics III</td>
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<tr>
<td>M 283Q - Honors Multivariable Calculus (Recommended)</td>
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<td>or M 273Q - Multivariable Calculus</td>
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<td>PHSX 261 - Laboratory Electronics I</td>
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<td>PHSX 262 - Laboratory Electronics II</td>
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<tr>
<td>PHSX 301 - Intro Theoretical Physics</td>
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<tr>
<td>M 284 - Honors Introduction to Differential Equations (Recommended)</td>
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<td>or M 274 - Introduction to Differential Equation</td>
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Junior Year 15 15

<table>
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<tr>
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<tr>
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<td>PHSX 331 - Meth of Computational Physics</td>
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<td>PHSX 343 - Modern Physics</td>
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<tr>
<td>PHSX 490R - Undergraduate Research</td>
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<td>Math Electives</td>
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<td>University Core and Electives</td>
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<td>PHSX 423 - Electricity and Magnetism I</td>
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<td>PHSX 446 - Thermodynamics &amp; Stat Mech</td>
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<td>Physics Electives</td>
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<tr>
<td>PHSX 425 - Electricity and Magnetism II</td>
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<td>PHSX 461 - Quantum Mechanics I</td>
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<td>PHSX 444 - Advanced Physics Lab</td>
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<td>PHSX 490R - Undergraduate Research</td>
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<td>Math Electives</td>
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<td>PHSX 462 - Quantum Mechanics II</td>
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<tr>
<td>PHSX 499R - Senior Capstone Seminar</td>
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<td>Physics Electives</td>
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<td>University Core and Electives</td>
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<tr>
<td>Year Total:</td>
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</table>

Total Program Credits: 120

* The physics electives are to be selected from PHSX courses numbered 200 and above. The physics electives can include no more than 1 credit of PHSX 494. A minimum of 128 credits is required for graduation; 42 of these credits must be in courses numbered 300 and above. A student changing majors or with unusual circumstances can substitute PHSX 220 for PHSX 240, or PHSX 222 for PHSX 242 with academic advisor’s approval. It is recommended to take “RH” and “RA” designated core classes in order to simultaneously satisfy the requirement for 3 credits of Core 2.0 “R”.

**Bachelors of Arts in Political Science**

The study of Political Science develops an understanding of politics, government, and public affairs. Political Science graduates develop a coherent and reasoned knowledge about governance, political behavior, and public administration. This degree prepares students to be part of an informed national and global citizenry. Political Science provides an excellent academic background for students preparing for careers in law, public service, journalism, non-profits, and many private sectors jobs. Students are encouraged to participate in our internship program to practice and expand skills gained in the classroom. The internship program gives students the opportunity to earn credit for on-the-job experience with government agencies, Members of Congress and the state legislature, and non-profit agencies. Students choose one of the four options offered for
an area of emphasis, and the options offered are Political Institutions, International Relations, Policy and Analysis and Political Theory.

Requirements for a degree in Political Science include:

1. Completion of five Political Science foundation courses with a grade of “C” or better;
2. Breadth requirement: Taking one course in each of the four options, including Political Institutions, International Relations, Policy and Analysis and Political Theory.
3. Specialization: Choosing one option and taking two more courses in that option along with an associated skills class;
4. Completion of a senior research project (PSCI 499R);
5. Completion of MSU general graduation requirements of 120 credits, including 42 upper division credits, and the MSU core.

Political Institutions Option (p. 246)
For students with an interest in political institutions, including legislative, executive and judicial branches, who wish to obtain a sound background in how political systems operate. This option includes courses on the American political system. The skills requirement is Applied Political Analysis (PSCI 310).

International Relations Option (p. 246)
Offering a sound background in international relations theory, international institutions, international policy and international political economy. The skills requirement is proficiency in a foreign language (two semesters of university level foreign language, CLEP, or existing bilingualism).

Policy and Analysis Option (p. 246)
This option develops skills in the analysis of public policies and knowledge of the policy process. The skills requirement is Applied Political Analysis (PSCI 310).

Political Theory Option (p. 246)
For students who wish to pursue key questions of political theory, including questions about rights, identity, virtue, gender, knowledge, and justice, among others. The skills requirement is Introduction to Logic (PHL 236Q).

Curriculum
Before a Political Science major may enroll in any upper division course, the student is expected to have achieved a grade of “C” or better in the five Political Science foundation courses.

First: Take all of the following foundation courses:
PSCI 200 Intro to Conducting Political Inquiry
PSCI 210IS Intro to American Government
PSCI 214IS Principles of Political Science or PSCI 240 Intro to Public Administration
PSCI 230D Intro to International Relations or PSCI 220 Comparative Politics
ECNS 101IS The Economic Way of Thinking

Second: Take one course in each of the following four options, then choose one option and take two more courses in that option along with an associated skills class.
Political Institutions
PSCI 302 Media and Politics
PSCI 306 Legislative Process
PSCI 337 Model United Nations
PSCI 341 Political Parties and Elections
PSCI 353 British Politics
PSCI 346 American Presidency
PSCI 444 Congressional Campaigns
PSCI 471 American Constitutional Law
Skills Course: PSCI 310 Applied Political Analysis

International Relations
PSCI 331 International Relations Theory
PSCI 337 Model United Nations
PSCI 353 British Politics
PSCI 406 Political Economy of Energy
PSCI 418 The Politics of War and Peace
PSCI 423 The Politics of Development
PSCI 434 International Law
PSCI 436 Politics of Food and Hunger
PSCI 437 International Political Economy
PSCI 439 International Human Rights
Skills Course: Proficiency in a foreign language (two semesters of university level foreign language, CLEP, or existing bilingualism)

Policy and Analysis
PSCI 337 Model United Nations
PSCI 353 British Politics
PSCI 362 Natural Resource Policy
PSCI 406 Political Economy of Energy
PSCI 407 Public Policy Analysis
PSCI 423 The Politics of Development
PSCI 436 Politics of Food and Hunger
PSCI 465 Public Administration and Policy
Skills Course: PSCI 310 Applied Political Analysis

Political Theory
PSCI 323 Modern Political Thought
PSCI 354 Contemporary Issues in Political Theory
PSCI 356 Classical Political Thought
PSCI 454 Cinema and Political Theory
PSCI 455 Politics and Virtue
Skills Course: PHL 236Q Intro to Logic

Third: take your senior thesis class
PSCI 499R Senior Thesis

Political Science Non-Teaching Minor
To earn a Political Science Non-Teaching Minor, a minimum of 21 credit hours are required, with 9 credits from upper division classes, 300-level and above.

Take 4 of the following:
PSCI 200 Introduction to Conducting Political Inquiry 3
PSCI 210IS Introduction to American Government 3
PSCI 214IS Principles of Political Science 3
PSCI 230D Introduction to International Relations 3
PSCI 240 Introduction to Public Administration 3
ECNS 101IS Economic Way of Thinking 3

And take at least 3 regularly scheduled upper division Political Science classes.

Total Credits 21
Undergraduate Curriculum in Political Science

- Policy and Analysis Option (p. 247)
- International Relations Option (p. 247)
- Political Institutions Option (p. 248)
- Political Theory Option (p. 248)

The Master of Public Administration (MPA) degree is a professional degree designed to prepare both pre- and mid-career professionals and administrators for supervisory, analytical support and policy-making positions in public sector agencies, and non-profit organizations, at local, state and federal levels. The program stresses sound preparation in wide range of administrative competencies. MPA coursework includes studies in public administration theory, human resource management, public budgeting, leadership, ethics, organization dynamics, and research methods for public administrators. Information on this program can be found at the MPA Graduate Program (p. 377) page.

International Relations Option

Freshman Year

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<tbody>
<tr>
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</tr>
<tr>
<td>PSCI 210IS - Introduction to American Government</td>
<td>3</td>
</tr>
<tr>
<td>PSCI 214IS - Principles of Political Science or PSCI 240 - Introduction to Public Administration</td>
<td>3</td>
</tr>
<tr>
<td>PSCI 230D - Introduction to International Relations</td>
<td>3</td>
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<tr>
<td>CLS 101US - Knowledge and Community</td>
<td>3</td>
</tr>
<tr>
<td>WRIT 101W - College Writing I</td>
<td>3</td>
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<tr>
<td>M 105Q - Contemporary Mathematics (formerly M 145Q, Math for Liberal Arts)</td>
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<td>University Core and Electives</td>
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Year Total: 30

Sophomore Year

And Junior Year

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<th>Course</th>
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<tr>
<td>Two Semesters Univ. Level Foreign Language/CLEP/Existing Bilingualism</td>
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<tr>
<td>ECNS 101IS - Economic Way of Thinking</td>
<td>3</td>
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<tr>
<td>Choose three of the following:</td>
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<tr>
<td>PSCI 331 - International Relations Theory</td>
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<tr>
<td>PSCI 337 - Model United Nations</td>
<td></td>
</tr>
<tr>
<td>PSCI 353 - British Politics</td>
<td></td>
</tr>
<tr>
<td>PSCI 406 - The Political Economy of Energy</td>
<td></td>
</tr>
<tr>
<td>PSCI 418 - The Politics of War &amp; Peace</td>
<td></td>
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<tr>
<td>PSCI 423 - Politics of Development</td>
<td></td>
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<tr>
<td>PSCI 434 - International Law</td>
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<tr>
<td>PSCI 436 - Politics of Food &amp; Hunger</td>
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<td>PSCI 437 - International Political Econ</td>
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<td>PSCI 439 - International Human Rights</td>
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<td>One upper division Policy &amp; Analysis course</td>
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<tr>
<td>One upper division Political Institutions course</td>
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<tr>
<td>One upper division Political Theory course</td>
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<td>University Core and Electives/Internship - PSCI 498</td>
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Year Total: 60

Senior Year

<table>
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<th>Course</th>
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<tr>
<td>PSCI 499R - Senior Project/Theiss</td>
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<tr>
<td>Electives/Internship - PSCI 498</td>
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</table>

Year Total: 30

Total Program Credits: 120

A minimum of 120 credits is required for graduation; 42 of these credits must be in courses numbered 300 and above. No political science course may be counted more than once. Political science majors must fulfill Social Science Inquiry (IS) and Diversity (D) University Core requirements outside of the PSCI rubric. Before a political science major may enroll in any upper division political science course, the student must have achieved a grade of “C” or better in all lower division courses required for the political science major. To be credited toward graduation, a student must earn a “C” or better in any upper division political science course required for the major.

Policy and Analysis Option

Freshman Year

<table>
<thead>
<tr>
<th>Course</th>
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<tbody>
<tr>
<td>PSCI 200 - Introduction to Conducting Political Inquiry</td>
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</tr>
<tr>
<td>PSCI 210IS - Introduction to American Government</td>
<td>3</td>
</tr>
<tr>
<td>PSCI 214IS - Principles of Political Science or PSCI 240 - Introduction to Public Administration</td>
<td>3</td>
</tr>
<tr>
<td>PSCI 230D - Introduction to International Relations</td>
<td>3</td>
</tr>
<tr>
<td>CLS 101US - Knowledge and Community</td>
<td>3</td>
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<tr>
<td>WRIT 101W - College Writing I</td>
<td>3</td>
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<tr>
<td>M 105Q - Contemporary Mathematics (formerly M 145Q, Math for Liberal Arts)</td>
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Year Total: 30

Sophomore Year

And Junior Year

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
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<tbody>
<tr>
<td>ECNS 101IS - Economic Way of Thinking</td>
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<tr>
<td>PSCI 310 - Applied Political Analysis</td>
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<tr>
<td>Choose three of the following:</td>
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<tr>
<td>PSCI 337 - Model United Nations</td>
<td></td>
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<tr>
<td>PSCI 353 - British Politics</td>
<td></td>
</tr>
<tr>
<td>PSCI 362 - Natural Resource Policy</td>
<td></td>
</tr>
<tr>
<td>PSCI 406 - The Political Economy of Energy</td>
<td></td>
</tr>
<tr>
<td>PSCI 407 - Public Policy Analysis</td>
<td></td>
</tr>
<tr>
<td>PSCI 423 - Politics of Development</td>
<td></td>
</tr>
<tr>
<td>PSCI 436 - Politics of Food &amp; Hunger</td>
<td></td>
</tr>
<tr>
<td>One upper division International Relations course</td>
<td>3</td>
</tr>
<tr>
<td>One upper division Political Institutions course</td>
<td>3</td>
</tr>
<tr>
<td>One upper division Political Theory course</td>
<td>3</td>
</tr>
<tr>
<td>University Core and Electives/Internship - PSCI 498</td>
<td>36</td>
</tr>
</tbody>
</table>

Year Total: 60

Senior Year

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>PSCI 499R - Senior Project/Theiss</td>
<td>3</td>
</tr>
<tr>
<td>Electives/Internship - PSCI 498</td>
<td>27</td>
</tr>
</tbody>
</table>

Year Total: 30

Total Program Credits: 120

A minimum of 120 credits is required for graduation; 42 of these credits must be in courses numbered 300 and above. No political science course may be counted more than once. Political science majors must fulfill Social Science Inquiry (IS) and Diversity (D) University Core requirements outside of the PSCI rubric. Before a political science major may enroll in any upper division political science course, the student must have achieved a grade of “C” or better in all lower division courses required for the political science major. To be credited
toward graduation, a student must earn a "C" or better in any upper division political science course required for the major.

**Political Institutions Option**

**Freshman Year**
- PSCI 200 - Introduction to Conducting Political Inquiry 3
- PSCI 210IS - Introduction to American Government 3
- PSCI 214IS - Principles of Political Science 3
- or PSCI 240 - Introduction to Public Administration 3
- PSCI 230D - Introduction to International Relations 3
- CLS 101US - Knowledge and Community 3
- WRIT 101W - College Writing I 3
- M 105Q - Contemporary Mathematics (formerly M 145Q, Math for Liberal Arts) 3

University Core and Electives 9
Year Total: 30

**Sophomore Year**
and Junior Year
- ECNS 101IS - Economic Way of Thinking 3
- PSCI 310 - Applied Political Analysis 3

Choose three of the following:
- PSCI 302 - Media & Politics 3
- PSCI 306 - Legislative Process 3
- PSCI 337 - Model United Nations 3
- PSCI 341 - Political Parties and Elections 3
- PSCI 346 - American Presidency 3
- PSCI 353 - British Politics 3
- PSCI 444 - Congressional Campaign 3
- PSCI 471 - American Constitutional Law 3

One upper division Policy & Analysis course 3
One upper division International Relations course 3
One upper division Political Theory course 3
University Core and Electives/Internship - PSCI 498 36
Year Total: 60

**Senior Year**
- PSCI 499R - Senior Project/Thesis 3
- Electives/Internship - PSCI 498 27
Year Total: 30

Total Program Credits: 120

A minimum of 120 credits is required for graduation; 42 of these credits must be in courses numbered 300 and above. No political science course may be counted in more than one upper division sub-field requirement. Political science majors must fulfill Social Science Inquiry (IS) and Diversity (D) University Core requirements outside of the PSCI rubric. Before a political science major may enroll in any upper division political science course, the student must have achieved a grade of "C" or better in all lower division courses required for the political science major. To be credited toward graduation, a student must earn a "C" or better in any upper division political science course required for the major.

**Political Theory Option**

**Freshman Year**
- PSCI 200 - Introduction to Conducting Political Inquiry 3
- PSCI 210IS - Introduction to American Government 3

**Sophomore Year**
- PSCI 214IS - Principles of Political Science 3
- or PSCI 240 - Introduction to Public Administration 3
- PSCI 230D - Introduction to International Relations 3
- CLS 101US - Knowledge and Community 3
- WRIT 101W - College Writing I 3
- M 105Q - Contemporary Mathematics (formerly M 145Q, Math for Liberal Arts) 3
- University Core and Electives 9
Year Total: 30

**Senior Year**
- PSCI 214IS - Principles of Political Science 3
- or PSCI 240 - Introduction to Public Administration 3
- PSCI 230D - Introduction to International Relations 3
- CLS 101US - Knowledge and Community 3
- WRIT 101W - College Writing I 3
- M 105Q - Contemporary Mathematics (formerly M 145Q, Math for Liberal Arts) 3
- University Core and Electives 9
Year Total: 30

**Pre-Med Intake**

The Pre-Med Intake Major is a program that encourages students to explore and prepare for academic majors leading to careers in the health professions. It is not a major from which students will graduate and it is not intended for Nursing students.

Starting at Orientation and throughout their freshmen year, students will be advised by a dedicated academic advisor from the Academic Advising Center. (http://www.montana.edu/www.us/advising.html) While students start on their CORE and math/science courses, the pre-med intake advisor provides students with one-on-one assistance in choosing a major to meet their interests, talents and future goals.

This major also works in partnership with the Health Professions Advising (HPA) Office (http://www.montana.edu/hsa). The HPA advisor offers workshops, advising, and coaching to prepare students in creating a competitive application to medical, dental, pharmacy, physical therapy and
other health care professional schools. Assistance from the HPA office is available to all MSU students and alumni.

The Pre-Med Intake major is designed to foster students’ awareness of the variety of academic majors and opportunities related to the health professions that MSU offers. Students in the program are encouraged to take advantage of special courses, such as MEDS 140, and workshops offered by the HPA office to broaden their knowledge of options in the health professions.

Curriculum in Pre-Med Intake Major

The following courses are recommended for Pre-Med Intake majors, assuming they enter the major with the appropriate Math level.

**Fall Curriculum**

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>STAT 216Q</td>
<td>Introduction to Statistics (3 cr)</td>
<td>3</td>
</tr>
<tr>
<td>BIOH 185</td>
<td>Integrated Physiology I (4 cr)</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td><strong>Choose one of the following:</strong></td>
<td></td>
</tr>
<tr>
<td>CHMY 141</td>
<td>College Chemistry I (4 cr)</td>
<td></td>
</tr>
<tr>
<td>CHMY 151</td>
<td>Honors College Chemistry I (4 cr)</td>
<td></td>
</tr>
<tr>
<td>US Core:</td>
<td>3 - 4 cr (Students may select any University Seminar (US core course))</td>
<td>14-15</td>
</tr>
</tbody>
</table>

**Spring Curriculum**

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>M 161Q</td>
<td>Survey of Calculus (4 cr)</td>
<td>4</td>
</tr>
<tr>
<td>BIOB 260</td>
<td>Cellular and Molecular Biology (4 cr)</td>
<td>4</td>
</tr>
<tr>
<td>MEDS 140</td>
<td>Intro Medicine Health (1 cr)</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td><strong>Take one of the following:</strong></td>
<td></td>
</tr>
<tr>
<td>CHMY 143</td>
<td>College Chemistry II (4 cr)</td>
<td></td>
</tr>
<tr>
<td>CHMY 153</td>
<td>Honors College Chemistry II (4 cr)</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Take one of the following:</strong></td>
<td></td>
</tr>
<tr>
<td>WRIT 101W</td>
<td>College Writing I (3 cr) if needed, or take:</td>
<td>16-17</td>
</tr>
<tr>
<td>WRIT 201</td>
<td>College Writing II (3 cr)</td>
<td></td>
</tr>
<tr>
<td>LIT 110IH</td>
<td>Introduction to Literature (3 cr)</td>
<td></td>
</tr>
</tbody>
</table>

At the end of their freshman year, students in this major will choose an academic major and move from the intake program to an academic degree program. If they remain interested in a career in health care, it is recommended that the student stay engaged with the Health Professions Advising Office.

**Pre-medical/Pre-Health Professional Programs**

The Health Professions Advising (HPA) Office (http://www.montana.edu/hpa) is committed to supporting undergraduate and graduate students, as well as alumni, as they prepare for careers in health care. This office helps students use an informed decision-making process to identify the most appropriate and individualized career choice. It also assists students from all majors to explore career options, understand the academic requirements of professional schools, and prepare the most competitive professional school application possible. While the HPA office works in partnership with the Pre-Med Intake major (p. 248) and the Pre-Med Advisor in the Academic Advising Center (http://www.montana.edu/wwwus/advising.html), it remains a resource for all MSU students, regardless of major.

Students may consult with the Health Professions Advising (HPA) office throughout, or even prior to, their MSU career. The goal of the HPA Office is to provide guidance related to career choices and professional school preparation. It has been central to the creation of MEDS 140, an exploratory class that looks at the range of academic opportunities at MSU and the breadth of opportunity among health-related professions. Exploratory courses are available to learn more about medicine MEDS 440 and dentistry MEDS 340. The HPA office provides a structured professional school application process. It also coordinates several pre-health professional clubs and the pre-health professional honor society. To learn more about its services, please check the HPA website. (http://www.montana.edu/hpa)

Undergraduate Programs

- Pre-Med Intake Major (p. 248)

The Health Professions Advising office hosts two graduate programs for students on the health professions trajectory, depending on whether they have the necessary professional school pre-requisites (Master of Science in Health Sciences (http://www.montana.edu/hpa/graduate)) or need to obtain said pre-requisites (Post Baccalaureate Pre-Medical Certificate (http://www.montana.edu/hpa/postbac)). To learn more about these programs, please click on the aforementioned webpage links or catalog links below:

- Post Baccalaureate Pre-Medical Certificate (p. 399)
- Master of Science in Health Sciences (p. 395)

**Psychology**

Psychology is the scientific study and application of knowledge concerning the behavioral and cognitive processes of humans and other animals. The Psychology Department offers a Bachelor of Science (B.S.) degree in Psychology. This degree prepares students for employment in applied settings or for graduate study in psychology and related fields. Students who choose not to continue toward a graduate degree may find employment in a wide variety of organizations and agencies as well as in research settings where knowledge of behavior and cognition is useful. For such students, a B.S. in psychology offers a broad liberal arts background. Those students who obtain an advanced degree (typically an M.S. or a Ph.D.) may find employment in research settings, academic settings, or private practice, although individuals with advanced degrees also work in a wide variety of other organizations.

The psychology curriculum introduces students to the basic scientific and applied areas of the discipline. It emphasizes theories, methods, and terminology, as well as research findings in each of psychology’s major subareas. Students learn about various research methods used to study psychological phenomena, as well as the strengths and limitations of each. Students conduct psychological research or perform fieldwork in a setting related to psychology, gaining experience that forms the basis for the Senior Thesis Capstone course.

**Prerequisite Requirements**

Any student who enrolls in a psychology course without having passed all prerequisite(s) with a “C” or better grade will be required to withdraw from the course.

Undergraduate Programs

- Psychological Science and Applied Psychology Options (p. 250)
- Psychology Minor (Non-Teaching) (p. 250)

The program leading to a B.S. degree offers psychological science and applied psychology options. Within these options, students select the appropriate psychology electives and career electives in consultation with their advisors based on the student’s career goals and interests. Options and
Electives are described below. Psychology majors cannot have a grade less than "C" in a PSYX course used to satisfy graduation requirements.

**Graduate Program**
- Ph.D. in Psychological Science (p. 378)

**Psychological Science and Applied Psychology Options**

**Freshman Year**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>PSYX 100IS - Intro to Psychology</td>
<td>4</td>
</tr>
<tr>
<td>Choose one of the following:</td>
<td></td>
</tr>
<tr>
<td>Math placement exam at level 4 or higher</td>
<td></td>
</tr>
<tr>
<td>M 105Q - Contemporary Mathematics (formerly M 145Q, Math for Liberal Arts)</td>
<td></td>
</tr>
<tr>
<td>STAT 216Q - Introduction to Statistics</td>
<td>6</td>
</tr>
<tr>
<td>Psychology Electives</td>
<td></td>
</tr>
<tr>
<td>Year Total:</td>
<td>10</td>
</tr>
</tbody>
</table>

**Sophomore Year**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>PSYX 223 - Research Design and Analysis I</td>
<td>4</td>
</tr>
<tr>
<td>PSYX 225 - Research Design and Analysis II</td>
<td>3</td>
</tr>
<tr>
<td>Psychology Electives</td>
<td>6</td>
</tr>
<tr>
<td>Year Total:</td>
<td>13</td>
</tr>
</tbody>
</table>

**Junior Year**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>PSYX 490R - Undergraduate Research or PSYX 495 - Field Pract in Applied Psy</td>
<td>3</td>
</tr>
<tr>
<td>Psychology Electives</td>
<td>6</td>
</tr>
<tr>
<td>Year Total:</td>
<td>9</td>
</tr>
</tbody>
</table>

**Senior Year**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>PSYX 499R - Senior Thesis/Capstone</td>
<td>3</td>
</tr>
<tr>
<td>Psychology Electives</td>
<td>6</td>
</tr>
<tr>
<td>Year Total:</td>
<td>9</td>
</tr>
</tbody>
</table>

**Total Program Credits:** 41

**Freshman, Sophomore, Junior & Senior Years**

**REQUIRED COURSES LISTED ABOVE** 44

**PSYCHOLOGY ELECTIVES (as noted above):**

- Choose at least one course from each of the following four groups (12 credits):
  - Biological/Emotion/Motivation/Learning:
    - PSYX 350 - Physiological Psychology
    - PSYX 370 - Psychology of Learning
  - Cognitive:
    - PSYX 354 - Sensation & Perception
    - PSYX 380 - Memory & Cognition
    - PSYX 481 - Judgment & Decision Making
  - Social/Personality:
    - PSYX 340 - Social Psychology
    - PSYX 385 - Psychology of Personality
    - PSYX 462 - Psychology of Prejudice
  - Developmental/Psychopathology:
    - PSYX 230 - Developmental Psychology
    - PSYX 333 - Psychology of Aging
    - PSYX 340 - Abnormal Psychology

- Choose at least four of the following courses (12 credits). Courses listed above in the four groups are also available:

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>PSYX 235D - Contemp Issues in Human Sexual</td>
<td></td>
</tr>
<tr>
<td>PSYX 263CS - The Psychology of Film</td>
<td></td>
</tr>
<tr>
<td>PSYX 270 - Fund Psychology of Learning</td>
<td></td>
</tr>
<tr>
<td>PSYX 274 - Psychological Measurement</td>
<td></td>
</tr>
<tr>
<td>PSYX 325 - Applied Critical Thinking</td>
<td></td>
</tr>
<tr>
<td>PSYX 335 - Psychology of Gender</td>
<td></td>
</tr>
<tr>
<td>PSYX 375 - Behavior Modification</td>
<td></td>
</tr>
<tr>
<td>PSYX 383 - Health Psychology</td>
<td></td>
</tr>
<tr>
<td>PSYX 384 - Consciousness</td>
<td></td>
</tr>
<tr>
<td>PSYX 400 - History &amp; System in Psychology</td>
<td></td>
</tr>
<tr>
<td>PSYX 461 - Indust &amp; Organiz Psych</td>
<td></td>
</tr>
<tr>
<td>PSYX 463 - Social Cognition</td>
<td></td>
</tr>
<tr>
<td>PSYX 475 - Advanced Behavior Analysis</td>
<td></td>
</tr>
<tr>
<td>PSYX 477 - Science of Psych Well-Being</td>
<td></td>
</tr>
<tr>
<td>PSYX 482 - Psycholinguistics</td>
<td></td>
</tr>
<tr>
<td>PSYX 491 - Special Topics</td>
<td></td>
</tr>
<tr>
<td>PSYX 494 - Seminar</td>
<td></td>
</tr>
</tbody>
</table>

**University CORE, PSYX, and General Electives** 76

**Total Credits** 120

A minimum of 120 credits is required for graduation; 42 of these credits must be in courses numbered 300 and above.

**Applied Psychology Option**

Students interested in areas of applied psychology such as industrial/organizational psychology, human resource management, or organizational behavior, may consider the Applied Psychology Option and may choose elective courses in such disciplines as business, management, industrial and management engineering, or statistics.

**Psychological Science Option**

Students interested in areas of psychological science may choose elective courses in disciplines such as sociology, political science, computer science, or statistics.

Students interested in advanced study in clinical psychology or counseling psychology may follow either the Psychological Science Option or the Applied Psychology Option and should choose elective courses in such disciplines as human development, pre-med, or statistics.

Students in either psychology option should consider developing a minor or second major in an area that enhances career interests. Information regarding these options is available through the Psychology Advising Office, Psychology Faculty Advisors, and the Psychology Department website.

**Psychology Minor (Non-Teaching)**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>PSYX 100IS - Intro to Psychology</td>
<td>4</td>
</tr>
<tr>
<td>PSYX 223 - Research Design and Analysis I</td>
<td>4</td>
</tr>
<tr>
<td>PSYX 225 - Research Design and Analysis II</td>
<td>3</td>
</tr>
<tr>
<td>Choose at least four of the following:</td>
<td>12</td>
</tr>
<tr>
<td>PSYX 230 - Developmental Psychology</td>
<td></td>
</tr>
<tr>
<td>PSYX 235D - Contemp Issues in Human Sexual</td>
<td></td>
</tr>
<tr>
<td>PSYX 263CS - The Psychology of Film</td>
<td></td>
</tr>
<tr>
<td>PSYX 270 - Fund Psychology of Learning</td>
<td></td>
</tr>
<tr>
<td>PSYX 274 - Psychological Measurement</td>
<td></td>
</tr>
<tr>
<td>PSYX 325 - Applied Critical Thinking</td>
<td></td>
</tr>
<tr>
<td>PSYX 333 - Psychology of Aging</td>
<td></td>
</tr>
<tr>
<td>PSYX 335 - Psychology of Gender</td>
<td></td>
</tr>
<tr>
<td>Course Code</td>
<td>Course Title</td>
</tr>
<tr>
<td>-------------</td>
<td>-------------------------------------</td>
</tr>
<tr>
<td>PSYX 340</td>
<td>Abnormal Psychology</td>
</tr>
<tr>
<td>PSYX 350</td>
<td>Physiological Psychology</td>
</tr>
<tr>
<td>PSYX 354</td>
<td>Sensation &amp; Perception</td>
</tr>
<tr>
<td>PSYX 360</td>
<td>Social Psychology</td>
</tr>
<tr>
<td>PSYX 370</td>
<td>Psychology of Learning</td>
</tr>
<tr>
<td>PSYX 375</td>
<td>Behavior Modification</td>
</tr>
<tr>
<td>PSYX 380</td>
<td>Memory &amp; Cognition</td>
</tr>
<tr>
<td>PSYX 383</td>
<td>Health Psychology</td>
</tr>
<tr>
<td>PSYX 384</td>
<td>Consciousness</td>
</tr>
<tr>
<td>PSYX 385</td>
<td>Psychology of Personality</td>
</tr>
<tr>
<td>PSYX 400</td>
<td>History &amp; System in Psychology</td>
</tr>
<tr>
<td>PSYX 461</td>
<td>Indus &amp; Organiz Psych</td>
</tr>
<tr>
<td>PSYX 462</td>
<td>Psychology of Prejudice</td>
</tr>
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<tr>
<td>PSYX 475</td>
<td>Advanced Behavior Analysis</td>
</tr>
<tr>
<td>PSYX 477</td>
<td>Science of Psych Well-Being</td>
</tr>
<tr>
<td>PSYX 481</td>
<td>Judgment &amp; Decision Making</td>
</tr>
<tr>
<td>PSYX 482</td>
<td>Psycholinguistics</td>
</tr>
<tr>
<td>PSYX 491</td>
<td>Special Topics</td>
</tr>
<tr>
<td>PSYX 494</td>
<td>Seminar</td>
</tr>
</tbody>
</table>

Total Credits: 23

### Religious Studies

#### BA in Religious Studies

**Department of History, Philosophy, and Religious Studies**

Religious studies at MSU introduces students to a vibrantly interdisciplinary academic field that is global in scope and addresses some of the key challenges facing citizens of the twenty-first century. Religious Studies asks not only how religion in its many forms has addressed fundamental human questions about life and death, truth and belief, ethics and social justice, but it also considers the political, social, and cultural effects of religion in both the ancient and the modern world.

Religious Studies courses do not advocate for particular theological views. Instead, the courses examine religion academically, from historical, literary, philosophical, and social scientific perspectives. Students in Religious Studies gain a rich body of factual knowledge about the global history of religion, as well as the critical thinking skills necessary for interpreting that knowledge.

Religious Studies offers a major and a minor, and Religious Studies courses can be used as humanities electives in almost any curriculum.

#### Undergraduate Programs

- Religious Studies Major (p. 251)
- Religious Studies Minor (p. 252)

The Department of History, Philosophy and Religious Studies currently offers no Graduate Studies in Religious Studies.

### Religious Studies Major Curriculum

**Degree Requirements**

<table>
<thead>
<tr>
<th>Curriculum</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Core Curriculum</td>
<td>27-30</td>
</tr>
<tr>
<td>Religious Studies courses</td>
<td>38-39</td>
</tr>
<tr>
<td>Foreign Language requirement</td>
<td>8</td>
</tr>
<tr>
<td>Methodologies requirement</td>
<td>6</td>
</tr>
<tr>
<td>Capstone course RLST 499R</td>
<td>3</td>
</tr>
</tbody>
</table>

Electives: 38

Total Credits: 120-124

#### Four-Year Plan

**Freshman Year**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CLS 101US - Knowledge and Community</td>
<td>3</td>
</tr>
<tr>
<td>WRIT 101W - College Writing I</td>
<td>3</td>
</tr>
<tr>
<td>Choose one of the following:</td>
<td>3-4</td>
</tr>
<tr>
<td>RLST 100D - Intro to the Study of Religion</td>
<td></td>
</tr>
<tr>
<td>RLST 110D - Religion, Conflict &amp; Politics</td>
<td></td>
</tr>
<tr>
<td>RLST 220H - Interpretations of Amrcn Relig</td>
<td></td>
</tr>
</tbody>
</table>

One Year Foreign Language: 8

Other University Core and Electives: 13

Year Total: 30-31

**Sophomore Year**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>RLST 202D - Hindu Traditions</td>
<td>3</td>
</tr>
<tr>
<td>or RLST 203D - Buddhist Traditions</td>
<td></td>
</tr>
<tr>
<td>Choose one of the following:</td>
<td>3</td>
</tr>
<tr>
<td>RLST 201 - Islam</td>
<td></td>
</tr>
<tr>
<td>RLST 204H - Intro to the Hebrew Bible</td>
<td></td>
</tr>
<tr>
<td>RLST 205IH - Introduction to New Testament</td>
<td></td>
</tr>
<tr>
<td>Choose two of the following (that have not been used to fulfill a requirement):</td>
<td>6</td>
</tr>
<tr>
<td>RLST 201 - Islam</td>
<td></td>
</tr>
<tr>
<td>RLST 202D - Hindu Traditions</td>
<td></td>
</tr>
<tr>
<td>RLST 203D - Buddhist Traditions</td>
<td></td>
</tr>
<tr>
<td>RLST 204H - Intro to the Hebrew Bible</td>
<td></td>
</tr>
<tr>
<td>RLST 205IH - Introduction to New Testament</td>
<td></td>
</tr>
<tr>
<td>RLST 291 - Special Topics</td>
<td></td>
</tr>
</tbody>
</table>

University Core and Electives: 18

Year Total: 30

**Junior Year**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Choose three of the following:</td>
<td>9</td>
</tr>
<tr>
<td>RLST 321 - Religion and Gender</td>
<td></td>
</tr>
<tr>
<td>RLST 325 - Religion and Literature</td>
<td></td>
</tr>
<tr>
<td>RLST 326 - Topics in Religion</td>
<td></td>
</tr>
<tr>
<td>RLST 330 - Religion of Ancient Egypt</td>
<td></td>
</tr>
<tr>
<td>RLST 332 - Archaeology &amp; Religion</td>
<td></td>
</tr>
<tr>
<td>RLST 370 - Philosophy of Religion</td>
<td></td>
</tr>
</tbody>
</table>

Methodologies requirement: in consultation with their advisor, students will take two courses outside the major that focus on any of the following methodologies: historical, archaeological, sociological, philosophical, literary, visual, etc.

University Core and Electives: 15

Year Total: 30

**Senior Year**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>RLST 499RH - Senior Capstone</td>
<td>3</td>
</tr>
<tr>
<td>Choose two of the following:</td>
<td>6-7</td>
</tr>
<tr>
<td>RLST 402 - Natural/U unnatural/Supernatural</td>
<td></td>
</tr>
<tr>
<td>RLST 405 - Text and Image</td>
<td></td>
</tr>
</tbody>
</table>
Religious Studies Minor (Non-Teaching)

The minimum number of credits required for a non-teaching minor is twenty-one, with nine of those being upper-division credits.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>RLIST 100D</td>
<td>Intro to the Study of Religion</td>
<td>3</td>
</tr>
<tr>
<td>or RLIST 110D</td>
<td>Religion, Conflict &amp; Politics</td>
<td></td>
</tr>
<tr>
<td>RLIST 202D</td>
<td>Hindu Traditions</td>
<td>3</td>
</tr>
<tr>
<td>or RLIST 203D</td>
<td>Buddhist Traditions</td>
<td></td>
</tr>
</tbody>
</table>

Choose two of the following:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>RLIST 201</td>
<td>Islam</td>
<td></td>
</tr>
<tr>
<td>RLIST 204H</td>
<td>Intro to the Hebrew Bible</td>
<td></td>
</tr>
<tr>
<td>RLIST 205H</td>
<td>Introduction to New Testament</td>
<td></td>
</tr>
<tr>
<td>RLIST 206H</td>
<td>Origins of God</td>
<td></td>
</tr>
<tr>
<td>RLIST 207H</td>
<td>Myth and Belief</td>
<td></td>
</tr>
<tr>
<td>RLIST 217H</td>
<td>Religion, Sci &amp; Environment</td>
<td></td>
</tr>
<tr>
<td>RLIST 220H</td>
<td>Interpretations of American Relig</td>
<td></td>
</tr>
<tr>
<td>RLIST 223H</td>
<td>Sacrifice, Rite &amp; Ritual</td>
<td></td>
</tr>
</tbody>
</table>

Choose three of the following:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>RLIST 321</td>
<td>Religion and Gender</td>
<td></td>
</tr>
<tr>
<td>RLIST 325</td>
<td>Religion and Literature</td>
<td></td>
</tr>
</tbody>
</table>

Sociology

Department of Sociology & Anthropology

The Bachelor of Science in Sociology program provides students the opportunity to combine a liberal arts education with a unique focus on the empirical study of human societies including social dynamics, institutions, and inequality. Students are permitted a large number of elective courses.

A Bachelor’s degree in Sociology prepares students for employment in a number of arenas, including governmental agencies, nonprofit organizations, for-profit businesses, agricultural organizations, and academic institutions. The fields of law enforcement, probation and corrections, labor relations, business management, personnel administration, market analysis, and various types of industrial research employ students who major in sociology. Many graduates enter social services. Sociology also provides excellent preparation for graduate school and other educational and career opportunities.

The Department offers a Bachelor of Science degree with two options: (a) General Sociology, or (b) Criminology. Both options require 39 credits in Sociology courses.

General Sociology Option

This option is for the student who desires a broad and general foundation in Sociology with the ability to fully customize their major and substantive focus. For this option, the student is required to take SOCI 101IS, SOCI 318R, SOCI 455, and SOCI 499. The remaining 24 credits in Sociology will be comprised of eight courses of the student’s choosing, of which seven must be at the 300-level or above. Students that choose the General Sociology Option often take a set of courses that lead to a specific area of emphasis, such as Social Inequality, Family Relations and Children, Business and Management, Marketing and Public Relations, Social Services, Health and Medicine, and Pre-Law.

Criminology Option

This option is for the student who desires a strong foundation in Sociology with a specific focus on laws, the legal system, the social structure of criminal behavior, and society’s efforts to understand and control crime. This option allows students to pursue a sociology degree that integrates core coursework in sociology with sociology courses that focus on law, crime, and the criminal justice system. To achieve this integration, the student is required to take SOCI 101IS, SOCI 202, SOCI 318R, SOCI 311, and SOCI 499. The remaining 24 credits in Sociology will be comprised of 15 credits in Criminology and Context courses and 9 credits in Criminology and Sociology elective courses.

We strongly recommend that prior to enrolling in any upper division courses in Sociology, students complete their core in Writing, Quantitative Reasoning, Diversity, and Inquiry-Social Sciences with a grade of “C-” or
better. We also recommend students take SOCI 202 in their sophomore year and SOCI 318R in their junior year.

**Prerequisite Requirements**
Any student who enrolls in a course offered by the Department of Sociology and Anthropology without the required prerequisite(s) will be required to withdraw from the course.

**Curricula in Sociology**
- General Sociology Option
- Criminology Option
- Sociology Minor (Non-Teaching) (p. 253)

**General Sociology and Criminology Options**

<table>
<thead>
<tr>
<th></th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Freshman Year</td>
<td></td>
</tr>
<tr>
<td>WRIT 101W - College Writing I</td>
<td>3</td>
</tr>
<tr>
<td>Quantitative Reasoning Core</td>
<td>3</td>
</tr>
<tr>
<td>University Core and Electives</td>
<td>15</td>
</tr>
<tr>
<td>SOCI 101IS - Introduction to Sociology</td>
<td>3</td>
</tr>
<tr>
<td>University Seminar Core</td>
<td>3</td>
</tr>
<tr>
<td>Diversity Core</td>
<td>3</td>
</tr>
<tr>
<td>Year Total:</td>
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</tr>
<tr>
<td>Sophomore Year</td>
<td></td>
</tr>
<tr>
<td>SOCI 202 - Social Statistics</td>
<td>3</td>
</tr>
<tr>
<td>SOCI Electives</td>
<td>6</td>
</tr>
<tr>
<td>University Core and Electives</td>
<td>15</td>
</tr>
<tr>
<td>Additional required social science, natural science &amp; humanities courses OR minor courses</td>
<td>6</td>
</tr>
<tr>
<td>Year Total:</td>
<td>30</td>
</tr>
<tr>
<td>Junior Year</td>
<td></td>
</tr>
<tr>
<td>Choose one of the following:</td>
<td>3</td>
</tr>
<tr>
<td>SOCI 455 - Classical Sociological Theory (General Sociology Option)</td>
<td></td>
</tr>
<tr>
<td>SOCI 311 - Criminology (Criminology Option)</td>
<td></td>
</tr>
<tr>
<td>SOCI 318R - Sociological Research Methods</td>
<td>3</td>
</tr>
<tr>
<td>SOCI Electives</td>
<td>9</td>
</tr>
<tr>
<td>Additional required social science, natural science &amp; humanities courses OR minor courses</td>
<td>6</td>
</tr>
<tr>
<td>University Core and Electives</td>
<td>9</td>
</tr>
<tr>
<td>Year Total:</td>
<td>30</td>
</tr>
<tr>
<td>Senior Year</td>
<td></td>
</tr>
<tr>
<td>SOCI 499 - Senior Thesis Capstone</td>
<td>3</td>
</tr>
<tr>
<td>Sociology Electives</td>
<td>9</td>
</tr>
<tr>
<td>Additional required social science, natural science &amp; humanities courses OR minor courses</td>
<td>3</td>
</tr>
<tr>
<td>University Core and Electives</td>
<td>15</td>
</tr>
<tr>
<td>Year Total:</td>
<td>30</td>
</tr>
<tr>
<td>Total Program Credits:</td>
<td>120</td>
</tr>
</tbody>
</table>

Required Courses: Students must complete SOCI 101IS, SOCI 202, SOCI 318R and SOCI 499 in sequence. In addition, students must complete SOCI 455 (General Sociology Option) or SOCI 311 (Criminology Option) before they enroll in SOCI 499.

Sociology Electives for General Sociology option: Students must take 12 additional credits from any courses designated as SOCI. All but 3 credits must be in upper-division courses and no more than 3 credits of SOCI 492, SOCI 498, and SOCI 490R combined can count toward the fulfillment of elective credits. Students may request, in writing, to count up to 6 credits of upper division ANTH courses as SOCI electives.

Sociology Electives for Criminology option: Students must take 15 additional credits from the following courses: SOCI 201D, SOCI 221IS, SOCI 313, SOCI 325, SOCI 326, SOCI 344, SOCI 357, SOCI 358, SOCI 359, SOCI 368, SOCI 414, SOCI 435, SOCI 436. All but 3 credits must be in upper-division courses. An additional 9 upper-division credits must be taken from any courses designated as SOCI, and no more than 3 credits of SOCI 492, SOCI 498, and SOCI 490R combined can count toward the fulfillment of these 9 elective credits.

Students should consult routinely with their advisors as they select elective SOCI courses. For students in the General Sociology option, the department has identified a variety of informal 'focus areas' where students with particular interests (e.g., prelaw, family/child relations, law enforcement, health & medicine, business, marketing, social inequality) can concentrate elective course work. For students in the Criminology option, departmental advisors can assist students in choosing the courses that best match their academic and occupational interests.

The maximum number of Sociology transfer credits accepted is 18. SOCI 318R, SOCI 455 and SOCI 499 must be taken at MSU-Bozeman. Transfer students who have taken these prior to transferring can petition to have these courses accepted. For graduation in the Sociology option, students must have a grade of "C-" or higher in all required and elective Sociology courses.

Department Breadth/Second Major/Minor Requirement: An additional 15 credits (outside of the SOCI rubric), 6 of which must be upper division, must be taken from programs in the College of Letters and Science to fulfill the department breadth requirement. Alternatively, students may complete a second major or a minor at Montana State to meet this requirement (students must check with department to get minor approved).

A minimum of 120 credits is required for graduation; 42 of these credits must be in courses numbered 300 and above.

### Sociology Minor (Non-Teaching)

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>SOCI 101IS</td>
<td>3</td>
</tr>
<tr>
<td>SOCI 318R or SOCI 455</td>
<td>3</td>
</tr>
<tr>
<td>Sociology Electives</td>
<td>15</td>
</tr>
<tr>
<td>Total Credits</td>
<td>21</td>
</tr>
</tbody>
</table>

12 of 21 credits must be from upper division courses numbered 300 or above.

### Women's and Gender Studies Minor

The College of Letters and Science, in conjunction with all other colleges at MSU, offers an interdisciplinary minor in Women's and Gender Studies. Students in the minor systematically study basic feminist theories and methodologies, as well as the experiences and contributions of women in a variety of cultures over time. Students in the minor will examine issues and theories of gender inequity and gender identity, and will engage in feminist analysis within their disciplines. Students find the minor a stimulating challenge to traditional assumptions in their academic programs. Because of its interdisciplinary nature, the minor is individually shaped in consultation with a Women’s and Gender Studies advisor. Students who declare a minor in Women’s and Gender Studies must complete 21 semester credits as outlined below. Contact the CLS Dean’s Office for additional
information and view the Women’s and Gender Studies Minor site at http://www.montana.edu/wgs.

WGSS 201IH Intro to Feminist Theories 3
Choose one of the following: 3
WGSS 301RH Integrative Seminar in Women’s Studies
WGSS 492 Independent Study
Elective Course Work
Choose five of the following: 15
ANTY 337 Sex, Gender, Sexuality Japan
ANTY 343 Popular Culture - Japan
ANTY 427 Anthropology of Gender
ANTY 441 Social Movements in Japan
FCS 263 Relationships and Fam Systems
FCS 464 Gndr, Rce, Clss, and Fam Diver
FCS 465R Family Law & Public Policy
HTH 220 Human Sexuality
HTH 455 The Ethic of Care
HSTA 407 Gender in US & Canadian West
HSTA 408 Gender in America
HSTA 409 Food in America
JPNS 325H Others in Japanese Lit/Culture
LIT 326 British Literature of the 19th Century to the Present
LIT 335 Women and Literature
LIT 371
LIT 438 Studies in Literary Topics
NASX 405 Gndr Iss In Native Amer Studies
PSYX 235D Contemp Issues in Human Sexual
PSYX 335 Psychology of Gender
PSYX 462 Psychology of Prejudice
RLST 321 Religion and Gender
SOCI 326 Sociology of Gender
SOCI 368 Latino Immigration
SOCI 455 Classical Sociological Theory
SPNS 350 US Latino Cultures
SPNS 351 US Latino Literature

Total Credits 21

Goals
1. To inspire baccalaureate and graduate students, within a diverse, challenging, and engaging learning environment, to become leaders in the practice of professional nursing.
2. To create an interactive environment in which faculty and students discover, learn, and integrate knowledge into nursing practice.
3. To serve as leaders in nursing by generating, translating, and disseminating knowledge through research and scholarly activities.
4. To promote health and wellness through professional practice, collaboration, consultation, civic engagement, education, and leadership.

Philosophy
Introduction
We believe in excellence in nursing education through a teaching learning process that is the responsibility of both faculty and student. We promote the development of lifelong self-directed learning that fosters leadership in education, research, practice, and service. We believe in a learning environment that supports diversity of people and ideas. Our efforts are directed toward achieving higher levels of education for all nurses, and transforming healthcare in the United States and the world. We believe that nursing education is framed within the context of nursing’s meta-paradigm: person, environment, health, and nursing.

Person
A person is any individual, family, group, community or population. Each person is unique and is entitled to treatment with dignity and respect.

Environment
Environment includes all factors influencing a person’s health perceptions, behaviors and responses. The human experience is contextually defined by the interrelationship of spiritual, cultural, developmental, physical, psycho-social, political, and economic subsystems. The appropriate arena for nursing action extends beyond the person and includes promotion of healthy environments through social action.

Health
Health is a state of physical, mental, social, and spiritual well-being defined by the person. It is not merely the absence of disease or disability. Health is multi-factorial and is influenced by many factors such as behaviors, environments, genetics, and resources. There are diverse cultural definitions of health. Health activities include those directed at maintenance, enhancement, prevention, and promotion.

Nursing
Nursing is a discipline of science and art requiring synthesis of evidence based knowledge, professional skills, ethical values, and human caring. Nurses assist persons to achieve optimal health. Nurses generate a unique body of knowledge to meet the complex needs of persons in a variety of health care settings from rural to urban.

Nursing education
Nursing education focuses on the knowledge, skills, and attitudes needed by nurses to practice effectively within a complex and changing environment. Nursing requires strong interpersonal skills and a solid understanding of human beings, human society, and the scientific basis of medicine and nursing. Nurses are responsible for clinical judgments based on your scientific reasoning. Graduates of MSU College of Nursing will not simply be a technician at the bedside; our graduates will be making decisions that impact the health of people in the local and global communities. Therefore, the education of nursing students is based on professional, regulatory and organizational standards.
Programs

The undergraduate professional nursing program is approved by the Montana State Board of Nursing and is nationally accredited by the Commission on Collegiate Nursing Education (CCNE). The traditional program includes two years of lower division study and two years of upper division study. It is possible for a student to complete all of the required prerequisite coursework at institutions other than Montana State University. All transfer credits are carefully evaluated to ensure equivalent content when students transfer to MSU and the College of Nursing curriculum. While it is possible to complete the program in four years, this requires careful planning and uninterrupted progression through the curriculum. Delays in progression related to reduced credit loads, repeated coursework, securing upper division placement, or change of curriculum commonly result in the student taking longer than four years to complete the program. All upper division coursework is taken at one of five upper division campus sites: Bozeman, Billings, Great Falls, Kalispell, and Missoula.

The College of Nursing at Montana State University offers an accelerated second degree option for students to earn a baccalaureate degree in nursing. This option is available only to students who already have earned a baccalaureate degree in a discipline other than nursing. Applications to the option will not be processed for individuals who do not have a degree in another discipline at the time they submit the application. Students are required to have completed the same pre-requisite courses as the traditional students EXCEPT for WRIT 101, CLS 101, and the art, humanities, and diversity Core 2.0 requirements (see required courses below). Once admitted to the nursing major, they complete the BSN degree in approximately 15 months, as opposed to the 29 months it takes the traditional students.

Undergraduate Program Objectives for Both Traditional and Accelerated Options

Graduates of the BSN program will:

• Use a foundation of community-based professional nursing to provide holistic client-centered health care in a variety of healthcare settings.
• Synthesize theoretical and empirical knowledge from nursing, the sciences, the arts and the humanities to practice safe and effective professional nursing across the lifespan.
• Practice basic leadership skills to create a safe caring environment and deliver quality care with an interprofessional healthcare team.
• Evaluate the applicability of research findings in evidence-based nursing practice.
• Utilize evidence-based clinical judgments to assist patients with the promotion, maintenance and restoration of health; prevention of disease; and death with dignity.
• Demonstrate professionalism by incorporating professional values of altruism, autonomy, human dignity, integrity, social justice and value-based behaviors into nursing practice and professional career development.
• Demonstrate basic knowledge of healthcare policy, finance, and regulatory environments, inducing local, state, national and global healthcare trends.
• Utilize effective communication in professional relationships with clients in order to influence health across the health-illness continuum.
• Utilize progressive technology and information management systems to support safe nursing practice and deliver effective, quality client care.
• Collaborate with communities to design, implement, and evaluate population-based approaches to care for diverse populations.

• Provide culturally sensitive direct and indirect care for clients across a variety of healthcare settings.

Admission to the Pre-Nursing Major

Enrollment in the pre-nursing major is available for students admitted to Montana State University-Bozeman provided they have met the University admission requirements (are not admitted on probation or into pre-university studies) and, if transferring from another institution, have at least a 3.0 cumulative grade point average. Montana State University students in another curriculum may process a change of curriculum request into pre-nursing provided their Montana State University-Bozeman cumulative GPA is 3.0 or better. Pre-nursing majors are assigned to advisors in the College of Nursing and encouraged to meet with their advisor at least once each semester.

Admission to the Nursing Major

Admission to the College of Nursing as a nursing major is achieved through a competitive application process. Acceptance into the nursing major (placement on a specific upper division campus site) is based on the student’s grades in the required prerequisite courses for the nursing major. Pre-nursing majors (at both Montana State University-Bozeman and transfer institutions) apply for admission to the nursing major during spring or fall one year before beginning upper division study (see Application for Nursing Major and Upper Division Placement). Admission to the nursing major permits students to be enrolled in sophomore, junior, and senior restricted entry nursing courses.

Progression through the Nursing Curriculum

Lower division courses, including pre-requisite nursing courses, must be completed prior to upper division courses. Nursing courses are generally offered every fall and spring semester. Some summer courses may be offered. Not all required non-nursing courses are offered every semester.

1. A calculated GPA of 3.0 or higher in required prerequisite courses is required to apply to the nursing program. Students are awarded placement based on their pre-requisite course work GPA. Selection moves from the highest GPA downward until all seats are filled. Historically, this has been a GPA of at least 3.5; this does vary with each applicant pool, however. Students should work closely with their advisor each semester to ensure readiness for application.

2. All required prerequisite courses must be completed with a grade of C or better (C- Grades are not acceptable) and no more than 2 of the required prerequisites courses may be repeated 1 time.

3. The College of Nursing considers a “W” grade on a transcript the same as C-, D, or F grade. “W” grades indicate an unsuccessful attempt to achieve a grade of C or better in a course.

4. Prerequisite courses for any nursing course must be completed with a grade of C or better (C- grades are not acceptable) before enrolling in the nursing course for which the prerequisite course is required.

5. Restricted entry lower division nursing courses are first offered to students in the nursing major. Students in the pre-nursing major, near the top of the wait list, may be enrolled pending availability.

6. A student’s cumulative MSU GPA must be at least 3.0 prior to beginning upper division study.

7. Unsatisfactory grades in required clinical nursing course(s) in two different semesters prohibits continuation in the nursing curriculum.

8. Exceptions to any requirements or readmission to the nursing major after removal, withdrawal or failure from the nursing curriculum in which there were documented extraordinary circumstances (e.g. death in family, personal illness requiring extended hospitalization, military orders, etc.) are dependent upon a successful appeal to the College of Nursing Scholastic Committee. Placement of students who have failed,
have been removed, or have withdrawn from coursework is dependent upon space availability.

Application for Upper Division Placement in the Traditional Bachelor of Science Degree in Nursing (BSN) Program

The number of students admitted to the nursing major and offered placement on one of the upper division campus sites is regulated to provide the best utilization of financial, clinical, and faculty resources. The application procedure for admission to the nursing major has been developed in order to:

1. provide the most highly qualified students a place in upper division coursework (pending successful completion of required lower division courses),
2. achieve maximum utilization of limited resources
3. increase the supply of professional registered nurses.

Applications are submitted during two specified periods each year; January 2nd for spring upper division placement and August 1st for fall upper division placement. These periods are publicly announced six weeks in advance on the College of Nursing website. The first opportunity for students to submit an application will be August 1st or following spring semester of their freshman year as pre-nursing students (or depending on when the applicant will be ready to begin upper division). Submission of an application packet is required which includes: official transcripts from every college/university attended; a background check, urine drug screen and immunizations by the application deadline.

At least 3 of the 5 required natural science courses must be completed with a grade of C or better, and one of those courses must be BIOH 201 (Human Anatomy and Physiology I) to apply to the nursing program. Those natural science pre-requisite courses are:

- BIOH 201 Human Anatomy and Physiology I 5
- BIOH 211 Human Anatomy and Physiology II 4
- BIOM 250 Microbiology for Health Sciences: Infectious Diseases 3
- CHMY 121IN Introduction of General Chemistry 4
- CHMY 123 Introduction of Organic Chemistry and Biochemistry 4

All required prerequisite courses must be completed with a grade of C or better (C- grades are not acceptable) and no more than 2 of the required prerequisite courses may be repeated 1 time to earn a grade of C or better. Those courses are:

- BIOH 201 Human Anatomy and Physiology I 5
- BIOH 211 Human Anatomy and Physiology II 4
- BIOM 250 Microbiology for Health Sciences: Infectious Diseases 3
- CHMY 121IN Introduction of General Chemistry 4
- CHMY 123 Introduction of Organic Chemistry and Biochemistry 4
- CLS 101US Knowledge and Community 3
- FCS 101IS Indiv and Fam Dev: Lifespan 3
- NUTR 221CS Basic Human Nutrition 3
- PSYX 100IS Intro to Psychology 4
- SOCI 101IS Introduction to Sociology 3
- STAT 216Q Introduction to Statistics 3

Upper division placement is dependent upon the grade point average in required lower division courses; students are also asked to indicate the campus of their choice.

A wait list of students with 3.0 or higher grade point averages in required lower division courses will be maintained in order to fill unexpected openings for placement at upper division campus sites. Students with grade point averages lower than 3.0 are not eligible to be placed. Students wishing to be considered for admission in later semesters must reapply.

Students need to carefully plan a course of study with advisors in order to complete all required lower division courses prior to upper division placement. Students who have not completed required lower division courses forfeit their upper division placement.

A $200 deposit must accompany an acceptance of upper division placement. This deposit is applied toward tuition and fees for first semester junior nursing courses. (This deposit will be forfeited unless students notify the Undergraduate Associate Dean’s office, in writing, at least a month in advance of placement that they will not be ready to use their placement).

Transfer Students to the Traditional BSN program of study

The above criteria and procedures for progression through the nursing curriculum apply to transfer students as well as MSU-Bozeman students. Students who have been enrolled as nursing students at any other institution (have nursing courses on their transcripts) must provide a letter from their Dean or Director regarding their status at the time they left the previous nursing program prior to enrolling in nursing courses at MSU.

In order to facilitate transcript evaluation, all transfer students must provide a copy of the original transcript(s) from all institutions of higher education they have attended to the College of Nursing Undergraduate Student Services Coordinator as well as to the MSU Admissions Office. Out-of-state transfer students must also provide a catalog or course descriptions from their former institution(s), if possible, to facilitate the course evaluation process. Course syllabi will be required as well.

Application for Accelerated Bachelor of Science Option

Applicants will be selected for the BSN accelerated option based on a calculated grade point average of 3.0 or higher in required prerequisite courses for the accelerated option; evidence of completion of a bachelor’s degree in a discipline other than nursing from a regionally accredited institution with at least a cum GPA of 3.0 or higher; signature on affidavit for “Abilities Required for Success in the BSN degree program” form. Prospective students may have no more than 2 required prerequisite courses (and no more than 9 credits) remaining in the fall semester of their application. All prerequisite courses must be completed with a grade of C or better by the end of the fall semester that precedes the May start date in the program. Submission of an application packet is required which includes: official transcripts from every college/university attended; a background check, urine drug screen and immunizations.

All required prerequisite courses must be completed with a grade of C or better (C- grades are not acceptable) and no more than 2 of the required prerequisite courses may be repeated 1 time. For the accelerated option:

- BIOH 201 Human Anatomy and Physiology I 5
- BIOH 211 Human Anatomy and Physiology II 4
- BIOM 250 Microbiology for Health Sciences: Infectious Diseases 3
Accelerated Program placement is dependent upon the grade point average in required pre-requisite courses; students are placed at one of four sites: Bozeman, Great Falls, Kalispell, Missoula.

Accelerated Program Application Deadline
Applications must be submitted completely and on-time. Applications which are incomplete, or have been received after the deadline will not be processed. See the College of Nursing Web site for further information at: http://www.montana.edu/nursing/undergraduate/acceleratedbsnapp.html

MSU Pre-Licensure Nursing Education and Standards of the Nursing Profession
The primary aim of the College of Nursing is the education of persons for professional nursing practice. Graduates of the program are recommended for admission to the National Licensing Examination for Registered Nurses (NCLEX-RN). As educators, faculty members have the responsibility to provide students with appropriate educational opportunities and with reasonable guidance and supervision. As professional practitioners, faculty members also have the obligation to patients to ensure that nursing students who care for them are competent. In the interest of patient safety, this responsibility also extends to the health agency administrator, to all licensed personnel providing care within that agency, and, in fact, to the nursing students themselves.

The 2015 ANA Code of Ethics for Nurses, Provision 3.3 describes Performance Standards and Review Mechanisms for the professional nurse:

Inherent in professional nursing is a process of education and formation. That process involves the ongoing acquisition and development of the knowledge, skills, dispositions, practice experiences, commitment, relational maturity, and personal integrity essential for professional practice. Nurse educators, whether in academics or direct care settings, must ensure that basic competence and commitment to professional standards exist prior to entry into practice (American Nurses Association, 2015, pg 11).

The student, upon admission to the nursing curriculum, assumes the obligations of performing and behaving according to the standards set by the College of Nursing. Mere satisfactory academic performance does not in and of itself constitute the basis for progression through the nursing major.

In keeping with the standards of the profession, the College of Nursing expects nursing students to demonstrate ethical behavior. Expected behaviors include, but are not limited to, abiding by guidelines for academic integrity; respecting the privacy rights of patients, students, and faculty members; placing priority on the health, safety, and welfare of patients; and avoiding prejudicial or discriminatory behavior in relationships with patients, students, and faculty members.

Some examples of misconduct are sharing confidential information, fabrication or falsification of information in the classroom or clinical area, any form of cheating, including plagiarism, and assisting or facilitating dishonesty or unethical behavior in others. Breaches in professional standards will result in disciplinary action, including the possibility of removal from the nursing curriculum. Students are responsible for reviewing the following publications which are available on each College of Nursing campus:

- Student Conduct & Instructional Guidelines & Grievances Procedures (MSU-Bozeman).
- The Essentials of Baccalaureate Education for Professional Nursing Practice (AACN, 2008).
- Code of Ethics for Nurses (ANA, 2015).

When a student fails to meet reasonable standards of performance or behavior or when, a faculty member deems reasonable supervision is inadequate to ensure patient safety, the faculty member has the authority to remove a student from the clinical setting (see College of Nursing Policy C-6).

The criteria considered in denying the student access to patients are: demonstrated emotional instability, indifference or insensitivity to patient safety and comfort, lack of professional judgment, disregard for professional ethics and standards, any health condition which makes it impossible for the student to carry out her/his work without jeopardizing patient safety and comfort, or any other condition or circumstance which constitutes an unreasonable risk to the safety and well being of the patient. A nursing student may be referred to appropriate resources for assistance with problems which are non-academic in nature but which might impair the student’s effectiveness as a professional nurse.

Denial of student access to a clinical agency will result in the student being dismissed from the nursing program. The student shall be fully informed of the decision and its consequences and shall be afforded the right to appeal to the College of Nursing Scholastic Committee (see Policy A-8).

Unique Requirements of the Nursing Programs
Annual Compliance with Immunizations, CPR, Urine Drug Screen, Background Check, HIPAA/OSHA
All applicants to the MSU College of Nursing Program must be submit documentation of compliance with immunizations, CPR, Urine Drug Screen, Background Check and HIPAA/OSHA training. Thereafter, students with placement will submit evidence of compliance annually. MSU College of Nursing utilizes a National accredited program to collect compliance documentation. Information and directions on this matter will be provided to students at application.

Transportation
Access to an automobile is necessary, particularly for clinical work in the community, including home visits, as well as in rural areas. Public transportation is not adequate in the cities with upper division campuses. Students are responsible for providing their own transportation.

Varied Schedules
Students are expected to participate in clinical experiences in a variety of community and rural agencies and at variously scheduled times. Therefore, students must make arrangements to accommodate an irregular academic schedule that may include evening and weekend hours.

Expenses
Nursing students have additional expenses beyond those normally required in other curricula. They include, but are not limited to, uniforms, immunizations, background checks, drug screening and current professional healthcare provider CPR certification (including infants, children and adults) before beginning clinical coursework. Special purchases include, but are not limited to, stethoscope and other clinical equipment. In addition, there is a $200 placement deposit (see section on Application Procedure for Placement in Nursing Curriculum) and a nursing program fee for each semester which covers such costs as pre-NCLEX testing fees, specialized
equipment and distance delivery support when enrolled in clinical nursing courses.

**Abilities and Skills**

College of Nursing Policy A-19 ("Abilities Required for Success in the BSN degree Program") requires that students read the policy and complete a form indicating their agreement that they have the ability to perform certain skills and tasks to successfully complete the BSN degree program.

**Final Exams**

**FINAL EXAMS-College of Nursing**

According to University policy, the examination period is instructional time, and it is expected that some instructional use is made of this period if a final examination is not given.

College of Nursing Final exams will be given in the last instructional week of the semester on Monday, Tuesday, and Wednesday.

1) By the fourth week of class, the CON shall distribute a final exam schedule to students. The campus directors are responsible for distributing this schedule to the Associate Dean for Undergraduate students.

2) CON faculty are responsible for coordinating the Final exam schedule to avoid conflict in timing of finals.

3) In the event of a conflict between scheduled examinations, the priority of scheduled versus make-up examination will be given to any course the student is enrolled in, which is not part of the CON curriculum. As an example, in the case of a student, who is pursuing a Hispanic Studies Minor and has a final Spanish exam which conflicts with a CON scheduled final, the CON faculty will accommodate a make-up exam for the student.

4) Make-up examinations for conflicts are to be given only to those students who, at the same hour:
   - Have another Common Hour Examination
   - Have a regularly scheduled class—either in or out of the CON curriculum
   - Are engaged in an activity or event sanctioned in paragraph 310.01 of the Student Conduct Code. (Official student representatives with a regularly scheduled practice or meeting that conflicts with a Common Hour Exam see point 5 below.)
   - Sustained a personal emergency that prevented participation in the scheduled examination.

5) Students are responsible for alerting faculty to potential conflicts in the schedule related to any courses they may be taking outside the CON curriculum by the 5th week of class.

   In addition, a student who has three or more final examinations in any one day or an exam schedule which exceeds 5 consecutive hours of examination should first contact the instructors of the course to see if one exam can be rescheduled. If this rescheduling can't be resolved, then the student should contact the campus director of his or her site at least one week before the beginning of final examination week to assist in resolving the conflict.

6) As per University policy, CON faculty must provide for make-up examinations or other equivalent means of evaluating the student who are absent from the scheduled examination for legitimate reasons.

**Computer Access and Skills**

**Access to and skills in using computer hardware and software**

Because many of the courses in the nursing program are Web-based or Web-enhanced, students must have access to and skills in using a computer and a printer. They must also have a reliable connection to the Internet with a current Internet browser.

**Undergraduate Programs**

- Nursing (p. 258)

**Graduate Programs**

- Master of Nursing (MN) (p. 381)
- Doctor of Nursing Practice (DNP) Degree (p. 381)
- Nursing Education certificate (non-degree option) (p. 390)

**Nursing**

**Traditional BSN Program:**

**Required Lower Division Pre-Requisite Courses**

The following courses must be completed prior to progression to upper division courses. Students are advised to consult appropriate sections of the MSU bulletin regarding required prerequisites for these courses.

**CORE 2.0: Foundation Courses**

- **University Seminar (US)**
  - CLS 101US Knowledge and Community
- **College Writing (W)**
  - WRIT 101W College Writing I
- **Quantitative Reasoning (Q)**
  - STAT 216Q Introduction to Statistics
- **Contemporary Issues in Science (CS)**
  - NUTR 221CS Basic Human Nutrition

**CORE 2.0: Ways of Knowing**

- **Social Science Inquiry (IS)**
  - PSYX 100IS Intro to Psychology
  - SOCX 101IS Introduction to Sociology
  - FCS 101IS Indiv and Fam Dev: Lifespan
- **Natural Science Inquiry (IN)**
  - CHMY 121IN Introduction to General Chemistry

**Other Required Courses**

- BIOH 201 Hum Anatomy & Physiology I
- BIOH 211 Hum Anatomy & Physiology II
- CHMY 123 Introduction of Organic Chemistry and Biochemistry
- BIOM 250 Microbiology for Health Sciences: Infectious Diseases

The following core courses must be completed prior to graduation:

**ARTS (A)**

Course of student’s choice

**DIVERSITY (D)**

Course of student’s choice

**HUMANITIES (H)**

Course of student’s choice
Lower Division Nursing - the following courses must be completed prior to progression to upper division courses

- NRSG 115: Nursing as a Profession 2
- NRSG 220: Fundamentals Ethical Nursing 2
- NRSG 225: Fundamentals Prgdg Clin Nurs Cr 4
- NRSG 238: Health Across Lifespan 4
- NRSG 258: Principles of Pathophysiology 3

Required Upper Division Courses

The University requires that 42 credits be in courses numbered 300 and above. The College of Nursing requires that 55 credits be in courses numbered 300 and above.

### Junior Year

**NRSG 336 - Nursing Pharmacotherapeutics** 3
**NRSG 341 - Psychosocial Nursing Concepts** 3
**NRSG 346 - Nurs Care of Childbearing Family** 5
**NRSG 348 - Nursing Care of Child & Family** 5
**NRSG 352 - Acute and Chronic Illness** 5
**NRSG 377 - Intro to Community Based Nursng** 2
**NRSG 387R - Research in Health Care** 3

**Year Total: 26 Credits**

### Senior Year

**NRSG 418 - Hlth Policy/Hlth Care Econ Cln** 2
**NRSG 437 - Psychiatric Nursing** 6
**NRSG 444 - Care Management** 3
**NRSG 454 - Urgent and Palliative Care** 6
**NRSG 477 - Pop Based Nursing Care in Comm** 6
**NRSG 487 - Nursing Ldrshp/Mgmnt Dvlpmnt** 6

**Year Total: 29 Credits**

**Total Program Credits: 55 Credits**

*NOTE: Required nursing curriculum courses must be completed with a grade of C or better and no more than one repeat of a course is permitted regardless of when or where taken. The College of Nursing does not accept C- as a passing grade in required courses.

Courses may be offered in a web-enhanced or completely online mode of delivery.

Elective credits as required to meet the minimum of 120 required credits for graduation.

### Accelerated BSN Program:

#### Required Lower Division Pre-Requisite Courses

The following courses must be completed prior to admission into the ABSN program. Students are advised to consult appropriate sections of the MSU bulletin regarding required prerequisites for these courses. The Accelerated BSN program students are required to have completed the same pre-requisite courses as the traditional students with the exception of: WRIT 101, CLS 101, and the art, humanities, and diversity Core 2.0 requirements.

Once admitted to the ABSN option, students complete the same required lower division and upper division course work (see above) toward the BSN degree in approximately 15 months, as opposed to 29 months in the traditional program.

All required prerequisite courses must be completed with a grade of C or better (C- grades are not acceptable) and no more than 2 of the required prerequisite courses may be repeated 1 time. Those courses are:

- BIOH 201: Human Anatomy and Physiology I 5
- BIOH 211: Human Anatomy and Physiology II 4
- BIOM 250: Microbiology for Health Sciences: Infectious Diseases 3
- CHMY 121IN: Introduction of General Chemistry 4
- CHMY 123: Introduction of Organic Chemistry and Biochemistry 4
- FCS 101S: Indiv and Fam Dev: Lifespan 3
- NUTR 221CS: Basic Human Nutrition 3
- PSYX 100IS: Intro to Psychology 4
- SOCI 101IS: Introduction to Sociology 3
- STAT 216Q: Introduction to Statistics 3

### Gallatin College

**Bob Hietala, Dean**

**Sarah Maki, Associate Dean**

#### Programs Available

- AAS in Aviation (p. 261)
- AAS in Design Drafting Technology (p. 263)
- AAS in Interior Design (p. 264)
- Associate of Arts (p. 260)
- Associate of Science (p. 260)
- CAS in Bookkeeping (p. 262)
- CAS in CNC Machine Technology (p. 262)
- CAS in Health Information Coding (p. 263)
- CAS in Medical Assistant (p. 265)
- CAS in Welding Technology (p. 265)
- Professional Certificate in Business Management (p. 262)

### Overview

Gallatin College is Southwest Montana’s two-year college, offering associate degrees and one-year certificates. Gallatin College complements the four-year programs at Montana State University and ensures access to workforce development, general education for transfer, and developmental education. Gallatin College collaborates extensively with the local community to develop new programs and provide responsive options. Gallatin College strongly supports open access, affordability and responsiveness to local needs.

### Mission

Gallatin College seeks to provide a comprehensive, accessible, responsive, student-centered learning environment that facilitates and supports the achievement of individuals’ professional and personal goals, and enhances the development of Montana’s citizens, communities and economy.

### Developmental Education

The Developmental Education program offers individual courses that prepare students for college-level work in math, writing, and college studies. High quality instruction, small class sizes, and out-of-class support are hallmarks of the Developmental Education program. Courses taught include:
General Education

Overview
Gallatin College MSU is Southwest Montana’s two-year college, offering associate degrees and one-year certificates. Gallatin College complements the four-year programs at Montana State University and ensures access to workforce development, general education for transfer, and developmental education. Gallatin College collaborates extensively with the local community to develop new programs and provide responsive options. Gallatin College strongly supports open access, affordability and responsiveness to local needs.

Mission
Gallatin College seeks to provide a comprehensive, accessible, responsive, student-centered learning environment that facilitates and supports the achievement of individuals’ professional and personal goals, and enhances the development of Montana’s citizens, communities and economy.

• Associate of Arts Degree (p. 260)
• Associate of Science Degree (p. 260)

Associate of Arts Degree
The Associate of Arts (A.A.) degree provides a foundation of general education studies with a concentration of coursework in the arts, humanities, and social sciences. This degree program is designed for students who are undecided about their educational goals, prefer smaller class sizes, need academic skills improvement, or desire a more gradual entrance into the university.

Students may earn this degree as preparation to transfer to a Bachelor degree program at Montana State University or another university. Each student will follow a specific curriculum based on the student’s personal, long term, and educational goals, as well as entering skills in math and writing.

To receive the A.A. degree, students must complete at least 60 credits including the following requirements:

• General Education Core requirements (30 credit hours)*
  • University Seminar (US)
  • Writing (W)
  • Cultural Diversity (D)
  • Quantitative Reasoning (Q)
  • Contemporary Issues in Science (CS)
  • Natural Science (IN or RN)
  • Arts (IA or RA)
  • Humanities (IH or RH)
  • Social Science (IS or RS)
  • Research or Creative Experience

• Coursework in the Arts, Humanities, or Social Sciences beyond the Core (9 credit hours)

• General Education Electives (21 credit hours)

* Only certain Core courses are offered each semester. Please check the Gallatin College Class Schedule for current offerings.

A grade of C- or better is required for all courses counted toward the degree.

Associate of Science Degree
Students may earn the A.S. degree as preparation to transfer to a Bachelor degree program at Montana State University or another university. The degree is suited for students who wish to pursue studies or a career in the sciences, mathematics, medical, or technology fields. Each student will follow a specific curriculum based on the student’s personal, long term, and educational goals, as well as entering skills in math and writing.

To receive the A.S. degree students must complete at least 60 credits including the following requirements:

• General Education Core requirements (30 credit hours)*
  • University Seminar (US)
  • Writing (W)
  • Cultural Diversity (D)
  • Quantitative Reasoning (Q)
  • Contemporary Issues in Science (CS)
  • Natural Science (IN or RN)
  • Arts (IA or RA)
  • Humanities (IH or RH)
  • Social Science (IS or RS)
  • Research or Creative Experience

• Coursework in Mathematics and Natural Sciences beyond the Core (9 credit hours)

• General Education Electives (21 credit hours)

* Only certain Core courses are offered each semester. Please check the Gallatin College Class Schedule for current offerings.

A grade of C- or better is required for all courses counted toward the degree.

Workforce Programs
Gallatin College one- and two-year Workforce Programs are designed to meet the needs of students who want to improve their skills and advance
their career opportunities, or who are interested in a career change. With Gallatin College’s relevant coursework, state-of-the-art classrooms, and responsiveness to local business and industry needs, our graduates are highly prepared for careers in a variety of industries.

**Undergraduate Programs**

- Aviation (p. 261)
- Bookkeeping (p. 262)
- Business Management (p. 262)
- CNC Machine Technology (p. 262)
- Design Drafting Technology (p. 263)
- Health Information Coding (p. 263)
- Interior Design (p. 264)
- Medical Assistant (p. 265)
- Welding Technology (p. 265)

**Aviation**

**Associate of Applied Science Degree**

**Description**

When you complete the Associate of Applied Science in Aviation, you will have all the credentials required to pursue a career as a professional pilot. The program offers in-depth training in all stages of pilot certification: Private Pilot, Instrument Rating, and Commercial Pilot. The program also offers classroom training in Aircraft Systems, Advanced Navigation Systems, Aviation Safety, Flight Instructor/ Aircraft Theory, and Aviation Regulations and Professional Conduct.

**Job Opportunities**

Job opportunities range from occupations as a pilot for a national or regional carrier to less well-known, but in-demand, work as a pilot for cargo services, air taxis, media aircraft, corporate jets, and as certified flight instructors. In Montana, employment for pilots is projected to grow faster than most occupations through 2018. An AAS in Aviation with a bachelor’s degree in a related field will make you especially competitive in the entry-level job market.

**Graduates are Prepared to**

- Apply knowledge in aviation to adapt to emerging aviation trends.
- Conduct themselves professionally and ethically.
- Understand and analyze the role of aviation safety and human factors to the aviation industry.
- Describe meteorology as it relates to aviation.
- Independently fly and safely operate airplanes for which they are rated.
- Demonstrate an understanding and the appropriate application of aeronautical principles, design characteristics, and operational limitations, for a variety of aircraft as it relates to the student’s career goals.
- Communicate effectively using both written and verbal skills.
- Demonstrate proficiency in math computation for aviation and modern society.
- Demonstrate effective skills in the use of computers and aviation related technology.

FAA medical certificates are issued by FAA designated Aviation Medical Examiners (AMEs), and are required by all pilots who operate aircraft. The names, addresses and phone numbers of AMEs in your area may be found at the FAA website (http://www.faa.gov/pilots/amelocator/) or you may contact the Gallatin College Director of Aviation for more information. A student enrolled in the Aviation Science Technology Program must obtain at least a Class II medical certificate before his or her first training flight.

Completion of the AAS in Aviation requires that students contract with a flight school recommended by the Aviation Gallatin College Advisory Council to complete the flight training leading to their Private pilot, Commercial pilot, and Instrument ratings. Flight schools that are interested in becoming a recommended flight training provider for Gallatin College Aviation students should contact the Gallatin College Aviation Program Director at 406-994-6151 or ryan.haskins@montana.edu for information on the requirements and approval process.

<table>
<thead>
<tr>
<th>Year 1</th>
<th>Credits</th>
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<tbody>
<tr>
<td><strong>Fall</strong></td>
<td><strong>Spring</strong></td>
</tr>
<tr>
<td>AVFT 121 - Private Pilot - Fundamentals</td>
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<tr>
<td>AVFT 122 - Private Pilot - Flight (42 Hours***)</td>
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<tr>
<td>AVFT 130 - Meteorology for Aviation</td>
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<tr>
<td>CAPP 120 - Introduction to Computers or ECNS 101IS - Economic Way of Thinking or WRIT 201 - College Writing II or GPHY 121D - Human Geography</td>
<td>3</td>
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<tr>
<td>AVFT 141 - Advanced Navigation Systems*</td>
<td>3</td>
</tr>
<tr>
<td>AVFT 143 - Instrument Ground’</td>
<td>3</td>
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<tr>
<td>AVFT 142 - Instrument Flight (40 hours)”</td>
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<tr>
<td>AVFT 150 - Aviation Operations</td>
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<tr>
<td>AVFT 171 - Aircraft Systems for Pilots</td>
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<td>WRIT 101W - College Writing I</td>
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<tr>
<td><strong>Fall</strong></td>
<td><strong>Spring</strong></td>
</tr>
<tr>
<td>AVFT 245 - Commercial Ground’</td>
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</tr>
<tr>
<td>AVFT 252 - Commercial Flight 1 Multi Eng (60 Hours***)</td>
<td>2</td>
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<tr>
<td>AVFT 260 - Aviation Safety</td>
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<tr>
<td>COMX 115 - Introduction to Interpersonal Communication</td>
<td>3</td>
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<td>Choose one of the following:</td>
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<tr>
<td>M 121Q - College Algebra**</td>
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<td>M 105Q - Contemporary Mathematics (formerly M 145Q, Math for Liberal Arts) (or any other Quantitative core math class)</td>
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<td>AVFT 253 - Commercial Flight 2 Multi Eng’</td>
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<td>AVFT 261 - Flight Instructor Theory’</td>
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<td>AVFT 262 - Advanced Aircraft Theory’</td>
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</tr>
<tr>
<td>AVFT 263 - Aviation Regulations and Professional Conduct’</td>
<td>3</td>
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<tr>
<td>Natural Science or Contemporary Issues in Science with Lab</td>
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<td><strong>Year Total:</strong></td>
<td>17</td>
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<tr>
<td><strong>Total Program Credits:</strong></td>
<td>60 or more</td>
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</tbody>
</table>

* Indicates prerequisites needed.

** Placement in course(s) is determined by placement assessment.

*** Flight times are program averages.

Many students need preliminary math and writing courses before enrolling in the program requirements. These courses may increase the total number of credits.
program credits. Students should review their math and English placement before planning out their full program schedules.

**Compliance and Liaison Advisory 223-15-01**
According to the VA Education Service Compliance and Liaison Staff (September 1, 2015), Institutions of Higher Learning (IHLs) “must provide the specific number of training hours required for the completion of any course involving such training, as well as the specific mandatory fees associated with any such course (to include a specific cost-per-hour rate), if the course is taken as part of a standard degree program.” Please see the Gallatin College Aviation program "Estimated Flight Training Costs (http://gallatin.montana.edu/programs/aviation.php)” for these details.

**Bookkeeping: Certificate of Applied Science Degree (CAS)**

**Certificate of Applied Science Degree**

**Description**
The Bookkeeping program will prepare students for entry level accounting-related positions that are used by a variety of businesses. The Bookkeeping program is designed to provide students with the knowledge and skills necessary for employment in an accounting profession. Using the language of business, bookkeepers assemble and analyze, process, and communicate essential information about financial operations. Upon completion of the Bookkeeping degree, students will be prepared to work in public, private, or governmental agencies as accounting clerks, accounting technicians, bookkeepers, accounting support personnel, or payroll assistants.

**Job Opportunities**
The Bookkeeping program has been designed to provide the necessary skills and experience for entry level accounting workers that every business hires. These employees manage accounts payable, accounts receivable, general bookkeeping, payroll processing, and a number of other functions in businesses of all sizes across the community. In many instances these workers function as small business office managers.

### Business Management

**Description**
The Professional Certificate in Business Management is a 25 credit certificate that supports current and future business owners and leaders. This certificate covers the many important aspects of growing and leading a successful small business.

Graduates with the professional certificate in Business Management will:

- Develop a working knowledge of business fundamentals such as management principles, marketing, product/service development, sales, and basic accountancy;
- Understand and be capable of building a business infrastructure for business operations, processes and financial decision making;
- Explore the risk and success factors in the marketplace;
- Understand how to access human, financial, and business resources;
- Identify and know how to meet market needs; and
- Create an environment that encourages interaction with other entrepreneurs and professionals.

### Cement Machine Technology Certificate of Applied Science

The CNC Machine Technology Certificate of Applied Science program is a 32 credit program designed to be completed in two semesters. This CAS will prepare students to apply technical knowledge and skills to operate computer numerically controlled (CNC) machines such as lathes, mills, precision measuring tools, and related attachments and accessories, to perform machining functions such as cutting, drilling, shaping, and finishing products and component parts. This CAS includes instruction in CNC terminology, setup, programming, operations, troubleshooting, blueprint reading, machining, lathe and mill operations, technical mathematics, computer literacy, CAD/CAM systems, shop and safety practices, equipment capabilities, and regulations and laws.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>Credits</th>
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<tr>
<td>MCH 103</td>
<td>Intro to Computer Aided Manufacturing Lvl 1</td>
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<tr>
<td>MCH 110</td>
<td>Machine Shop</td>
<td>3</td>
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<tr>
<td>MCH 120</td>
<td>Blueprint Reading</td>
<td>2</td>
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<tr>
<td>MCH 231</td>
<td>CNC Turning Operations Level 1</td>
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<tr>
<td>MCH 234</td>
<td>CNC Milling Operations Level 1</td>
<td>3</td>
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<td>Total Credits</td>
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### Fall Credits

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<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>Credits</th>
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<tr>
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<tr>
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</tr>
<tr>
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<td>Blueprint Reading</td>
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</tr>
<tr>
<td>MCH 231</td>
<td>CNC Turning Operations Level 1</td>
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<tr>
<td>MCH 234</td>
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<td>Total Credits</td>
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### Spring Credits

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<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>COMX 222</td>
<td>Professional Communication</td>
<td>3</td>
</tr>
</tbody>
</table>
Graduates are prepared to
• Create construction documents and shop drawings for architects, engineers and manufacturers.
• Visualize and measure 3D objects and buildings and recreate them in computer-aided design software (CAD).
• Render objects and buildings for presentation in programs including Adobe Photoshop, AutoCAD Architecture, 3DS Max, and Sketchup.
• Create a complete set of residential plans using CAD software.
• Draw a site plan including topography using CAD software.
• Create thematic maps from GIS data.
• Estimate construction material quantities and building costs.

Design Drafting

Associate of Applied Science Degree

Description
In the Design Drafting Technology program, students acquire the skills necessary for entry-level drafting jobs in the design/drafting industry using computer-based systems to produce technical illustrations used in manufacturing, production, and construction. Sometimes called a CAD (Computer Aided Drafting) technician, students will create design concepts that are workable in the real world. Using the CAD workstation, students perform calculations, develop simulations, and manipulate and modify the displayed material. Although most drafters work at computer terminals much of the time, students will also learn traditional drafting which entails creating manual drawings at drafting tables.

Graduates are prepared to
• Create construction documents and shop drawings for architects, engineers and manufacturers.
• Produce and manipulate drawings on a computer-aided design workstation.
• Perform calculations for the project in which the drawings were made.
• Make adjustments to drawings using computer-aided design software.
• Have the knowledge to work in a variety of design fields: manufacturing, production, and construction. Sometimes called a CAD technician, students will create design concepts that are workable in the real world.

Table:

<table>
<thead>
<tr>
<th>Credits</th>
<th>Year 1</th>
<th>Year 2</th>
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<tbody>
<tr>
<td></td>
<td>Fall</td>
<td>Credits</td>
</tr>
<tr>
<td>MCH 232</td>
<td>CNC Lathe Operation Level 2</td>
<td>3</td>
</tr>
<tr>
<td>MCH 235</td>
<td>CNC Milling Programmer Level 2</td>
<td>3</td>
</tr>
<tr>
<td>MCH 230</td>
<td>Tooling and Work Holding for CNC</td>
<td>2</td>
</tr>
<tr>
<td>MCH 104</td>
<td>Intro to Computer Aided Manufacturing</td>
<td>2</td>
</tr>
<tr>
<td>MCH 122</td>
<td>Introduction to CAM</td>
<td>3</td>
</tr>
<tr>
<td>Total Credits</td>
<td>16</td>
<td></td>
</tr>
<tr>
<td>Total Program Credits</td>
<td>32</td>
<td></td>
</tr>
</tbody>
</table>

Health Information Coding

Certificate of Applied Science Degree

The Certificate of Applied Science (CAS) in Health Information Coding provides students the ability to code and work in a variety of health care settings: hospitals, clinics, home health agencies, long-term care, insurance companies, consulting firms and software vendors. Graduates are likely to work on the administrative team of a health facility. This program closely follows the standards set forth by the American Health Information Management Associations (AHIMA) certification program. Upon completion of the required 35 hours of coursework, students take the certifying examination offered through the AHIMA. This industry specific certification demonstrates to the employer that this student has a particular aptitude in coding.

Math requirement options—Can be fulfilled by taking the following courses:

<table>
<thead>
<tr>
<th>Credits</th>
<th>Year 1</th>
<th>Year 2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Fall</td>
<td>Spring</td>
</tr>
<tr>
<td>M 105Q</td>
<td>Contemporary Mathematics (formerly M 145Q, Math for Liberal Arts) (formerly M 145Q)</td>
<td>3</td>
</tr>
<tr>
<td>M 108</td>
<td>Business Mathematics (Spring)</td>
<td>3</td>
</tr>
<tr>
<td>M 121Q</td>
<td>College Algebra</td>
<td>3</td>
</tr>
<tr>
<td>M 151Q</td>
<td>Precalculus</td>
<td>4</td>
</tr>
</tbody>
</table>

Comparative AP Credit may also be used if approved by MSU and the Program Director.
AHMS 156 - Medical Billing Fundamentals 3
AHMS 158 - Legal and Regulatory Aspects of Healthcare 2
AHMS 250 - Advanced Medical Coding 4
AHMS 108 - Health Data Content and Structure 3
AHMS 298 - Professional Practice Experience - Coding 1
COMX 222 - Professional Communication 3
Total Program Credits: 36

* Indicates prerequisites needed

A grade of "C-" or above is required for all courses for graduation.

Interior Design Associate of Applied Science Degree

The Interior Design program has been developed to prepare students with a wide variety of skills and competencies for entry into various areas of the design field, ranging from residential to commercial design. Gallatin College maintains a high level of expertise in our faculty drawing from those in the industry to provide current, relevant education for our students. After graduating and working in the field for over three years, students may be eligible to sit for the NCIDQ Exam, a national exam designed to demonstrate competency on a national level. Graduates of the Interior Design program find careers in all facets of design.

Description

The Interior Design program provides students with an avenue to join an elite industry with a large impact. Interior designers affect the function and efficiency of projects ranging from major industry to small residences. Trained interior designers are in demand in many fields as they provide for spaces that impact the look, feel and functionality of the built environments in which we live, work and play.

Manual and computer drafting, space planning and sketching along with a knowledge in construction and materials are some of the tools students use to bring their ideas to life. Students take classes that help them analyze spaces for appropriate use and function. Interior design students learn how their contribution as designers can address a wide range of social, economic and environmental issues facing our nation.

Job opportunities

Interior designers work in a variety of fields both residential and commercial. Gallatin College prepares students to enter the industry in a range of jobs, including residential design, kitchen and bath design, architectural design and various construction trade positions. Students may choose to work in the wholesale design industry with contractors and vendors, or with end users in the retail design market helping clients make appropriate selections. Some students may choose the commercial design field working on everything from restaurants to retail stores, schools to offices.

Graduates are Prepared to:

- Understand the theory and history of design and apply design principles and elements to their projects.
- Communicate in the language of interior design using listening, verbal, and written skills to interact with clients.
- Communicate graphically according to current architectural standards using both hand-drafting and AutoCAD techniques.
- Demonstrate research abilities and critical thinking in space planning, selection of finish materials, and application of codes for residential and commercial projects.
- Increase their body of knowledge in a wide variety of areas including construction and finish materials, color and lighting technologies, residential and commercial codes, sustainability, and professional practice.
- Employ creative skills to create client presentations using hand- and AutoCAD drafting, rendering, and professional sample boards and finish schedules.

Year 1

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Fall</th>
<th>Spring</th>
<th>Summer</th>
</tr>
</thead>
<tbody>
<tr>
<td>IDSN 101</td>
<td>Intro to Interior Design</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>IDSN 130</td>
<td>Interior Design Graphics</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DDSN 118</td>
<td>CAD I</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>WRIT 101W</td>
<td>College Writing I*</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>IDSN 131</td>
<td>Presentation Drawing*</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>IDSN 135</td>
<td>Fundamentals of Space Planning*</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>IDSN 225</td>
<td>Light/Color/Lighting Systems*</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CSTN 173</td>
<td>Arch Construct and Material</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>M 108</td>
<td>Business Mathematics**</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DDSN 166</td>
<td>Revit I (Fall)</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DDSN 276</td>
<td>Presentation &amp; Animation (Spring)</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DDSN 275</td>
<td>Computer Rendering (Fall)</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>COMX 115</td>
<td>Introduction to Interpersonal Communication</td>
<td>3</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Year Total: 13 21 3

Year 2

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Fall</th>
<th>Spring</th>
<th>Summer</th>
</tr>
</thead>
<tbody>
<tr>
<td>IDSN 122</td>
<td>Textiles and Interior Finishes</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>IDSN 240</td>
<td>Studio I Residential*</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>IDSN 266</td>
<td>Kitchen and Bath I</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>IDSN 110</td>
<td>Hist of Int Dsgn I Ancent-1900</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>IDSN 298</td>
<td>Internship (Fall or Spring)</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>IDSN 111</td>
<td>Hist Int Dsgn II 1900-Contemp</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>IDSN 250</td>
<td>Studio II Commercial*</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>IDSN 255</td>
<td>Environmental Design Studio</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>IDSN 275</td>
<td>Professional Practices*</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Choose one elective from the following:</td>
<td>3-4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IDSN 292</td>
<td>Independent Study</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ARTZ 105RA</td>
<td>Visual Language - Drawing</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PSYX 100IS</td>
<td>Intro to Psychology</td>
<td>3</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Medical Assistant: Certificate of Applied Science Degree (CAS)

Certificate of Applied Science Degree

Description

Students completing the Certificate of Applied Science-Medical Assistant will acquire the skills necessary for entry-level jobs in medical settings. Graduates are prepared to work in ambulatory medical settings such as physicians’ offices, clinics, and surgical centers; they function as members of the health care delivery team and perform administrative duties and basic clinical procedures. A grade of “C-” or above is required for all courses for graduation.

<table>
<thead>
<tr>
<th>Credits</th>
<th>Fall</th>
<th>Spring</th>
<th>Summer</th>
</tr>
</thead>
<tbody>
<tr>
<td>AH 140 - Pharmacology</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AHMS 144 - Medical Terminology</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BIOH 112 - Human Form &amp; Function I</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AHMA 201 - MA Clinical Procedures I</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>COMX 222 - Professional Communication</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AHMA 203 - MA Clinical Procedures II</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AHMA 280 - Med Assisting Exam Prep*</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AHMS 100 - Math Applications Health</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AHMS 158 - Legal and Regulatory Aspects of Healthcare</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AHMS 220 - Medical Office Procedures</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BIOH 113 - Human Form and Function II</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AHMA 298 - Medical Assisting Externship</td>
<td>4</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Total Program Credits: 35

* Indicates prerequisites needed.

Job Opportunities

The world is growing and building at a much faster rate than workers can be trained. Welding Technology Certificate Program students’ skills will be in high demand in many different settings from the creative arts in a museum district to oil rigs in the Atlantic Ocean. Other places needing students’ new skills are: fabrication shops, aircraft contractors, boiler maintenance companies, specialty welding shops, as well as ship building and other transportation industries. According to the Montana Department of Labor, the 2007 median hourly wage was $15.86. A welding student’s salary may grow when an employer sees the completed one year training program and the AWS National Registry of Welders listing.

Graduates are Prepared to

• Meet safety requirements.
• Produce welds in all positions that meet industry standards using the following process(es):
  • Flux Cored Arc Welding (FCAW)
  • Gas Metal Arc Welding (GMAW)
  • Gas Tungsten Arc Welding (GTAW)
  • Shielded Metal Arc Welding (SMAW)
• Make cuts that meet industry standards in the following process(es):
  • Acetylene Cutting, Welding
  • Air Carbon Arc Cutting (CAC-C)
  • Plasma Arc Cutting (PAC)
• Understand the use of measuring instruments and their purpose
• Understand power sources and current types
• Interpret welding blueprints and weld symbols
• Use basic welding metallurgy
• Use oral and written communication skills in the workplace, including terminology in the welding industry

Welding Technology

Certificate of Applied Science Degree

Students in the Welding Technology Certificate Program will gain the knowledge and the skills to make satisfactory welds in all positions using the following techniques: shielded metal arc welding, gas metal arc welding, gas tungsten arc welding, and flux cored arc welding. Students will also learn how to maintain tools and equipment and they will learn how to read and interpret blueprints. Upon completion of this program, students are eligible to apply to be listed in the AWS National Registry of Welders.

Job Opportunities

The world is growing and building at a much faster rate than workers can be trained. Welding Technology Certificate Program students’ skills will be in high demand in many different settings from the creative arts in a museum district to oil rigs in the Atlantic Ocean. Other places needing students’ new skills are: fabrication shops, aircraft contractors, boiler maintenance companies, specialty welding shops, as well as ship building and other transportation industries. According to the Montana Department of Labor, the 2007 median hourly wage was $15.86. A welding student’s salary may grow when an employer sees the completed one year training program and the AWS National Registry of Welders listing.

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  • Air Carbon Arc Cutting (CAC-C)
  • Plasma Arc Cutting (PAC)
• Understand the use of measuring instruments and their purpose
• Understand power sources and current types
• Interpret welding blueprints and weld symbols
• Use basic welding metallurgy
• Use oral and written communication skills in the workplace, including terminology in the welding industry

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Honors College

The Honors College at Montana State University provides opportunities for students to study, conduct research, and exchange ideas in a challenging and supportive academic environment. In addition to learning from outstanding faculty members, Honors students can attend special Honors seminars, take interdisciplinary Honors courses, and engage in independent study and research opportunities.

For details about admission and graduation requirements, contact the Honors College Office in Quad F by calling 406-994-4110, sending an e-mail to honors@montana.edu or by checking www.montana.edu/honors.

An essential component of higher education is preparing students to better understand themselves, others, and the increasingly complex world around them. Undergraduate education in particular has the goal of helping students become, in time, their own best teachers. At Montana State University, the Honors College (http://www.montana.edu/honors) addresses this goal by providing academically motivated students with unique opportunities to undertake interdisciplinary course work and undergraduate research leading to an Honors Baccalaureate Degree. Such studies, in addition to courses within their chosen discipline, provide extraordinary preparation for professional and technical careers, or graduate and advanced studies.

Entering students have the opportunity to undertake innovative studies during their freshman year. "Texts and Critics: Knowledge and Imagination" is a semester-long seminar that address fundamental issues in the humanities, social sciences, natural sciences, and the fine arts through critical reading and analysis of seminal texts which serve as a foundation for advanced studies in major disciplinary fields. Instructed by faculty representing every college at the University, Texts and Critics earns University Seminar and Inquiry-Humanities core credits. In addition, the Honors College annually offers a variety of upper-division interdisciplinary seminars. These seminars employ Socratic methodology through which faculty and students engage in critical discussion of issues spanning a diverse range of academic interests. Such engagement also fosters the development of analytic and critical communication skills. Many of these seminars, typically taught by the most respected and inspirational professors on campus, carry university core credit in each of the major discipline categories.

Special Honors sections of departmental courses in Chemistry, Physics, Math, Music, History, Biology, Sociology, Psychology, Earth Science, Engineering, and Economics are also offered. Limited enrollment in seminars and classes permits lively discussion and interactive study among faculty and students.

"Great Expeditions" is an Honors course that includes two-weeks of international travel following a semester of study pertinent to the expedition theme. After travel is completed, students present a public symposium highlighting the results of their journey.

"Mentoring Gifted Students," a service-learning course, enables students to work with gifted and talented students in the public schools.

Additional opportunities for independent study are available through Honors contracts, which are offered primarily at the upper-division level. Contracts prepare students to accept the special challenges and benefits of an Honors thesis. Upper-class students may also qualify to undertake supervised tutorial study.

Honors students have been remarkably successful in earning other scholarships for further study, both in the United States and abroad. Special attention is given to preparation for professional and graduate schools. Extracurricular, outdoor, and social activities are an important feature of the daily life of the College.

Enrollment in Honors College courses is restricted to students officially admitted to Honors. Admission is normally limited to students in the upper ten percent of their high school class and who have high ACT or SAT scores, or to those already enrolled in the University who have demonstrated academic achievement and personal initiative.

To maintain good standing, students must have a cumulative GPA of 3.0 or higher and demonstrate significant and continuing progress toward their specific degree in addition to satisfying the particular standards of Honors course work or research. Graduation with an Honors Baccalaureate Degree requires the accumulation of a specific number of Honors credits as determined by the category of Honors degree the student pursues. All such credits may be acquired through successful completion of Honors courses, a minimum 3.5 cumulative grade-point average, and one-year (or its equivalent) of a second language. To graduate with Highest Distinction, a thesis and a minimum cumulative 3.7 GPA are required. Students are encouraged to discuss their interest with the Dean.

For details about admission and graduation requirements, contact the Honors College Office in Quad F by calling 406-994-4110, sending an e-mail to honors@montana.edu or by visiting the Honors website at www.montana.edu/honors.

Undergraduate Programs

Directed Interdisciplinary Studies (p. 266)

Directed Interdisciplinary Studies

Students may formally apply for admission to the DIS program no earlier than the second semester of their freshman year through the first semester of their junior year, and will be admitted on the strength of their written application, academic record, letters of recommendation and personal interview. Applications will be reviewed by the DIS Oversight Board, which will be comprised of representatives of all the academic colleges at Montana State University.

Applicants for admission to the DIS degree options must provide appropriately detailed answers to the questions listed below. Particular attention should be given to Question #3: Statement of Senior Year Research/Creative Project, and Question #4: DIS Course Plan. If necessary, applicants may attach separate sheets providing a documentation which might be useful to the DIS Oversight Board’s deliberations.

Applicants must also include an academic transcript with grades earned (3.5 minimum GPA) and two letters of reference attesting to the motivation of the applicant and their ability to work independently. Applicants must have gained admission to the Honors College at Montana State University, and be in good academic standing in that College.

All applicants will be invited to discuss their proposals with the DIS Oversight Board during a formal interview, and applicants may resubmit amended proposals if they wish.

1. What are your reasons for wishing to undertake the Directed Interdisciplinary Studies Degree program? Comment briefly on your undergraduate education thus far, and give a brief account of why the DIS degree is particularly appropriate to your intellectual/academic goals.

2. Describe your anticipated and/or career goals after graduation from Montana State University.
3. Describe your anticipated Senior Year Research/Creative Project. It is understood that in consultation with your Faculty Advisory Committee (FAC), you may amend this initial proposal prior to the beginning of your final year of study as a DIS major.

4. Provide details of your anticipated DIS Course Plan. (See appendix A)

A minimum of 120 semester credit hours will be required for graduation. No B.A. or B.S. DIS Degree will be awarded with less than 90 semester credit hours of DIS course work, (30 per academic discipline) nor less than 62 semester credit hours of DIS course work at the Upper Division level. At least 15 credits must be at the 400 level. Students must complete HONR 201 and HONR 202 (Texts and Critics: Knowledge and Imagination) or HONR 301 (Text and Critics for transfer students or students who enter the program late in their academic careers). Of particular use to the students in this curriculum will be existing Honors contracts including HONR 292 or HONR 492 Independent Study; HONR 450 Honors Tutorial; HONR 490R Honors Thesis and HONR 494 Honors Seminars.

The Senior Year Research/Creative Project must represent no fewer than 8 semester credit hours. Upon successful completion of their thesis defense, students will be required to present their Senior Year Research/Creative Project in a public forum.

Students will not be eligible for the award of a DIS Degree unless they have also satisfied the Montana State University Core Curriculum requirements.

University Programs

- Academic Advising Center (p. 267)
- McNair’s Scholarship Program (p. 267)
- MSU Leadership Fellows Certificate (p. 267)
- National Student Exchange (NSE) (p. 267)
- Pre-Law Advising (p. 267)
- Pre-Med Intake Major (p. 268)
- Pre-Veterinary Options (p. 268)
- Undergraduate Scholars Program (p. 268)
- University Studies Program (p. 268)
- First-Year Seminar (p. 268)

University Programs offers several important academic programs to students, regardless of major. Undergraduate research and creative activity, thematic research seminars, and major/career exploration are just a few of the many opportunities available. Special programs for academic enrichment include the Undergraduate Scholars Program and Leadership Fellows. University Programs also includes the MSU Advising Center and the National Student Exchange which are housed in University Studies.

Academic Advising Center

Academic Advising

University Studies is the home of the MSU Academic Advising Center (AAC). Advising professionals, well-acquainted with the curricula in all of MSU’s colleges, aid students in their exploration of courses, majors, and career objectives. Advisors work with students to match their individual interests and goals with college coursework. The advisors construct personalized programs of academic study that incorporate both Core 2.0 requirements and other courses that will apply to a wide range of curricula. Advising is available by appointment or on a walk-in basis, 8:00-5:00, Monday through Friday.

The advisors and resources of the AAC are available to all undergraduate students. AAC advisors help students

1. Explore their academic strengths and interests

2. Review Core 2.0 requirements

3. Select a degree program suited to their personal and career goals

4. Identify ways to add value to their degree

5. Connect with resources available to MSU students

McNair’s Scholarship Program

The Ronald E. McNair Post-Baccalaureate Achievement Program (McNair Scholars Program) is a nationally recognized graduate school preparatory program funded by the U.S. Department of Education that prepares eligible students who aspire to attain doctoral degrees through paid summer research/project internships and other academic activities. Students from all disciplines who have completed at least 60 credits, are first generation students, have low-income status, or are members of an underrepresented minority group are encouraged to apply.

The program supports scholars during their Junior and Senior years as they earn their undergraduate degrees, helps them enroll in graduate programs, and tracks their progress as they complete graduate degrees. Students accepted to the program are eligible for two consecutive years of summer research allowance, up to 6-credits of summer tuition waiver, 10-weeks of paid room/board, and a food allowance. McNair Scholars are paired with a faculty mentor in their field of interest who helps them present and publish their McNair research projects. Students receive graduate school application assistance, Graduate Record Exam (GRE) preparation, and specific instruction through a semester long seminar discussing all aspects of applying, preparing, and financing graduate school.

For more information about the McNair Scholars Program, visit our website at http://www.montana.edu/mcnair/, e-mail: mcnair@montana.edu, or call (406) 994-5072.

MSU Leadership Fellows Program

The MSU Leadership Fellows Program, administered by University Programs, challenges students to discover their true potential by developing ethical and critical thinking skills as they relate to leadership. Students completing the requirements will receive certificates of completion and have “Leadership Fellow” noted on their academic transcripts. For more information click here (p. 268).

National Student Exchange

Montana State University participates in the National Student Exchange (NSE), a consortium of over 190 state-supported universities and private institutions offering students the opportunity to study for up to one year at a university in another part of the United States and Canada.

By bringing together students from different areas of the country, NSE encourages participants to broaden their academic, social, and cultural awareness. Through a straightforward admissions process, students are able to enroll at a host institution under the same financial benefits as their home institution (MSU). Credits and grades are recorded at MSU-Bozeman as a part of the student’s regular transcript. For more information, follow this link to the NSE homepage: http://www.montana.edu/universitystudies/nse/index.html

Pre-Law Advising

Many students at MSU are interested in exploring possible careers in law. Every year MSU students are accepted at excellent law schools across the country. MSU offers a variety of resources and advising to students who wish to pursue a career in law after their undergraduate degree. These resources include:

- One-on-one law school advising
- Personal assistance with the application process, writing personal statements, law school selection, and planning for LSAT prep
• Law school information sessions and events scheduled several times during the academic year
• US 140 Introduction to Law and the Legal Profession – a one credit exploratory course

For more information about pre-law advising, please visit the Pre-Law website: http://www.montana.edu/universitystudies/advising/pre-law/index.html

**Pre-Med Intake Major**

MSU offers a Pre-Med Intake major for students interested in pursuing a career in the health professions, including medical, dental, pharmacy, and physical therapy. The Pre-Med intake major does not include nursing. Pre-Med is not a major from which students will graduate. It is a two-semester program designed to encourage students to explore the academic environment at MSU, to understand the breadth of career opportunities in the health professions, and to help students select courses from the science curriculum associated with professional school pre-requisites.

Pre-Med Intake Major students benefit from:

• Individualized advising with a dedicated Pre-Med advisor during the first-year
• Assistance with course and major selection
• Workshops on academics, professionalism, and the health professions application process
• The course "MEDS 140," Introduction to Medicine Health (offered spring semesters)

For more information about the Pre-Med Intake Major, please Visit the College Of Letters and Science Pre-Med Intake Major. (p. 248)

**Pre-Veterinary Options**

MSU offers pre-veterinary coursework and advising for students interested in pursuing admission into any school or college of veterinary medicine. MSU’s pre-veterinary curriculum is not a major from which students will graduate, and ‘pre-vet’ is not a degree-granting option on the MSU campus. Rather, it is an advising program and a series of required undergraduate classes that prepare students for admission into schools of veterinary medicine. The Pre-Veterinary intake major is supported through the College of Agriculture, and we offer several resources to students who are interested in attending a veterinary medical program after their MSU baccalaureate careers. Pre-vet advisors are available to work with students as they prepare to apply for admission to schools of veterinary medicine.

Click here (p. 98) for details.

**Undergraduate Scholars Program**

The Undergraduate Scholars Program (USP) promotes and facilitates undergraduate research in collaboration with faculty mentors. Projects range from scientific research and humanistic scholarship to the creation of original artistic works. Projects may stem from ongoing faculty research or be developed from a student’s novel idea. USP funds student research through grants and also provides training and logistical support. Students can earn academic credit for research projects.

The wide scope of USP research is showcased in recent projects including an investigation of underground coal beds, exploring the microscopic structure of biofilms, examining stereotypes in the nursing profession, bio-prospecting for novel organisms in Yellowstone National Park, a travel-inspired musical composition, diverse photography exhibits, and the creation of a life-sized educational pterosaur puppet. USP funds projects in all disciplines of study across the university.

For more information about the Undergraduate Scholars Program, visit the USP website at http://www.montana.edu/usp/, e-mail usp@montana.edu, or call (406) 994-3561.

**University Studies Program**

University Studies is the initial academic program for first-year students who want to explore their options before declaring a major field of study -- approximately 20% of entering students at MSU. Through its programs of individualized academic advising and first-year seminar, University Studies plays a key role in preparing MSU students for study in a chosen major. Undergraduate students may take up to 30 semester credits (typically 2 semesters) in University Studies before declaring a major, but students may declare at any time. Students who start in a declared major are also welcome to visit with the advisors in University Studies should they have questions about their initial choice of major, and University Studies offers individualized advising for students in-transition.

This program also serves students who plan to pursue specialized degrees at other institutions but wish to take courses at MSU for one or two years before transferring. Transfer students may enter University Studies to fulfill requirements and explore MSU degree programs before declaring a major.

For more information about University Studies, please visit the University Studies website: http://www.montana.edu/wwwus/

**First-Year Seminar**

First-Year Seminar, US 101US, is a 3-credit course, open to students of all majors, that fulfills the University Seminar requirement of CORE 2.0. The seminar is a focused, student-directed classroom experience that explores questions of place and identity through a range of texts in a discussion format.

Students explore their role as engaged citizens in their education and in society, questions of morality and justice, and their responsibilities to themselves and each other. The seminar focuses on helping students reach their academic and intellectual potential through a concentration on critical thinking, verbal and written communication, academic research, and intellectual exploration.

**MSU Leadership Fellows Certificate**

Montana State University’s Leadership Fellows Certificate Program (LFCP), a 16-credit program of study, is interdisciplinary in nature. With personal development as a focus, and based upon historical and theoretical foundations of leadership, students develop competencies needed for relational and engaged leadership in all their future endeavors.

Required coursework toward the certificate includes UC 202 Leadership Foundations*, 3 credits, and UC 302 Leadership Capstone, 1 credit. Designed to provide students with the essential tools needed to discover and develop their potential as positive change agents and empowered followers, these courses utilize critical reading and writing; require original undergraduate research; and encourage dialectical thinking through lecture and class discussion, experiential learning, and in-nature and arts-based modalities.

To obtain the Leadership Fellows Certificate, students must take 12 additional, selected electives. Six of the selected electives are chosen from the student’s major area(s) of study. This allows the student to investigate more deeply the ethical, contextual, and relational issues of leadership and followership within their particular program of study. The remaining six electives are chosen from an approved list of leadership-specific electives outside the student’s major area(s) of study, thereby providing the student with universal perspectives on leading and following.

Sooner or later, regardless of one’s chosen career, everything comes to how one leads and, for that matter, follows. The courses offered in MSU’s...
Leadership Fellows Certificate Program are universally applicable to, and relevant for, any student interested in effecting life-affirming change in the world.

To access the updated complete list of approved, leadership-specific electives and to learn more about the program, please see the Leadership Fellows website (http://www.montana.edu/leadershipfellows).

Other requirements:
1. Earn a grade of “C” (2.0) or better in each course used to satisfy the certificate
2. No “credit by exam” may be used

<table>
<thead>
<tr>
<th>Course Code</th>
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<th>Credits</th>
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<td>UC 302</td>
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</table>

Jake Jabs College of Business & Entrepreneurship

Administration
Kregg Aytes, Ph.D., Dean
Myleen Leary, Ph.D., Associate Dean for Academic Affairs
Tia Kelley, MBA, Director of Operations
Brenda Truman, MPA, Director of Student Services

General Information

- The Gary K. Bracken Center for Excellence in Undergraduate Business Education (p. 269)
- The Jake Jabs Center for Entrepreneurship and the Alderson Program in Entrepreneurship (p. 270)
- Degree Programs (p. 270)
  - Bachelor of Science in Business (p. 271)
  - Master of Professional Accountancy (p. 271)
- Academic Policies (p. 271)
  - Formal Admission to the Jake Jabs College of Business & Entrepreneurship (JJCBE (p. 271))
  - Advising and Student Services (p. 272)
  - Acceptance of Transfer Credits and Residency Requirements (p. 272)
- Pre-Professional Requirements for the Master of Business Administration (MBA) (p. 272)

The mission of the Jake Jabs College of Business & Entrepreneurship is to inspire innovation, creativity, and growth. We accomplish this through a personalized learning environment that challenges students to deeply engage in their education and take initiative for their own success in school and life.

An extraordinary faculty offers transformational learning experiences that help students develop the initiative, skills, and creativity to be effective innovators in many different organizational contexts, including entrepreneurial ventures and large corporations. Distinguishing features of the program include small classes, exceptional faculty members in every classroom (no graduate student instructors), rigorous course work, an interactive, personalized learning environment, an emphasis on professional skills, and high-performing students. Each student has a faculty advisor who is available to mentor the student on both academic and career choices.

The College’s mission is embodied by Jabs Hall, the College’s new home which opened in summer 2015. Jabs Hall offers students a brand new energy-efficient building with cutting-edge classrooms, student work rooms, and many collaboration and social areas. In addition, new opportunities in entrepreneurship, creativity, and innovation will be added to the College’s programs in the near future.

The College is fully accredited by AACSB International—the Association to Advance Collegiate Schools of Business, the premium accrediting association for business programs. AACSB has awarded its mark of distinction to only five percent of all business programs worldwide. Not only does this accreditation certify that the JJCBE meets AACSB’s rigorous standards for business education, but it also signals to local, regional, and national employers that the College’s graduates are well-prepared for careers in business.

Learning Objectives

The College has established the following learning objectives for our students:

- **Knowledge of Business:** Students will have strong working knowledge of fundamental concepts in accounting, finance, management, marketing, information technology, strategy, and law.
- **Critical Thinking:** Students will learn to effectively and persuasively assimilate and evaluate information to solve business problems.
- **Quantitative Reasoning:** Students will be able to interpret, represent, and evaluate quantitative information and integrate such information into business decisions and recommendations.
- **Effective Written Communication:** Students will be able to develop and organize ideas, adopt an appropriate tone, employ correct grammar, sentence structure and mechanics, use appropriate vocabulary, and correctly cite sources for facts, quotations and ideas.
- **Effective Oral Communication:** Students will be able to develop and organize ideas, successfully employ technology in support of a message, speak extemporaneously with minimal hesitations and fillers, adopt an appropriate tone, use appropriate vocabulary, employ correct grammar and sentence structure, and manage presentation pacing and timing effectively.
- **Ethical Decision Making and Social Responsibility:** Students will recognize the ethical and societal implications of proposed actions, employ decision-making tools to evaluate the ethical and societal effects of a variety of options, and make sound decisions in accordance with the analysis and evaluation of options.
- **Life-Long Learning:** Students will be immersed in an environment that encourages life-long learning through extensive opportunities to learn in team settings and to develop effective team skills, to develop research skills to advance learning, and to strengthen critical thinking skills.

Throughout the business curriculum, students receive significant exposure to each of these learning objectives. The level of student learning related to each objective is assessed in the senior year.

The Gary K. Bracken Center for Excellence in Undergraduate Business Education

The JJCBE’s commitment to undergraduate student success is embodied in The Gary K. Bracken Center (http://www.montana.edu/business-bracken) for Excellence in Undergraduate Business Education, which is both a physical place and a philosophy.

The Bracken Center is physically located within the Jake Jabs College of Business & Entrepreneurship (JJCBE) in Jabs Hall, where it offers...
access to internship and career information, employer interviews, state-of-the-art conference rooms for student use, and the Bracken Business Communication Clinic (BBCC). The BBCC is staffed by business communication professionals who coach students on oral presentations and written assignments, including basic grammar, punctuation, sentence structure and tenses, and business themes, content, and organization of material.

The philosophy of the Bracken Center is reflected in its mission to facilitate excellence in undergraduate business education through a high quality learning environment. The foundation for student success is based on "Three Pillars":

1. "Learning to Do” — Excellent Academic Preparation:
   - Innovative, challenging, and practical curriculum
   - Small classes taught exclusively by faculty, not by graduate students
   - Focus on experiential, hands-on learning
2. "Learning to Act” — Developing Professional Skills:
   - Student commitment to the student PRIDE Code of Excellence
   - Emphasis on team work and communication skills
   - Guidance in finding internships and jobs, including "Meet the Recruiters” events, and resume and interviewing assistance
3. "Learning to Be” — Nurturing Personal Growth:
   - Individualized attention to help students recognize their strengths and interests
   - Faculty advisors/mentors assigned to all students from their very first day on campus
   - Study abroad opportunities supported by fellowships to help pay for travel expenses

The JJCBE considers student professionalism and personal development to be essential complements to academic excellence. Business students, in conjunction with the faculty, have therefore developed a Student PRIDE Code of Excellence to help guide students in their academic, professional, and personal choices:

**Student PRIDE Code of Excellence**

We, the students of the MSU Jake Jabs College of Business & Entrepreneurship (JJCBE), understand that in choosing to enroll at MSU we are investing in our professional futures. Therefore, we proudly commit to the following Code of Excellence:

**Performance:** I am accountable for and take pride in my own learning and conduct.

**Respect:** I treat with respect all members of my community, including peers, staff, and faculty.

**Integrity:** I am ethical in all that I do.

**Diligence:** I do my best work at all times.

**Engagement:** I challenge myself to invest proactively in my academic, professional, and personal development.

The College offers a wide array of opportunities for students to develop their academic, professional, and personal skills, including:

- First Year and Senior Seminars consisting of no more than 20 students
- Courses in which students serve as consultants for real firms and not-for-profit organizations
- Minors (p. 276) in Accounting, Business Administration, Entrepreneurship and Small Business Management, Finance, and International Business
- Student organizations (http://www.montana.edu/business/current-students/clubs), including Accounting Club/Beta Alpha Psi, Beta Gamma Sigma, Finance Club, International Business Club, Human Resources Management Club, Marketing Club, Montana Investment Group, and Enactus (entrepreneurship)
- Internships at local, regional, and national companies and government agencies
- Study abroad opportunities and short term international programs, including a most-expenses-paid internship in Tokyo, Japan; the Bracken Center offers scholarships specifically to support international activities
- David B. Orser Executive Speakers Forum, which brings several high-profile professionals to the College annually to interact with students and offer insights into business
- The Entrepreneur-in-Residence program, described below

The Bracken Center also provides assistance to faculty members to support their teaching and professional development activities.

**The Jake Jabs Center for Entrepreneurship and the Alderson Program in Entrepreneurship**

The mission of the Jake Jabs Center for Entrepreneurship is to help Montana businesses flourish by connecting them to Montana State University students and resources. Through several courses each semester, students provide pro bono consulting to businesses and not-for-profit organizations. Projects for these clients include market assessments, creating promotional materials, writing employee handbooks, and assessing the feasibility of new technologies. Students gain valuable, real-life experience working with start-up companies, while entrepreneurs gain valuable consulting for their businesses. The Center also offers the Entrepreneur-in-Residence program, which brings in experienced entrepreneurs to spend a week with students and faculty, as well as the Family Business Day on the Road program, which offers business skills development to communities across Montana. The Center provides funding for student and faculty Entrepreneurship Fellows, as well as other opportunities in entrepreneurship.

The Alderson Program in Entrepreneurship enables students to study entrepreneurship through the College’s 30-credit minor in Entrepreneurship and Small Business Management. The culmination of the program is the capstone course—BMGT 463 Entrepreneurial Experience. Students in BMGT 463 gain valuable experience working with start-up or growth companies and may also provide assistance to scientists at MSU in commercializing their scientific discoveries. This partnership not only allows students to apply knowledge gained from their academic work to businesses, but also makes a significant contribution to the economic development of the state of Montana. The Alderson Program has been recognized twice by Entrepreneur Magazine as one of the top 10 entrepreneur-emphasis programs in the U.S.

In addition, MSU’s Blackstone LaunchPad, a collaboration of the Blackstone Charitable Foundation, Montana State University, the University of Montana, and Headwaters RCD, provides guidance, resources, and mentoring to students from all majors as they develop their ideas into entrepreneurial opportunities.

**Degree Programs**

The Jake Jabs College of Business & Entrepreneurship (JJCBE) grants two degrees: a Bachelor of Science in Business, with options in Accounting (p. 272), Finance (p. 273), Management (p. 274) and Marketing (p. 275); and a Master of Professional Accountancy.
Bachelor of Science in Business

The JJCBE undergraduate curriculum is structured on a four-stage model. The four stages include the University Core, the business pre-core, the common body of business knowledge (CBK), and the option courses. Courses are numbered to reflect their position within the curriculum. 100-level courses are generally taken in the freshman year, 200-level courses in the sophomore year, 300-level courses in the junior year, and 400-level courses in the senior year.

The University Core (p. 63), which is required of all MSU students, is described in its own section in this catalog. The business pre-core consists of 100- and 200-level courses that are necessary to develop fundamental knowledge and skills in business, accounting, mathematics, statistics, economics, information technology, and communication. Completion of the business pre-core is required for formal admission to the JJCBE. The business pre-core includes:

- BGEN 194US Seminar: Business & Entrepreneurship Fundamentals 3
- BMGT 205 Prof Business Communication 3
- BMIS 211 Intro to Bus Decision Support 3
- ACTG 201 Principles of Financial Acct 3
- ACTG 202 Principles of Managerial Acct (ACCT students take ACTG 202 & 223; FIN students take ACTG 223, MGMT & MKTG students take ACTG 202.) 3
- or ACTG 223 Principles of Accounting II 3
- M 161Q Survey of Calculus 4
- ECNS 202 Principles of Macroeconomics 3
- ECNS 204IS Microeconomics 3
- STAT 216Q Introduction to Statistics 3
- STAT 217Q Intermediate Statistical Concepts 3
- or BMGT 240IS Business Research Methods 3

* Students transferring into the JJCBE, either from another institution or from another MSU department, who have already earned credit for a University Seminar (US) course must take BGEN 204 instead of BGEN 194US.

The business common body of knowledge (CBK) courses, most of which are 300-level courses designed for juniors, establish the basis for business education in management, marketing, finance, information technology, production and operations management, law, and strategy. The business CBK courses are prerequisites for most upper-level option courses. The business CBK courses include:

- BMGT 335 Management and Organization 3
- BGEN 302 Career Perspectives 1
- or BGEN 303 Professional Coaching Clinic 1
- BMIS 311 Management Information Systems 3
- BMGT 322 Operations Management 3
- BMKT 325 Principles of Marketing 3
- BFIN 322 Business Finance 3
- BGEN 361 Principles of Business Law 3
- BGEN 499 Senior Thesis/Capstone: Strategy Seminar 4

The option courses, most of which are 400-level courses designed for seniors, enhance the depth of understanding in one area of business: Accounting (p. 272), Finance (p. 273), Management (p. 274), or Marketing (p. 275). Please see the descriptions of the option requirements for more detail on the option courses.

Senior Strategy Seminar: BGEN 499 is the capstone course to be taken in the last semester prior to graduation. Completion of CBK courses (BMGT 335, BMIS 311, BMGT 322, BMKT 325, BFIN 322, and BGEN 361) with a C- or better and full formal admission to the JJCBE are required before enrolling in BGEN 499. No concurrent enrollment between prerequisite courses and BGEN 499 is permitted. This course is restricted entry/no online registration available.

Master of Professional Accountancy

The JJCBE’s Master of Professional Accountancy degree is a demanding and highly reputed program that should be considered by students who are interested in pursuing CPA certification or advanced financial positions. Information about this program can be found in the College of Business (JJCBE) (p. 405) section of MSU’s Graduate Catalog.

Academic Policies

Formal Admission to the Jake Jabs College of Business & Entrepreneurship (JJCBE)

All business majors must be formally admitted to the JJCBE in order to enroll in upper-division (300-400 level) option (ACTG, BGEN, BFIN, BMGT, BMIS, BMKT) courses and the senior capstone, BGEN 499.

The performance criteria for formal admission to the JJCBE are as follows:

- Junior standing (completion of 60 semester credits)
- Completion of all business pre-core courses with no grade less than a C-
- Minimum 3.00 cumulative MSU GPA (grade point average) for priority admission

Admission to the JJCBE is competitive, and the number of students admitted each term is limited by the instructional, classroom, and resource constraints of the College. To be considered for admission, students must submit a completed admission application prior to the deadlines below.

Students who meet all performance criteria and have a 3.00 or higher cumulative MSU GPA will be given priority admission. Applications from transfer students and students with cumulative grade point averages less than 3.00 will be considered on a case-by-case basis with preference based on academic performance. Applications from students with a cumulative grade point average less than 2.50 will not be considered.

Applications for formal admission to the College will be considered twice a year. The application deadlines for admission are as follows:

- Admission for Fall/Spring Term On or before May 1st
- Admission for Summer Term On or before December 1st

Applications are available in the JJCBE Student Services Office located in Jabs Hall Room 124, and on the JJCBE website at: http://www.montana.edu/business/current-students/advising-faq.html. Notification of admission decisions will be made via the student’s official e-mail address as listed in MyInfo.

Minimum Grades

The Montana Board of Regents has established a common policy on minimum course grades across all campuses in the Montana University System. According to the policy, a grade of C- or better is required to satisfy requirements for prerequisite and required courses in majors, minors, and certificate programs and for all core requirements. Further, a grade of C- or better is required in all courses that will be counted toward the 42 upper-division credits required in all degrees. Courses with a passing grade of D-,
D, or D+ may only be counted toward the overall 120 credit requirement. This policy creates a minimum requirement, which may be superseded by more stringent requirements within specific majors. Any such requirements are explained within the descriptions of those curricula. To graduate with a Bachelor of Science degree in Business, a student must earn a C- or better in all required courses.

Repeat Grades
It is JJCEB policy that any upper-division required business or business option course(s) in which a student earns an unsatisfactory grade (D+, D, D-, or F) must be repeated at MSU-Bozeman. A transfer course may not be used to fulfill a degree requirement in which a student earned an unsatisfactory grade at MSU-Bozeman. If a student earns an unsatisfactory grade in a Restricted Elective course, s/he should contact the JJCEB Office of Student Services at business@montana.edu to discuss his/her possible remedies.

Advising and Student Services
The JJCEB’s Office of Student Services coordinates new and transfer student orientation, continuing student registration, formal admission to the JJCEB, and certification of degree requirements. Each student is also assigned a faculty advisor to consult about the student’s career-related goals and objectives.

Acceptance of Transfer Credits and Residency Requirements
University undergraduate programs in business administration normally concentrate on professional business courses in the last two years of a four-year program. The objective is to allow students the opportunity to build a foundation of work in the arts, sciences, and humanities prior to beginning professional course work. As a result of this approach, and because of the standards and requirements of AACSB - International, most students transferring into the College from another university should do so no later than the end of their sophomore year.

Students taking their first two years of work at another institution should take only those business courses offered at the freshman or sophomore level at Montana State University. Lower-division business courses may not be used to satisfy upper-division course requirements of the JJCEB. If at all possible, students should complete courses which will transfer to Montana State University as the equivalent to the business pre-core.

All students transferring to the JJCEB must meet the JJCEB residency requirement. Students are required to complete at least the following 28 credits in residence at MSU:

Minimum of 12 credits/4 courses of upper-division required option courses 12
Plus a minimum of 12 credits/4 courses of upper-division required

BGEN, BMGT, BMIS, or BMKT courses

BGEN 499 Senior Thesis/Capstone: Strategy Seminar 4

Total Credits 28

For additional guidance on transferring to Montana State University, see the Admissions (p. 14) section of this catalog, explore the Admissions website at: http://www.montana.edu/wwwnss/, and/or contact the JJCEB’s Office of Student Services at business@montana.edu.

It is JJCEB policy that any upper-division required business or business option course(s) in which a student earns an unsatisfactory grade (D+, D, D-, or F) must be repeated at MSU-Bozeman. A transfer course may not be used to fulfill a degree requirement in which a student earned an unsatisfactory grade at MSU-Bozeman. If a student earns an unsatisfactory grade in a Restricted Elective course, s/he should contact the JJCEB Office of Student Services at business@montana.edu to discuss his/her possible remedies.

Pre-Professional Requirements for the Master of Business Administration (MBA)
The JJCEB does not offer a Master of Business Administration (MBA) degree. The following courses are recommended for non-business undergraduate students who are considering graduate study in business at another institution. These courses provide the “common body of knowledge” required for most MBA programs. Completion of these courses can reduce the time required to obtain an MBA, but students should correspond with the Graduate Admissions Officer at their intended graduate school to confirm the acceptability of these courses.

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<thead>
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<th>Title</th>
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<td>ACTG 202</td>
<td>Principles of Managerial Accounting</td>
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<td>BMIS 311</td>
<td>Management Information Systems</td>
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<td>BMGT 322</td>
<td>Operations Management</td>
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<td>BMKT 325</td>
<td>Principles of Marketing</td>
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<td>BFIN 322</td>
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<td>BGEN 499</td>
<td>Senior Thesis/Capstone: Strategy Seminar</td>
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<td>ECNS 202</td>
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<td>ECNS 204IS</td>
<td>Microeconomics</td>
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<td>M 161Q</td>
<td>Survey of Calculus</td>
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<td>M 216Q</td>
<td>Introduction to Statistics</td>
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<td>STAT 217Q</td>
<td>Intermediate Statistical Concepts</td>
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<tr>
<td>or BMGT 240IS</td>
<td>Business Research Methods</td>
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Undergraduate Programs
• Accounting (p. 272)
• Finance (p. 273)
• Management (p. 274)
• Marketing (p. 275)
• Business Minors & Certificates (p. 276)

Graduate Degrees
• Master of Professional Accountancy (MPAc) (p. 405)

Accounting
Accountants are business professionals who work with people to identify, analyze, and solve business problems. Completing an Accounting option opens the door to a wide range of career opportunities. The Accounting option is designed to help students develop the necessary technical expertise and broad-based business knowledge required for long-term success in careers such as audit, assurance, tax consulting, corporate accounting/finance, not-for-profit/government, financial analysis/venture capital, and financial planning.

Students planning to pursue CPA certification or advanced financial positions should also complete the Master of Professional Accountancy Program. Students completing MSU’s undergraduate and graduate
accounting programs are in high demand and often have multiple job offers at graduation.

Accounting Option

Freshman Year

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<td>M 161Q - Survey of Calculus</td>
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<td>ECNS 202 - Principles of Macroeconomics</td>
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Sophomore Year

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<td>BMIS 211 - Intro to Bus Decision Support</td>
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<td>ECNS 204IS - Microeconomics</td>
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<td>STAT 216Q - Introduction to Statistics</td>
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<tr>
<td>ACTG 202 - Principles of Managerial Acct</td>
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<tr>
<td>ACTG 223 - Principles of Accounting II</td>
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<tr>
<td>BMGT 205 - Prof Business Communication</td>
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<td>Choose one of the following:</td>
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<tr>
<td>STAT 217Q - Intermediate Statistical Concepts</td>
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<tr>
<td>BMGT 240IS - Business Research Methods</td>
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Junior Year

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<td>ACTG 321R - Acct Information Systems I</td>
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<td>BMGT 355 - Management and Organization</td>
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<tr>
<td>BGEN 302 - Career Perspectives</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>or BGEN 303 - Professional Coaching Clinic</td>
<td>3</td>
<td></td>
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<tr>
<td>BMIS 311 - Management Information Systems</td>
<td>3</td>
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<tr>
<td>Non-business/non-economics and general electives, and University Core</td>
<td>2</td>
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<tr>
<td>ACTG 328 - Inter Fin Acct &amp; Reporting II</td>
<td>3</td>
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</tr>
<tr>
<td>BFIN 322 - Business Finance</td>
<td>3</td>
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<tr>
<td>BMGT 322 - Operations Management</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>BMKT 325 - Principles of Marketing</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>BGEN 361 - Principles of Business Law</td>
<td>3</td>
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<tr>
<td><strong>Year Total:</strong></td>
<td>15</td>
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Senior Year

<table>
<thead>
<tr>
<th>Credits</th>
<th>Fall</th>
<th>Spring</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACTG 401 - Principles of Federal Taxation-Individuals</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>ACTG 410 - Cost Management Accounting I</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Choose one of the following Accounting electives:</td>
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</tr>
<tr>
<td>ACTG 420 - Cost Management Accounting II</td>
<td>3</td>
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</tr>
<tr>
<td>ACTG 421 - Acct Information Systems II</td>
<td>3</td>
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<tr>
<td><strong>Year Total:</strong></td>
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</table>

Finance

Finance is the art and science of managing money. Financial management involves corporations raising and employing funds in order to maximize shareholders' wealth. The investments field involves balancing the expected return and risk characteristics of securities in order to make optimal portfolio investment decisions. Financial institutions and markets serve as conduits through which the economy matches supply and demand of investable funds so that scarce resources are allocated efficiently. Career opportunities include credit, financial, and securities analysts, bank examiners, loan officers, comptrollers, treasurers, portfolio managers, financial services representatives, financial planners, and insurance underwriters.

Finance Option

Freshman Year

<table>
<thead>
<tr>
<th>Credits</th>
<th>Fall</th>
<th>Spring</th>
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<tbody>
<tr>
<td>BGEN 194US - Seminar: Business &amp; Entrepreneurship Fundamentals’</td>
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<td>Non-business/non-economics and general electives, and University Core</td>
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<tr>
<td>ECNS 202 - Principles of Macroeconomics</td>
<td>3</td>
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<tr>
<td>M 161Q - Survey of Calculus</td>
<td>4</td>
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<tr>
<td>Non-business/non-economics and general electives, and University Core</td>
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<tr>
<td><strong>Year Total:</strong></td>
<td>15</td>
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</tbody>
</table>

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Any students transferring to the JJcBE must meet the JJcBE residency requirement (p. 272).
## Sophomore Year

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Fall Credits</th>
<th>Spring Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACTG 201</td>
<td>Principles of Financial Acct</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>BMIS 211</td>
<td>Intro to Bus Decision Support</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>STAT 216Q</td>
<td>Introduction to Statistics</td>
<td>3</td>
<td></td>
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<tr>
<td></td>
<td>Non-business/non-economics and general electives, and University Core</td>
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<td>ACTG 223</td>
<td>Principles of Accounting II</td>
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<tr>
<td>BMGT 205</td>
<td>Prof Business Communication</td>
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<tr>
<td>ECNS 204IS</td>
<td>Microeconomics</td>
<td>3</td>
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<tr>
<td>STAT 217Q</td>
<td>Intermediate Statistical Concepts or BMGT 240IS - Business Research Methods</td>
<td>3</td>
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## Junior Year

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<thead>
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<tbody>
<tr>
<td>BMGT 335</td>
<td>Management and Organization</td>
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<tr>
<td>BMIS 311</td>
<td>Management Information Systems</td>
<td>3</td>
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<tr>
<td>BFIN 322</td>
<td>Business Finance</td>
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<tr>
<td>BFIN 357</td>
<td>Financial Markets &amp; Institutions</td>
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<td></td>
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<tr>
<td>ACTG 327</td>
<td>Inter Fin Acct &amp; Reporting I</td>
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<td>BGEN 302</td>
<td>Career Perspectives or BGEN 303 - Professional Coaching Clinic</td>
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<td>BMGT 322</td>
<td>Operations Management</td>
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<tr>
<td>BMKT 325</td>
<td>Principles of Marketing</td>
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<td>BFIN 441</td>
<td>Advanced Analysis of Financial Statements</td>
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<td>ECNS 301</td>
<td>Intermediate Micro with Calc</td>
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<td>Non-business/non-economics and general electives, and University Core</td>
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<td><strong>Year Total:</strong></td>
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## Senior Year

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Fall Credits</th>
<th>Spring Credits</th>
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<tbody>
<tr>
<td>BGEN 361</td>
<td>Principles of Business Law</td>
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<td>BFIN 420R</td>
<td>Investments I</td>
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<td>BFIN 435</td>
<td>Corporate Finance</td>
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<td>BFIN 460</td>
<td>Derivative Securities and Risk</td>
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<tr>
<td>BGEN 499</td>
<td>Senior Thesis/Capstone: Strategy Seminar</td>
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</table>

## Management

The Management option prepares women and men to think critically and to act decisively in the dynamic global marketplace. Management option graduates are ready to make immediate contributions to organizations in a variety of roles such as analysts, managers, and team members. An academically and professionally experienced management faculty whose priority is excellence in teaching, provides students with contemporary business management theory and practice. Emphasis is placed on the application of theory and knowledge in solving practical problems. The curriculum focuses on the development of personal capacity in leadership, critical thinking, problem solving, and ethical decision making at all organizational levels from first line supervision through middle management to executive levels.

### Management Option

#### Freshman Year

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Fall Credits</th>
<th>Spring Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BFIN 194US</td>
<td>Seminar: Business &amp; Entrepreneurship Fundamentals’</td>
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<td>ECNS 202</td>
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<td></td>
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<thead>
<tr>
<th>Course</th>
<th>Fall</th>
<th>Credits</th>
<th>Spring</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACTG 201 - Principles of Financial Acct</td>
<td>3</td>
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<tr>
<td>BMGT 205 - Prof Business Communication</td>
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<tr>
<td>ACTG 202 - Principles of Managerial Acct</td>
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<td>BMIS 211 - Intro to Bus Decision Support</td>
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<tr>
<td>ECNS 204IS - Microeconomics</td>
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<tr>
<td>Year Total:</td>
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### Junior Year

<table>
<thead>
<tr>
<th>Course</th>
<th>Fall</th>
<th>Credits</th>
<th>Spring</th>
<th>Credits</th>
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<tbody>
<tr>
<td>BMGT 335 - Management and Organization</td>
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<td>BMIS 311 - Management Information Systems</td>
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<td>BMKT 325 - Principles of Marketing</td>
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<td>BMGT 322 - Operations Management</td>
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<td>BFIN 322 - Business Finance</td>
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<td>BMGT 366 - Supervisory Management Skills</td>
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<td>BMGT 329 - Human Resource Management</td>
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### Senior Year

<table>
<thead>
<tr>
<th>Course</th>
<th>Fall</th>
<th>Credits</th>
<th>Spring</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BMGT 466 - Middle Management Skills</td>
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<td>BMGT 475R - Management Experience</td>
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<td>BMGT 405 - Supply Chain Analytics</td>
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<td>BMGT 406 - Negotiation/Dispute Resolution</td>
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<td>BMGT 410 - Sustainable Business Practices</td>
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<td>BMGT 420 - Leadership and Motivation</td>
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<td>BMGT 433 - Managing Quality and Productivity</td>
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<td>BMGT 448 - Entrepreneurship</td>
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<td>BMGT 458 - Adv Entrepreneurship Sem</td>
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<td>BMGT 460 - Practical Management Perspectives</td>
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<td>BMGT 461 - Small Business Management</td>
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<td>BMGT 464 - International Management</td>
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<td>BMGT 463 - Entrepreneurial Experience</td>
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<td>BMGT 465 - International Practicum</td>
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<td>BGEN 468 - Contemporary Issues in Business Ethics</td>
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<td>BMGT 469 - Community Entrepreneurship &amp; Nonprofit Management</td>
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<td>BGEN 472 - Legal and Social Framework of Business Regulation</td>
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<td>BMGT 498 - Internship (Must be taken for at least 3 credits, but counts as one Management elective)</td>
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<td>BMIS 314 - Business Web Site Design</td>
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<td>Advisor Approved Electives**</td>
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<td>BGEN 499 - Senior Thesis/Capstone: Strategy Seminar</td>
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<tr>
<td>Advisor Approved Electives**</td>
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</table>

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** Advisor Approved Electives: Three courses (9 credits), all in addition to University Core, of any relevant upper-division courses that are pre-approved by the student’s faculty advisor.

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### Marketing

Marketing is the art and science of managing relationships between buyers and sellers. As such, every product, service, and idea that is offered requires marketing. In addition to businesses, marketing technologies are used by non-profit organizations, government agencies, political entities, and other types of organizations. Modern marketing decisions are based on statistical analyses, market tests, and other research techniques. Studying marketing prepares students to enter this growing and ever-changing sector of the global economy in positions such as marketing managers, sales managers, retail buyers, marketing representatives, professional salespersons, internet or direct response marketing managers, and advertising account representatives.

### Marketing Option

<table>
<thead>
<tr>
<th>Course</th>
<th>Fall</th>
<th>Credits</th>
<th>Spring</th>
<th>Credits</th>
</tr>
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<tbody>
<tr>
<td>BGEN 194US - Seminar: Business &amp; Entrepreneurship Fundamentals’</td>
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</table>
Business Minors

The Jake Jabs College of Business & Entrepreneurship (JJCBE) offers five business minors and a Business Certificate as described below. All minors and the Business Certificate are open to students pursuing majors outside of the JJCBE; however, the Accounting minor is not available to business students in the Accounting option, the Business Administration minor and the Business Certificate are not available to any business students, and the Finance minor is not available to business students in the Finance option. In accordance with the Board of Regents’ policy, students must earn a C- or better in all courses in a minor or certificate.

Minors:

- Accounting (p. 276) (not available to business students in the Accounting option)
- Business Administration (p. 277) (not available to business-major students)
- Entrepreneurship and Small Business Management (p. 278)
- Finance (p. 278) (not available to business students in the Finance option)
- International Business (p. 278)

Certificates:

- Business Certificate (p. 277)

Accounting Minor

The Accounting minor is open to all students, with the exception of students pursuing a business degree with an Accounting option. The coursework helps students understand the role that accounting plays in business decisions. Students who minor in accounting will learn how to prepare and analyze income statements, balance sheets, cost/managerial reports, and tax returns. Students must complete all of the following courses:

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACTG 201 - Principles of Financial Acct</td>
<td>3</td>
</tr>
<tr>
<td>BMGT 205 - Prof Business Communication</td>
<td>3</td>
</tr>
<tr>
<td>STAT 216Q - Introduction to Statistics</td>
<td>3</td>
</tr>
<tr>
<td>Non-business/non-economics and general electives, and University Core</td>
<td>6</td>
</tr>
<tr>
<td>ACTG 202 - Principles of Managerial Acct</td>
<td>3</td>
</tr>
<tr>
<td>BMIS 211 - Intro to Bus Decision Support</td>
<td>3</td>
</tr>
<tr>
<td>ECNS 204IS - Microeconomics</td>
<td>3</td>
</tr>
<tr>
<td>STAT 217Q - Intermediate Statistical Concepts or BMGT 240IS - Business Research Methods</td>
<td>3</td>
</tr>
<tr>
<td>Non-business/non-economics and general electives, and University Core</td>
<td>3</td>
</tr>
<tr>
<td>BMGT 322 - Operations Management</td>
<td>3</td>
</tr>
<tr>
<td>BFIN 322 - Business Finance</td>
<td>3</td>
</tr>
<tr>
<td>BGEN 361 - Principles of Business Law</td>
<td>3</td>
</tr>
<tr>
<td>BMKT 342R - Marketing Research</td>
<td>3</td>
</tr>
<tr>
<td>BMKT 337 - Consumer Behavior</td>
<td>3</td>
</tr>
<tr>
<td>BMKT 343 - Integrated Marketing Communication</td>
<td>3</td>
</tr>
<tr>
<td>BMKT 436 - Sales and Sales Management</td>
<td>3</td>
</tr>
<tr>
<td>Choose two of the following Marketing electives:</td>
<td>6</td>
</tr>
<tr>
<td>BMKT 420 - Integrated Online Marketing</td>
<td></td>
</tr>
<tr>
<td>BMKT 441 - International Marketing</td>
<td></td>
</tr>
<tr>
<td>BMKT 444 - Retail Management</td>
<td></td>
</tr>
<tr>
<td>BMKT 446 - Marketing for Entrepreneurs</td>
<td></td>
</tr>
<tr>
<td>BMKT 447 - Marketing Mix and Design</td>
<td></td>
</tr>
<tr>
<td>BMKT 490R - Undergraduate Research (May be taken more than once, but counts as one Marketing elective)</td>
<td></td>
</tr>
<tr>
<td>BMKT 498 - Internship (Must be taken for at least 3 credits, but counts as one Marketing elective)</td>
<td></td>
</tr>
<tr>
<td>BMGT 405 - Supply Chain Analytics</td>
<td></td>
</tr>
<tr>
<td>Non-business/non-economics and general electives, and University Core</td>
<td>3</td>
</tr>
<tr>
<td>BGEN 499 - Senior Thesis/Capstone: Strategy Seminar</td>
<td>4</td>
</tr>
<tr>
<td>BMKT 499 - Senior Capstone: Marketing</td>
<td>3</td>
</tr>
<tr>
<td>Approved Restricted Elective **</td>
<td>3</td>
</tr>
</tbody>
</table>
A total of 18 credits (5 required courses and 1 elective) plus an assessment and marketing to solve basic business problems. The certificate consists of fundamental concepts in economics, accounting, finance, management and marketing, plus one elective. The Business Certificate is for non-business majors who want an overview of business concepts in order to enhance their future career success, but do not want to pursue a full 30-credit business minor. The goal of the Business Certificate consists of five required courses that introduce students to basic concepts in economics, business, accounting, finance, management and marketing, plus one elective.

Business Administration Minor

The Business Administration minor is open to all non-business students. Students who obtain this minor will gain critical insights into business operations and strategy from accounting, finance, management and marketing coursework. The Business Administration minor will provide students with fundamental knowledge and exposure to key business concepts. Students seeking a minor in Business Administration must complete the following courses.

- ACTG 201 Principles of Financial Acct 3
- ACTG 202 Principles of Managerial Acct 3
- BMKT 335 Management and Organization 3
- BMKT 325 Principles of Marketing 3
- BFIN 322 Business Finance 3
- BGEN 361 Principles of Business Law 3
- ECNS 202 Principles of Macroeconomics 3
- ECNS 204IS Microeconomics 3
- STAT 216Q Introduction to Statistics 3

Choose one of the following: 3

- BMGT 205 Prof Business Communication
- WRIT 201 College Writing II
- WRIT 221 Intermediate Tech Writing

Total Credits 24

* ACTG 328 is a prerequisite for these courses.

Four of the five upper-division courses must be taken in residence at MSU-Bozeman.

Business Certificate

The Business Certificate is for non-business majors who want an overview of business concepts in order to enhance their future career success, but do not want to pursue a full 30-credit business minor. The goal of the certificate is to enable non-business students to learn how to apply fundamental concepts in economics, accounting, finance, management and marketing to solve basic business problems. The certificate consists of a total of 18 credits (5 required courses and 1 elective) plus an assessment test. It is not available to business majors or to students pursuing a business administration minor.

The Business Certificate consists of five required courses that introduce students to basic concepts in economics, business, accounting, finance, management and marketing, plus one elective.

ECNS 101IS Economic Way of Thinking 3
BGEN 204 Business & Entrepreneurship Fundamentals 3
or BGEN 194US Seminar: Business & Entrepreneurship Fundamentals
BGEN 210 Accounting & Finance Basics 3
or BFIN 322 Business Finance
or EGEN 325 Engineering Economic Analysis
BMGT 335 Management and Organization 3
BMKT 325 Principles of Marketing 3

Select one (1) course from the following: 3

- ACTG 201 Principles of Financial Acct
- BGEN 242D Intro to Int’l Business
- BGEN 361 Principles of Business Law
- BMGT 406 Negotiation/Dispute Resolution
- BMGT 410 Sustainable Business Practices
- BMGT 420 Leadership and Motivation
- BMGT 448 Entrepreneurship
- BMGT 461 Small Business Management
- BMGT 469 Community Entrepreneurship & Nonprofit Management
- BMKT 337 Consumer Behavior
- BMKT 420 Integrated Online Marketing
- BMKT 436 Sales and Sales Management
- BMKT 444 Retail Management
- BMKT 446 Marketing for Entrepreneurs
- AGBE 345 Ag Finance and Credit Analysis
- EGEN 325 Engineering Economic Analysis
- EIND 300 Engineering Management & Ethics
- EIND 373 Production Inventory Cost Analysis
- EIND 425 Technology Entrepreneurship
- GDSN 378 Guerrilla Advertising
- SFBS 429 Small Business and Entrepreneurship in Food and Health

Total Credits 18

In accordance with the Board of Regents’ policy, students must earn a C- or better in all courses applied toward the certificate.

It will be easy for students pursuing the certificate to take all prerequisites for courses in the certificate. The prerequisites for all required courses in the proposed certificate are either already included in the certificate (i.e. ECNS 101) or easily obtained by non-business students (M 121Q or M 145Q). Seventeen of the elective courses have prerequisites that are either already contained in the certificate (e.g. ECNS 101, BMGT 335, BMKT 325) or easily obtained by non-business students (e.g. WRIT 101, junior or senior standing). Several electives with more stringent prerequisites are included to accommodate students majoring in those disciplines who will most likely already have taken the prerequisite courses for their major (e.g. AGBE 345, EGEN 325, EIND 373, GDSN 378). Please see attached explanation of prerequisites for more detailed information.
Entrepreneurship and Small Business Management Minor

The Entrepreneurship and Small Business Management minor is open to all business and non-business students. This rigorous minor is designed to provide students with perspective and skills to pursue a successful entrepreneurial career through the Alderson Program in Entrepreneurship (http://www.montana.edu/cob/centernewwest/AldersonProgram.html) coursework. Program objectives include:

- To provide the knowledge, skills, and expertise necessary for successful entrepreneurial careers
- To provide a general overview of the field of business and management
- To provide entrepreneurial expertise and economic stimulus to the region and the state

Students seeking the Entrepreneurship and Small Business Management minor will take the following courses.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BMGT 205</td>
<td>Prof Business Communication</td>
<td>3</td>
</tr>
<tr>
<td>BMKT 325</td>
<td>Principles of Marketing</td>
<td>3</td>
</tr>
<tr>
<td>BGEN 361</td>
<td>Principles of Business Law</td>
<td>3</td>
</tr>
<tr>
<td>BMGT 448</td>
<td>Entrepreneurship</td>
<td>3</td>
</tr>
<tr>
<td>BMGT 463</td>
<td>Entrepreneurial Experience</td>
<td>3</td>
</tr>
</tbody>
</table>

Take one of the following accounting courses:

- ACTG 201 Principles of Financial Acct
- ACTG 202 Principles of Managerial Acct
- ACTG 220 Survey of Accounting
- EIND 373 Production Inventory Cost Analysis

Take one of the following management courses:

- BMGT 335 Management and Organization
- EIND 300 Engineering Management & Ethics

Take one of the following finance courses:

- BFIN 322 Business Finance
- EGEN 325 Engineering Economic Analysis
- AGBE 345 Ag Finance and Credit Analysis

Take two of the following electives:

- ACTG/BFIN 441 Financial Statement Analysis
- BFIN 456 Fin Mgmt for the Entrepreneur
- BMGT 458 Adv Entrepreneurial Sem
- BMGT 461 Sustainable Business Practices
- BMGT 469 Community Entrepreneurship & Nonprofit Management
- BMKT 342R Marketing Research
- BMKT 420 Integrated Online Marketing
- BMKT 436 Sales and Sales Management
- BMKT 446 Marketing for Entrepreneurs
- EIND 425 Technology Entrepreneurship
- GDSN 378 Guerrilla Advertising
- SFBS 429 Small Business and Entrepreneurship in Food and Health

Total Credits: 30

Students must take at least 3 of the following courses in residence at MSU-Bozeman: BMGT 448, BMGT 463, and courses listed above as ‘electives.’

Finance Minor

The Finance minor is open to all students, with the exception of students pursuing a business degree with the Finance option. Program objectives include:

- To provide the tools for financial decision making, including time value of money techniques, asset valuation, and capital budgeting analysis
- To develop in students an analytical perspective in problem solving
- To provide flexibility to design one’s own program through choice of electives

Students seeking the Finance minor must complete the following courses:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECNS 101IS</td>
<td>Economic Way of Thinking</td>
<td>3</td>
</tr>
<tr>
<td>ECNS 204IS</td>
<td>Microeconomics</td>
<td>3</td>
</tr>
<tr>
<td>BMIS 211</td>
<td>Intro to Bus Decision Support</td>
<td>3</td>
</tr>
<tr>
<td>ACTG 201</td>
<td>Principles of Financial Acct</td>
<td>3</td>
</tr>
<tr>
<td>ACTG 202</td>
<td>Principles of Managerial Acct</td>
<td>3</td>
</tr>
<tr>
<td>ACTG 223</td>
<td>Principles of Accounting II</td>
<td>3</td>
</tr>
<tr>
<td>STAT 216Q</td>
<td>Introduction to Statistics</td>
<td>3</td>
</tr>
<tr>
<td>BFIN 322</td>
<td>Business Finance</td>
<td>3</td>
</tr>
<tr>
<td>BFIN 357</td>
<td>Financial Markets &amp; Institutions</td>
<td>3</td>
</tr>
</tbody>
</table>

Choose at least two of the following:

- ACTG/BFIN 441 Financial Statement Analysis
- BFIN 420R Investments I
- BFIN 421 Real Estate and Investment Analysis (on demand)
- BFIN 435 Corporate Finance
- BFIN 452 International Finance
- BFIN 456 Fin Mgmt for the Entrepreneur
- BFIN 458 Commercial Bank Management (on demand)
- BFIN 460 Derivative Securities and Risk Management
- BFIN 466 Investments II (on demand)
- BFIN 490R Undergrad Research

Total Credits: 30

Students must meet prerequisite requirements of individual courses. Three of the four upper-division courses must be taken in residence at MSU-Bozeman.

International Business Minor

The International Business minor is open to all business and non-business students. The objectives of the International Business minor are:

- To provide students a broad-based interdisciplinary educational experience that will enable students to succeed in a culturally diverse global business environment
- To enable students to acquire the basic skills and knowledge necessary for a career in international business
- To provide students a flexible yet rigorous program that suits each student’s own individual needs and interests

* JJCBE Management option students must take at least one course outside of BMGT.
Foreign language study is not required to obtain the International Business minor but is strongly recommended. As many as 11 credits of language study may be applied toward the minor as electives. The required 17 credits of electives, as listed below, must come from at least three different disciplines, e.g., language, geography, history, political science, religious studies, business, etc. When completing the International Business minor, a study abroad experience is highly recommended. In addition, going on an exchange, doing an internship with an international context, and doing an independent study that allows the student to incorporate the various international courses he or she has taken in one research project, are all strongly recommended. Students completing the International Business minor will complete the following courses, and are responsible for fulfilling the appropriate prerequisites for all courses:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECNS 314</td>
<td>International Economics</td>
<td>3</td>
</tr>
<tr>
<td>BGEN 242D</td>
<td>Intro to Int'l Business</td>
<td>3</td>
</tr>
<tr>
<td>BMKT 441</td>
<td>International Marketing</td>
<td>3</td>
</tr>
<tr>
<td>BMGT 464</td>
<td>International Management</td>
<td>3</td>
</tr>
<tr>
<td>General Electives *</td>
<td></td>
<td>11</td>
</tr>
<tr>
<td>Restricted Electives **</td>
<td></td>
<td>6</td>
</tr>
</tbody>
</table>

Total Credits 29

* General electives are selected in consultation with the JJCBE International Business minor advisor from an approved list of lower- and upper-division elective courses, which can include up to 11 credits of language study. The list is available on the College website, in the Bracken Center (Jabs Hall Room 108), or in the Office of Student Services (Jabs Hall Room 124).

** Restricted electives are selected in consultation with a JJCBE International Business minor advisor from an approved list of upper-division courses, which is available on the College website, in the Bracken Center (Jabs Hall Room 108), or in the Office of Student Services (Jabs Hall Room 124).
Graduate Catalog

Vision
The Graduate School strives to foster an environment that produces outstanding graduate scholars who contribute new ideas and knowledge using creative and innovative approaches to solve challenges in an evolving world.

Mission
The Graduate School enriches the graduate student experience by providing excellent service, timely oversight, and relentless advocacy for student success.

Welcome from the Dean of The Graduate School
Dr. Karlene Hoo, Dean of The Graduate School

The Graduate School welcomes you to Montana State University. We are delighted that you have chosen MSU. Graduate school is a place where you will gain expertise in your field and prepare to become the scientists, engineers, nurses, educators, agronomists, artists and architects of tomorrow.

When you become an MSU graduate student, you become an essential part of the university by conducting cutting edge research, assisting in instructional teaching, and making significant contributions to your field of study.

We invite you to explore the MSU website to learn more about our outstanding graduate programs, the exciting and challenging opportunities afforded graduate students, and the eclectic community of Bozeman, Montana. The Graduate School staff and I are committed to helping you succeed at all points throughout your education and welcome your questions and comments. We can be reached at 406-994-4145, gradschool@montana.edu.

Graduate Programs
For detailed information about The Graduate School at MSU, visit the webpage (http://www.montana.edu/gradschool). The master's, doctoral, and certificate offerings are listed below, along with links to each academic department's webpage. To find out more about a specific graduate program, please contact the department.

Department of Agricultural Economics and Economics (p. 283)
Home Page: http://www.montana.edu/econ/
• Master of Science in Applied Economics (p. 284)

Division of Agriculture Education (p. 283)
Home Page: www.ag.montana.edu/ageducation/
• Master of Science in Agricultural Education (p. 384)

American Studies (p. 355)
Home Page: http://www.montana.edu/amst/index.html
• Master of Arts in American Studies (p. 356)
• Doctor of Philosophy in American Studies (p. 355)

Department of Animal and Range Sciences (p. 284)
Home Page: http://animalrange.montana.edu/degree-grad.htm
• Master of Science in Animal and Range Sciences (p. 285)
• Master of Science in Land Rehabilitation (p. 286) (Interdisciplinary)

School of Architecture (p. 295)
Home Page: http://www.arch.montana.edu/pages/programs/programs.php
• Master of Architecture (p. 297)
• Certificate of Professional Practice of Architecture (p. 390)

School of Art (p. 298)
Home Page: http://art.montana.edu
• Master of Fine Arts (p. 299)
• Master of Art in Art History (p. 298)

Jake Jabs College of Business & Entrepreneurship (JJCBE) (p. 405)
Home Page: http://www.montana.edu/cob/
• Master of Professional Accountancy (p. 405)

Department of Cell Biology and Neuroscience (p. 357)
Home Page: http://www.montana.edu/cbn/
• Master of Science in Biological Sciences (p. 358)
• Master of Science in Neuroscience (p. 358)
• Doctor of Philosophy in Biological Sciences (p. 358)
• Doctor of Philosophy in Neuroscience (p. 358)

Department of Chemical and Biological Engineering (p. 334)
Home Page: http://www.chbe.montana.edu/
• Master of Science in Chemical Engineering (p. 335)
• Master of Science in Environmental Engineering (p. 336)
• Master of Engineering In Chemical Engineering (p. 338)
• Master of Engineering in Bioengineering (p. 338)
• Doctor of Philosophy in Engineering (p. 343)
• Doctor of Philosophy in Materials Science (p. 402)

Department of Chemistry and Biochemistry (p. 358)
Home Page: http://www.chemistry.montana.edu/graduate/
• Master of Science in Chemistry (p. 360)
• Master of Science in Biochemistry (p. 360)
• Doctor of Philosophy in Chemistry (p. 361)
• Doctor of Philosophy in Biochemistry (p. 361)
• Doctor of Philosophy in Materials Science (p. 402)

Department of Civil Engineering (p. 338)
Home Page: http://www.coe.montana.edu/cce/
• Master of Science in Civil Engineering (p. 339)
• Master of Science in Environmental Engineering (p. 336)
• Master of Science in Land Rehabilitation (p. 286)
• Master of Construction Engineering Management (PMSEM) (p. 341)
• Doctor of Philosophy in Engineering (p. 343) (Options in Environmental Engineering, Civil Engineering, Applied Mechanics)

Department of Computer Science (p. 348)
Home Page: http://www.cs.montana.edu/
• Master of Science in Computer Science (p. 348)
• Doctor of Philosophy in Computer Science (p. 348)

**Department of Earth Sciences (p. 361)**
Home Page: http://www.montana.edu/wwwes/programs/graduate.htm

• Master of Science in Earth Sciences (p. 362)
• Master of Science in Land Rehabilitation (p. 286) *(Interdisciplinary)*
• Doctor of Philosophy in Earth Sciences (p. 362)

**Department of Ecology (p. 363)**
Home Page: http://www.montana.edu/ecology/

• Master of Science in Biological Sciences (p. 363)
• Master of Science in Fish and Wildlife Management (p. 364)
• Doctor of Philosophy in Fish and Wildlife Biology (p. 365)
• Doctor of Philosophy in Biological Sciences (p. 364)
• Doctor of Philosophy in Ecology and Environmental Sciences (p. 364) *(Interdisciplinary)*

**Department of Education (p. 300)**
Home Page: http://www.montana.edu/wwweduc/grad/index.shtml

• Master of Education
  • Adult and Higher Education (p. 306)
  • Curriculum and Leadership (p. 308)
  • Educational Leadership (p. 312)
• Doctor of Education (Ph.D. & Ed.D)
  • Adult and Higher Education (p. 313)
  • Curriculum and Instruction (p. 316)
  • Educational Leadership (p. 318)
• Educational Specialist in Educational Leadership (p. 326)
• College Teaching Certificate (p. 304)
• School Library Media Graduate Endorsement (p. 305)

**Department of Electrical and Computer Engineering (p. 348)**
Home Page: http://www.coe.montana.edu/eeresearch/postdoc1.htm

• Master of Science in Electrical Engineering, Plan A (p. 350) *(Thesis)*
• Master of Science in Electrical Engineering, Plan B (p. 350) *(Professional Paper)*
• Master of Engineering in Electrical Engineering (p. 350)
• M.S. in Optics Plan A (p. 350) *(Thesis)*
• M.S. in Optics Plan B (p. 351) *(Professional Paper)*
• Doctor of Philosophy in Engineering (p. 351) *(Option in Electrical and Computer Engineering)*
• Doctor of Philosophy in Materials Science (p. 402)

**College of Engineering (p. 334)**
Home Page: http://www.coe.montana.edu/

**Department of English (p. 365)**
Home Page: http://www.montana.edu/english/

• Master of Arts in English (p. 365)

**School of Film and Photography (p. 299)**
Home Page: http://naturefilm.montana.edu/

• Master of Fine Arts in Science and Natural History Filmmaking (p. 299)

**Department of Health and Human Development (p. 327)**
Home Page: http://www.montana.edu/hhhd/

• Counseling (p. 328)
• Exercise and Nutrition Sciences (p. 330)
• Family & Consumer Sciences (p. 331)
• Family Financial Planning (p. 331)
• Food, Family and Community Health Sciences (p. 332)
• Master of Education in School Counseling (p. 328)

**Department of History and Philosophy (p. 366)**
Home Page: http://www.montana.edu/wwwwhp/

• Master of Arts in History (p. 366)
• Doctor of Philosophy in History (p. 366)

**Department of Land Resources and Environmental Sciences (p. 290)**
Home Page: http://landresources.montana.edu/

• Master of Science in Entomology (p. 291) *(Coordinating department)*
• Master of Science in Land Rehabilitation (p. 286)
• Master of Science in Land Resources and Environmental Sciences (p. 292)
• Doctor of Philosophy in Ecology and Environmental Sciences (p. 293)

**Department of Mathematical Sciences (p. 367)**
Home Page: http://www.math.montana.edu/grad/index_future.html

• Master of Science in Mathematics (p. 367)
• Master of Science in Mathematics (p. 387) *(Mathematics Education option)*
• Master of Science in Statistics (p. 368)
• Doctor of Philosophy in Mathematics (p. 369)
• Doctor of Philosophy in Mathematics (p. 370) *(Mathematics Education option)*
• Doctor of Philosophy in Statistics (p. 371)
• Applied Statistics Certificate (p. 367)

**Department of Mechanical and Industrial Engineering (p. 352)**
Home Page: http://www.coe.montana.edu/mie/

• Master of Science in Mechanical Engineering (p. 353)
• Master of Science in Industrial and Management Engineering (p. 352)
• Doctor of Philosophy in Engineering (p. 343) *(Option in Industrial Engineering and Mechanical Engineering)*
• Doctor of Philosophy in Materials Science (p. 402)

**Department of Microbiology and Immunology (p. 371)**
Home Page: http://www.montana.edu/mbim/

• M.S. in Immunology and Infectious Diseases (p. 288)
• M.S. in Microbiology, Plan A (p. 288) *(Thesis)*
• M.S. in Microbiology, Plan B (p. 289) *(Professional Paper)*
• Ph.D. in Microbiology (p. 289)
• Ph.D. in Immunology and Infectious Diseases (p. 290)

Molecular Biosciences Program
Home Page: http://mbprogram.montana.edu/index.asp

Department of Native American Studies (p. 372)
Home Page: http://www.montana.edu/wwwnas/
• Master of Arts in Native American Studies (p. 373)
• Online Certificate in Native American Studies (p. 389)

College of Nursing (p. 379)
Home Page: http://www.montana.edu/nursing/
• ADRN to MN: Associate to Masters in Nursing (MN) (http://montana.edu/nursing/graduate/teaching_methods.html)
• Master of Nursing (MN) (p. 381)
• Doctor of Nursing Practice (DNP) Degree (p. 381)
• Nursing Education Certificate (p. 390) (Non-degree option)

Department of Physics (p. 375)
Home Page: www.physics.montana.edu
• Master of Science in Physics (p. 376)
• Doctor of Philosophy in Physics (p. 376)
• Doctor of Philosophy in Materials Science (p. 402)

Department of Plant Sciences (p. 293)
Home Page: http://plantsciences.montana.edu/studentinfo/grad/student_grad.html
• Master of Science in Plant Pathology (p. 294)
• Master of Science in Plant Science (p. 294)
• Doctor of Philosophy in Plant Science (p. 294)

Department of Political Science (p. 377)
Home Page: http://www.montana.edu/wwwcat/programs/grad_mpa.htm
• Master of Public Administration (p. 377)

Department of Psychology (p. 378)
Home Page: http://www.montana.edu/wwwwp/
• Doctor of Philosophy in Psychological Science (p. 379)

Master of Science in Science Education
Home Page: http://www.montana.edu/msse/
• Master of Science in Science Education (p. 388)

Interdisciplinary Programs
• Doctor of Philosophy in Ecology and Environmental Sciences (p. 293)
• Master of Science in Environmental Engineering (p. 336)
• Master of Science in Health Science (p. 395)
• Master of Science in Science Education (p. 388)
• Molecular Biosciences Program (p. 398)
• Professional Master of Science and Engineering Management (p. 341)
• Post Baccalaureate Pre-Medical Certificate (p. 399)
• WIMU Veterinary Medicine (p. 403)
• WWAMI Medical Education Program (p. 403)
• Doctor of Philosophy in Materials Science (p. 402)

Montana State Online
http://eu.montana.edu/online/degrees/

Graduate Programs
• Master of Science in Agricultural Education (p. 384)
• Master of Education in Curriculum and Instruction (p. 308)
• Master of Science in Health and Human Development-Family Financial Planning (p. 331)
• Master of Science in Land Resources and Environmental Sciences (p. 292)
• Mathematics Education Option (p. 387)
• Nursing MN (p. 381)
• Nursing DNP (p. 381)
• Master of Science in Science Education (p. 388)
• Science and Engineering Management (http://catalog.montana.edu/graduate/extended-university/science-engineering-management)
• Professional Master of Science and Engineering Management (p. 341) (PMSEM)

Graduate Certificates
• Addiction Counseling (p. 389)
• Architecture, Professional Practice of (p. 390)
• Chemistry Teaching Certificate (p. 392)
• Earth Science Teaching Certificate (p. 393)
• Elementary School Science Teaching Certificate (p. 393)
• Life Science Teaching Certificate (p. 393)
• Native American Studies (p. 389)
• Nursing Education (p. 390)
• School Library Media (p. 305)
• Science Teaching (p. 392)
• Physics Teaching Certificate (p. 394)

College of Agriculture

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Department of Animal and Range Sciences (p. 284)
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• M.S. in Entomology (p. 291) (coordinating department)
• M.S. in Land Rehabilitation (p. 286)
• M.S. in Land Resources and Environmental Sciences (p. 292)
• M.S. in Land Resources and Environmental Sciences - Online (http://landresources.montana.edu/grad/landonline.html)
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Agricultural Education Program

Division of Agricultural Education
230 Linfield Hall
PO Box 172830, Bozeman, MT 59717-2830
Tel: 406-994-2132, Fax: 406-994-6696, email: aged@montana.edu

Division of Agricultural Education Head: Dr. Tracy Dougher (tracyaod@montana.edu)
Associate Professor: Dr. Carl G. Igo (http://ag.montana.edu/ageducation/facultyandstaff.html)
Associate Professor and Graduate Coordinator: Dr. Shannon Arnold (http://ag.montana.edu/ageducation/facultyandstaff.html)
Assistant Professor: Dr. Dustin Perry (http://ag.montana.edu/ageducation/facultyandstaff.html)

Admission
In order to apply for the Ag Ed Education program, be sure you have completed the following and are prepared to report it during the application process:

• A bachelor's degree in an appropriate field such as agricultural education, agricultural communications, or an agriculturally related area from an accredited university
• An acceptable grade point average in undergraduate studies (minimum GPA of 3.0)
• Graduate Record Examination score of 300 or above (combined verbal and quantitative; verbal section minimum 152). Score of 3.5 or higher on the GRE analytical writing section
• International students only: Minimum TOEFL score of 213 is required for all international applicants

Once all application materials are received they will be reviewed by the Agricultural Education graduate committee. Based on their review, a recommendation will be made to The Graduate School regarding admission. The Graduate School will inform the applicant of their final decision. If you do not meet these requirements, you may seek provisional admission. Provisional admission is not guaranteed to students who do not meet the requirements but is used in defined instances.

Degree Requirements
To earn a Masters of Science in Agricultural Education students must complete a minimum of 30 credits. Students deficient in preliminary course work may be required by their graduate committee to take additional courses for which they will not receive graduate credit (courses numbered <400). All students' coursework must include Research Methods (AGED 506), Program Planning and Evaluation (AGED 507), Graduate Seminar (AGED 594), and Special Topics (AGED 591).

The masters program may be taken under either of two plans. One plan requires a thesis (Plan A) and other requires a professional paper or project (Plan B, online). All students are expected to submit their research to a journal or periodical for publication upon the completion of their degree program.

Financial Assistance
Teaching and Research Assistantships may be available for qualified students. Interested students should apply to: Department of Agricultural Education, 230 Linfield Hall MSU, Bozeman, MT 59717. See the Graduate Assistantship section of The Graduate School website for detailed information on appointment criteria.

Deadlines
Deadlines for applying to the Ag Ed program are:
• July 1st for Fall semester, November 15th for Spring Semester**
• March 15th for Summer semester**

**International students should have application materials in two months prior to the dates mentioned.

Graduate Programs
• M.S. in Agricultural Education (p. 384)

Department of Agricultural Economics and Economics

Department Head
Dr. Wendy Stock
P.O. Box 172920
306 Linfield Hall, Bozeman, MT 59717-2920
Tel: 406-994-3701 Fax: 406-994-4838
Email: ageconadvising@montana.edu

Our Master of Science degree in Applied Economics encourages students to develop and apply their skills in economic analysis and examine a wide array of economic and political issues. Learning takes place through coursework in economic theory, quantitative methods and econometrics, through collaborative work with departmental faculty, and through an intensive research thesis that addresses an important economic issue selected by the student.

Admission
Core graduate courses are taught at a level that requires entering students to have successfully completed courses in intermediate microeconomic and macroeconomic theory, calculus, matrix algebra, and statistics. Applicants who have not completed the prerequisite material, but who have apparent potential for graduate study, may be admitted to the program on a provisional basis. A math review course is offered prior to Fall semester each year for all incoming graduate students. Applicants must submit Graduate Record Examination (GRE) scores, official transcripts of all degree coursework, three letters of recommendation, and an application fee of $60. A personal statement is recommended, but is not required. Foreign applicants must also include English proficiency test scores from: TOEFL [80], IELTS [level 6.5] or PTE [54]; this test is necessary for applicants who are not U.S. citizens and not from countries where English is the official language. To apply for the M.S. in Applied Economics, use this link: www.montana.edu/gradschool/apply.html
Degree Requirements
A core of economic theory and quantitative methods courses (or equivalent) is required. Students are required to maintain a 3.0 grade point average in all their core courses and the courses in their graduate program. Failure to meet these requirements, as well as receipt of more than one grade less than a “B-” in the core courses will be grounds for termination. See Program Requirements on the department website for course information.

Student Graduate Committee
Faculty members in our Department have expertise in a wide variety of fields. Some examples of graduate topics taught by our faculty are advanced economic theory, static and dynamic optimization models in economics, the dynamic effects of fiscal & monetary policy on the macroeconomy, theory and use of regression analysis, public policy, and research methodology. Our faculty takes an active interest in our students, and this one-on-one contact with faculty in our department is consistently given high praise among our students.

Financial Assistance
A number of research and teaching assistantships are available for graduate students and are awarded on a competitive basis. Late applications will be considered as space and funding become available. To ensure full consideration for assistantship awards for Fall semester, applications should be received by January 15. For further information, refer to the Graduate Assistantships sections on the department website.

Degree Offered
• M.S. in Applied Economics (p. 284)

M.S. in Applied Economics

Program Requirements
A core of economic theory and quantitative methods courses (or equivalent) is required. Students are required to maintain a 3.0 grade point average in all their core courses and the courses in their graduate program. Failure to meet these requirements, as well as receipt of more than one grade less than a “B-” in the core courses will be grounds for termination. The core includes:

Required Core Courses

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>AGBE 467</td>
<td>Quantitative Method in Ag Econ</td>
<td>3</td>
</tr>
<tr>
<td>ECNS 401</td>
<td>Microeconomic Theory</td>
<td>3</td>
</tr>
<tr>
<td>ECNS 501</td>
<td>Microeconomic Theory</td>
<td>3</td>
</tr>
<tr>
<td>ECNS 502</td>
<td>Macroeconomic Theory</td>
<td>3</td>
</tr>
<tr>
<td>ECNS 561</td>
<td>Econometrics I</td>
<td>3</td>
</tr>
<tr>
<td>ECNS 562</td>
<td>Econometrics II</td>
<td>3</td>
</tr>
<tr>
<td>ECNS 594</td>
<td>Seminar</td>
<td>1</td>
</tr>
<tr>
<td>ECNS 594</td>
<td>Seminar</td>
<td>1</td>
</tr>
<tr>
<td>ECNS 590</td>
<td>Master’s Thesis</td>
<td>10</td>
</tr>
</tbody>
</table>

In addition to theory and quantitative methods core courses, students will successfully complete ECNS 569 Research Methodology. Supplementary coursework and research may focus on agricultural economics, natural resource economics, or general applied economics. Through continued discussions with the advisor and other faculty, students will select additional courses and either a thesis topic (Plan A) or research paper topic (Plan B) to complete a program of study consistent with their interests.

Students may choose to study special problems on an individual basis. Students desiring “Individual Problem” credit as either ECNS 592 Independent Study, AGBE 592 Independent Study, or AGBE 591 Special Topics should consult with a faculty member and agree upon a plan of study before the beginning of the semester in which the credits are to be undertaken. The Graduate School must approve all such courses, and limits the number of credits applicable toward degree requirements as: maximum of 3 credits for Option A or 6 credits for Option B.

Under Plan A, required minimums are: 20 semester credits (including the core courses of graduate coursework), and 10 semester credits of thesis. For those who have satisfied coursework prerequisites, the required degree coursework should be completed in two semesters. The thesis must be acceptable to the student’s graduate committee and to The Graduate School, and it must demonstrate independent and original research.

Under Plan B, a thesis is not required. This option includes at least 30 semester credits of graduate coursework. Students who select Option B are required to include a Professional Paper and Project (ECNS 575); maximum of 4 credits in a semester and a maximum of 6 credits for the program as part of their program. For those who have satisfied coursework prerequisites, the required degree coursework (other than the research paper) should be completed in two or three semesters. The paper must be original, of professional quality (meet style and format requirements set forth in The Graduate School Guide for Preparation of Thesis and Professional Papers), be acceptable to the student’s graduate committee, and receive final approval by the Department Head.

Two examinations complete degree requirements. Each student is required to pass a Microeconomics Theory Core Exam – a written exam administered by the Department’s Graduate Affairs Committee. The exam is offered early spring semester, and may be offered one additional time each year; it will consist of questions covering the fundamental concepts of microeconomic theory and their application.

In addition to the Core Exam, each student is required to pass an oral examination in defense of their thesis (Option A) or research paper (Option B). The oral examination is administered by the student’s graduate committee and is open to all members of the faculty. Students are expected to present a typed draft, in final form, of the thesis or research paper to each member of their graduate committee at least seven days prior to the scheduled date of their examination. The examination for Option A students should not be scheduled until the student’s thesis committee agrees that the thesis is essentially in a form acceptable to the University Library (that is, copies of the typed draft should be readable and have a table of contents, list of tables and figures, chapter titles, section headings, bibliography, and consecutively numbered pages). The examination for Option B students should not be scheduled until the paper is in a form that satisfies style and format requirements.

Department of Animal and Range Sciences
P.O. Box 172900
Bozeman, MT 59717-2900
406-994-5582

Department Head
Dr. Patrick Hatfield
103 Animal Bioscience Building, Bozeman, MT 59717
406-994-3722 Email:animalrange@montana.edu

Graduate Coordinator
Dr. Jane Ann Boles
207 Animal Bioscience Building, Bozeman, MT 59717
406-994-7352 Email:jboles@montana.edu

Admission
A minimum of 3.0 GPA on a 4.0 scale is required by The Graduate School for admittance. The undergraduate work should have been in Animal
Science, Range Science or a closely related field. A faculty member must agree to advise a student before they will be accepted into the Animal and Range Sciences department. Acceptance to the MSU Animal and Range Sciences department does not imply automatic acceptance to The Graduate School at MSU. Financial support in the form of research assistantships and/or tuition and fee waivers is limited and will be awarded on a competitive basis.

We do require that a student take the GRE (Graduate Record Examination) and that the scores be included as part of the application material (sent directly from the testing agency to MSU); unofficial scores will be used for initial evaluation by the department. If you have not taken the GRE exam, you should do so at your earliest convenience. A minimum GRE score of 150 verbal and 146 quantitative (450 verbal and 550 quantitative in previous GRE scoring system) are required for full admission. GRE scores cannot be over 5 years old at time of application. In addition to the above requirements international applicants must have a TOEFL (English proficiency) score of 550 (paper) or 213 (computer).

Additional required application materials: Official transcripts (sent directly to the Department from all higher education schools attended (universities, colleges, and/or community colleges) or via email: gradschool@montana.edu. Three reference letters (letters cannot be from the intended major professor or potential committee members) and a personal statement must be submitted through the online application.

A complete domestic application package must be received by the department by the following dates and International applications are due one month prior:

- For admission Fall semester - June 1
- For admission Spring semester - November 1
- For admission Summer semester - March 1

Degrees Offered

- M.S. in Animal and Range Sciences (p. 285)
- M.S. in Land Rehabilitation (interdisciplinary) (p. 286)
- Ph.D. in Animal and Range Sciences (p. 286)

Master of Science Animal and Range Sciences

Animal Science Emphasis

Graduate students in the Animal Science emphasis receive broad-based training resulting in experiences that qualify them for many agricultural jobs. Areas of emphasis include nutrition, breeding and genetics, physiology, production systems, and meat science/muscle growth. Research problems may involve beef cattle, sheep and biochemical or other properties of agricultural products. Supporting course work may be taken from Animal Science, Range Science, Biology, Wildlife Management, Biochemistry, Statistics, Plant Sciences, Land Resources and Environmental Sciences, and Economics.

Research laboratories are available in the department and specialized equipment is also available through cooperation with other departments.

The department conducts cooperative research with the U.S. Livestock and Range Research Station at Miles City, Montana, and the U.S. Sheep Experiment Station at Dubois, Idaho. Facilities for the maintenance of beef cattle and sheep are available at the Red Bluff Research Ranch, 30 miles west of Bozeman, the Fort Ellis Research Center, near Bozeman, and the Northern Agricultural Research Center at Havre. The main station has facilities for sheep, horses and beef cattle (a cattle feedlot and nutrition laboratory). A wool laboratory is located on campus.

Range Science Emphasis

Research and training opportunities in the Range Science programs are diverse, and students with a wide variety of backgrounds, goals, and educational needs are accepted. Major areas of study are range ecology, habitat management, watershed management, grazing management, monitoring, riparian ecosystems, measurements, and plant-animal (livestock and wildlife) interactions. A graduate degree with the range science emphasis prepares students for careers in rangeland management, wildlife management, habitat management, natural resource conservation and restoration, research, land-use planning, and consultation. Research facilities include the Red Bluff Research Ranch, several research centers of the Montana Agricultural Experiment Station, U.S. Livestock and Range Research Station at Miles City, Montana, and the U.S. Sheep Experiment Station at Dubois, Idaho. Cooperative projects with ranchers and federal and state agencies are also conducted. Supporting courses at the graduate level include botany, wildlife biology and management, soils, animal science, earth science, plant science, statistics and biochemistry.

Biology Emphasis

Graduate students in the Biology emphasis receive training directed toward the basic biological functions as they relate to animal production, meat science/meat food safety or entomology. Research projects may involve beef cattle, sheep and biochemical or other properties of agricultural products. Supporting course work may be taken from Animal Science, Range Science, Biology, Wildlife Management, Biochemistry, Statistics and Plant Sciences.

Minimum Requirements for a M.S. in Animal & Range Sciences

- At least one upper level (400 or 500) course in statistics.
- Two semesters of ARNR 507 Research Methods.
- Students must declare either the Animal Science, Range Science or Biology Emphasis:
  - Course requirements for students in the Animal Science Emphasis:
    - At least two courses from the Graduate Animal Science block (must be 500 level course)
  - Course requirements for students in the Range Science Emphasis:
    - At least two courses from the Graduate Range Science block (must be 500 level course)
  - Course requirements for students in the Biology Emphasis:
    - At least two biology-related 500-level courses in their area of emphasis

AND

- At least one course from the Graduate Animal Science block or Range Science block

NOTE: students emphasizing meat science in the Biology Emphasis can substitute –Biochemistry of Macromolecules for one of the two 500-level courses.

Graduate Animal Science Block

<table>
<thead>
<tr>
<th>Course</th>
<th>Description</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>ARNR 520</td>
<td>Nutrient Metabolism</td>
<td>3</td>
</tr>
<tr>
<td>ARNR 521</td>
<td>Adv Ruminant Nutrition</td>
<td>3</td>
</tr>
<tr>
<td>ARNR 523</td>
<td>Adv Physiology of Reproduction</td>
<td>3</td>
</tr>
<tr>
<td>ARNR 524</td>
<td>Adv Animal Breeding</td>
<td>3</td>
</tr>
<tr>
<td>ARNR 525</td>
<td>Muscle Growth &amp; Biology</td>
<td>3</td>
</tr>
</tbody>
</table>

Graduate Range Science Block

<table>
<thead>
<tr>
<th>Course</th>
<th>Description</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>ARNR 541</td>
<td>Range Ecophysiology</td>
<td>3</td>
</tr>
<tr>
<td>ARNR 543</td>
<td>Riparian Process &amp; Function</td>
<td>3</td>
</tr>
</tbody>
</table>
ARNR 544  Adv Grazing Mgmt & Ecology  3
ARNR 555  Rangeland Wildlife Ecology & Management  3

Students must meet the proficiency requirements for their emphasis area (see Proficiencies below).

Proficiency Requirements for Animal Science Emphasis
By the time a student completes a M.S. or Ph.D. in Animal & Range Sciences (Animal Science Emphasis), he/she must have successfully completed undergraduate or graduate coursework in three of the four areas listed below. Examples of MSU courses that fulfill these requirements are given. Students who have successfully completed an equivalent course may apply that course toward the proficiency requirements, subject to the approval of the student’s Graduate Committee. Undergraduate courses in these categories are not intended to comprise a substantial portion of a student’s graduate curriculum. These courses should be taken in addition to, not in lieu of, other courses in a graduate program. While some courses may apply toward requirements for the M.S. in Animal & Range Sciences and proficiency requirements, the student’s Graduate Committee must not allow the need to meet proficiency requirements detract from a student completing a rigorous graduate degree program.

• Breeding/Genetics (ANSC 322 Principles of Animal Breeding and Genetics or BIOB 375 General Genetics)
• Physiology/Reproduction (ANSC 321 Physiology of Animal Reproduction)
• Nutrition (ANSC 320 Animal Nutrition)
• Production/Management (ANSC 434R Beef Cattle Management)

Proficiency Requirements for Biological Science Emphasis
By the time a student completes a M.S. degree in Animal & Range Sciences (Biological Science Emphasis), he/she must have successfully completed a minimum of 15 credit hours in the biological sciences with at least 9 credit hours in upper division course work which may include: biological sciences, chemistry, microbiology, food science, entomology, and ecology. Examples of MSU courses that fulfill these requirements are given. Students who have successfully completed an equivalent course may apply that course toward the proficiency requirements, subject to the approval of the student’s Graduate Committee. Undergraduate courses in these categories are not intended to comprise a substantial portion of a student’s graduate curriculum. These courses should be taken in addition to, not in lieu of, other courses in a graduate program. While some courses may apply toward requirements for the M.S. in Animal & Range Sciences and proficiency requirements, the student’s Graduate Committee must not allow the need to meet proficiency requirements detract from a student completing a rigorous graduate degree program.

• Biology (BIOB 160 Principles of Living Systems, BIOB 170N Principles of Biological Diversity, BIOB 260 Cellular and Molecular Biology)
• Ecology (BIOE 370 General Ecology (equiv to 270); BIOE 405 Behavioral and Evolutionary Ecology)
• Chemistry (CHMY 141 College Chemistry I, CHMY 143 College Chemistry II, CHMY 211 Elements of Organic Chemistry; CHMY 311 Fundamental Analytical Chem, CHMY 321 Organic Chemistry I)
• Biochemistry (BCH 380 Biochemistry)
• Entomology (BIOO 262IIN Introduction to Entomology)

• Food Science / Meat Science (Introductory Food Science or upper division food science or food safety course)

M.S. in Land Rehabilitation
Course work in land rehabilitation is designed to serve students new to the rehabilitation field, as well as to experienced individuals or those already working in land rehabilitation or restoration ecology and who desire further education and training. Montana State University offers core courses in land rehabilitation and restoration ecology, and a very strong array of supporting courses in relevant disciplines. These courses are integrated with the core curriculum to add breadth and depth to the program and to make specialization possible in a given aspect of land rehabilitation. Site revegetation, soil remediation, restoration of riparian zones and stream channels, remediation of contaminated sites, and management of invasive plants are among the many potential areas of study. Emphasis is placed on developing a broad understanding of soil, plant and hydrological processes as foundation to effective applications. With the exception of required core courses, course sequences will be designed to correspond with the specific needs, interests and educational goals of the individual student. This program emphasizes soil, vegetation and water sciences, and graduates are expected to be well versed in these areas in addition to the student’s particular area of interest.

Core Curriculum
30 credits minimum (10 thesis, 20 course work) required for master’s degree. 2/3 of total credits must be 500 level. Candidates for the M.S. degree in Land Rehabilitation must complete a 8 credit core curriculum. Elective credits will reflect foundational courses as well as student’s special interests. A minimum of 20 credits of coursework must be taken from MSU.

Required Core Courses (8 credits) Credits
LRES 563 Restoration Ecology  3
ENSC 460 Soil Remediation  3
LRES 562 Land Rehab Field Problem  2

Ph.D. in Animal & Range Sciences Requirements
The Ph.D. program is based upon an area of specialization in research and intensive coursework that would normally require three years of full-time work beyond the M.S. degree.

In addition to departmental requirements candidates must fulfill the requirements of The Graduate School. The general requirements include:

• PhD students in Animal and Range Sciences will be required to take 3 credits of ARNR 507 Research Methods and a graduate (400-500 level) course in experimental design and two graduate statistical methods courses.
• The major professor and the student’s graduate committee will determine additional specific course requirements for completion of the Ph.D. degree.
• All PhD programs must comply with The Graduate School, including 60 credits hours (18 which must be dissertation credits) above the B.S. degree.
• Students must choose either the Animal Science option or the Range Science option; beyond this there are no specific minimum course requirements for the PhD program.
• Specific requirements are to be decided by the student’s graduate committee.
The Department of Microbiology and Immunology (M&I) conducts one of the premier infectious disease research programs in the Northwest, as demonstrated by the success of our faculty in competing nationally for extramural grant funding and publishing high-impact papers. Research funding comes from a range of sources such as the National Institutes of Health, US Department of Agriculture, National Science Foundation and the Montana Agricultural Experimental Station among others. Over the past five years, M&I averaged over $6 million for annual research expenditures. M&I is also home to an NIH Center of Biomedical Research Excellence in Zoonotic and Emerging Infectious Diseases, which provides substantial core facilities and training opportunities for junior investigators. M&I is housed in a state-of-the-art facility with core laboratories for flow cytometry, cell biology, and molecular sciences, as well as pathogen containment facilities for small (BSL-3) and large animal research (ABSL-2). Instrumentation suites house equipment for DNA sequencing, genomic analysis, flow cytometry and cell sorting, and confocal microscopy.

We are truly unique in our close proximity to Yellowstone National Park. On our doorstep is one of the most exciting microbial ecosystems in North America, ripe with opportunities to discover new microbial life forms and contribute to major biotechnological advances. Many of our undergraduate and graduated students conduct research in the Park under the mentoring of our distinguished faculty.

Weekly seminars are offered by the department and the Frank N. Nelson Distinguished Lecture Series brings many accomplished scientists to Montana State University.

Admission
For detailed information, refer to the Admission Policies and Application Requirements sections. The M&I Core Committee will screen all applications and make recommendations to the Graduate Dean for acceptance to the M&I graduate program. Successful applicants are accepted into both the department and The Graduate School.

In addition to the documents required in the Application Requirements section, the Graduate Core Committee will consider the applicant’s research experience and the potential of the applicant to complete an appropriate program of study and an independent research project. The final disposition of each application will also take into account other factors, such as the availability of research positions (stipends).

The Graduate Core Committee, M&I faculty, and the M&I head will decide on the acceptability of all applicants. The Graduate Core Committee will serve as the “adviser” for all students accepted into the program during their first year of study.

Research
The research problem will be chosen in consultation with the student’s thesis or dissertation advisor. Research areas include microbiology, molecular biology and immunology, bacteriology, cell biology, mycology, parasitology, protozoology, physiology, genetics, biochemistry, ultrastructural cytology, virology, immunopathology, and a strong focus on biomedical research. Specialized equipment and facilities include large and small animal isolation units, a flow cytometry core facility, automated DNA sequencers, proteomics and genomics instrumentation, a microscopy core, numerous analytical equipment, multiple tissue-culture and histopathology laboratories.

Financial Assistance

Normally, all students accepted into the M&I graduate program are offered graduate stipends funded by State sources and research grants obtained by M&I faculty. Teaching assistantships are normally not available. Appointments are made on a 12-month basis. Beginning stipends are supported at a level of $22,000 per year plus tuition, health insurance, and other fees.

See the Graduate Assistantship sections on the department website for detailed information on appointment criteria.

Degrees Offered
- M.S. in Immunology and Infectious Diseases (p. 288)
- M.S. in Microbiology (Plan A) (p. 288)
- M.S. in Microbiology (Plan B) (p. 289)
- Ph.D. in Microbiology (p. 289)
- Ph.D. in Immunology and Infectious Diseases (p. 290)

The Immunology and Infectious Diseases Program uniquely combines expertise in the study of pathogen biology, host defense, cell biology and use of small and large animal models. Four areas broadly encompass the scope of immunology and infectious diseases research:

- Molecular and genetic studies of animal and pathogen biology
- Understanding molecular pathways of communication between pathogen and host
- Regulation of host immune responses in human and animal diseases
- Uncovering molecular mechanisms of pathogen virulence

Immunology and Infectious Diseases Program

Requirements
Graduate students are expected to have a basic understanding of biochemistry, molecular biology, immunology, and microbiology. The Master of Science degree requires a minimum of twenty (20) course credits and ten (10) credits of Master’s Thesis research beyond the baccalaureate degree as specified below. Students must maintain a 3.0 GPA.

1. A maximum of 3 credits of 400-level coursework may be applied to the M.S. degree.

Elective 400-level coursework Credits

<table>
<thead>
<tr>
<th>Course</th>
<th>Description</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BCH 441</td>
<td>Biochemistry of Macromolecules</td>
<td>3</td>
</tr>
<tr>
<td>STAT 401</td>
<td>Applied Methods in Statistics</td>
<td>3</td>
</tr>
</tbody>
</table>

2. There are 18 credits of required 500-level coursework for the M.S. degree.

Required 500-level coursework Credits

<table>
<thead>
<tr>
<th>Course</th>
<th>Description</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOB 524</td>
<td>Ethical Practice of Science</td>
<td>3</td>
</tr>
<tr>
<td>IMID 501</td>
<td>Exper Immunology/Pathology</td>
<td>3</td>
</tr>
<tr>
<td>IMID 505</td>
<td>Eukaryotic Gene Regulation</td>
<td>3</td>
</tr>
<tr>
<td>IMID 594</td>
<td>Seminar</td>
<td>1</td>
</tr>
</tbody>
</table>

3. A minimum of 6 credits of elective 500-level coursework is required for the M.S. degree.
Elective Coursework Credits (examples)

- BCH 524 Mass Spectrometry 3
- BCH 543 Proteins 3
- BCH 544 Molecular Biology 3

4. A minimum of 10 credits of IMID 590 (Master’s Thesis) is required for the M.S. degree.

Master’s Thesis Research Credits

- IMID 590 Master’s Thesis 10

Graduate students enrolled for the Ph.D. degree are required to take at least 25 credits of coursework and 35 credits of doctoral Thesis Research credits as specified below. Students must maintain a 3.0 GPA.

1. 9 credits of 400-level coursework may be applied to the Ph.D. degree.

Elective coursework Credits

- BCH 441 Biochemistry of Macromolecules 3
- STAT 401 Applied Methods in Statistics 3

2. There are 23 credits of required 500-level coursework for the Ph.D. degree.

Required coursework Credits

- BIOB 524 Ethical Practice of Science 3
- IMID 501 Exper Immunology/Pathology 3
- IMID 505 Eukaryotic Gene Regulation 3
- IMID 521 Laboratory Rotation I 2
- IMID 522 Laboratory Rotation II 2
- IMID 523 Laboratory Rotation III 2
- IMID 594 Seminar 1

3. A minimum of 6 credits of elective 500-level coursework is required for the Ph.D. degree.

Elective Coursework Credits

- BCH 524 Mass Spectrometry 3
- BCH 543 Proteins 3
- BCH 544 Molecular Biology 3

4. 35 credits of IMID 690 Doctoral Thesis is required for the Ph.D. degree

Doctoral Thesis Research Credits

- IMID 690 Doctoral Thesis 35

Candidates for Ph.D. degree are required to pass qualifying examinations prepared by the members of their advisory committee. Refer to the For Master’s Students and For Doctoral Students sections for further degree requirements.

M.S. in Immunology and Infectious Diseases

The M.S. in Immunology and Infectious Diseases requires the below courses. The list represents only the minimum number of courses a student will take; as the student may be required to take preparatory courses if they are found to be deficient in specific areas (for example, Biochemistry or Immunology). These additional classes can count in the students Program of Study (no more than 9 credits can be 400-level). The students’ Ph.D. adviser may recommend additional coursework if it is relevant to the research within the Ph.D. program.

- 20 credits coursework
- 10 credits 590 thesis credits
- 30 credits total

M.S. in Microbiology (Plan A)

Course credits

- A minimum of 30 credits is required for graduation of which 20 must be for course work and not thesis credit.
- At least half of these 20 credits must be in the major subject area (MB).
- A minimum of 10 thesis credits must be successfully completed.
- Two-thirds of the minimum 30 credits must be at the 5XX-level. (Undergraduate courses at the 4XX-level are allowed but not 3XX-level).
- Credit in Seminar (MB 594), Independent Study (MB 592) and Internship (MB 598) courses in seminar (500), individual problem (570) and internship (576) courses may not exceed 1/3 of credits required.
- Course work more than 6 years old cannot be applied toward the program - see The Graduate School policy on transfer and age of credits (http://www.montana.edu/gradschool/policy).
- Transfer credits – see The Graduate School policy at Transferring Credits.

Pass-fail

No more than 3 credits taken on Pass/Fail basis may be applied to a M.S. program (aside from thesis credits). For more information on Pass/Fail courses, see The Graduate School policy on Pass/Fail.

Core Curriculum

All M.S. students are required to take at least one course in three of the six areas of the core curriculum. The six areas of the core curriculum and the courses which can be used to satisfy the requirement are:

Bioinformatics

- MB 535 Genomic Analysis Lab (Fall) 4
- MB 537 Advance in Molecular Evol (Fall) 3
- MB 544 Advanced Bioinformatics (Spring) 4

Biochemistry

- BCH 543 Proteins (Fall alt odd yrs) 3
- BCH 544 Molecular Biology (Spring alt odd) 3

Immunology

- MB 525 Advanced Immunology (Spring alt even) 3

Microbial evolution & ecology

- BIOM 505 Host Associated Microbial Ecosystems (Fall) 3
- MB 515 Microbial Ecology (Spring alt odd) 3
- MB 552 Adv Soil & Env Microbiology (Spring alt even) 3
ERTH 505  Geomicrobiology (Spring alt even)  3
Microbial genetics & physiology
MB 520  Microbial Physiology (Fall)  3
MB 528  Advanced Genetics (Spring alt odd)  3
IMID 505  Eukaryotic Gene Regulation (Spring alt odd)  3
Microbial pathogenesis & epidemiology
MB 530  Virology (Fall)  3
MEDS  Infectious Diseases and Microbiology (Spring)  5

Courses required to fill each area of the core are likely to change as new courses are developed and approved by the Graduate Program Committee. Current course descriptions are available in the MSU On-Line Catalog. Current course availability is found in the MSU On-Line Schedule of Classes.

• MB 594 seminars
  • All students are required to attend and participate in the Departmental Seminar (MB 594 section 01) each semester in residence. [Students who are also members of the Center for Biofilm Engineering will have the option of attending either the Departmental Seminar or the CBE Seminar during their first two years, but must attend at least two semesters of each during this time.]
  • Students are encouraged to register for these each semester, if possible, although there are limits to the number of MB 594 credits allowed in a Graduate Program (3 for M.S.)
  • Have the office staff register you online – there are conflicts when taking multiple MB 594 sections.

• Thesis
  • A thesis approved by the Graduate Committee, Department Head, and the Dean of The Graduate School is required.
  • A hardbound copy of Thesis must be provided to the Microbiology Department for inclusion in the Corner-Morris library.

M.S. in Microbiology (Plan B)

Course credits
• A minimum of 30 credits is required for graduation.
• At least half of these 30 credits must be in the major subject area (MB).
• Two-thirds of the minimum 30 credits must be at the 5XX-level. (Undergraduate courses at the 4XX-level are allowed but not 3XX-level).
• Credit in Seminar (MB 594), Independent Study (MB 592) and Internship (MB 598) courses may not exceed 1/3 of credits required.
• Credit for a Professional Paper (MB 575) may not exceed 6 credits.
• Course work more than 6 years old cannot be applied toward the program - see The Graduate School policy on transfer and age of credits (http://www.montana.edu/gradschool/policy).
• Transfer credits – see The Graduate School policy at Transferring Credits (http://www.montana.edu/gradschool/policy).

Pass-fail
No more than 3 credits taken on Pass/Fail basis may be applied to a M.S. program (aside from thesis credits). For more information on Pass/Fail courses, see The Graduate School policy on Pass/Fail.

Core Curriculum
All M.S. students are required to take at least one course in three of the six areas of the core curriculum. The six areas of the core curriculum and the courses which can be used to satisfy the requirement are:

Bioinformatics
MB 535  Genomic Analysis Lab (Fall)  4
MB 537  Advance in Molecular Evol (Fall)  3
MB 544  Advanced Bioinformatics (Spring)  4

Biochemistry
BCH 543  Proteins (Fall alt odd yrs)  3
BCH 544  Molecular Biology (Spring alt odd)  3

Immunology
MB 525  Advanced Immunology (Spring alt even)  3

Microbial evolution & ecology
Biom 505  Host Associated Microbial Ecosystems (Fall)
MB 515  Microbial Ecology (Spring alt odd)  3
MB 552  Adv Soil & Env Microbiology (Spring alt even)

ERTH 505  Geomicrobiology (Spring alt even)  3

Microbial genetics & physiology
MB 520  Microbial Physiology (Fall)  3
MB 528  Advanced Genetics (Spring alt odd)  3
IMID 505  Eukaryotic Gene Regulation (Spring alt odd)  3

Microbial pathogenesis & epidemiology
MB 530  Virology (Fall)  3
MEDS  Infectious Diseases and Microbiology (Spring)  5

Courses required to fill each area of the core are likely to change as new courses are developed and approved by the Graduate Program Committee. Current course descriptions are available in the MSU On-Line Catalog. Current course availability is found in the MSU On-Line Schedule of Classes.

• MB 594 seminars
  • All students are required to attend and participate in the Departmental Seminar (MB 594 section 01) each semester in residence. [Students who are also members of the Center for Biofilm Engineering will have the option of attending either the Departmental Seminar or the CBE Seminar during their first two years, but must attend at least two semesters of each during this time.]
  • Students are encouraged to register for these each semester, if possible, although there are limits to the number of MB 594 credits allowed in a Graduate Program (3 for M.S.)
  • Have the office staff register you online – there are conflicts when taking multiple MB 594 sections.

Ph.D. in Microbiology and Immunology

Course credits
• A minimum of 60 post-baccalaureate credits* are required for graduation. Students who already have an applicable Master’s degree may be able to apply up to 30 credits toward the 60 credits for the Ph.D.
  *The 60 credit minimum was instated for students beginning Fall 2007 semester. Students who enrolled prior to this time may stay with the 30 credit minimum previously required.
• A minimum of 18 Doctoral Thesis (MB 690) credits are required.
• 20 credits of coursework are recommended and at least half of those must be in the major subject area (MB).
• Two-thirds of the minimum 60 credits must be at the 5XX-level. (Undergraduate courses at the 4XX-level are allowed but not 3XX-level).
• Credit in MB 594 Seminar), MB 592 Independent Study (individual problem) and MB 598 Internship courses may not exceed 1/3 of credits required.
• Credit for a Professional Paper (MB 575) may not exceed 6 credits.
• Course work more than 10 years old cannot be applied toward the program.
• Transfer credits – see The Graduate School policy at Transferring Credits (http://www.montana.edu/gradschool/policy).

**Pass-fail**

No more than 3 credits taken on Pass/Fail basis may be applied to a Ph.D. program (aside from thesis credits). For more information on Pass/Fail courses, see The Graduate School policy on Pass/Fail (http://www.montana.edu/gradschool/policy/degreq_specialcourses.html#degreq_special_pass_fail).

**Core Curriculum**

All Ph.D. students are required to take at least one course in **four** of the six areas of the core curriculum. The six areas of the core curriculum and the courses which can be used to satisfy the requirement are:

**Bioinformatics**

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>MB 535</td>
<td>Genomic Analysis Lab (Fall)</td>
<td>4</td>
</tr>
<tr>
<td>MB 537</td>
<td>Advance in Molecular Evol (Fall)</td>
<td>3</td>
</tr>
<tr>
<td>MB 544</td>
<td>Advanced Bioinformatics (Spring)</td>
<td>4</td>
</tr>
</tbody>
</table>

**Biochemistry**

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BCH 543</td>
<td>Proteins (Fall alt odd yrs)</td>
<td>3</td>
</tr>
<tr>
<td>BCH 544</td>
<td>Molecular Biology (Spring alt odd)</td>
<td>3</td>
</tr>
</tbody>
</table>

**Immunology**

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>MB 525</td>
<td>Advanced Immunology (Spring alt even)</td>
<td>3</td>
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</tbody>
</table>

**Microbial evolution & ecology**

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOM 505</td>
<td>Host Associated Microbial Ecosystems (Fall)</td>
<td>3</td>
</tr>
<tr>
<td>MB 515</td>
<td>Microbial Ecology (Spring alt odd)</td>
<td>3</td>
</tr>
<tr>
<td>MB 552</td>
<td>Adv Soil &amp; Env Microbiology (Spring alt even)</td>
<td>3</td>
</tr>
</tbody>
</table>

**ERTH 505**

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Geomicrobiology (Spring alt even)</td>
<td>3</td>
<td></td>
</tr>
</tbody>
</table>

**Microbial genetics & physiology**

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>MB 520</td>
<td>Microbial Physiology (Fall)</td>
<td>3</td>
</tr>
<tr>
<td>MB 528</td>
<td>Advanced Genetics (Spring alt odd)</td>
<td>3</td>
</tr>
<tr>
<td>IMID 505</td>
<td>Eukaryotic Gene Regulation (Spring alt odd)</td>
<td>3</td>
</tr>
</tbody>
</table>

**Microbial pathogenesis & epidemiology**

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>MB 530</td>
<td>Virology (Fall)</td>
<td>3</td>
</tr>
<tr>
<td>MEDS</td>
<td>Infectious Diseases and Microbiology (Spring)</td>
<td>5</td>
</tr>
</tbody>
</table>

Courses required to fill each area of the core are likely to change as new courses are developed and approved by the Graduate Program Committee. Current course descriptions are available in the MSU On-Line Catalog. Current course availability is found in the MSU On-Line Schedule of Classes.

• **MB 500 seminars**
  • All students are required to attend and participate in the Departmental Seminar (MB 594 section 01) each semester in residence. Students who are also members of the Center for Biofilm Engineering will have the option of attending either the Departmental Seminar or the CBE Seminar during their first two years, but must attend at least two semesters of each during this time.
  • Students are encouraged to register for these each semester, if possible, although there are limits to the number of MB 594 credits allowed in a Graduate Program (3 for M.S.)
  • Have the office staff register you online – there are conflicts when taking multiple MB 594 sections.

• **Laboratory Rotations**. New students in the Ph.D. program are encouraged to participate in laboratory rotations. Students will be expected to work at least 12 hours per week in each rotation and will register for two semester credits of MB 592 Independent Study (Individual Problems) each semester.

• **Minor/Supporting Area**. A student has the option of including a minor (15 credits) or a supporting area (9 credits) in their degree program.

• **Dissertation**. A dissertation approved by the Graduate Committee, Department Head, and the Dean of The Graduate School is required. This must be submitted as an electronic dissertation not later than 14 days before the end of the semester.

• A hardbound copy of the dissertation must be provided to the Microbiology Department for inclusion in the Cotner-Morris library.

*No more than five years may pass between successful completion of comprehensive exams and the time of completion of the Ph.D. degree. For more details on doctoral requirements, refer to The Graduate School policies (http://www.montana.edu/gradschool/policy).

**Ph.D. in Immunology and Infectious Diseases**

Below are a list of the minimum number of courses needed for the Ph.D. in Immunology and Infectious Diseases. Students may be required to take preparatory courses if they are found to be deficient in specific areas (For example, Biochemistry or Immunology). These additional courses can count in your Program of Study; however, no more than 9 credits can be 400-level. The Ph.D. adviser may recommend additional coursework if it is relevant to the students' research program.

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOB 524</td>
<td>Ethical Practice of Science</td>
<td>3</td>
</tr>
<tr>
<td>IMID 501</td>
<td>Exper Immunology/Pathology</td>
<td>3</td>
</tr>
<tr>
<td>IMID 505</td>
<td>Eukaryotic Gene Regulation</td>
<td>3</td>
</tr>
<tr>
<td>IMID 521</td>
<td>Laboratory Rotation I</td>
<td>2</td>
</tr>
<tr>
<td>IMID 522</td>
<td>Laboratory Rotation II</td>
<td>2</td>
</tr>
<tr>
<td>IMID 523</td>
<td>Laboratory Rotation III</td>
<td>2</td>
</tr>
<tr>
<td>IMID 594</td>
<td>Seminar</td>
<td>1</td>
</tr>
<tr>
<td>Electives</td>
<td></td>
<td>9</td>
</tr>
<tr>
<td>IMID 690</td>
<td>Doctoral Thesis (Research Credits)</td>
<td>35</td>
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</table>

**Total Credits**

<table>
<thead>
<tr>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>60</td>
</tr>
</tbody>
</table>

**Department of Land Resources and Environmental Sciences**

Montana State University
334 Leon Johnson Hall
P.O. Box 173120
Bozeman, MT 59717-3120
Other financial assistance is awarded on a competitive basis, with prior financial aid not available, you must have your own financial resources. Assistantships are awarded through a faculty adviser. In the event that Assistantship awards are dependent on availability of funding. In general, Graduate Assistantships are submitted directly from the testing agency to MSU.

Degree from an institution in the United States. These scores must be of citizenship or if the applicant has received an undergraduate or graduate degree whose first language is not English. English proficiency exam scores are not required if English is the first official language of the applicant’s country of citizenship or if the applicant has received an undergraduate or graduate degree from an institution in the United States. These scores must be submitted directly from the testing agency to MSU.

An appropriate faculty mentor must agree to serve as the student’s major adviser as a condition of admission.

GRE (Graduate Record Examination) exams are to be taken before applying for admittance and are part of the required application materials. The Educational Testing Service must forward an official copy of the score directly to The Graduate School. Successful applicants are accepted into both the Department and The Graduate School. A GPA of 3.0 for the last two years, three letters of recommendation and a letter of application (personal statement) describing the applicant’s research interests and career goals in pursuing graduate training are minimum requirements for acceptance to the LRES graduate program.

Admission

Students seeking admission to graduate status in the Department of Land Resources and Environmental Sciences must hold a B.S. or M.S. degree, have a record of high scholarship in areas closely related to land resources and environmental sciences and show significant promise for success in a graduate program. They are expected to present evidence of college level training and mastery in biology, chemistry and mathematics sufficient to provide a good background for further study at the advanced level. Students with deficiencies may be required to take background courses to make up these deficiencies before or after being approved for acceptance. All applications are evaluated by a departmental review committee and the Department Head for final recommendation to The Graduate School. Successful applicants are accepted into both the Department and The Graduate School. A GPA of 3.0 for the last two years, three letters of recommendation and a letter of application (personal statement) describing the applicant’s research interests and career goals in pursuing graduate training are minimum requirements for acceptance to the LRES graduate program.

For international applicants, a TOEFL (Test of English as a Foreign Language) score of 550 for the paper based test, 213 for the computer based test and 80 for the internet based test is required for international students whose first language is not English. English proficiency exam scores are not required if English is the first official language of the applicant’s country of citizenship or if the applicant has received an undergraduate or graduate degree from an institution in the United States. These scores must be submitted directly from the testing agency to MSU.

Graduate Assistantships

Assistantship awards are dependent on availability of funding. In general, assistantships are awarded through a faculty adviser. In the event that financial aid is not available, you must have your own financial resources. Other financial assistance is awarded on a competitive basis, with prior academic performance serving as a major criterion.

Application Deadlines

U.S. and Canada

- Fall - May 15
- Spring - October 1
- Summer - February 1

International

- Fall - April 15
- Spring - September 1
- Summer - January 1

Interested students should contact our Academic Programs Coordinator, Department of Land Resources and Environmental Sciences, 334 Leon Johnson Hall, 994-3090, lresinfo@montana.edu

Departmental Facilities

LRES faculty members conduct cutting-edge investigations in state-of-art laboratory facilities, the modern Plant Growth Center, and in the many outstanding and diverse natural laboratories within and beyond the Greater Yellowstone Ecosystem. We utilize public and private lands across the state and region, as well as the MSU Agricultural Experiment Station facilities. Our faculty are participants and collaborators in many centers and institutes within and outside MSU. LRES faculty advisers work with national and international scientific collaborators, and are internationally recognized for their research and instructional excellence.

Environmental Sciences Analytical Laboratory

The department boasts a modern shared analytical facility that houses many state of art instruments for soil, water, air and plant analyses. The facility supports faculty and graduate student research programs, and provides outstanding hands-on experiences and instruction with diverse analytical measurement techniques.

Spatial Sciences Center

LRES faculty and staff are key members of the MSU Spatial Sciences Center. The Global Positioning System (GPS) Laboratory provides GPS base station data for determination of accurate location coordinates for field mapping projects. The Remote Sensing Laboratory offers a state-of-the-art facility with extensive abilities to analyze both digital and analog imagery. Equipment and support for both laboratories facilitate teaching, cooperative research, and land resource inventory and management activities.

Degrees Offered

- M.S. in Entomology (p. 291) (coordinating department)
- M.S. in Land Rehabilitation (p. 286)
- M.S. in Land Resources and Environmental Sciences (p. 292)
- M.S. in Land Resources and Environmental Sciences – Online (http://landresources.montana.edu/grad/gradonline.html)
- Ph.D. in Ecology and Environmental Sciences (Interdisciplinary) (p. 293)

M.S. in Entomology

The graduate program in Entomology at Montana State University leads to a Master of Science degree. Students in the program are required to take formal course work and conduct independent research guided by the student’s advisory committee. Each student, during the course of her/his graduate program, will also have the opportunity to participate in activities outside their degree program that will benefit them academically.
and professionally. Such activities include participating in teaching and outreach programs, taking part in the entomology seminar series, and attending and presenting research results at professional meetings. Each student is strongly encouraged to take advantage of these opportunities. A student’s individual program can be designed, with approval of the graduate advisor and graduate committee, to suit the student’s individual interests and career goals.

The entomology faculty at MSU conduct research in a variety of disciplines, including behavioral ecology, biodiversity studies, biological control of insects and weeds, biosystematics, chemical ecology, ecology, integrated pest management, pollination ecology, risk assessment, stored-product entomology, thermal biology, and veterinary entomology. Entomological research at MSU includes some of the most important pests in the western U.S., including alfalfa weevil, aphids, cutworms, grasshoppers, Hessian fly, lygus bugs, mosquito vectors of West Nile Virus, wheat-stem sawfly, wireworms, and others. Beneficial insects under study include various biological control agents and pollinators. Most faculty conduct both applied and basic research.

Admission
An entering student is expected to have a solid background in the basic sciences and a B.S. or B.A. in biological or related sciences. They are expected to present evidence of college level training and mastery in biology, chemistry and mathematics sufficient to provide a good background for further study at the advanced level. Students with deficiencies may be required to take background courses to make up these deficiencies before or after being approved for acceptance.

GRE exams are to be taken before applying for admittance and are part of the required application materials. Minimum scores of 150 verbal and 146 quantitative (Old scoring system: 450 verbal and 550 quantitative).

International Applicants: An English proficiency test is required for all applicants who are not U.S. citizens and are not from countries where English is the official language. This requirement is waived if the applicant has earned an undergraduate or graduate degree from an institution in the U.S. Minimum scores required are: TOEFL [80], IELTS [level 6.5] or PTE [54].

A GPA of 3.0 for the last two years, three letters of recommendation and a letter of application describing the applicant’s research interests and career goals in pursuing graduate training are minimum requirements for acceptance to the LRES graduate program.

All applications are evaluated by a departmental review committee and the Department Head for final recommendation to the Dean of The Graduate School. Successful applicants are accepted into both the Department and The Graduate School.

Entomology Curriculum
A minimum of 20 semester hours of course work and at least 10 thesis credit hours are required for the degree. Students deficient in preliminary course work may be required to take additional courses for which they will not receive graduate credit (course numbers <400). A minimum of 24 credits of course work (Including not more than 10 thesis credits) must be taken from Montana State University. Courses taken outside of Entomology must constitute a unified program approved by the student’s graduate committee.

Current research focuses on insect pests of agricultural importance, biological control of insects and weeds, integrated pest management, and basic studies in ecology, physiology, behavior, and evolution. Fieldwork is an integral part of most programs. Resources include a comprehensive insect collection, the regional Insect Quarantine Facility, and access to a state-of-the-art Plant Growth Center with glasshouse space, growth rooms, and growth chambers.

Required Courses (must be taken by all M.S. students)

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOE 465</td>
<td>Insect Identification</td>
<td>4</td>
</tr>
<tr>
<td>ENTO 510</td>
<td>Insect Ecology</td>
<td>3</td>
</tr>
<tr>
<td>ENTO 520</td>
<td>Insect Physiology</td>
<td>3</td>
</tr>
<tr>
<td>ENTO 594</td>
<td>Seminar (1 credit each semester-3 credits total)</td>
<td>1</td>
</tr>
<tr>
<td>ENTO 590</td>
<td>Master’s Thesis</td>
<td>10</td>
</tr>
<tr>
<td>STAT 511</td>
<td>Methods of Data Analysis I</td>
<td>3</td>
</tr>
<tr>
<td>STAT 512</td>
<td>Methods of Data Analysis II</td>
<td>3</td>
</tr>
<tr>
<td>Take one of the following:</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>AGSC 401</td>
<td>Integrated Pest Management</td>
<td></td>
</tr>
<tr>
<td>ANSC 410</td>
<td>Veterinary Entomology and Parasitology</td>
<td></td>
</tr>
<tr>
<td>ENTO 525</td>
<td>Insect Morphology</td>
<td></td>
</tr>
</tbody>
</table>

Total Credits: 30

M.S. in Land Rehabilitation
Course work in land rehabilitation is designed to serve students new to the rehabilitation field, as well as to experienced individuals or those already working in land rehabilitation or restoration ecology and who desire further education and training. Montana State University offers core courses in land rehabilitation and restoration ecology, and a very strong array of supporting courses in relevant disciplines. These courses are integrated with the core curriculum to add breadth and depth to the program and to make specialization possible in a given aspect of land rehabilitation. Site revegetation, soil remediation, restoration of riparian zones and stream channels, remediation of contaminated sites, and management of invasive plants are among the many potential areas of study. Emphasis is placed on developing a broad understanding of soil, plant and hydrological processes as foundation to effective applications. With the exception of required core courses, course sequences will be designed to correspond with the specific needs, interests and educational goals of the individual student. This program emphasizes soil, vegetation and water sciences, and graduates are expected to be well versed in these areas in addition to the student’s particular area of interest.

Core Curriculum
30 credits minimum (10 thesis, 20 course work) required for master’s degree. 2/3 of total credits must be 500 level. Candidates for the M.S. degree in Land Rehabilitation must complete a 8 credit core curriculum. Elective credits will reflect foundational courses as well as student’s special interests. A minimum of 20 credits of coursework must be taken from MSU.

Required Core Courses (8 credits) Credits

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>LRES 563</td>
<td>Restoration Ecology</td>
<td>3</td>
</tr>
<tr>
<td>ENSC 460</td>
<td>Soil Remediation</td>
<td>3</td>
</tr>
<tr>
<td>LRES 562</td>
<td>Land Rehab Field Problem</td>
<td>2</td>
</tr>
</tbody>
</table>

M.S. in Land Resources and Environmental Sciences
The M.S. program in Land Resources and Environmental Sciences is designed to provide outstanding graduate training opportunities across a substantial breadth of disciplinary interests. Research and coursework programs are specifically adapted to each graduate student. Research projects are directed toward improving our understanding of principles and processes important to land resources and environmental sciences,
with opportunities for direct ties to management in many cases. Many projects address processes at multiple scales through well-integrated, multi-disciplinary efforts. Understanding is developed through targeted advanced coursework tailored to the student and to the research project. Research projects involve topics such as hydrology, watershed analysis, integrated management of invasive plant species, soil nutrient management, bioremediation, land reclamation, restoration ecology, fluvial systems ecology and restoration, riparian ecology, microbial ecology of natural systems, chemical fate and transport, water quality, crop diversification, precision agriculture, environmental risk assessment, remote sensing applications, and climate variability.

**Curriculum**

30 credits minimum (10 thesis, 20 course work) required for master’s degree. 2/3 of total credits must be 500 level. Elective credits will reflect foundational courses as well as student’s special interests. 1 credit of LRES 594 Seminar is required.

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### Ph.D. Degree in Ecology and Environmental Sciences

This cross-college doctoral degree represents a broad collaboration among departments and faculty from across MSU. It provides the opportunity for motivated students to integrate our world-class faculty research programs in diverse aspects of ecology and environmental sciences, often within the unparalleled natural laboratory that is the Greater Yellowstone Ecosystem. Particular program strengths include terrestrial and aquatic ecology, environmental biogeochemistry, evolutionary biology, hydrology and watershed analysis, quantitative ecology, agroecology, environmental risk assessment, invasive plant ecology and management, conservation biology, land rehabilitation/restoration ecology, environmental microbiology, remote sensing and spatial sciences, chemical ecology and land-atmosphere interactions.

Graduates will be well-trained professionals who will compete strongly in research, teaching, and related fields nationally and internationally.

Ecology and Environmental Sciences doctoral students will be affiliated with a home department that corresponds to that of their major faculty advisor. Other specific graduate program criteria, procedures, and processes vary among departments; students will follow those of their home department, which are also consistent with policies set forth by The Graduate School (http://www.montana.edu/gradschool).

### Core Curriculum

Because of the substantial diversity in disciplinary and multidisciplinary foci within the Ecology and Environmental Sciences doctoral program, there is no universal required core curriculum. The student’s individual coursework program will be developed in partnership with the major advisor and graduate committee, and must be consistent with the home department and the Graduate School guidelines and requirements. A minimum of 30 credits of resident coursework must be taken from MSU.

### Program Participants

The program is jointly centered in the departments of Land Resources and Environmental Sciences (http://landresources.montana.edu) (College of Agriculture and Ecology (http://www.montana.edu/eco) (College of Letters and Science) but is also open to students and faculty mentors in other MSU departments who undertake relevant doctoral study, such as the departments of:

- Microbiology and Immunology (http://www.montana.edu/mbi) in the College of Agriculture and
- Earth Sciences (http://www.montana.edu/earthsciences)
- College of Nursing (http://www.montana.edu/nursing)

in the College of Letters and Science.

Stipend and operations funding are generally from research grants awarded to faculty members, but graduate teaching assistantships and other forms of support are also available on a limited basis.

For more information about the Ph.D. degree in Ecology and Environmental Sciences, faculty and their areas of research, application requirements and procedures, visit the departmental web pages listed below.

- Ecology - http://www.montana.edu/ecology/
- Land Resources & Environmental Sciences - http://landresources.montana.edu/

### Department of Plant Sciences and Plant Pathology

Montana State University  
324 Leon Johnson Hall, Bozeman, MT 59717  
406-994-4832 Email: psppgrad@montana.edu

#### Department Head

Dr. John Sherwood (http://plantsciences.montana.edu/facultyorstaff/  
305 Plant BioScience Building  
Bozeman, MT 59717  
406-994-5153 Email: sherwood@montana.edu

The department offers advanced study leading to a Master of Science degree in plant sciences and plant pathology under either Plan A (thesis) or B (project or professional paper). In addition, a Ph.D. degree is offered in plant sciences with an option in either plant pathology or plant genetics. Supporting minors are also available in each of the degree fields. The department has major research strengths in the following areas: plant breeding and genetics, plant pathology, plant-microbe interactions, mycology, biocontrol, biotechnology, plant physiology, plant systematics, molecular evolution, and biochemistry.

#### Departmental Facilities

The department is housed in both Leon Johnson Hall and the Plant BioScience Facility located on the Bozeman campus. The research laboratories range in size from 600-720 sq. ft and are assigned to individual researchers. Individual laboratories are well equipped with the instruments and tools necessary to complete each research project. Researchers cooperate to purchase, share and maintain expensive pieces of specialized equipment or facilities such as the Electron Microscope Lab. Laboratories and offices are wired with high-speed computer lines for direct access to the Internet and the World Wide Web. The faculty has access to the Plant Growth Center Facility (a teaching and research facility available to the College of Agriculture staff). The current 60,000 square-foot facility houses 29 glasshouse rooms with 8,300 square feet of bench space – both temperature and lights are micro-computer controlled; 13 walk in growth rooms where all environmental variables are computer controlled; insect quarantine facilities with separate glasshouses and growth chambers; plant pathogen isolation facilities with 4 glasshouse rooms of 320 sq. ft; the Montana Potato Lab which is responsible for providing disease free seed stock to Montana potato producers. Other important accesses to the department are the Horticulture Farm, Post Research Farm, which is a 300 acre site
Many research projects are problem oriented and pertain to major plant pathological problems in the state. Currently active research projects involve soil-borne diseases of cereals, genetic basis for disease resistance in field crops, cereal leaf spots, virus diseases of cereals and potatoes, bacterial diseases and the biochemistry and molecular genetics of plant disease. Additional current research projects pertain to the biocontrol of plant diseases and the biocontrol of weeds using plant pathogens and/or their toxins.

Department research projects employ modern molecular biological and biotechnological techniques as well as traditional plant pathological techniques.

**Financial Assistance**

Graduate research assistantships are available from several sources including state, farm commodity groups and federal grants. For information, contact the department.

### M.S. in Plant Sciences

**Plant Pathology Option**

Many research projects are problem oriented and pertain to major plant pathological problems in the state. Currently active research projects involve soil-borne diseases of cereals, genetic basis for disease resistance in field crops, cereal leaf spots, virus diseases of cereals and potatoes, bacterial diseases and the biochemistry and molecular genetics of plant disease. Additional current research projects pertain to the biocontrol of plant diseases and the biocontrol of weeds using plant pathogens and/or their toxins.

Department research projects employ modern molecular biological and biotechnological techniques as well as traditional plant pathological techniques.

**Financial Assistance**

Graduate research assistantships are available from several sources including state, farm commodity groups and federal grants. For information, contact the department.

### Ph.D. in Plant Sciences

**Plant Pathology Option**

The Department offers advanced study leading to a Ph.D. degree in Plant Pathology with supporting minors. Thesis research problems are related to the diverse research projects of the faculty.

The Department conducts research programs in: cereal quality; cropping systems/specialty crops; molecular and conventional approaches to plant improvement. Faculty have expertise in molecular genetics, plant breeding and genetics, cereal quality, cytogenetics, biochemistry, plant physiology and agronomy.

**Financial Assistance**

Graduate research assistantships are available from several sources including state, farm commodity groups and federal grants. For information, contact the department.

### M.S. in Plant Sciences

Graduate students majoring in this field may obtain a Master of Science degree in plant science or a Ph.D. degree in plant science with a plant genetics option. Areas of concentration include plant breeding and genetics, plant molecular genetics and biotechnology, physiological genetics, plant systematics, and population genetics.

**Ph.D. in Plant Sciences**

**Plant Genetics Option**

The Department offers advanced study leading to a Ph.D. degree in Plant Genetics with supporting minors. Thesis research problems are related to the diverse research projects of the faculty.

The Department conducts research programs in: cereal quality; cropping systems/specialty crops; molecular and conventional approaches to plant improvement. Faculty have expertise in molecular genetics, plant breeding and genetics, cereal quality, cytogenetics, biochemistry, plant physiology and agronomy.

**Financial Assistance**

Graduate research assistantships are available from several sources including state, farm commodity groups and federal grants. For information, contact the department.

### College of Arts and Architecture

**School of Architecture (p. 295)**

The School of Architecture offers a five and a half year professional program culminating in a Master of Architecture degree. The Master of Architecture...
is fully accredited by NAAB. The program has 250 undergraduate and 60 graduate students.

• Master of Architecture (p. 297)

School of Art (p. 298)
The Master of Fine Arts is a project based, non-media specific curriculum that focuses on individual artistic development and creative leadership. The program brings together talented individuals from a variety of different media building a community that fosters exploration, professionalism and creative success.

• M.F.A. in Art (p. 299)
The MA in Art History program welcomes inquiries and applications from students who have an academic background in art history or a broad spectrum of the humanities and social sciences. Candidates should have the motivation to learn to read a foreign language, to employ analytical structures, and to make timely progress through the two-year program.

• M.A. in Art History (p. 298)

School of Film and Photography (p. 299)
M.F.A. in Science and Natural History Filmmaking seeks candidates with at least an undergraduate major or minor degree concentration in natural, applied, or social sciences. These fields include but are not limited to biology, physics, chemistry, mathematics, astronomy, engineering, earth sciences, computer and technology science, environmental sciences, psychology, anthropology, archaeology, sociology, health sciences, and other related fields. Some research experience is preferred. Candidates are not expected to have education or experience in filmmaking although applications from filmmakers with science backgrounds or science production experience will be given full consideration.

• M.F.A. in Science and Natural History Filmmaking (p. 299)

Dean, College of Arts & Architecture
William A. Shields
217 Cheever Hall, Bozeman, MT 59717
406-994-4405 Email: william.shields3@montana.edu

Interim Director of the School of Architecture
Ralph Johnson, Professor
160 Cheever Hall, Bozeman, MT 59717
406-994-4256 Email: ralphj@montana.edu (stevej@montana.edu)

Director, School of Art
Vaughn Judge, Professor
213 Haynes Hall, Bozeman, MT 59717
406-994-4501 Email: Vaughn.judge@montana.edu

Interim Director of the School of Film & Photography
Dennis I. Aig, PhD Professor
226 VCB, Bozeman, MT 59717
406-994-6224 Email: daig@montana.edu

School of Architecture
P.O. Box 173760, Bozeman, MT 59717-3760
406-994-4256 http://www.arch.montana.edu/

Degree Offered
• Master of Architecture

The School of Architecture professional curriculum leads to a Master of Architecture degree, a professional degree program in architecture fully accredited by the National Architectural Accrediting Board. The design studio forms the core of architectural education, and every student makes a significant design studio commitment each semester.

In the United States, most state registration boards require a degree from an accredited professional degree program as a prerequisite for licensure. The National Architectural Accrediting Board (NAAB)*, which is the sole agency authorized to accredit U.S. professional degree programs in architecture, recognizes three types of degrees: the Bachelor of Architecture, the Master of Architecture and the Doctor of Architecture. A program may be granted a 6-year, 3-year or 2-year term of accreditation, depending on the extent of its conformance with established educational standards.

Master’s degree programs may consist of a pre-professional undergraduate degree and a professional graduate degree that when earned sequentially, constitute an accredited professional education. However, the pre-professional degree is not, by itself, recognized as an accredited degree.

The Montana State University School of Architecture received a full 8 year accreditation standard in Summer 2014.

The next accreditation visit for this program will take place in 2022.

Students wishing to acquire the Masters of Architecture Degree must complete three semesters of graduate study. Throughout this graduate study, students will choose from a variety of architectural studios, craft studios, architectural seminars, and non-architectural electives intended to emphasize the development of a critical position with regard to the environment and architecture. A comprehensive studio is required that demonstrates, through the development of an architectural project, the student’s ability to synthesize their aesthetic, technical and theoretical knowledge. The final design studio in the graduate program consists of a student-directed design project that demonstrates the student’s design and research capabilities and explores the student’s moral, ethical and aesthetic responsibility to society and the natural world.

Students receiving a Master of Architecture degree from the MSU School of Architecture must have completed a minimum of 168 combined graduate and undergraduate credits—of which a minimum of 42 graduate credits are to be completed at MSU. Students who completed a pre-professional undergraduate degree program at another institution, and completed less than 126 undergraduate credits, will be required to take additional credits at MSU in order to meet the combined graduate and undergraduate 168 credit requirement for graduation.

School of Architecture Philosophy
The School seeks to prepare students for a lifelong critical engagement in the arts and science of architecture. Located in “the last best place” of the Northern Rockies we are in an extraordinary position to engage questions regarding the relationship between the natural and built environments. As architects, we strive to play an essential and innovative role in enhancing the human condition. To that end, we teach and practice a moral, ethical and aesthetic responsibility to society and the natural world in the design of the built environment. The School of Architecture empowers students to critically engage the complexities of society and the natural environment by instilling the fundamental principles of design and inspiring a spirit of exploration and creative experimentation in shaping the built environment.

It is in our design studios, that this philosophy is most clearly demonstrated. Each studio is conceived to build upon the previous studio in a manner that develops a student’s mastery of the science of architecture while at the same time exposing the student to the rich diversity of our faculty’s philosophical beliefs. Within a structured sequence of increasingly complex
problems, emphasis is placed on teaching both an iterative design process and the visualization skills necessary to demonstrate the resultant design proposals. The science of architecture is continuously evolving and will do so over the life of every architect. We are committed to preparing our students to enter the profession with the contemporary scientific knowledge and emerging technical expertise to further this evolution while at the same time ensuring that our graduates are grounded in the fundamental design thinking, investigative and communication skills that have been central to architecture throughout its history. In addition to the science of architecture we are equally committed to ensuring that our graduates acquire a critical philosophy with which they can engage the design of the built environment.

Knowing how to build is a matter of science and technology but knowing what to build is a question of morality, ethics, and aesthetic responsibility. In this regard the faculty shares a commitment to the stewardship of our environment. This is particularly important in the Northern Rockies where our historic fabric of cities, rural communities and the natural landscape coexist in a tenuous balance. Focusing on the broad principles of creating a sustainable social, cultural, economic and physical environment we utilize the region, from its major cities to its national parks, as the canvas for our teaching, research and creative activities.

As a faculty we are committed to emphasizing the architect’s responsibility to create and maintain a sustainable environment formulated from a belief system of moral, ethical and aesthetic theories, but our philosophical beliefs with regard to how this is to be achieved are diverse. This is by intent. Each student, as she or he matriculates through the design studio sequence, is expected to develop an understanding of the various critical approaches advocated by their professors and ultimately reaches a position of their own. Thus our graduates become empowered to assume a leadership role in the synthesis of the natural environment, human activity and the built environment from a critical, responsible and mature perspective. In doing so, our students discover the commitment of our faculty to both the future of our environment and that of their students. Because of this an extraordinary sense of community emerges within the School of Architecture at Montana State University. Students develop a sense of responsibility not only to the environment and architecture but also to their peers where all share a passion for design.

Program Requirements

The Master of Architecture professional degree is a Plan B program (professional paper or project plan) that requires forty-two (42) credits of graduate coursework. A student’s program of study includes three graduate design studios; Advanced Arch Studio (ARCH 551), Comprehensive Design Studio (ARCH 558), Masters Studio Project ARCH 560, required advanced theory and systems courses (Advanced Architectural Theory (ARCH 526), Adv Bldg Sys Integration (ARCH 535)), a required Professional Paper (ARCH 575) and graduate electives. The Plan B Program requires that students successfully complete a Masters Studio Project as their comprehensive examination.

Admission

Admission into the architecture graduate program is competitive. The school is able to admit approximately 60 graduate students per year, many of whom represent the best students from our own undergraduate B.A. in Environmental Design program. However, spaces are available for highly qualified students with undergraduate degrees from other universities. Placement may vary depending upon the student’s background; students with an undergraduate degree in a field other than architecture will be considered, and must, if accepted, complete a full course of study in design studio.

Portofolio review is of primary importance to the School of Architecture’s application review committee. All applicants are required to submit a portfolio of their best work that is reviewed by the school’s faculty.

Examples of student work and additional information visit the School of Architecture website at www.arch.montana.edu.

Admission Standards/Score

Admissions Numeric Evaluation Scale – Admissions Review is performed by a committee of five faculty members. An admission score is developed based upon the following percentages and are weighted accordingly (see scoring breakdown below). A perfect admissions score is a 12. A minimum score of 7.6 on a 12 point scale is need for admission.

Scoring Breakdown

- Cumulative GPA (40%) - Min 3.0/Max 4.0 GPA based on a 4.0 system (4.0 = a letter grade of A)
- Portfolio (40%) - Min 6.5/Max 12 - Final Score is determined by averaging 5 reviewers portfolio scores.
- Writing Component (10%) - Min 0/Max 6 - This score is the actual score received on written portion of the GRE.
- Letters of Reference (10%) - Min 0/Max 3 - Letter of Reference score is determined by averaging the overall recommendation criteria from each of the three letters of recommendation.

Highly Recommend= 3/ Recommend= 2/ Recommend with reservations= 1/ Do Not recommend= 0

Application Submission Requirements

1. On-line application for the MSU Graduate School which can be found at http://www.montana.edu/gradschool/.
2. During the online application process, you will be asked to submit an electronic portfolio of architectural work sufficient to demonstrate the one’s ability and achievement in architecture. Portfolio form and format are left to the discretion of the applicant, though the portfolio must be suitable for review by a committee. NOTE: If a hard copy of portfolio work is submitted, please also include a suitable mailing receptacle and sufficient postage for the return. The School of Architecture cannot guarantee its return; portfolios have been lost in transit.
3. You will be asked to submit three letters of reference during the online application process. Be sure you have contact information on the individuals you wish to ask as your recommenders will be prompted through an email upon submission of your on-line application.
4. Official results of the Graduate Record Examination (send to campus code: 4488).
5. $60.00 non-refundable application fee.
6. Official transcript(s) from universities attended (MSU graduates do not need to submit MSU transcripts)

Deadline

- January 15 - Deadline for application submission of portfolio, application forms, GRE scores to the School of Architecture for Fall admittance.

Expected Placement for Students with an Undergraduate Degree in an Architecture Related Field, Environmental Design, or Architectural Studies

If an applicant has an undergraduate 4-year degree in architectural studies or environmental design and are admitted to the Master of Architecture program, he/she will be placed at an appropriate point in the architecture
curriculum and can expect to pursue a series of rigorous design studios, specialized courses in advanced architecture, a research paper/project and a student-directed design project in order to be granted the Master of Architecture degree. Students entering with excellent portfolios can expect to complete the Master of Architecture degree in three to four semesters.

Expected Placement for Students with an Undergraduate Degree in Other Fields

If an applicant has an undergraduate degree in another field and desires to study architecture at Montana State, he/she will be expected to complete the full eleven semesters of design studio. Advanced placement can be made depending on the quality of one’s portfolio, which may demonstrate equivalent achievement. The applicant will be placed as a “Second-Degree Student” until the prerequisites for graduate study have been completed. Upon successful completion of the required prerequisites, the applicant can be advanced to “graduate degree” status.

### Required Courses

<table>
<thead>
<tr>
<th>Semester</th>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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<tr>
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<td>Advanced Architectural Theory</td>
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<tr>
<td></td>
<td>ARCH 535</td>
<td>Adv Bldg Sys Integration</td>
<td>3</td>
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<tr>
<td></td>
<td>ARCH 558</td>
<td>Comprehensive Design Studio</td>
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<tr>
<td></td>
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<td></td>
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</tr>
<tr>
<td>Semester II</td>
<td>ARCH 551</td>
<td>Advanced Arch Studio</td>
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<td>6</td>
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<tr>
<td></td>
<td>ARCH 559</td>
<td>Master Studio Research</td>
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<td></td>
<td>ARCH 560</td>
<td>Masters Studio Project</td>
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<tr>
<td></td>
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</tr>
</tbody>
</table>

### Notes:

1. Students must have completed a total of 45 non-architecture credits to receive their Master of Architecture degree. These credits can occur at the undergraduate or graduate level.
2. All graduate students will be required to receive a minimum grade of “B” (3.0) in any Design Studio (ARCH 558, ARCH 551, ARCH 560). Failure to receive a “B” will result in the student needing to retake that design studio. In addition a student must receive a minimum grade of “B” (3.0) in ARCH 575 Professional Paper/Project in order to be able to progress to ARCH 560.
3. Per Graduate School policy, a student will have only two opportunities to pass a Masters Studio Project similar to a thesis student having only two opportunities to pass the closed door defense and the comprehensive examination.
4. Students may petition the Graduate Program Coordinator to take non-traditional studio classes for graduate elective credit.

All students shall continue to meet with the Graduate Program Coordinator or Administrative Support staff throughout their graduate year to track their progress toward completion of the Master program. The program study will be developed with the advisor, approved by the committee and be submitted to the Graduate School by the add deadline of the first semester of attendance. Final approval of the program and committee rests with the Graduate School. Students may change courses or committee members on the program by completing a Program Change or Change of Committee form. All Graduate School transfer credit policies apply to March students.

The student is expected to be familiar with both School of Architecture and The Graduate School degree requirements. Refer to the For Master’s Students section on The Graduates School website for additional information.

### Financial Assistance

Applicants should contact the director of the school for information regarding the availability of assistantships. See the Graduate Assistantship section of the department website for detailed information on appointment criteria.

### Degree Offered

- Master of Architecture (p. 297)
- Certificate of Professional Practice of Architecture (p. 390)

### Master of Architecture

Throughout the graduate program, students choose from a variety of architectural studios, architectural electives and non-architectural electives intended to emphasize the development of a critical position with regard to the environment and architecture. A comprehensive studio is required to demonstrate, through the development of an architectural project, the student’s moral, ethical and aesthetic responsibility to society and the natural world.

The Master of Architecture professional degree is a Plan B program (professional paper or project plan) that requires forty-two (42) credits of graduate coursework. A student’s program of study includes three graduate design studios courses (Advanced Arch Studio (ARCH 551) ARCH 551) ARCH 551) ARCH 551) Comprehensive Design Studio (ARCH 558) ARCH 558) ARCH 558) ARCH 558) ARCH 558) and Master Studio Project (ARCH 560), required advanced theory and systems courses (Advanced Architectural Theory (ARCH 526) ARCH 526) ARCH 526) ARCH 526) ARCH 526) and Adv Bldg Sys Integration (ARCH 535) ARCH 535) ARCH 535) ARCH 535) ARCH 535), a required Professional Paper (ARCH 575) ARCH 575) ARCH 575) ARCH 575) paper/project and graduate electives. The Plan B Program requires that students successfully complete a Masters Studio Project as their comprehensive examination.

Initial admission to the M.Arch program occurs only during the Fall term.

### Graduate Design Studios

ARCH 551 Advanced Arch Studio (6 credits) are studios that are classified as experimental or theoretical design studios. These studios may be design/build in nature, place specific or theoretical and are intended to give a student an experience that is outside the traditional realm of Architecture. A field trip is associated with this studio.

ARCH 558 Comprehensive Design Studio (6 credits)is a studio that fulfills the NAAB requirements for comprehensive design and is also inclusive of all components of the field. This includes but is not limited to: structural systems, environmental controls, life safety, technical documentation, etc. This studio is designed to evaluate a student’s competency in areas of Architecture. The Comprehensive Design Studio is best described as a programmatically complex problem with an underlying agenda or theoretical component and should be considered the most challenging structured studio experience that a student will undertake within the School.
of Architecture. Requirements will be rigorous and demanding beyond the expectations of those studios in the undergraduate program. The design problem is developed by a faculty member and implemented and solved by the students.

ARCH 560 Masters Studio Project (6 credits) is a student-directed design studio project that provides students with the opportunity for advanced exploration of a wide-range of architectural issues and solutions. This studio serves to cover the Comprehensive Exam for the Master of Architecture degree program.

**Advanced Theory, System Integration and Research Methods**

All graduate students are required to take Advanced Architectural Theory (ARCH 526) ARCH 526(ARCH 526)ARCH 526) and Adv Bldg Sys Integration (ARCH 535) ARCH 535) ARCH 535) in conjunction with Comprehensive Design Studio (ARCH 558) ARCH 558) ARCH 558) and a ARCH 575 Professional Paper is to be taken prior to a Master’s Studio Project. These courses are designed to provide advanced studies in the areas of theory, system integration and research.

**Graduate Elective**

The final component of the M.Arch program is Graduate Elective. An M.Arch student will be required to take at least 14 credits of Graduate Electives. Nine of the credits can be credits that a student "petitioned" to use while an undergraduate. Electives vary from semester to semester. Six to ten electives will be offered each semester. Electives can be courses such as ARCH 533 Adv Environmental Controls, ARCH 564 Adv Arch Graphics, ARCH 525 Special Design Topic, etc.

**Three semester graduate program.**

**Year 1 - Fall Semester**

<table>
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<tr>
<th>Course</th>
<th>Credits</th>
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<tbody>
<tr>
<td>ARCH 558</td>
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</tr>
<tr>
<td>ARCH 526</td>
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<tr>
<td>Total Credits</td>
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**Year 1 - Spring Semester**

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<th>Course</th>
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</thead>
<tbody>
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<td>ARCH 575</td>
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<td>Graduate Electives</td>
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**Year 2 - Fall Semester**

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<th>Course</th>
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<tr>
<td>ARCH 560</td>
<td>6</td>
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<tr>
<td>Total Credits</td>
<td>11</td>
</tr>
</tbody>
</table>

**School of Art**

213 Haynes Hall
Bozeman, MT 59717-3680
406-994-4501 Email: art@montana.edu

The School of Art, fully accredited by the National Association of Schools of Arts and Design, was established in 1893 and its first graduate degree was conferred in 1932. We currently offer 2 Master degrees, a Master of Art (M.A.) in Art History and a Master of Fine Art in Studio Arts. The MFA degree is designed for the professional artist including those who plan to teach art at the university level while the MA degree prepares students for graduate work leading to careers as academic instructors, museum curators or art critics and in allied fields such as art administration, historic preservation and gallery work.

The MFA degree offers courses at the graduate level in ceramics, metalsmithing, painting, drawing, sculpture and printmaking, but does not offer any graduate level courses in either photography or graphic design. The MA degree candidates can concentrate in the areas of Ancient Greek & Roman Civilization; Medieval France, Germany & Britain; Renaissance Italy & Northern Europe; Baroque Italy & Northern Europe; Rococo & Neoclassical France & Britain; Modern France, Spain, Germany & Britain; Contemporary Europe & The United States; History of Printmaking; History of Photography.

**Degrees Offered**

- M.F.A. in Art (p. 299)
- M.A. in Art History (p. 298)

**M.A. in Art History**

**Admission**

The M.A. Program welcomes applications from all those interested in seeking an advanced degree in Art History. Approximately eight students are accepted each year to a thirty-two unit program that emphasizes focused study of cultural production from ancient times to the present and interdisciplinary connections with collateral departments in the Colleges of Arts & Architecture and Letters and Sciences. Art History faculty meet twice a year to read and assess applications, with a particular sensitivity to the students’ work and professional goals.

All materials must be postmarked by March 15 (Fall deadline) and October 15 (Spring deadline) for full consideration. In addition to completing the application and paying the application fee, candidates for admission to the Art History M.A. Program must send a letter of intent, one writing sample, official transcripts, GRE scores, and three letters of recommendation. International applicants must also include an official English proficiency exam score report and a completed and signed Financial Certificate.

The faculty consider the letter of intent and the writing sample to be among the most important parts of the application. The letter should describe your preparation for the program, academic interests, and professional goals. The most useful statements are those that present an intellectual portrait of the applicant, an account of the issues the applicant now finds engaging, and the program of study the candidate envisions for him/herself at MSU. The writing sample should be a substantial essay, ideally a seminar paper or senior thesis, that demonstrates the candidate’s potential for advanced work in the discipline.

**Program Requirements**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
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<tr>
<td>ARTH 501</td>
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<td>One Foreign Language Course</td>
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<td>ARTH 590</td>
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</table>

All graduate students must take: Pedagogy and Professionalism (ARTH 501), Methods and Critical Theory (ARTH 506), and Master’s Thesis (ARTH 590).
In addition to the courses listed above, graduate students will select 5 courses, of which 3 must be 500-level graduate art history seminars, and 2 must be 400-level upper division undergraduate art history lectures in which the student will be required to complete supplementary readings, write advanced comparative analyses of articles, and complete a rigorous research project. Students will also select 2 elective courses at the 500-level taught in other departments in the humanities (e.g. History and Philosophy, English).

After passing an exam in foreign language translation during the first semester, students must complete one additional semester of language translation appropriate to their area of concentration (offerings to be determined by the Department of Modern Languages).

Mastery of the discipline will be determined by a record of excellence in all courses taken within the graduate program and a well-written, well-argued thesis.

Financial Assistance
Limited numbers of graduate teaching assistantships are usually available within the School of Art and are awarded on a competitive basis to formally admitted graduate students. See the Graduate Assistantships sections for detailed information on appointment criteria. Assistantships are requested from the student’s home department.

M.F.A. in Art
The School of Art, accredited by the National Association of Schools of Art and Design, offers a Master of Fine Arts (MFA) degree. The MFA degree requires 60 credits of coursework including a minimum of 15 credits of thesis. The Master of Fine Arts is a project based non-media specific curriculum that focuses on individual artist development and creative leadership. The program brings together talented individuals from a variety of different media, building a community that fosters exploration, professionalism and creative success. Projects based in all traditional fine art media along with environmental art, new media and installation can be accommodated.

The program is housed at the Melvin Graduate Studios. The School of Art does not offer a MFA degree in either graphic design or photography, nor is the GRE required for entrance.

Admission
Students applying to the School of Art must submit a portfolio of 20 digital images in jpg format, online application, official transcripts, artist statement, current resume and three letters of recommendation, along with an artist statement or statement of intent. Completed applications for the following academic year must be received by February 15.

Qualified students may be admitted to The Graduate School in a regular or provisional basis. Provisional acceptance is usually based on undergraduate deficiencies.

Program Requirements

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Studio credits (ARTZ 500 level)</td>
<td>30</td>
</tr>
<tr>
<td>Art History</td>
<td>6</td>
</tr>
<tr>
<td>ARTH 451 Contemporary Art</td>
<td>3</td>
</tr>
<tr>
<td>ARTZ 590 Master’s Thesis</td>
<td>15</td>
</tr>
<tr>
<td>ARTZ 594 Seminar</td>
<td>6</td>
</tr>
<tr>
<td><strong>Total Credits</strong></td>
<td><strong>60</strong></td>
</tr>
</tbody>
</table>

Each student’s progress is reviewed by the School of Art faculty at the end of fall and spring semesters with special emphasis being given to students in their first semester of residence and students beginning their thesis work. Passing of these reviews every semester is required for a student to be considered a degree candidate. Students registered in thesis then work with their committees graduate students culminate their final semester with an exhibition and defense of their thesis work in the Helen E. Copeland Gallery.

Financial Assistance
Limited numbers of graduate teaching assistantships are usually available within the School of Art and are awarded on a competitive basis to formally admitted graduate students. See the Graduate Assistantships sections for detailed information on appointment criteria. Assistantships are requested from the student’s home department.

School of Film and Photography
Visual Communications Building
Room 202
P.O. Box 173350
Bozeman, MT 59717-3350
406-994-2484 Email: naturefilm@montana.edu

Admission
We seek candidates with at least an undergraduate degree in biological or physical sciences, engineering, technology, or the social sciences, and preferably with some research experience. Candidates are not expected to have any formal education or experience in filmmaking. Candidates with filmmaking degrees or degrees in other fields must have a minor in a scientific field or equivalent work experience.

Financial Assistance
Depending on the availability of funds, a limited number of teaching assistantships and research fellowships are available each year.

Degrees conferred
• M.F.A. in Science and Natural History Filmmaking (p. 299)

M.F.A. in Science and Natural History Filmmaking
The Master of Fine Arts Program in Science and Natural History Filmmaking at Montana State University is the largest and best known of only three programs in the world dedicated to this unique and rewarding field of filmmaking. Students in the program have had their work broadcast on many major channels and programs such as The Discovery Channel, National Geographic, The Science Channel, CNN, Sixty Minutes II, Larry King, CBS Evening News, and NBC Nightly News.

Students have produced films for the National Park Service, the National Science Foundation, the Department of Agriculture, NOAA, NASA, National Geographic, Discovery, and such non-profit organizations as the Wildlife Conservation Society, the Sierra Club, the Audubon Society, the Nature Conservancy, the Field Museum and the Boston Museum of Science. Students’ work has also been featured in numerous festivals internationally.

Our students have won EMMYS, been awarded Fulbright scholarships, a Fred Rogers Scholarship from the National Academy of Television Arts and Sciences, Webby awards, and many other honors. The students have documented the work of explorers and scientists on every continent in the world. The graduate student podcast and website TERRA: THE NATURE OF OUR WORLD (http://www.lifeonterra.com) attracts and distributes
some of the world’s leading science and conservation productions to more than 100,000 viewers a month and has won three Webby awards.

Our mission is to provide filmmaking knowledge to students with formal education and experience in science, engineering and technology so they may create accurate, innovative, and exciting programs that advance the public understanding of science.

Candidates for the MFA take courses that include film and video production, the history and theory of science and natural history film, cinematography, production management, editing, and writing. All students must also work at one or more production internships during their time as MFA students.

Program Requirements
The curriculum consists of a minimum of sixty semester credit hours of study, written thesis, and thesis film taken over a minimum of three years. To graduate, a student should complete the course of study in good academic standing and produce and defend a written thesis and thesis film.

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>FILM 504</td>
<td>Film and Documentary Theory</td>
<td>3</td>
</tr>
<tr>
<td>FILM 505</td>
<td>Crit Apprch Nat Hst Filmmaking</td>
<td>3</td>
</tr>
<tr>
<td>FILM 506</td>
<td>Crit Approach Sci Filmmaking</td>
<td>3</td>
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<tr>
<td>FILM 510</td>
<td>Fundamentals of Filmmaking</td>
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</tr>
<tr>
<td>FILM 513</td>
<td>Advanced Cinematography</td>
<td>3</td>
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<tr>
<td>FILM 515</td>
<td>Science and Natural History Film Prod.</td>
<td>3</td>
</tr>
<tr>
<td>FILM 517</td>
<td>Production Management</td>
<td>3</td>
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<td>FILM 518</td>
<td>Writing for Documentary and Non-Fiction Film</td>
<td>3</td>
</tr>
<tr>
<td>FILM 519</td>
<td>Post Production Workflow</td>
<td>3</td>
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<td>FILM 521</td>
<td>Interactive Documentary</td>
<td>3</td>
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<td>FILM 523</td>
<td>Second Year Film Prep</td>
<td>2</td>
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<td>FILM 524</td>
<td>Research Methods</td>
<td>3</td>
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<td>FILM 525</td>
<td>Second Year Film Prod</td>
<td>3</td>
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<td>FILM 526</td>
<td>Alternative Nonfiction</td>
<td>3</td>
</tr>
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<td>FILM 533</td>
<td>Adv Prob TV and Internet Prod</td>
<td>1-9</td>
</tr>
<tr>
<td>FILM 560</td>
<td>Post Production Meets Info Design</td>
<td>3</td>
</tr>
<tr>
<td>FILM 581</td>
<td>Special Professional Proj</td>
<td>1-3</td>
</tr>
<tr>
<td>FILM 590</td>
<td>Master’s Thesis</td>
<td>1-15</td>
</tr>
<tr>
<td>FILM 592</td>
<td>Independent Study</td>
<td>1-3</td>
</tr>
<tr>
<td>FILM 598</td>
<td>Professional Internship</td>
<td>1-12</td>
</tr>
</tbody>
</table>

- FILM 592 Independent Study - 1-3 Credits, Max. 3 credits May be repeated
- FILM 598 Professional Internship - 1-12 Credits, max 12 Credits, credits, May be repeated
- FILM 591 Special Topics - 1-4 cr., Max. 12 credits, May be repeated
- FILM 581 Special Professional Proj - 1-3 Credits, Max 6 credits, May be repeated
- FILM 590 Master’s Thesis - 1-15, May be Repeated

College of Education, Health and Human Development
Alison Harmon, Interim Dean
250 Reid Hall, Bozeman, MT 59717
406-994-4133 Email: ehhddean@montana.edu

Department of Education (p. 300)
- College Teaching Certificate (p. 304)
- School Library Media Graduate Endorsement (p. 305)
- MEd
  - Adult and Higher Education (p. 306)
  - Curriculum and Instruction (p. 308)
  - Educational Leadership (p. 312)
- EdD
  - Adult and Higher Education (p. 313)
  - Curriculum and Instruction (p. 316)
  - Educational Leadership (p. 318)
- EdS
  - EdS. in Educational Leadership (p. 326)
- PhD
  - Adult and Higher Education (p. 319)
  - Curriculum and Instruction (p. 322)
  - Educational Leadership (p. 324)

Department of Health and Human Development (p. 327)
- Addiction Counseling Certificate (p. 333)
- Counseling (p. 328)
- Exercise and Nutrition Sciences (p. 330)
- Family & Consumer Sciences (p. 331)
- Family Financial Planning (p. 331)
- Food, Family and Community Health Sciences (p. 332)
- School Counseling (p. 328)

Northern Plains Transition to Teaching (NPTT) (p. 394)
- Certificate Leading to Secondary Teacher Licensure (p. 395)
- Master of Education (p. 395)

Department of Education
Department of Education Graduate Programs Website: http://www.montana.edu/wwweduc/grad/index.shtml

Department Head
Dr. Jayne Downey
213 Reid Hall
406-994-3120 Email: jdowney@montana.edu

Graduate Program Assistant
Maggie Secrest
215 Reid Hall
406-994-6786 Email: edgrad@montana.edu

The Department of Education’s graduate offerings are divided into three units: Adult & Higher Education, Curriculum & Instruction, and Educational Leadership. Master’s (MEd) and Doctoral (EdD and PhD) programs are offered in all three areas. In addition, the Adult & Higher Education program offers the College Teaching Certificate, the Curriculum and Instruction program offers the Library Media Certificate, and an Education Specialist (EdS) degree is available in Educational Leadership only. Additional degree requirements are listed in each program’s section.

For information on graduate programs, please contact the appropriate Program Leader:
- Adult & Higher Education: Dr. Tricia Seifert, 406-994-3127 or email tricia.seifert@montana.edu
Adult and Higher Education
http://www.montana.edu/education/grad/ahe/index.html

The Adult and Higher Education (A&HE) program offers three degrees: Master’s of Education, Doctor of Education, and a Doctor of Philosophy in Education. The A&HE graduate program prepares students to work in and/or research both formal and informal educational opportunities beyond traditional Pre-K-12 settings. Students in the program would be specifically focused on (a) college teaching and college students and their development, (b) higher education leadership, administration, and organization, (c) postsecondary institutional and program evaluation, assessment, and accreditation, and (d) comparative international and diverse postsecondary (e.g., Tribal Colleges) institutional contexts. Special attention is directed at underrepresented student groups and diverse learners within these foci areas. There are three specialization options for the Master’s in Education (MEd) degree: Adult Education, Student Affairs, and Higher Education.

There are two specialization options for the Doctor of Education (EdD) degree: Higher Education Administration and Higher Education Academics. The EdD in Higher Education Administration specialization is intended for individuals who will contribute to the administrative leadership within a range of diverse postsecondary settings. The EdD Higher Education Academics specialization is intended for individuals who will teach and provide academic leadership in the area of college teaching and learning within a diverse range of postsecondary settings.

The Doctor of Philosophy in Education (PhD), Adult & Higher Education degree is designed for graduate students seeking faculty or research positions in higher education or positions within research organizations that require educational research in highly specialized disciplines. Progress through the degree provides students with opportunities to develop specialized disciplinary content and research knowledge along with scholarly experiences that provide the foundational knowledge and skills required for success as faculty in higher education and in research organizations. Specifically, the PhD program prepares students to develop knowledge and conduct research related to six (6) major areas of strength among our existing faculty: (1) Leadership and Policy Analysis, (2) STEM Education, (3) the K-20 Trajectory, (4) Online and Distance Education Delivery, (5) Pedagogy and Teacher Preparation, and (6) Education Evaluation, Assessment, Research Design and Analysis. Special emphasis in these major research areas addresses topics specific to Montana including working with rural communities and Native Americans on state and other educational issues. Graduates of this PhD program in education will be well-positioned to directly and positively affect the data driven culture related to improving the educational systems of Montana and beyond.

The Department also offers the School Library Media Certificate (LMC) program. This totally online program is offered through the Montana State University Extended University and consists of 21 semester credits (7 courses). The program is for teachers who want to add an endorsement in K-12 Library Media to an existing teaching license or take courses for certification in Library Media.

Curriculum and Instruction
http://www.montana.edu/education/grad/ci/index.html

The program in Curriculum & Instruction (C&I) offers a Master of Education and a Doctor of Education. The Master of Education (MEd) degree is designed to meet the needs of elementary and secondary classroom teachers, subject matter specialists, and educational scholars and researchers. The MEd degree has three options: the Professional Educator, Educational Researcher, and Technology Education.

The Doctor of Education (EdD) degree is designed to prepare graduates to assume positions in college and university teacher education programs. Graduates will develop the rich knowledge base in educational theory and practice needed to conduct research and engage in service to the greater education community. The program offers multiple opportunities to engage in college teaching, research grounded in cutting-edge educational issues, and collaborative activities in diverse educational settings including faculty from other disciplines.

The Doctor of Philosophy in Education (PhD), Curriculum and Instruction degree is designed for graduate students seeking faculty or research positions in higher education or positions within research organizations that require educational research in highly specialized disciplines. Progress through the degree provides students with opportunities to develop specialized disciplinary content and research knowledge along with scholarly experiences that will provide the foundational knowledge and skills required for success as faculty in higher education and in research organizations.

The PhD in Education, with emphasis in Curriculum and Instruction, will prepare students to develop knowledge and conduct research related to six major areas of strength among our existing faculty including: (1) Leadership and Policy Analysis, (2) STEM Education, (3) the K-20 Trajectory, (4) Online and Distance Education Delivery, (5) Pedagogy and Teacher Preparation, and (6) Education Evaluation, Assessment, Research Design and Analysis. Special emphasis in these major research areas will address topics specific to Montana including working with rural communities and Native Americans on state and other educational issues. Graduates of this PhD program in education will be well-positioned to directly and positively affect the data driven culture related to improving the educational systems of Montana and beyond.

The program in Educational Leadership offers a Master of Education, Education Specialist, Doctor of Education and Doctor of Philosophy in Education. The Master of Education (MEd) degree is designed to meet the needs of those who desire positions in school leadership: Curriculum Director, principal and superintendent certification. The MEd degree allows candidates to gain certification in Montana as a K-12 Principal. Once candidates complete the MEd degree and earn principal certification they may take additional coursework to obtain superintendent licensure. This can be accomplished through earning an Education Specialist (EdS) degree or in non-degree status.

The Doctor of Education (EdD) degree is designed to prepare graduates to assume positions in college and university educational leadership programs. The emphasis of this program is that of the scholar-practitioner where students are engaged researching problems encountered in practice related to K-20 educational organizations and educational leadership. Graduates will develop the rich knowledge base in educational theory and practice and leadership theory needed to conduct practical educational
research and engage in service to the greater education community. The program offers multiple opportunities to engage in research grounded in cutting-edge educational issues and collaborative activities in diverse educational settings, including faculty from other disciplines.

The Doctor of Philosophy in Education (PhD), Educational Leadership degree is designed for graduate students seeking faculty or administrative positions in higher education or positions within research organizations that require educational research skills in highly specialized disciplines. Specifically, this PhD program prepares students to develop knowledge and conduct research related to six (6) major areas of strength among our existing faculty: (1) Leadership and Policy Analysis, (2) Leader Identity and Authenticity, (3) Leadership for Social Justice and in Indigenous Contexts, (4) Leader Self-Efficacy/ School Collective Efficacy, (5) Instructional Leadership in Rural Contexts, (6) Education Evaluation, Assessment, Research Design and Analysis. Special emphasis in these major research areas addresses topics specific to Montana including working with rural communities and Native Americans on state and other educational issues. Graduates of this PhD program in education will be well-positioned to directly and positively affect the data driven culture related to improving the K-20 educational systems.

Programs and Degrees Offered

• Certificates
  • College Teaching Certificate (p. 304)
  • School Library Media Certificate (p. 305)

• M.Ed.
  • Adult and Higher Education (p. 306)
  • Curriculum and Instruction (p. 308)
  • Educational Leadership (p. 312)

• Ed.D.
  • Adult and Higher Education (p. 313)
  • Curriculum and Instruction (p. 316)
  • Educational Leadership (p. 318)

• Ed.S. in Educational Leadership

• Ph.D.
  • Adult and Higher Education (p. 319)
  • Curriculum and Instruction (p. 322)
  • Educational Leadership (p. 324)

Administrative Licensure

The Educational Leadership program at Montana State University is nationally accredited by the Council for the Accreditation of Educator Preparation (CAEP), as well as by the Montana Board of Public Education. The focus of the program is to prepare K-12 School Principals and School Superintendents to effectively serve Montana communities and rural communities throughout the Northern Plains and Northern Rocky Mountain region of the United States. Those students completing the degree requirements for the M.Ed. will also have met the academic requirements necessary for a Montana Class III Administrative license with a K-12 Principal Endorsement. In addition, School Superintendent Endorsement courses, courses required for out-of-state administrators coming to Montana to practice, and the Board of Education/OPI Internship program are offered by the Educational Leadership program.

Administrative Licensure Programs

• Board of Public Education/OPI Internship (p. 302)
• Out of State School Administrative License (p. 302)
• Superintendent Licensure (p. 303)

Board of Public Education/OPI Internship

Objectives

Students who have been hired into a school administrative position in Montana requiring an administrative license, but have not met the academic requirements for a Class III license, may be eligible for Class V license which will allow them to practice as an administrator while obtaining the required coursework. While holding a Class V license they must be enrolled in a Board of Public Education/OPI Internship program and be supervised by a university faculty member licensed at the appropriate level.

Board of Public Education (BPE) / Office of Public Instruction (OPI) Internship only pertains to those students who have been hired into and are currently working in an education administrative position requiring licensure, and are more than 6 credit hours away from having met the academic requirements for licensure and endorsement at the appropriate level.

Eligibility

In order to be considered for the Board of Public Education / OPI Internship, candidates must first be hired into an administrative position within a school. If you have been contracted into an administrative position, please contact our office to discuss the requirements for licensure through the BPE / OPI Internship program.

Educational Leadership Faculty

Dr. Tena Versland, Program Leader
406-994-6799 Email: tena.versland@montana.edu

Dr. Bill Ruff
406-994-4182 Email: wruff@montana.edu

Dr. David Henderson
406-994-6424 Email: david.henderson3@montana.edu

Dr. Art Bangert
406-994-7424 Email: abangert@montana.edu

Contact Information

Maggie Secrest, Graduate Program Assistant
PO Box 172880
Montana State University
Reid Hall 215, Bozeman, MT 59717-2880
margaret.secrest@montana.edu (margaret.secrest@montana.edu)

Out of State School Administrative License

Out-of-State School Administrators Seeking Administrative Licensure in Montana

Principal Endorsement

Educators who have completed their principal preparation coursework in other states and are seeking Administrative Licensure with a Principal Endorsement in Montana must complete a course in Montana School Law. An additional recommendation is that principals be licensed K-12 in Montana, and completion of EDLD 565 Instructional Leadership is required to do so. The following courses are recommended for K-12 MT Licensure:
EDLD 565  K-12 Instructional Leadership  3
EDLD 655  MT Legal & Policy Studies  3
or
EDLD 532  School Law  3

Although EDLD 532 Montana School Law or EDLD 655 Montana Legal and Policy Studies will meet this requirement, the recommended course is EDLD 655 Montana Legal and Policy Studies. EDLD 655 delves more substantively into Montana case law without duplicating the U.S. Constitutional Law content present in most school law courses offered in principal preparation programs.

**School Superintendent Endorsement**

Educators who have completed their School Superintendent preparation coursework and licensure in other states and are seeking Administrative Licensure with a School Superintendent Endorsement in Montana must complete both a course in Montana School Law and a course in Montana School Finance. The following courses are required and are typically offered every summer:

EDLD 655  MT Legal & Policy Studies  3
EDLD 650  MT Finance & Facilities  3
EDLD 645  Personnell and Collective Bargaining in MT  3

**How to Apply**

Contact the Educational Leadership faculty to discuss requirements for licensure.

Complete the Graduate School application available online at the Graduate School website.
http://www.montana.edu/gradschool/admissions/apply.html

**Educational Leadership Faculty**

Dr. Tena Versland, Program Leader  
406-994-6799 Email: tena.versland@montana.edu  
Dr. Bill Ruff  
406-994-4182 Email: wruff@montana.edu  
Dr. David Henderson  
406-994-6424 Email: david.henderson3@montana.edu  
Dr. Art Bangert  
406-994-7424 Email: abangert@montana.edu

**Contact Information**

Maggie Secrest, Graduate Program Assistant  
PO Box 172880  
Montana State University  
Reid Hall 215, Bozeman, MT 59717-2880  
margaret.secrest@montana.edu (margaret.secrest@montana.edu)

**Superintendent Licensure**

**Objectives**

This is a post-master’s program. Although formal admission into the Educational Leadership program is not required, candidates must apply to the Graduate School as a non-degree seeking student before April 1. Candidates must also hold a master’s degree and principal endorsement as a prerequisite for taking courses within this option. The Superintendent Licensure Program provides the minimum academic requirements needed for a Superintendent Endorsement in Montana to those currently holding a Class III License with a K-12 Principal Endorsement.

**Program Flow**

The purpose of this program is to provide the minimum skills and knowledge required for the position of district superintendent. In addition to improving skill and knowledge, it is the goal of the program to create strong networks among students to support effective practices. To that end, classes are generally offered in a blended format which combines face-to-face delivery and distance delivery. An appropriate balance of theory and practice is designed into the content of the coursework.

Courses are offered in a blended format. The summer courses start with online instruction in early June and face-to-face instruction is held later in June with course completion in July.

Contact the Department of Education's Graduate Program Office (see contact information below) before April 1, for assistance in completing the Graduate Application for a non-degree seeking student.

*Note, there will be no fee attached to the application, as students will not be associated with the MSU Graduate School. The application is merely for contact and previous schooling information.*

Contact Dr. Tena Versland, Program Leader in Educational Leadership, to discuss the lineup of courses required for certification and individual circumstances.

Information about course offerings may be found on the Department of Education website: http://www.montana.edu/ehhd/educ/edleadership/super.shtml

**Program of Study**

All candidates must complete courses in the following: Montana School Law; Montana School Finance; Montana Collective Bargaining and Employment Law. MSU Courses that satisfy those requirements are: EDLD 655; EDLD 650; EDLD 645

<table>
<thead>
<tr>
<th>Course</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>EDLD 620</td>
<td>The School Superintendent</td>
<td>3</td>
</tr>
<tr>
<td>EDLD 645</td>
<td>Personnell and Collective Bargaining in MT</td>
<td>3</td>
</tr>
<tr>
<td>EDLD 650</td>
<td>MT Finance &amp; Facilities</td>
<td>3</td>
</tr>
<tr>
<td>EDLD 655</td>
<td>MT Legal &amp; Policy Studies</td>
<td>3</td>
</tr>
<tr>
<td>EDLD 574</td>
<td>Field Exp in Ed Ldrship</td>
<td>3</td>
</tr>
<tr>
<td><strong>Total Credits</strong></td>
<td></td>
<td><strong>15</strong></td>
</tr>
</tbody>
</table>

*Candidates with 5 or more years experience as a principal and who have extensive central office experience may petition the faculty to waive the Field Experience requirement.*

*Note: candidates who do not have a K-12 endorsement must also take EDLD 565 Instructional Leadership and 3 credits of EDLD 574 Field Experience in a setting that compliments their current principal endorsement. Those with a Secondary School Principal endorsement will perform Field Experience in an elementary school setting. Those with an Elementary School Principal endorsement will perform Field Experience in a secondary school setting.

**How to Apply**

Contact the Educational Leadership faculty to discuss requirements for licensure.

Complete the Graduate School application available online at the Graduate School website.
http://www.montana.edu/gradschool/admissions/apply.html

**Educational Leadership Faculty**

Dr. Tena Versland, Program Leader  
406-994-6799 Email: tena.versland@montana.edu

Dr. Bill Ruff  
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Dr. David Henderson  
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Dr. Art Bangert  
406-994-7424 Email: abangert@montana.edu

**Contact Information**

Maggie Secrest, Graduate Program Assistant  
Montana State University  
PO Box 172880  
Reid Hall 215, Bozeman, MT 59717-2880  
Email: margaret.secrest@montana.edu  
(margaret.secrest@montana.edu)

**College Teaching Certificate**

**Objectives**

The Adult and Higher Education Program offers a Certificate in College Teaching to develop and promote exemplary teaching among graduate students, aspiring faculty, and current faculty wanting to enhance their teaching skills. The goal of the certificate is to make individuals more competitive in the job market as instructors and faculty members at colleges and universities. A total of 12 credits of coursework are required to earn the certificate. Participants may enroll in the program either Fall or Spring.

**Program Flow**

A total of 12 credits of coursework are required to earn the College Teaching Certificate. Taking three credits a semester, participants will be able to earn the certificate in two years. Taking six credits a semester, participants will be able to earn the certificate in one year. Participants may enroll in the program for Fall or Spring semesters.

**Program of Study**

**Required Courses - 6 credits**

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
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<tbody>
<tr>
<td>EDLD 635</td>
<td>College Teaching</td>
</tr>
<tr>
<td>EDLD 574</td>
<td>Field Exper in Ed Ldrshp (Section-006, College Teaching Practicum)</td>
</tr>
</tbody>
</table>

Field Experience is the experiential component for the certificate program and is taken after the majority of the coursework is completed.

**Electives - choose 6 credits**

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>EDLD 509</td>
<td>Issues and Trends in Higher Education</td>
</tr>
<tr>
<td>EDLD 616</td>
<td>Organization and Administration of Higher Education</td>
</tr>
<tr>
<td>EDLD 628</td>
<td>College Students</td>
</tr>
<tr>
<td>EDLD 529</td>
<td>Post Secondary Distance Delievered Education</td>
</tr>
<tr>
<td>EDLD 531</td>
<td>Theoretical Foundations of Student Services</td>
</tr>
<tr>
<td>EDLD 535</td>
<td>Student Services</td>
</tr>
<tr>
<td>EDLD 592</td>
<td>Independent Study</td>
</tr>
<tr>
<td>EDLD 598</td>
<td>Internship</td>
</tr>
</tbody>
</table>

**Application for Certificate in College Teaching**

The minimum requirement for admission to the certificate program is a master’s degree or current enrollment in a master’s or doctoral degree program as well as knowledge of a self-identified discipline or area of specialization. In the personal statement candidates should describe their qualifications to teach the content of their discipline or area of specialization at the college level and their teaching goals.

Complete the online application through the [Graduate School Online Application System](http://www.montana.edu/wwdg/apply.html)

Applicants are to submit the following documentation during the application process:

1. **Official Transcripts** – current students at MSU may submit copies of transcripts
2. **Three letters of reference** – one of these must address the discipline/specialization qualifications of the applicant to teach at the college level.  
   a. **Note:** If applicant is a current graduate student at MSU then only one reference is required.
3. **Current Curriculum Vitae**
4. **Personal statement** – please address the following:  
   a. Brief background  
   b. Goal for completing the Certificate – What are the applicants teaching goals?  
   c. Discipline/content knowledge – What qualifications does the applicant have to teach the content of the discipline or area of specialization at the college level?  
   d. List of current teaching responsibilities or experiences  
   e. Initial ideas on a possible course(s) the applicant would like to “teach” as part of the practicum experience. Also, include names of any mentors who might serve as a master teacher for the practicum experience.  
   f. Has the applicant taken or are currently enrolled in any courses that might count towards the Certificate? If yes, list these and when taken.

**Note:** Additional information may be requested by the Admissions Committee upon receipt of application.

**Application Deadlines**

The following are the preferred application deadline dates by which all of the application materials must be submitted via the online application system.
Fall Semester: April 1st  
Spring Semester: November 1st  
Summer Semester: April 1st

The following is the absolute deadline date for the fall semester. If an applicant is unable to submit all application materials via the online application system by the preferred dates listed above, he or she can submit the materials by the date listed below, as there will be a second review for the fall semester.

Fall Semester: August 15th

Contact Information
Maggie Secrest  
Graduate Program Assistant  
PO Box 172880  
Montana State University  
Reid Hall 215, Bozeman, MT 59717-2880  
margaret.secrest@montana.edu (margaret.secrest@montana.edu)

School Library Media Graduate Certificate

Program Objectives
This program is geared toward licensed teachers who want to obtain the school library media endorsement. This certification program/endorsement can only be added to an existing teaching license.

We have received official approval from accreditation officials in Alaska, Colorado, Idaho, Montana, Oregon, South Dakota, North Dakota, Washington, and Wyoming. Many other states accept our program as well. Contact your state’s Department of Education to ensure that the program is accepted. Our education programs are accredited by the Montana Board of Public Education, the Teacher Education Accreditation Council/Council for the Accreditation of Educator Preparation (TEAC/CAEP), and we participate in the National Association of State Directors of Teacher Education and Certification’s (NASDTEC) Interstate Contract.

Additionally, the Library Media program offers an option to earn a Master’s degree (MEd) in Curriculum & Instruction after completion of all Library Media coursework. The Master’s portion involves completion of 9 additional credits past the 21 required by the Library Media Certificate program, and these courses are also offered online. A student must apply to the full MEd program either initially or before 9 credits of Library Media coursework have been completed. See Master of Education in Curriculum & Instruction - Professional Educator Option (p. 310).

Program Flow
Following admission, the student should register for the course(s) offered in the upcoming semester. Two to three courses are typically offered each semester.

This is a fully online program. Therefore, students must have reliable Internet access. Students also need:

1. Basic understanding of word processing and email applications
2. Familiarity with spreadsheet and database applications and software
3. Basic knowledge of the Web, search engines, and experience using different browsers and online databases
4. Experience with software downloads and multimedia plug-ins

Program of Study

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>EDCI 522</td>
<td>Info Resources &amp; Services</td>
<td>3</td>
</tr>
<tr>
<td>EDCI 545</td>
<td>Organization of Information in School Library Media Centers</td>
<td>3</td>
</tr>
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<td>EDCI 546</td>
<td>School Library Media Specialist</td>
<td>3</td>
</tr>
<tr>
<td>EDCI 547</td>
<td>Info Inquiry &amp; Ed Change</td>
<td>3</td>
</tr>
<tr>
<td>EDCI 548</td>
<td>Management of Information &amp; Resources</td>
<td>3</td>
</tr>
<tr>
<td>EDCI 549</td>
<td>Applications of Literature for Children and Young Adults</td>
<td>3</td>
</tr>
<tr>
<td>EDCI 598</td>
<td>Internship</td>
<td>3</td>
</tr>
</tbody>
</table>

Total Credits: 21

Contact Information
Dr. Ann Ewbank, Program Leader  
406-994-5788  
Email: ann.ewbank@montana.edu

Application Process for the Library Media Certificate Program
Prior to applying for the Library Media Certificate program applicants must hold a teaching license and have gained at least one year teaching experience.

1. Complete the online application through the Graduate School Online Application System (http://www.montana.edu/wwwdg/apply.html)
2. Provide official transcripts from all higher education institutions attended to the Department of Education Graduate Programs Office, 215 Reid Hall, PO Box 172880, Montana State University, Bozeman, MT 59717.

• Note: Admission to the program requires a cumulative GPA of 3.0 for the last two years of undergraduate coursework.

Application Deadlines
The following are the preferred application deadline dates by which all of the application materials must be submitted via the Graduate School Online Application System (http://www.montana.edu/wwwdg/apply.html):

• Fall Semester: April 1st  
• Spring Semester: November 1st  
• Summer Semester: April 1st

The following are the absolute application deadline dates. If an applicant is unable to submit all application materials via the online application system by the preferred dates listed above, he or she can submit the materials by the date listed below, as there will be a second review.

• Fall Semester: July 15th

Contact Information
Maggie Secrest  
Graduate Program Assistant  
Montana State University  
PO Box 172880  
Reid Hall 215, Bozeman, MT 59717-2880  
margaret.secrest@montana.edu (margaret.secrest@montana.edu)
Master of Education in Adult & Higher Education

Objectives
There are three specialization options for the Master’s in Education (MEd): Adult Education, Student Affairs, and Higher Education.

Adult Education (p. 307)
- Community education
- Religious education
- Workplace training and development

Higher Education (p. 307)
- Entry-level general administrative positions in higher education
- Intercollegiate athletics
- Institutional development

Student Affairs (p. 308)
- Residence life
- Career services
- Leadership Development
- Student government

Program Flow
After acceptance, the student will be assigned a temporary advisor and should then meet with his/her assigned advisor. During the second semester of enrollment, the student will identify a graduate committee chair and committee members, establish and submit their program of study to the Graduate School, and clarify plans for the comprehensive examination or master’s thesis. Near the completion of course work, the student will write the comprehensive examination. Students writing a thesis will not be required to write a comprehensive examination.

Committees
Each masters student’s committee must consist of three members. The chair and one other member must be from the Adult & Higher Education faculty. The third committee member must have academic credentials in the area of the student’s program of study and be approved by the Head of the Department of Education and Dean of The Graduate School.

Chairs
The student should carefully select his/her chair after thorough conversations with members of the Adult & Higher Education faculty. The graduate committee chair will give strong leadership and approval regarding the balance of the committee’s potential membership. The committee, as a whole, is subject to the approval of the Head of the Department of Education. The chair will facilitate program approval, comprehensive exam planning and clarification. Chairs and members of a student’s committee are subject to change. In addition, revision to the program of study can be made during the course of study with the chair’s approval.

Comprehensive Examinations
Near the end of completing course work, MEd students will complete a written comprehensive exam or a Master’s Thesis. Students are expected to demonstrate mastery of the program of study and the ability to interact with the research in that area. The substantive content of the written exam questions will be determined by the chair in consultation with the committee. Students may be required to meet with the committee to provide oral clarification of their written responses.

If completing a masters thesis in lieu of a comprehensive exam, you will need to discuss thesis credit requirements with your graduate committee chair by the second semester.

Contact Information
Dr. Tricia Seifert
tricia.seifert@montana.edu
Dr. Carrie Myers
cbmyers@montana.edu
Dr. Sweeney Windchief
sweeney.windchief@montana.edu
Dr. Bryce Hughes
bryce.hughes@montana.edu (cbmyers@montana.edu)

MEd in Adult and Higher Education Options:
- Adult Education Option (p. 307)
- Higher Education Option (p. 307)
- Student Affairs Option (p. 308)

Application Process for the M.Ed. in Adult & Higher Education
Click Here to access the online application (http://www.montana.edu/wwwdg/apply.html)

During the online application process you will be asked to submit the following materials.

1. Completed Graduate School Application
2. GPA calculation sheet – The form is provided during the application process.
3. Resume/Curriculum Vitae
4. Documentation of verbal and quantitative skills needed for the degree – Do one of the following:
   a. Submit official GRE (minimum Verbal 150, Quantitative 145) or MAT scores (minimum 390) to Montana State University (code 4488).
5. Academic Transcripts – Provide official transcripts verifying all Bachelors degree course work submitted directly to the Department of Education Graduate Programs Office, 215 Reid Hall, PO Box 172880, Montana State University, Bozeman, MT 59717. Transcripts will be evaluated for rigor and academic fit.
6. Personal essay – The suggested length is 2-3 pages, double-spaced. Briefly describe your background, prior professional and leadership experience, why you are interested in our program, and how you plan to use your degree.
7. Three (3) professional references – The letters should be from individuals qualified to assess your ability and potential as a graduate student and/or be able to attest to your work ethic and professionalism. References from relatives are not acceptable.
8. For International Applicants ONLY
   TOEFL (https://www.ets.org/toefl) or ACE level 7 – Applicants who are not U.S. citizens and not from countries where English is the official language are required to take the Test
of English as a Foreign Language and score a minimum 213 (paper version- 550, 80 for the iBT). This requirement may be waived if the applicant has earned an undergraduate or graduate degree from an institution in the U.S.

9. For International Applicants ONLY
International Student Financial Certificate (http://www.montana.edu/international/admissions/graduatefinancialcertificate.pdf)

Application Deadlines
Below are the deadlines by which all of the application materials for the M.Ed. in Adult & Higher Education must be submitted via the online application system.
By submitting materials by the deadline, accepted students may be eligible for early registration. In order for a graduate degree application to be reviewed for admission, all required application documents must be submitted prior to the department’s posted deadline. Applications received after the deadline may be reviewed for acceptance on a case-by-case basis.

Fall Semester: April 1st
Spring Semester: November 1st
Summer Semester: April 1st

We hope that you are interested in our program! We strongly suggest that you contact one of our faculty by e-mail or phone for further information and before applying. We would like to get to know you as early as possible. E-mail addresses of our faculty are listed on the Overview page.

Contact Information
Maggie Secrest
Graduate Program Assistant
PO Box 172880
Montana State University
Reid Hall 215, Bozeman, MT 59717-2880
margaret.secrest@montana.edu

Adult Education Option
Objectives
The M.Ed. Adult Education specialization emphasizes fundamental skills and understandings of adult learners and is intended for individuals who will work within programs of adult education in contexts other than higher education institutions. This program of study is designed to develop skills in working with adult learners within formal and informal contexts such as community education, nonprofit settings, religious education, corporate training, and workforce development. (30 credits).

Program of Study
Adult Education Core - 12 credit hours
EDLD 501 Foundations of Adult Education
EDU 614 Planning Program Assessment
EDLD 513 Resource and Program Management
EDLD 616 Organization and Administration of Higher Education

Statistics and Research - 6 credit hours
EDCI 501 Educational Statistics I
EDCI 506 Applied Educational Research

Electives - 12 credit hours
Approved electives may be selected from other Education programs or departments that strengthen the student’s program of study. These courses need to be selected in consultation with the chair.

Total Credits 30

Internship
Students with no professional experience working in an adult education program are encouraged to enroll in a three-credit higher education Internship (EDLD 598) to gain practical field experience.

Higher Education Option
Objectives
The MEd Higher Education specialization emphasizes the structure and function of higher education and is intended for individuals interested in working within both student and academic affairs. Graduates with this specialization will be prepared to work within a range of post-secondary settings such as registrar, institutional research & assessment, library, marketing, and entry level programming and administration. (30+ credits)

Program of Study
Higher Education Core - 12 credit hours
EDLD 605 Higher Education History and Philosophy
EDLD 616 Organization and Administration of Higher Education
EDLD 628 College Students
EDU 637 Institutional Research and Assessment
EDU 614 Planning Program Assessment

Higher Education Specialized Courses - 12 credit hours from the following:
EDLD 509 Issues and Trends in Higher Education
EDLD 512 Finance and Administration in Higher Education
EDLD 513 Resource and Program Management
EDLD 529 Post Secondary Distance Delievered Education
EDLD 635 College Teaching
EDLD 531 Theoretical Foundations of Student Services
EDLD 533 Law and Policy in Higher Education
EDLD 535 Student Services

Approved electives may be selected from other Education programs or departments that strengthen the student’s program of study.

Statistics and Research - 6 credits
EDCI 501 Educational Statistics I
EDCI 506 Applied Educational Research

Total Credits 30

Internship
Students with no professional experience working in higher education are encouraged to enroll in a three-credit higher education Internship (EDLD 598) to gain practical field experience.
Student Affairs Option

Objectives
The MEd Student Affairs specialization emphasizes student development & advising and is intended for individuals who will work within college student affairs' programs in higher education. This program plan is designed to provide the graduates with the fundamental skills and understandings necessary to work within diverse post-secondary settings such as residence life, career services, athletics, and student government. (30+ credits)

Program of Study

Student Affairs Required - 18 credit hours

<table>
<thead>
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<th>Course Title</th>
<th>Credit Hours</th>
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<tbody>
<tr>
<td>EDLD 616</td>
<td>Organization and Administration of Higher Education</td>
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</tr>
<tr>
<td>EDU 614</td>
<td>Planning Program Assessment</td>
<td>3</td>
</tr>
<tr>
<td>EDLD 628</td>
<td>College Students</td>
<td>3</td>
</tr>
<tr>
<td>EDLD 531</td>
<td>Theoretical Foundations of Student Services</td>
<td>3</td>
</tr>
<tr>
<td>EDLD 533</td>
<td>Law and Policy in Higher Education</td>
<td>3</td>
</tr>
<tr>
<td>EDLD 535</td>
<td>Student Services</td>
<td>3</td>
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Statistics and Research - 6 credit hours

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<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>EDCI 501</td>
<td>Educational Statistics I</td>
<td>3</td>
</tr>
<tr>
<td>EDCI 506</td>
<td>Applied Educational Research</td>
<td>3</td>
</tr>
</tbody>
</table>

Electives - 6 credit hours

Approved electives may be selected from other Education programs or departments that strengthen the student’s program of study. These courses need to be selected in consultation with the chair.

Total Credits 30

Internship

Students with no professional experience working in college student affairs are encouraged to enroll in a three-credit higher education Internship, EDLD 598 Internship to gain practical field experience.

Master of Education in Curriculum & Instruction

Program Objectives
At the Master’s level, the Curriculum and Instruction program offers the following three options:

Professional Educator (p. 310)
In our redesigned online program students will share strengths, develop new instructional strategies, study theory and best practice, as well as examine current issues in education and consider implications for teaching practice. Students who complete the Professional Educator option of the Curriculum & Instruction Master’s degree are expected to demonstrate the knowledge, skills, and dispositions of a master teacher.

There are four specializations available within the Professional Educator option:

- Elementary (K-8) Teachers
- Secondary (6-12) Teachers
- K-12 Music Teachers

Technology Education (p. 311)
Students who complete the online Technology Education option of the Curriculum & Instruction Master’s degree are expected to demonstrate the knowledge, skills, and dispositions of a master teacher.

Educational Researcher (p. 311)
Students who complete the hybrid Educational Researcher option of the Curriculum & Instruction Master’s degree are expected to demonstrate the knowledge, skills, and dispositions of a professional researcher.

Program Flow
The graduate faculty are committed to offering multiple avenues for students to fulfill their goals and expectations for advanced study in teaching, learning, and curriculum design. The program provides academic preparation for educators who seek higher education in order to become master teachers, scholars, researchers, or curriculum coordinators in schools, districts, and other educational agencies. The program is structured to allow full-time working professionals to continue their jobs while working toward an advanced degree.

Committees
Students in the Professional Educator and Technology Education options of the Curriculum and Instruction Master’s program will be assigned an advisor. The advisor will guide the student’s course selection and progress toward degree completion including the submission of the student’s Graduate Program of Study form.

Students in the Educational Researcher option will be guided by a graduate committee. A minimum of three committee members will be included on the student’s Program of Study at the discretion of the advisor/chair.

The Master’s Capstone ~ Comprehensive Examinations

Capstone for the Professional Educator, Technology Education, and Library Media Certificate Core Options
As MEd students in the Professional Educator and Technology Education Options approach the end of their coursework (approximately 21 credits completed), they will contact their advisor/chair to discuss the content, format, and time frame for their Master’s Capstone.

The Master’s Capstone for the Professional Educator, Technology Education, and Library Media Certificate Core Options is composed of two elements:

1. The Written Comprehensive Exam entails the completion of EDCI 575 Professional Paper and Project. The content and design of the Professional Paper/Project will be determined by consultation between the advisor/chair and the student. The Professional Paper/Project will be designed to most appropriately meet the professional growth and learning needs of the individual student. Students are required to use APA format. The completed Professional Paper/Project will be evaluated for written competency (quality, thoroughness, depth, and professionalism) as well as the student’s mastery of: pertinent literature, academic and theoretical underpinnings, development of professional skills, and the ability to conduct effective educational research.

2. The Oral Comprehensive Exam entails formal presentation of the findings from the Professional Paper/Project. The student will give
a one (1) hour oral presentation of the Professional Paper/Project. Students can be queried about their research as well as all areas of program content during the oral presentation. The presentation will be evaluated for oral competency and mastery of: knowledge of pertinent literature, academic and theoretical grounding, development of professional skills, and the ability to conduct effective educational research.

Capstone for the Educational Researcher Option

The Master’s Capstone for the Educational Researcher Option is composed of a Written Comprehensive Exam and an Oral Comprehensive Exam. These are the major final academic examinations during a Master’s degree study that assure the student has attained sufficient mastery of a program of study. Through this Capstone experience, students will demonstrate mastery in: knowledge of pertinent literature, academic and theoretical grounding, development of professional skills, and the ability to conduct effective educational research.

1. Written Comprehensive Exam

As MEd students in the Educational Research Option approach the end of their first year of study, they will contact their Committee Chair to discuss the format, content, and time frame of their Master’s Thesis. The content of the Master’s Thesis will be an original research project determined by consultation between the chair and the student and must be approved by the student’s Master’s Committee. Students are required to complete the Master’s Thesis using APA format. (Professional Paper Guidelines (http://www.montana.edu/wwweduc/grad/ci/edm/docs/ProfessionalPaperGuidelines.pdf) The completed Master’s Thesis will be submitted to the student’s Committee for evaluation. Committee members will have approximately two weeks to read and evaluate the content and written competency (quality, thoroughness, and completeness of the research) of the Thesis.

2. Oral Comprehensive Exam

At the end of the two-week period, the student will give a 1-2 hour oral presentation and defense of the Thesis to the Master’s Committee. Students can be queried about all areas of program content during the oral presentation and Thesis defense. The presentation will be evaluated for research content and oral competency.

Contact Information

Dr. Ann Ewbank, Program Leader
406-994-5788 Email: a
(tena.versland@montana.edu)nn.ewbank@montana.edu
(ann.ewbank@montana.edu)

Options

• Professional Educator Option (p. 310)
• Technology Education Option (p. 311)
• Educational Researcher Option (p. 311)

Application Process

Applicants are required to submit the following documentation during the online application process through The Graduate School (http://www.montana.edu/wwwedu/apply.html) (A nonrefundable $60 application fee must accompany the online application):

1. Resume/Curriculum Vitae
2. GPA calculation sheet for undergraduate degree – The form is provided during the application process.

3. Academic Transcripts – Provide official transcripts from all higher education institutions attended to the Department of Education Graduate Programs Office, 213 Reid Hall, PO Box 172880, Montana State University, Bozeman, MT 59717. Admission to the program requires a cumulative GPA of 3.0 for the last two years of undergraduate coursework. Applicants who earned a degree from MSU do not need to submit MSU transcripts.

4. Personal Essay – The essay should be a maximum of 4 pages in length, typed, double spaced, and must respond to the following:
   a. Describe your personal strengths as an educator and identify the ways in which you believe you could use your strengths to contribute to the cohort of students with whom you will be studying.
   b. Indicate the content/pedagogical area within curriculum & instruction that you wish to pursue.
   c. Describe the areas in which you want and need to grow as a professional educator/researcher.

5. Three (3) Professional References – During the application process you will be asked to submit contact information for each recommender. One of the recommenders should be from your current direct supervisor. Applicants who do not have a letter from a present supervisor must provide a written explanation identifying the specific reason(s) why they were unable to secure a letter of recommendation from their present supervisor.

6. Official GRE scores – These scores are required ONLY for those applying to the Professional Researcher option. (minimum Verbal 150, Quantitative 145). Submit official scores to Montana State University (code 4488).

7. For International Applicants ONLY - International applicants must submit an English proficiency exam (TOEFL (https://www.ets.org/toefl) or ACE level 7 - Applicants who are not U.S. citizens and not from countries where English is the official language are required to take the Test of English as a Foreign Language and score a minimum 213 (paper version- 550, 80 for the iBT). This requirement may be waived if the applicant has earned an undergraduate or graduate degree from an institution in the U.S.) and a International Student Financial Certificate (http://www.montana.edu/international/admissions/graduatetfncertlfy.pdf).

Application Deadlines

Below are the deadlines by which all of the application materials for the M.Ed. program in Curriculum and Instruction must be submitted via the online application system. By submitting materials by the deadline, accepted students may be eligible for early registration. In order for a graduate degree application to be reviewed for admission, all required application documents must be submitted prior to the department’s posted deadline. Applications received after the deadline may be reviewed for acceptance on a case-by-case basis.

• Fall Semester: April 1st
• Spring Semester: November 1st
• Summer Semester: April 1st

Admission to Curriculum & Instruction Programs

Complete applications will be reviewed and rated by members of the Graduate Admissions Committee who then convene to make final admission decisions. Once applicants are accepted, their applications will be forwarded to The Graduate School for final administrative processing. Please note that the application review process will begin on the application deadline dates and not before.
Contact Information
Maggie Secrest
Graduate Program Assistant
PO Box 172880
Montana State University
Reid Hall 215, Bozeman, MT 59717-2880
margaret.secrest@montana.edu (margaret.secrest@montana.edu)

Professional Educator Option

Objectives
Students who complete the Professional Educator option of the Curriculum & Instruction Master’s degree are expected to demonstrate the knowledge, skills, and dispositions of a Master Teacher.

Four options are available:

- Elementary (K-8) Teachers
- Secondary (6-12) Teachers
- K-12 Music Teachers
- Library Media Certificate Core

Graduates will exhibit:

1. Deep understanding of student development, diversity, and learning processes;
2. Content mastery of the subjects they teach and how to teach those subjects to students;
3. Skill in managing, monitoring, and assessing student learning;
4. Systematic reflection regarding their professional practice and experience; and
5. Commitment to membership in a community of learners.

Program of Study for Elementary (K-8) Teachers

Signature Content - 12 credits

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>EDCI 504</td>
<td>Assessment and Evaluation in Education</td>
<td>12</td>
</tr>
<tr>
<td>EDCI 506</td>
<td>Applied Educational Research</td>
<td></td>
</tr>
<tr>
<td>EDCI 514</td>
<td>Mentoring New Teachers</td>
<td></td>
</tr>
<tr>
<td>EDCI 531</td>
<td>Contemporary Issues in Education</td>
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Core Content - 15 credits; choose from the following

<table>
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<th>Course Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>EDCI 510</td>
<td>Issues and Trends in Social Studies Instruction</td>
<td>15</td>
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<tr>
<td>EDCI 520</td>
<td>Visual Arts and Learning</td>
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<td>EDCI 525</td>
<td>Improvement of Instruction in Science</td>
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<td>EDCI 533</td>
<td>Middle Years School</td>
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<tr>
<td>EDCI 534</td>
<td>Literacy Assessment and Instruction</td>
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<tr>
<td>EDCI 540</td>
<td>American Indian Studies for Ed</td>
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<tr>
<td>EDCI 551</td>
<td>Education Technology: Teaching, Learning, and Leadership</td>
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</tbody>
</table>

EDEL 533
Or Electives relevant to licensure area and approved by graduate advisor

Master’s Capstone - 3 credits

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>EDCI 575</td>
<td>Professional Paper and Project</td>
<td>3</td>
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</table>

Total Credits 30

Program of Study for Secondary (6-12) Teachers

Signature Content - 12 credits

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
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</tr>
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<tbody>
<tr>
<td>EDCI 504</td>
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<td>EDCI 514</td>
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</tr>
<tr>
<td>EDCI 531</td>
<td>Contemporary Issues in Education</td>
<td></td>
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</tbody>
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Core Content - 15 credits; choose from the following

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>EDCI 610</td>
<td>Qualitative Educational Research</td>
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<tr>
<td>EDCI 604</td>
<td>Advanced Educational Psychology</td>
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<tr>
<td>EDCI 532</td>
<td>General School Curriculum</td>
<td></td>
</tr>
<tr>
<td>EDCI 540</td>
<td>American Indian Studies for Ed</td>
<td></td>
</tr>
<tr>
<td>Or Electives relevant to licensure area and approved by graduate advisor</td>
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</tr>
</tbody>
</table>

Master’s Capstone - 3 credits

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>EDCI 575</td>
<td>Professional Paper and Project</td>
<td>3</td>
</tr>
</tbody>
</table>

Total Credits 30

Program of Study for K-12 Music Teachers

Signature Content - 12 credits

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>EDCI 504</td>
<td>Assessment and Evaluation in Education</td>
<td>12</td>
</tr>
<tr>
<td>EDCI 506</td>
<td>Applied Educational Research</td>
<td></td>
</tr>
<tr>
<td>EDCI 514</td>
<td>Mentoring New Teachers</td>
<td></td>
</tr>
<tr>
<td>EDCI 531</td>
<td>Contemporary Issues in Education</td>
<td></td>
</tr>
</tbody>
</table>

Core Content - 9 credits

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>MUSI 504</td>
<td>Studies in Hist and Analysis</td>
<td>9</td>
</tr>
<tr>
<td>MUSE 530</td>
<td>Music, Society, Education</td>
<td></td>
</tr>
<tr>
<td>MUSE 532</td>
<td>Music Ed: Res and Practice</td>
<td></td>
</tr>
<tr>
<td>MUSE 542</td>
<td>Graduate Vocal Pedagogy</td>
<td></td>
</tr>
<tr>
<td>MUST 544</td>
<td>Comp App Mus Ed</td>
<td></td>
</tr>
<tr>
<td>MUSE 545</td>
<td>General Music Practicum</td>
<td></td>
</tr>
<tr>
<td>MUSI 595</td>
<td>Applied Music</td>
<td></td>
</tr>
</tbody>
</table>

Music Education Electives - 6 credits; choose from the following

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>MUSI 540</td>
<td>Advanced Conducting</td>
<td>6</td>
</tr>
<tr>
<td>MUSE 542</td>
<td>Graduate Vocal Pedagogy</td>
<td></td>
</tr>
<tr>
<td>MUST 544</td>
<td>Comp App Mus Ed</td>
<td></td>
</tr>
<tr>
<td>MUSE 545</td>
<td>General Music Practicum</td>
<td></td>
</tr>
<tr>
<td>MUSI 595</td>
<td>Applied Music</td>
<td></td>
</tr>
</tbody>
</table>

upper division ensembles

Master’s Capstone - 3 credits

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>EDCI 575</td>
<td>Professional Paper and Project</td>
<td>3</td>
</tr>
</tbody>
</table>

Total Credits 30

Program of Study for Library Media Certificate Core

A student must apply to the full MEd program either initially or before 9 credits of Library Media coursework have been completed.

Signature Content - 21 credits

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>EDCI 522</td>
<td>Info Resources &amp; Services</td>
<td>21</td>
</tr>
<tr>
<td>EDCI 545</td>
<td>Organization of Information in School Library Media Centers</td>
<td></td>
</tr>
<tr>
<td>EDCI 546</td>
<td>School Library Media Specialist</td>
<td></td>
</tr>
<tr>
<td>EDCI 547</td>
<td>Info Inquiry &amp; Ed Change</td>
<td></td>
</tr>
<tr>
<td>EDCI 548</td>
<td>Management of Information &amp; Resources</td>
<td></td>
</tr>
<tr>
<td>EDCI 549</td>
<td>Applications of Literature for Children and Young Adults</td>
<td></td>
</tr>
<tr>
<td>EDCI 598</td>
<td>Internship</td>
<td></td>
</tr>
</tbody>
</table>

Total Credits 30
absence of the student, the entire committee will discuss their evaluation of
the oral presentation and thesis defense. The chair will lead the committee
to a determination regarding the passing or failing of both the written and
oral components of the thesis.

The thesis defense is graded with either a passing or failing grade -
determined by a majority committee vote. The student will officially pass
the written and oral components of the thesis by demonstrating evidence
of knowledge of pertinent literature, academic and theoretical grounding,
development of professional skills, and the ability to conduct effective
educational research.

A “fail” occurs when a majority of the committee determines that a student
has not demonstrated sufficient evidence of knowledge of pertinent
literature, academic and theoretical grounding, development of professional
skills, or the ability to conduct effective educational research. A failure on
either portion of the thesis is considered to be a failed exam. A failed defense
may be repeated once. At least two months must elapse before the second
defense takes place.

Failure to pass a second thesis defense results in termination of graduate
study and dismissal from the academic program. Students who are
dismissed from the program due to a failed thesis are ineligible to reapply to
the same degree program at any time.

Technology Education Option

Objectives

Students who complete the Technology Education option of the
Curriculum & Instruction Master’s degree are expected to demonstrate the
knowledge, skills, and dispositions of a Master Teacher.

Graduates will exhibit:

1. Skill in managing, monitoring, and assessing student learning;
2. Systematic reflection regarding their professional practice and
   experience; and
3. Commitment to membership in a community of learners.

Program of Study

Core Content - 12 credits

EDCI 504 Assessment and Evaluation in Education
EDCI 506 Applied Educational Research
EDCI 514 Mentoring New Teachers
EDCI 531 Contemporary Issues in Education

Signature Content - 15 credits; choose from the following

TE 501 History and Philosophy of Technology Education
TE 530 3D Modeling & Animation
TE 594 Seminar
EDCI 532 General School Curriculum
EDCI 555 Technology, Instructional Design, and
   Learner Success
EDCI 571 In-Service Education

Electives relevant to licensure area and approved by graduate
advisor

Master’s Capstone - 3 credits

EDCI 575 Professional Paper and Project

Total Credits

30
Contact Information
Dr. Gilbert Kalonde
406-994-5775  kalonde@montana.edu

Master of Education in Educational Leadership

Objectives
The Educational Leadership program at Montana State University is nationally accredited by the Council for the Accreditation of Educator Preparation (CAEP) as well as by the Montana Board of Public Education. The focus of the program is to prepare K-12 school principals to effectively serve Montana communities and rural communities throughout the Northern Plains and Northern Rocky Mountain region of the United States. Those students completing the degree requirements for the MEd will also have met the academic requirements necessary for a Montana Class III Administrative license with a K-12 Principal Endorsement. This is a full Master’s program with a MEd granted upon graduation.

This program of study has been developed to prepare effective K-12 principals. Using a blended delivery model, it seeks to meet the needs of students who desire convenience and face-to-face interaction. Courses will be delivered using distance educational methods during the school year and a few face-to-face instructional sessions. Other face-to-face sessions will be held in conjunction with various administrator association meetings during the semester. During the summer, students will meet on the Bozeman campus for two full weeks of face-to-face instruction. The face-to-face instruction will usually take place during the latter weeks of June or early July.

Program Flow
The ideal time to begin the Educational Leadership masters program is in the summer. Students are expected to take coursework in the sequence outlined in the course offerings found below. Developing a learning community is a critical aspect of principal preparation. To enhance the development of a learning community among the students and to facilitate learning by offering an integrated curriculum, students will be placed into a cohort based on year of acceptance into the program and will matriculate together.

All options in the Educational Leadership program are offered using a combination of delivery methods. Online courses are delivered completely via distance technology and hybrid courses use a combination of distance delivery and face-to-face meetings. The structure of the course will determine the delivery methods employed. For example, the MEd principal preparation coursework is delivered almost completely online using distance delivery methods during the school year with one or two weekend face-to-face sessions, while the summer courses are blended with two weeks of face-to-face instruction.

K-12 Principal Cohort Typical Program of Study

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>EDLD 507</td>
<td>Foundations of Educational Leadership</td>
<td>3</td>
</tr>
<tr>
<td>EDLD 508</td>
<td>Supervision of Instruction</td>
<td>3</td>
</tr>
<tr>
<td>EDLD 515</td>
<td>Planned Change</td>
<td>3</td>
</tr>
<tr>
<td>EDLD 520</td>
<td>Schools &amp; Diverse Communities</td>
<td>3</td>
</tr>
<tr>
<td>EDLD 526</td>
<td>Evaluating School Programs</td>
<td>3</td>
</tr>
<tr>
<td>EDLD 532</td>
<td>School Law</td>
<td>3</td>
</tr>
<tr>
<td>EDLD 534</td>
<td>Data Driven Decisions</td>
<td>3</td>
</tr>
<tr>
<td>EDLD 555</td>
<td>School Finance</td>
<td>3</td>
</tr>
<tr>
<td>EDLD 565</td>
<td>K-12 Instructional Leadership</td>
<td>3</td>
</tr>
</tbody>
</table>

EDLD 574  Field Exper in Ed Ldrship (I & II)  6
EDLD 566  Administration and Supervision of Special Education Programs  3

Total Credits  36

Committees
Each master’s student’s committee must consist of three members. The chair and one other member must be from the Educational Leadership faculty. The third committee member must have academic credentials in the area of the student’s program of study and be approved by the Head of the Department of Education and Dean of the College of Graduate Studies.

Chairs
The student should carefully select his/her chair after thorough conversations with the approved Educational Leadership faculty members. The chair will serve as the student’s primary advisor. The committee, as a whole, is subject to the approval of the Head of the Department of Education. Chairs and members of a student’s committee are subject to change. In addition, revision to the program of study can be made during the course of study with the chair’s approval.

Contact Information
Dr. Tena Versland, Program Leader
406-994-6799  Email: tena.versland@montana.edu

Dr. Bill Ruff
406-994-4182  Email: wruff@montana.edu

Dr. David Henderson
406-994-6424  Email: david.henderson3@montana.edu

Dr. Art Bangert
406-994-7424  Email: abangert@montana.edu

Application Materials for the MEd in Educational Leadership

1. GPA calculation form: The form is provided during the application process. NOTE: We require a GPA of 3.00 for the last two (2) years of undergraduate course work.

2. Resume/Curriculum Vitae

3. Three (3) letters of recommendation: Candidates must meet the following criteria for one of the three letters of recommendation.
   a. At least one of the three letters must be from the candidate’s DIRECTOR. That means a school district administrator who (a) is currently administratively certified by the Montana Office of Public Instruction or other equivalent state agency; AND (b) currently acts as direct supervisor for the candidate, and has done so for a minimum period of one semester. If for any reason you cannot secure a letter from your present supervisor, then:


b. At least one of the letters of recommendation must be from a **PREVIOUS** direct supervisor. That means a school district administrator who is (a) currently certified by the Montana Office of Public Instruction or other equivalent state agency; **AND** (b) has, at some point preceding the date of this application, acted as direct supervisor for the candidate for a minimum period of one semester. **Any applicant who does not have a letter from a present direct supervisor must indicate in the self-nomination letter** (see below) the specific reason(s) why they were unable to secure a letter of recommendation from their present supervisor.

4. **Self-Nomination Letter:** The self-nomination letter should be 2-3 pages, double-spaced, and focus on the following:
   a. Your development and growth as a teacher, including professional development
   b. Your contributions to the school and district
   c. Your development as a leader. Specific examples are needed that clarify how you have grown as a leader and your leadership activities
   d. Your specific goals, including a timeline for assuming a school leadership position
   e. Your motivation to become a school leader and an explanation of how you came to this decision, and
   f. Personal qualities you possess that are desirable in a leader

5. **Academic Transcripts:** Official transcripts verifying all Bachelor's Degree course work should be sent to the Department of Education Graduate Programs Office, 215 Reid Hall, PO Box 172880, Montana State University, Bozeman, MT 59717. Transcripts from a degree awarded through MSU are not needed.

6. For International Applicants ONLY -
   a. TOEFL (https://www.ets.org/toefl) or **ACE level 7** - Applicants who are not U.S. citizens and not from countries where English is the official language are required to take the Test of English as a Foreign Language and score a minimum 213 (paper version-550, 80 for the iBT). This requirement may be waived if the applicant has earned an undergraduate or graduate degree from an institution in the U.S.
   b. International Student Financial Certificate (http://www.montana.edu/international/admissions/graduatefinancialcertificate.pdf)

**Application Deadlines**

Below is the deadline by which all of the application materials for the Master’s Program in Educational Leadership must be submitted via the online application system. By submitting materials by the deadline, accepted students may be eligible for early registration. In order for a graduate degree application to be reviewed for admission, all required application documents must be submitted prior to the department’s posted deadline. Applications received after the deadline may be reviewed for acceptance on a case-by-case basis.

- Fall Semester: April 1st
- Spring Semester: April 1st
- Summer Semester: April 1st

**Contact Information**

Maggie Secrest  
Graduate Program Assistant  
PO Box 172880

Montana State University  
Reid Hall 215, Bozeman, MT 59717-2880  
margaret.secrest@montana.edu  (margaret.secrest@montana.edu)

**Doctor of Education in Adult & Higher Education**

**Objectives**

At the Doctor of Education level, the Adult & Higher Education program offers two specializations:

**Higher Education Academics**

The EdD Higher Education Academics specialization is intended for individuals who will teach and/or provide academic leadership and support within a range of diverse post-secondary settings. Individuals pursuing this option may hold a Master’s degree within higher education or another discipline in which they will teach or provide academic leadership.

**Higher Education Administration**

The EdD in Higher Education Administration specialization is intended for individuals who will contribute to the administrative leadership and support within a range of diverse post-secondary settings. The primary objective of the degree is to produce informed scholarly practitioners for mid- to upper-level management or administrative positions. These individuals typically manage or direct either academic or student affairs operational functions.

**Program Flow**

After acceptance, the student will be assigned a temporary advisor and should then meet with his/her assigned advisor. During the first semester, students will complete the 1-credit Doctoral Seminar (EDU 691). Coursework will be based on the student’s previous academic work and advisor/committee approval. By the third semester of enrollment, the student will identify a graduate committee chair and committee members, establish and submit their program of study to the Graduate School, and clarify plans for the comprehensive examination.

Near the end of completing course requirements, the student will write the comprehensive exam and will later meet with the committee for the oral defense of the comprehensive exam. If deemed necessary by the committee, the student may be required to take additional coursework to make up identified deficiencies. Toward the end of the program, the student will take 3-credit hours of Dissertations Seminar (EDU 650) to begin preparation of the proposal. During the proposal preparation, the student will work closely with his/her chair and the readers of the committee with progress being made each semester. The student then presents/defends their proposal, which includes the study introduction, literature review, and research methodology. The student conducts the research and writes the dissertation, with progress being made each semester toward completion. When the committee chair determines the student is ready, the student defends the dissertation.

**Committees**

Each doctoral student’s committee must consist of at least four approved members. The chair and one other approved member must be from the Adult & Higher Education faculty. Two other approved members will be selected based upon their ability to contribute to the student’s studies leading up to and through the dissertation research. These two committee members must have academic credentials in the area of the student’s program of study and be approved by the Head of the Department of
Education and Dean of The Graduate School. For information regarding graduate representatives, please refer to the Graduate School policy.

**Chairs**

The student should carefully select his/her graduate committee chair after thorough conversations with the approved Adult & Higher Education faculty members that he/she believes might have an interest in their doctoral research agenda and/or the ability to work with them toward generating a defensible dissertation. The chair will give strong leadership and approval regarding the balance of the committee’s potential membership. The committee, as a whole, is subject to the approval of the Head of the Department of Education. The chair will facilitate program approval, comprehensive exam planning and clarification, proposal hearing, and dissertation defense. The chair and two other committee members will be the primary “readers” of the dissertation as it is being written. The importance of selecting the right chair cannot be overstated. However, chairs and members of a student’s committee are subject to change. In addition, revision to the program of study can be made during the course of study with the chair’s approval.

**Comprehensive Examinations**

Comprehensive examinations are required for completion of all graduate degrees at Montana State University. Students are expected to demonstrate mastery of the program of study and the ability to interact with the research in that area. Students should refer to The Graduate School’s web page at: http://www.montana.edu/gradschool/policy/degreq_doctoral.html. The comprehensive exams must be completed by the posted Graduate School deadlines.

Near the end of completing coursework and before the dissertation proposal defense, EdD students will complete a written and oral comprehensive exam. The exam is completed in writing and then orally defended in front of the entire Graduate Committee. Through the comprehensive exam, students will be expected to demonstrate:

- a competency in the breadth of knowledge covered in their coursework
- the ability to integrate concepts from courses into a holistic viewpoint
- the ability to apply material to anticipated real life situations based on the theoretical principles and concepts covered in classes
- the ability to critically read, analyze, and critique research
- a readiness to move forward to create their own research

Generally, there will be four primary question areas:

- Specialization area
- Foundation of Higher Education
- Research
  - Read, analyze, and critique a research article
  - Design a project - will be expected to demonstrate a mastery of aspects of both qualitative and quantitative projects (such as sampling, validity, reliability, and data analysis)

However, these areas may be revised according to individual programs.

**Additional Doctor of Education Requirements**

The Doctor of Education degree must meet the minimum requirements in the For Doctoral Students section on The Graduate School’s website with the following exception: only fourteen (14) credits of dissertation are required. Additional requirements for the EdD degree beyond these minimums are available through the Department of Education. All EdD degree candidates are expected to be familiar with both The Graduate School’s degree requirements listed here: http://www.montana.edu/gradschool/policy/degreq_doctoral.html and Department of Education degree requirements listed on each of the three program’s websites.

**Contact Information**

**EdD in Higher Education Options:**
- EdD Higher Education Academics (Teaching) (p. 315)
- EdD Higher Education Administration (p. 315)

**Application Process for the Doctor of Education in Adult & Higher Education**

Applicants are required to complete the online application and submit the following documentation via the [Graduate School Online Application System](http://www.montana.edu/wwwdg/apply.html)

1. Completed Graduate School Application
2. GPA calculation sheet (The form is provided during the application process).
3. Resume/Curriculum vitae.
4. Documentation of verbal and quantitative skills needed for the degree: Submit official GRE (minimum Verbal 150, Quantitative 145) or MAT scores (minimum 390) sent from the testing agency to Montana State University (code 4488).
5. Academic Transcripts: Applicants must provide official transcripts verifying all Bachelors degree and Masters degree course work. Unofficial transcripts may be uploaded during the application process. Official transcripts must be sent from the Institution directly to the Department of Education Graduate Programs Office, 215 Reid Hall, PO Box 172880, Montana State University, 59717. Electronic transcripts are also acceptable as long as they arrive directly from the applicants certifying university. Please have electronic transcripts sent to margaret.secrest@montana.edu. Transcripts will be evaluated for rigor and academic fit.
6. Personal essay: Suggested length is 2-3 pages, double-spaced. The applicant should briefly describe the following:
   a. Background,
   b. Prior professional and leadership experience
   c. Why the interest in the EdD program
   d. How the applicant plans to use the degree.
7. Three (3) professional references: The letters should be from individuals qualified to assess the following:
   a. Applicant’s ability and potential as a graduate student
   b. Attest to the applicants work ethic and professionalism
   c. References from relatives are not acceptable.
8. For International Applicants ONLY: In addition to the above, international applicants will be required to submit the following:
   a. TOEFL (https://www.ets.org/toefl) or ACE level 7 – Applicants who are not U.S. citizens and not from countries where English is the official language are required to take the Test of English as a Foreign Language and score a minimum 213 (paper version-550, 80 for the iBT). This requirement may be waived if the applicant has earned an undergraduate or graduate degree from an institution in the U.S. For more information on the International application process, see this link: http://www.montana.edu/gradschool/policy/admissions_intl.html
   b. International applicants must fill out an International Student Financial Certificate.
Application Deadlines
Below is the deadline by which all of the application materials for the EdD in Adult & Higher Education must be submitted via the online application system. Students matriculate into the EdD program in the fall semester only. Applications to the EdD programs are reviewed once per year at the April 1 deadline. Applications received after the deadline may be reviewed for acceptance on a case-by-case basis.

- Fall Semester: April 1st

Contact Information
Maggie Secrest, Graduate Program Assistant
PO Box 172880
Montana State University
Reid Hall 215, Bozeman, MT 59717-2880
Email: margaret.secrest@montana.edu (margaret.secrest@montana.edu)

EdD Higher Education Academics (Teaching) Option
Objectives
This EdD Higher Education Academics specialization educates informed practitioners who want to teach or provide academic leadership and support at the post-secondary level. Students will work with their advisor on designing a program of study that meets their educational and professional objectives.

Program of Study
Core Courses (12 Credit Hours)
- EDLD 605 Higher Education History and Philosophy
- EDLD 616 Organization and Administration of Higher Education
- EDLD 628 College Students
- EDU 637 Institutional Research and Assessment
 or
- EDU 614 Planning Program Assessment

Other Required Core Courses (4 Credit Hours)
- EDU 650 Dissertation Seminar
- EDU 691 Doctoral Seminar

Electives (15-24 credit hours) 15-24
- EDLD 509 Issues and Trends in Higher Education
- EDLD 512 Finance and Administration in Higher Education
- EDLD 513 Resource and Program Management
- EDU 612 Critical Race Theory
- NASX 523 Am Indians/Minority in High Ed
- EDLD 529 Post Secondary Distance Delivered Education
- EDLD 635 College Teaching
- EDLD 531 Theoretical Foundations of Student Services
- EDLD 533 Law and Policy in Higher Education
- EDLD 535 Student Services

Approved electives may be selected from other Education programs or departments that strengthen the student’s program of study. These courses need to be selected in consultation with the chair.

Statistics and Research Courses (9 Credit Hours beyond the masters)
- EDU 602 Educational Statistics II
- EDU 610 Qualitative Educational Research
- EDU 607 Quantitative Educational Research

Dissertation (14 Credit Hours)
- EDLD 690 Doctoral Thesis

Total Credits 54-60

* EDCI 506, EDU 602 or equivalent are prerequisite courses.

Higher Education Administration Option
Objectives
This EdD Higher Education Administration specialization educates informed scholarly practitioners for mid-to-upper level management or administrative positions within a range of diverse post-secondary settings. Students will work with their advisor on designing a program of study that meets their educational and professional objectives. Coursework is divided into two categories: required and electives, and research and statistics. Doctoral students must conduct research and write an original theory-based dissertation. Courses are offered generally on evenings and weekends. Many courses are offered as blended courses with a combination of face-to-face and distance delivery.

Program of Study
Core Courses (12 Credit Hours)
- EDLD 605 Higher Education History and Philosophy
- EDLD 616 Organization and Administration of Higher Education
- EDLD 628 College Students
- EDU 637 Institutional Research and Assessment
 or
- EDU 614 Planning Program Assessment

Other Required Core Courses (4 Credit Hours)
- EDU 650 Dissertation Seminar
- EDU 691 Doctoral Seminar

Electives (15-24 credit hours) 15-24
- EDLD 509 Issues and Trends in Higher Education
- EDLD 512 Finance and Administration in Higher Education
- EDLD 513 Resource and Program Management
- EDU 612 Critical Race Theory
- NASX 523 Am Indians/Minority in High Ed
- EDLD 529 Post Secondary Distance Delivered Education
- EDLD 635 College Teaching
- EDLD 531 Theoretical Foundations of Student Services
- EDLD 533 Law and Policy in Higher Education
- EDLD 535 Student Services
Doctor of Education in Curriculum & Instruction

Program Objectives
The Doctor of Education (EdD) degree in Curriculum and Instruction has been designed to prepare students to teach in teacher education programs across the country in college and university settings. Progress through the degree provides students with opportunities to develop their professional knowledge and skills in the areas of research, teaching, and service.

The graduate faculty is committed to offering multiple avenues for students to reach their goals and expectations for advanced study in teaching, learning, and teacher education. The program takes an integrated approach to pre-service teacher education. The study of the theoretical underpinnings of teacher education are carefully examined in the context of practical experiences in teacher education research, college teaching, and professional service.

Program Flow
After being admitted the student will be assigned a temporary advisor and should then meet with his/her assigned advisor. Actual courses taken during the initial stage will be based on the student’s previous academic work and advisor/committee approval.

The EdD program emphasizes the study of disciplinary content knowledge and related theories guided by a scholar-practitioner approach that can be used to devise applied research studies designed to solve practical problems encountered in K-12 school systems. The program is structured to be completed in 3 to 4 years with tuition support for a limited number of residential EdD students.

Program of Study

Core Content ~ 15 Credits
Research - 9 credits; choose from the following:
- EDCI 506: Applied Educational Research
- EDU 610: Qualitative Educational Research
- EDU 607: Quantitative Educational Research

Or Research Electives appropriate to area of specialization & approved by Graduate Advisor
Curriculum & Instruction Core - 3 credits; choose from the following:
- EDCI 604: Advanced Educational Psychology

Statistics and Research Courses (9 Credit Hours beyond the masters)
- EDU 602: Educational Statistics II
- EDU 610: Qualitative Educational Research
- EDU 607: Quantitative Educational Research

Or Curriculum & Instruction Electives appropriate to area of specialization & approved by Graduate Advisor

Internships/Apprenticeships - 3 credits; choose one or more of the following:
- EDCI 598: Internship (Teaching)
- EDCI 598: Internship (Supervision)
- EDCI 598: Internship (Research)
- EDCI 592: Independent Study

Concentration ~ 15 credits
Courses selected appropriate to area of specialization & approved by Graduate Advisor

Dissertation ~ 15 credits
- EDCI 690: Doctoral Thesis

Doctor of Education in Curriculum & Instruction

Committees
Each doctoral student’s committee must consist of at least four approved members. The chair and one other approved member must be from the Curriculum & Instruction faculty. Two other approved members will be selected based upon their ability to contribute to the student’s studies leading up to and through the dissertation research. These two committee members must have academic credentials in the area of the student’s program of study and be approved by the Head of the Department of Education and Dean of The Graduate School. For information regarding graduate representatives, please refer to the Graduate School policy.

Chairs
The student should carefully select his/her chair after thorough conversations with those Curriculum & Instruction faculty members that he/she believes might have an interest in their doctoral research agenda and/or the ability to work with them toward generating a defensible dissertation. The chair will give leadership and approval regarding the balance of the committee’s potential membership. The committee, as a whole, is subject to the approval of the Head of the Department of Education. The chair will facilitate program approval, comprehensive exam planning and clarification, proposal hearing, and dissertation defense. Chairs and members of a student’s committee are subject to change. Revision to the program of study can be made during the course of study with the chair’s approval.

Comprehensive Examinations
As EdD students in Curriculum & Instruction approach the end of their coursework (30 credits completed), and prior to the Dissertation Proposal Meeting, they will contact their committee chair to discuss the content and format of the required written and oral comprehensive examinations. The Written Comprehensive Examination will be composed of one question from each of three primary areas:

- Educational Foundations (e.g., synthesis of theoretical and empirical literature regarding various aspects of teaching and learning),
- Educational Research (demonstration of mastery of aspects of both qualitative and quantitative projects such as sampling, validity, reliability, data analysis), and
- The student’s major area of study (e.g., methods of science education for pre-service teachers). Students who are completing a minor (e.g., History) will answer one additional question in their minor area.
The committee chair will discuss the process with committee members and based upon the members’ area of expertise, designate one member to compose an appropriate question for each of the suggested areas. The members will submit their questions to the chair who will compile them and give them to the student. The Written Comprehensive Examination will be structured as a written take-home exam that is to be completed over the subsequent 1 to 2 week period. Students are required to complete the exam using APA format.

The completed written examination will be submitted to the committee chair and copies will be distributed to the entire doctoral committee for evaluation. Committee members will have two weeks to read and evaluate the content and written competency of the student’s responses. At the end of the two week period, the committee will meet for a two-hour Oral Comprehensive Examination. The chair will facilitate the meeting and determine the order of questioning. At the completion of the questioning and in the absence of the student, the entire committee will discuss their evaluation of the outcome of the examination. The chair will work with the committee to make a determination regarding passing or failing both the written and comprehensive components of the examination.

The comprehensive exams must be completed by the posted Graduate School deadlines.

Additional Doctor of Education Requirements

The Doctor of Education degree must meet the minimum requirements in the For Doctoral Students section of the Graduate School’s website. Additional requirements for the EdD degree beyond these minimums are available through the Department of Education. All EdD degree candidates are expected to be familiar with both The Graduate School’s degree requirements listed here: http://www.montana.edu/gradschool/policy/dregq_doctoral.html#degreq_doc_gen and the Department of Education degree requirements listed on the department website.

Contact Information
Dr. Ann Ewbank, Program Leader
406-994-5788 Email: a.ewbank@montana.edu
(tena.versland@montana.edu)nn.ewbank@montana.edu
(ann.ewbank@montana.edu)

Application Process for the Doctorate of Education in Curriculum and Instruction

Applicants are required to complete the online application and submit the following documentation via the Graduate School Online Application System (http://www.montana.edu/wwwdg/apply.html).

1. Completed Graduate School Application
2. GPA calculation sheet for Masters Degree (provided during the application process)
3. Resume/Curriculum Vitae
4. Documentation of verbal and quantitative skills needed for the degree: Submit official Graduate Record Exam (GRE) scores – Applicants are required to take the General Test of the GRE (the subject exam is not required); minimum Verbal score of 150 and a minimum Quantitative score of 145. Scores should be sent from the testing agency to Montana State University (code 4488).
5. Academic Transcripts: Applicants must provide Official transcripts verifying all Bachelor’s degree and Master’s degree coursework. Unofficial transcripts may be uploaded during the online application process. Official transcripts must be sent from the Institution directly to the Department of Education Graduate Programs Office, 215 Reid Hall, PO Box 172880, Montana State University, Bozeman, MT 59717. Electronic transcripts are also acceptable as long as they arrive directly from the applicants’ certifying university. Please have electronic transcripts sent to margaret.secrest@montana.edu.

6. Personal Essay: The essay should be a maximum of 4 pages in length, typed, double spaced, and respond to the following:
   a. Describe your development as an educator, your future career goals, and how you see the completion of a Doctoral Degree in Curriculum & Instruction as helping you achieve your goals.
   b. Describe your personal strengths and interests as an educator and identify the ways in which you believe you could use your strengths to contribute to the cohort of students with whom you will be studying.
   c. Indicate whether you would be studying as a resident close to the MSU campus or via distance education.
   d. Indicate the area of curriculum, instruction, or teacher education in which you would like to conduct research.

7. Three (3) Professional References

8. For International Applicants ONLY: In addition to the above, International applicants will be required to submit the following:
   a. English proficiency scores: TOEFL or ACE level 7: Applicants who are not U.S. citizens and not from countries where English is the official language are required to take the Test of English as a Foreign Language and a score a minimum 213 (paper version – 550, 60 for the iBT). This requirement may be waived if the applicant has earned an undergraduate or graduate degree from an institution in the U.S. For more information on the International application process, see this link: http://www.montana.edu/gradschool/policy/admissions_intl.html
   b. International Applicants must complete an International Student Financial Certificate (http://www.montana.edu/international/admissions/graduatefinancialcertificate.pdf)

Application Deadlines

Below is the deadline by which all of the application materials for the EdD program in Curriculum and Instruction must be submitted via the online application system. Students matriculate into the EdD program in the fall semester only. Applications to the EdD programs are reviewed once per year at the April 1 deadline. Applications received after the deadline may be reviewed for acceptance on a case-by-case basis.

• Fall Semester: April 1st

Admission Process

Complete applications will be reviewed by members of the Graduate Admissions Committee who then convene to make final admission decisions. Once a decision has been made the application will be forwarded to The Graduate School for final administrative processing. Please note that the application review process will begin on the application deadline dates and not before.

Contact Information
Maggie Secrest, Graduate Program Assistant
PO Box 172880
Reid Hall 215, Bozeman, MT 59717-2880
Email: margaret.secrest@montana.edu (margaret.secrest@montana.edu)
Doctor of Education in Educational Leadership

Objectives
Those students completing the degree requirements for the EdS or EdD will have met the academic requirements necessary for a Montana Class III Administrative license with a Superintendent endorsement. Additionally, a non-degree Superintendent Preparation program is available for those students who already hold a Master’s degree and Principal Licensure (please see Post Master’s Superintendent Licensure (p. 303)).

Program Flow
The Educational Leadership program courses are offered using a combination of delivery methods. Online courses are delivered completely via distance technology and blended courses use a combination of distance delivery and face-to-face meetings. The structure of the course will determine the delivery methods employed. For example, many EdD program courses are usually blended such that the class meets for face-to-face instruction one weekend a month and online during the weeks in between meetings.

After admission to the EdD program, the applicant will be assigned a temporary advisor and should then meet with his/her assigned advisor. Actual courses taken during the initial stage will be based on the student’s previous academic work and advisor/committee approval.

Program of Study

<table>
<thead>
<tr>
<th>Doctoral Core</th>
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</thead>
<tbody>
<tr>
<td>EDCI 604 Advanced Educational Psychology</td>
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</tr>
<tr>
<td>EDLD 610 Ldrshp and Organizational Thry</td>
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<tr>
<td>EDLD 630 Supervision &amp; Instruct Ldrshp</td>
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<td>EDLD 643 Leading Social Justice</td>
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<td>EDLD 657 Ed Policy &amp; Politics</td>
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<td>EDLD 591 Special Topics</td>
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<tr>
<th>Superintendent Certification Required Courses</th>
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<tr>
<td>EDLD 620 The School Superintendent</td>
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<td>EDLD 645 Personell and Collective Bargaining in MT</td>
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<tr>
<td>EDLD 650 MT Finance &amp; Facilities</td>
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<td>EDLD 655 MT Legal &amp; Policy Studies</td>
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Total Credits: 53

Committees
Each doctoral student’s committee must consist of at least four approved members. The chair and one other approved member must be from the Educational Leadership faculty. Two other approved members will be selected based upon their ability to contribute to the student’s studies leading up to and through the dissertation research. These two committee members must have academic credentials in the area of the student’s program of study and be approved by the Head of the Department of Education and Dean of the Graduate School. For information regarding graduate representatives, please refer to the Graduate School policy.

Chairs
The student should carefully select his/her chair after thorough conversations with the Educational Leadership faculty members that he or she believes might have an interest in their doctoral research and/or the ability to work with them towards generating a defensible dissertation. The committee as a whole is subject to approval by the Head of the Department of Education. The chair will advise students in selecting committee members and in understanding the dissertation process. The chair and at least one committee member will be the primary readers of the dissertation as it is being written. The importance of selecting the right chair cannot be overstated. However, chairs and members of the student’s committee are subject to change. In addition, revision to the program of study can be made during the course of study with the committee’s approval.

Comprehensive Examinations

Comprehensive examinations are required for completion of all EdD degrees in Educational Leadership. Students are expected to demonstrate mastery of the program of study and the ability to interact with the research in that area. Students should refer to The Graduate School’s Policies and Procedures (http://www.montana.edu/gradschool/policy/degreq_doctoral.html#degreq_doc_gen) web page.

After completion of at least two thirds of the required coursework, EdD students will complete a written comprehensive exam. The exam is completed in writing and then orally defended in front of the entire Graduate Committee. Through the comprehensive exam, students will be expected to demonstrate: 1) the ability to integrate concepts from courses into a holistic viewpoint; 2) the ability to apply material to anticipated real-life situations based on the theoretical principles and concepts covered in classes; 3) the ability to critically read, analyze, and critique research; and 4) a readiness to move forward to create their own research.

Generally, there are two primary question areas: 1) Identification of a topic with the potential to contribute to the literature in Educational Leadership, and a critical evaluation of the research on that topic; and 2) Design a research project on the topic of interest. Students will be expected to demonstrate a mastery of aspects of both qualitative and quantitative projects (such as sampling, validity, reliability, data analysis).

Additional Doctor of Education Requirements

The Doctor of Education degree must meet the minimum requirements in the For Doctoral Students section of the Graduate School’s website with the following exception: only fourteen (14) credits of dissertation are required. Additional requirements for the EdD degree beyond these minimums are available through the Department of Education. All EdD degree candidates are expected to be familiar with both The Graduate School’s degree requirements (http://www.montana.edu/gradschool/policy/degreq_doctoral.html#degreq_doc_gen) and Department of Education degree requirements listed on the program’s website.

Contact Information

Dr. Tena Versland, Program Leader
406-994-6799 Email: tena.versland@montana.edu

Dr. Bill Ruff
406-994-4182 Email: wruff@montana.edu

Dr. David Henderson
Application process:
Applicants are to submit the following documentation during the application process. Complete the online application through the Graduate School Online Application System (http://www.montana.edu/wwwdg/apply.html)

Applicants are to submit the following documentation during the application process:

1. Completed Graduate School Application
2. GPA calculation form: The form is provided during the application process. NOTE: We require a GPA of 3.00 for the last two (2) years of undergraduate course work.
3. Resume/Curriculum Vitae
4. Documentation of verbal and quantitative skills needed for the degree: The general test of the Graduate Record Examination (GRE) or Miller Analogies Test (MAT) is required of all doctoral students prior to consideration for admission in the Department of Education. The expected minimum score for the GRE is 150 on the Verbal and 145 on the Quantitative. The expected minimum score on the MAT is 413. Official scores can be sent to Montana State University (code 4488).
5. Personal Essay: Suggested length is 2-3 typed, double-spaced pages. The applicant should briefly describe the following:
   a. Education and other educational professional experiences
   b. Research interests and experience including alignment with faculty interests and expertise and an example of research experiences using educational theory, research methods, and application.
   c. Professional goals
6. Three (3) letters of recommendation: (NOTE: At least one of the three letters must be from the candidate’s direct supervisor in his/her educational field.) The letters should be from individuals qualified to assess the following:
   a. Knowledge in chosen field
   b. Motivation and perseverance toward goals
   c. Ability to work independently
   d. Ability to express thoughts in speech and writing
   e. Ability/potential for college teaching
   f. Ability to plan and conduct research
7. Academic Transcripts: Applicants must provide Official transcripts verifying all Bachelor’s degree and Master’s degree coursework. Unofficial transcripts may be uploaded during the online application process. Official transcripts must be sent from the Institution directly to the Department of Education Graduate Programs Office, 215 Reid Hall, PO Box 172880, Montana State University, Bozeman, MT 59717. Electronic transcripts are also acceptable as long as they arrive directly from the applicants’ certifying university. Please have electronic transcripts sent to margaret.secrest@montana.edu.

8. For International Applicants ONLY: In addition to the above, international applicants will be required to submit the following:
   a. TOEFL (https://www.ets.org/toefl) or ACE level 7 - Applicants who are not U.S. citizens and not from countries where English is the official language are required to take the Test of English as a Foreign Language and a score a minimum 213 (paper version 550, 60 for the iBT). This requirement may be waived if the applicant has earned an undergraduate or graduate degree from an institution in the U.S. For more information on the international application process, see this link: http://www.montana.edu/gradschool/policy/admissions_intl.html
   b. International Student Financial Certificate

Application Deadlines
Below is the deadline by which all of the application materials for the EdD in Educational Leadership must be submitted via the online application system. Students matriculate into the EdD program in the fall semester only. Applications to the EdD programs are reviewed once per year at the April 1 deadline. Applications received after the deadline may be reviewed for acceptance on a case-by-case basis.

- Fall Semester: April 1st

Contact Information
For additional application information:
Maggie Secrest
Graduate Program Assistant
PO Box 172880
Montana State University
Reid Hall 215
Bozeman, MT 59717-2880
margaret.secrest@montana.edu (margaret.secrest@montana.edu)

Doctor of Philosophy in Adult & Higher Education

Objectives
The PhD in Education with the Adult & Higher Education specialization educates individuals who wish to become faculty members and/or who wish to conduct research to inform post-secondary policy and practice. Students will work with their advisor on designing a program of study that meets their educational and professional objectives.

Coursework is divided into two categories: required and electives, and research and statistics. Doctoral students must conduct research and write an original theory-based dissertation. Courses are offered generally on evenings and weekends. Many courses are offered in blended format with a combination of face-to-face and distance delivery.
Residency Requirement

The PhD requires one year of on-campus full-time residency. The residency requirement consists of two consecutive semesters of full-time enrollment (6-9 credits per semester) in PhD coursework.

Program of Study

Core Content - choose 9 credits

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>EDLD 605</td>
<td>Higher Education History and Philosophy</td>
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<td>EDCI 604</td>
<td>Advanced Educational Psychology</td>
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<tr>
<td>EDLD 653</td>
<td>College Teaching</td>
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<td>EDLD 610</td>
<td>Ldrshp and Organizational Thry</td>
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<td>EDLD 643</td>
<td>Leading Social Justice</td>
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Required Core Content Courses - 4 credits

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<tr>
<th>Course Code</th>
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<tbody>
<tr>
<td>EDU 650</td>
<td>Dissertation Seminar</td>
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<tr>
<td>EDU 691</td>
<td>Doctoral Seminar</td>
<td></td>
</tr>
</tbody>
</table>

Electives - 15 credits

Approved electives may be selected from other Education programs or departments that strengthen the student’s program of study. These courses need to be selected in consultation with the chair.

Required Research Courses - 9 credits

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>EDU 602</td>
<td>Educational Statistics II</td>
<td>9</td>
</tr>
<tr>
<td>EDU 610</td>
<td>Qualitative Educational Research</td>
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<td>EDU 607</td>
<td>Quantitative Educational Research</td>
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Advanced Research Electives - choose 9 credits

<table>
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<tr>
<td>EDU 614</td>
<td>Planning Program Assessment</td>
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<tr>
<td>EDU 612</td>
<td>Critical Race Theory</td>
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<tr>
<td>EDU 637</td>
<td>Institutional Research and Assessment</td>
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<tr>
<td>EDU 606</td>
<td>Mixed Methods Research Design in Education</td>
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<tr>
<td>EDU 608</td>
<td>Advanced Quantitative Research</td>
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<tr>
<td>EDU 611</td>
<td>Indigenous Methodologies in Educational Research</td>
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<tr>
<td>EDU 613</td>
<td>Planning Program Assessment</td>
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</tbody>
</table>

Electives also may be taken that are appropriate to the research area of specialization and approved by the graduate advisor.

Dissertation - 18 credits

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
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<tbody>
<tr>
<td>EDLD 690</td>
<td>Doctoral Thesis</td>
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</table>

Total Credits 64

Comprehensive Examinations

Comprehensive examinations are required for completion of all graduate degrees at Montana State University. Students are expected to demonstrate mastery of the program of study and the ability to interact with the research in that area. Students should refer to The Graduate School’s web page at: http://www.montana.edu/gradschool/policy/dregreq_doctoral.html.

The comprehensive exam must be completed by the posted Graduate School deadlines.

Near the end of completing coursework and before the dissertation proposal defense, PhD students will complete a written and oral comprehensive exam. The exam is completed in writing and then orally defended in front of the entire Graduate Committee.

Through the comprehensive exam, students will be expected to demonstrate:

- a competency in the breadth of knowledge covered in their coursework
- the ability to integrate concepts from courses into a holistic viewpoint
- the ability to apply material to anticipated real life situations based on the theoretical principles and concepts covered in classes
- the ability to critically read, analyze, and critique research
- a readiness to move forward to create their own research

Generally, there will be four primary question areas:

- Specialization area
- Foundation of Higher Education
- Research
  - Read, analyze, and critique a research article

Program Flow

After acceptance, the student will be assigned a temporary advisor and should then meet with his/her assigned advisor. During the first semester, students will complete the 1-credit Doctoral Seminar (EDU 691). Coursework will be based on the student’s previous academic work and advisor/committee approval. By the third semester of enrollment, the student will identify a graduate committee chair and committee members, establish and submit their program of study to the Graduate School, and clarify plans for the comprehensive examination.

Near the end of completing course requirements, the student will write the comprehensive exam and will later meet with the committee for the oral defense of the comprehensive exam. If deemed necessary by the committee, the student may be required to take additional coursework to make up identified deficiencies. Toward the end of the program, the student will take 3 hours of Dissertation Seminar (EDU 650) to begin preparation of the proposal. During the proposal preparation, the student will work closely with his/her chair and the readers of the committee with progress being made each semester. The student then presents/defends their proposal, which includes the study introduction, literature review, and research methodology. The student conducts the research and writes the dissertation, with progress being made each semester towards completion. When the chair determines the student is ready, the student defends the dissertation.

Chairs

The student should carefully select his/her graduate committee chair after thorough conversations with those Adult & Higher Education faculty members that he/she believes might have an interest in their doctoral research agenda and/or the ability to work with them toward generating a defensible dissertation. The chair will give leadership and approval regarding the balance of the committee’s potential membership. The committee, as a whole, is subject to the approval of the Head of the Department of Education. The chair will facilitate program approval, comprehensive exam planning and clarification, proposal hearing, and dissertation defense. Chairs and members of a student’s committee are subject to change. Revision to the program of study can be made during the course of study with the chair’s approval.

Committees

Each doctoral student’s committee must consist of at least four approved members. The chair and one other approved member must be from the Adult & Higher Education faculty. Two other approved members will be selected based upon their ability to contribute to the student’s studies leading up to and through the dissertation research. These two committee members must have academic credentials in the area of the student’s program of study and be approved by the Head of the Department of Education and Dean of The Graduate School. For information regarding graduate representatives, please refer to the Graduate School policy.
• Design a project - will be expected to demonstrate a mastery of aspects of both qualitative and quantitative projects (such as sampling, validity, reliability, and data analysis)

However, these areas may be revised according to individual programs.

**Additional Requirements**

The Doctor of Education degree must meet the minimum requirements in the *For Doctoral Students* section of the Graduate School’s website. Additional requirements for the PhD degree beyond these minimums are available through the Department of Education. All PhD degree candidates are expected to be familiar with both The Graduate School’s degree requirements listed here: http://www.montana.edu/gradschool/policy/degreq_general.html and the Department of Education degree requirements listed on the department website.

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**How to Apply**

Application requirements can be accessed through the Department of Education’s Doctor of Philosophy in Adult & Higher Education Application Process (http://www.montana.edu/education/grad/abe/applications.html) page. Apply online through The Graduate School (http://www.montana.edu/gradschool/admissions/apply.html).

**Contact Information**

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Dr. Sweeney Windchief  
sweeney.windchief@montana.edu

Dr. Bryce Hughes  
bryce.hughes@montana.edu

Maggie Secrest, Graduate Program Assistant  
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Montana State University  
Reid Hall 215, Bozeman, MT 59717-2880  
margaret.secrest@montana.edu (margaret.secrest@montana.edu)

**Application Process for the PhD in Education, Adult & Higher Education**

Applicants are required to complete the online application and submit the following documentation via the Graduate School Online Application System (http://www.montana.edu/wwwdg/apply.html)

1. Completed Graduate School Application

2. GPA calculation sheet (The form is provided during the application process)

3. Resume/Curriculum Vitae

4. Documentation of verbal and quantitative skills needed for the degree: Submit official GRE (minimum Verbal 155, Quantitative 150) sent from the testing agency to Montana State University (code 4488).

5. Academic Transcripts: Applicants must provide Official transcripts verifying all Bachelor’s degree and Master’s degree coursework. Unofficial transcripts may be uploaded during the online application process.

Official transcripts must be sent from the Institution directly to the Department of Education Graduate Programs Office, 215 Reid Hall, PO Box 172880, Montana State University, Bozeman, MT 59717. Electronic transcripts are also acceptable as long as they arrive directly from the applicants’ certifying university. Please have electronic transcripts sent to margaret.secrest@montana.edu. Transcripts will be evaluated for rigor and academic fit.

6. Personal Essay: Suggested length is 2-3 typed, double-spaced pages. The applicant should briefly describe the following:

• Education and other educational professional experiences
• Research interests and experience including alignment with faculty interests and expertise and an example of research experiences using educational theory, research methods, and application.
• Professional goals

7. Three (3) Professional References: The letters should be from individuals qualified to assess the following:

• Knowledge in chosen field
• Motivation and perseverance toward goals
• Ability to work independently
• Ability to express thoughts in speech and writing
• Ability/potential for college teaching
• Ability to plan and conduct research

8. For International Applicants ONLY: In addition to the above, International applicants will be required to submit the following:

• English proficiency scores: TOEFL [80], IELTS [level 6.5], or PTE [54], are necessary for applicants who are not U.S. citizens and not from countries where English is the official language. This requirement is waived if the applicant has earned an undergraduate or graduate degree from an institution in the U.S. For more information on the International application process, see this link: http://www.montana.edu/gradschool/policy/admissions_intl.html
• Evidence of Financial Support: International Student Financial Certificate (http://www.montana.edu/international/admissions/graduatefinancialcertificate.pdf)
• Proof of funds (if self-funded)
• Copy of applicant’s passport
• Degree certificates as well as an English translation for all non-English academic transcripts and credentials. Photocopies can be used to initiate the application process; however, official transcripts/credentials are still required upon admission.

*Note: Applicants may be contacted for an interview by the program specific applicant review committee.

**Application Deadlines**

Below is the deadline by which all of the application materials for the PhD in Education must be submitted via the online application system. Students matriculate into the PhD program in the fall semester only. Applications to the PhD programs are reviewed once per year at the April 1 deadline. Applications received after the deadline may be reviewed for acceptance on a case-by-case basis.

• Fall Semester: April 1st
Admission Process
Complete applications will be reviewed by members of the Graduate Admissions Committee who then convene to make final admission decisions. Once a decision has been made the application will be forwarded to The Graduate School for final administrative processing. Please note that the application review process will begin on the application deadline dates and not before.

Contact Information
Maggie Secrest
Graduate Program Assistant
PO Box 172880
Reid Hall 215, Bozeman, MT 59717-2880
Email: margaret.secrest@umontana.edu (margaret.secrest@umontana.edu)

Doctor of Philosophy in Curriculum & Instruction

Objectives
The PhD in Education is designed for graduate students seeking faculty or research positions in higher education or positions within research organizations that require educational research in highly specialized disciplines. Progress through the degree provides students with opportunities to develop specialized disciplinary content and research knowledge along with scholarly experiences that will provide the foundational knowledge and skills required for success as faculty in higher education and in research organizations.

The PhD in Education, with emphasis in Curriculum and Instruction, will prepare students to develop knowledge and conduct research related to six major areas of strength among our existing faculty including: (1) Leadership and Policy Analysis, (2) STEM Education, (3) the K-20 Trajectory, (4) Online and Distance Education Delivery, (5) Pedagogy and Teacher Preparation, and (6) Education Evaluation, Assessment, Research Design and Analysis. Special emphasis in these major research areas will address topics specific to Montana including working with rural communities and Native Americans on state and other educational issues. Graduates of this PhD program in education will be well-positioned to directly and positively affect the data driven culture related to improving the educational systems of Montana and beyond.

Program Flow
After being admitted to the PhD program, the student will be assigned a temporary advisor and should then meet with his/her assigned advisor. Actual courses taken during the initial stage will be based on the student’s previous academic work and advisor/committee approval.

The program is designed to be specifically tailored to each doctoral student’s related research interest while providing cutting edge knowledge and skills in research and theory.

Program of Study

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<th>Core Content - 13 credits</th>
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<th>Required Core Content Courses - 4 credits</th>
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<tr>
<td>EDU 650 Dissertation Seminar</td>
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<table>
<thead>
<tr>
<th>Electives - choose 9 credits from the following</th>
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<tbody>
<tr>
<td>EDLD 605 Higher Education History and Philosophy</td>
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<tr>
<td>EDLD 643 Leading Social Justice</td>
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<tr>
<td>EDLD 610 Leadership and Organizational Theory</td>
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<tr>
<td>EDLD 635 College Teaching</td>
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<tr>
<td>EDCL 604 Advanced Educational Psychology</td>
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</table>

Or approved substitutions

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<thead>
<tr>
<th>Curriculum &amp; Instruction Concentration Options - 15 credits</th>
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<tbody>
<tr>
<td>Electives appropriate to area of specialization (Curriculum Design; English Language Arts Education; Social Studies Education; Science Education) &amp; approved by Graduate Advisor.</td>
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<table>
<thead>
<tr>
<th>Required Research Courses - 18 credits</th>
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<tbody>
<tr>
<td>Required: 9 credits</td>
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<tr>
<td>EDU 602 Educational Statistics II</td>
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<tr>
<td>EDU 607 Quantitative Educational Research</td>
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<tr>
<td>EDU 610 Qualitative Educational Research</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Advanced Research Electives - choose 9 credits</th>
<th>9</th>
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</thead>
<tbody>
<tr>
<td>EDU 606 Mixed Methods Research Design in Education</td>
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<tr>
<td>EDU 611 Advanced Quantitative Research</td>
<td></td>
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<tr>
<td>EDU 612 Critical Race Theory</td>
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<tr>
<td>EDU 613 Indigenous Methodologies in Educational Research</td>
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<tr>
<td>EDU 637 Institutional Research and Assessment</td>
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<td>EDU 614 Planning Program Assessment</td>
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<td>EDU 615</td>
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<tr>
<td>EDU 617 Electives also may be taken that are appropriate to the research area of specialization and approved by the graduate advisor.</td>
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<th>Dissertation - 18 credits</th>
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<tr>
<td>EDCI 690 Doctoral Thesis</td>
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Total Credits: 64

Residency Requirement
The PhD requires one year of on campus full-time residency. The residency requirement consists of two consecutive semesters of full-time enrollment (6-9 credits per semester) in PhD coursework.

Committees
Each doctoral student’s committee must consist of at least four approved members. The chair and one other approved member must be from the Curriculum & Instruction faculty. Two other approved members will be selected based upon their ability to contribute to the student’s studies leading up to and through the dissertation research. These two committee members must have academic credentials in the area of the student’s program of study and be approved by the Head of the Department of Education and Dean of The Graduate School. For information regarding graduate representatives, please refer to the Graduate School policy.

Chairs
The student should carefully select his/her chair after thorough conversations with those Curriculum & Instruction faculty members that he/she believes might have an interest in their doctoral research agenda and/
or the ability to work with them toward generating a defensible dissertation. The chair will give leadership and approval regarding the balance of the committee’s potential membership. The committee, as a whole, is subject to the approval of the Head of the Department of Education. The chair will facilitate program approval, comprehensive exam planning and clarification, proposal hearing, and dissertation defense. Chairs and members of a student’s committee are subject to change. Revision to the program of study can be made during the course of study with the chair’s approval.

Comprehensive Examinations
As PhD students in Curriculum & Instruction approach the end of their coursework (46 credits completed), and prior to the Dissertation proposal meeting, they will contact their committee chair to discuss the content and format of the required written and oral comprehensive examinations. The comprehensive exams must be completed by the posted Graduate School deadlines.

Additional Requirements
The PhD degree must meet the minimum requirements in the For Doctoral Students section of the Graduate School’s website. Additional requirements for the PhD degree beyond these minimums are available through the Department of Education. All PhD degree candidates are expected to be familiar with both The Graduate School’s degree requirements listed here: http://www.montana.edu/gradschool/cat_for_doc_stud.html and Department of Education degree requirements listed on the department website.

How to Apply
Application requirements can be accessed through the Department of Education’s Doctor of Philosophy in Curriculum & Instruction Application Process (http://www.montana.edu/education/grad/ci/applications.html) web page. Apply online through The Graduate School (http://www.montana.edu/gradschool/admissions/apply.html).

Contact Information
Dr. Ann Ewbank, Program Leader
406-994-5788 Email: a (tena.versland@montana.edu)nn.ewbank@montana.edu
(ann.ewbank@montana.edu)

Maggie Secrest, Graduate Program Assistant
PO Box 172880
Montana State University
Reid Hall 215, Bozeman, MT 59717-2880
margaret.secrest@montana.edu (margaret.secrest@montana.edu)

Application Process for the PhD in Education, Curriculum & Instruction
Applicants are required to complete the online application and submit the following documentation via the Graduate School Online Application System (http://www.montana.edu/wwwdg/apply.html)

1. Completed Graduate School Application
2. GPA calculation sheet (The form is provided during the application process)
3. Resume/Curriculum Vitae

4. Documentation of verbal and quantitative skills needed for the degree: Submit official GRE (minimum Verbal 155, Quantitative 150) sent from the testing agency to Montana State University (code 4488).

5. Academic Transcripts: Applicants must provide Official transcripts verifying all Bachelor’s degree and Master’s degree coursework. Unofficial transcripts may be uploaded during the online application process. Official transcripts must be sent from the Institution directly to the Department of Education Graduate Programs Office, 215 Reid Hall, PO Box 172880, Montana State University, Bozeman, MT 59717. Electronic transcripts are also acceptable as long as they arrive directly from the applicants’ certifying university. Please have electronic transcripts sent to margaret.secrest@montana.edu. Transcripts will be evaluated for rigor and academic fit.

6. Personal Essay: Suggested length is 2-3 typed, double-spaced pages. The applicant should briefly describe the following:
   • Education and other educational professional experiences
   • Research interests and experience including alignment with faculty interests and expertise and an example of research experiences using educational theory, research methods, and application.
   • Professional goals

7. Three (3) Professional References: The letters should be from individuals qualified to assess the following:
   • Knowledge in chosen field
   • Motivation and perseverance toward goals
   • Ability to work independently
   • Ability to express thoughts in speech and writing
   • Ability/potential for college teaching
   • Ability to plan and conduct research

8. For International Applicants ONLY: In addition to the above, International applicants will be required to submit the following:
   • English proficiency scores: TOEFL [80], IELTS [level 6.5], or PTE [54], are necessary for applicants who are not U.S. citizens and not from countries where English is the official language. This requirement is waived if the applicant has earned an undergraduate or graduate degree from an institution in the U.S. For more information on the International application process, see this link: http://www.montana.edu/gradschool/policy/admissions_intl.html
   • Evidence of Financial Support: International Student Financial Certificate (http://www.montana.edu/international/admissions/graduatefinancialcertificate.pdf)
   • Proof of funds (if self-funded)
   • Copy of applicant’s passport
   • Degree certificates as well as an English translation for all non-English academic transcripts and credentials. Photocopies can be used to initiate the application process; however, official transcripts/credentials are still required upon admission.

*Note: Applicants may be contacted for an interview by the program specific applicant review committee.

Application Deadlines
Below is the deadline by which all of the application materials for the PhD in Education must be submitted via the online application system. Students matriculate into the PhD program in the fall semester only. Applications to the PhD programs are reviewed once per year at the April 1 deadline.
Applications received after the deadline may be reviewed for acceptance on a case-by-case basis.

- Fall Semester: April 1st

### Admission Process

Complete applications will be reviewed by members of the Graduate Admissions Committee who then convene to make final admission decisions. Once a decision has been made the application will be forwarded to The Graduate School for final administrative processing. Please note that the application review process will begin on the application deadline dates and not before.

### Contact Information

Maggie Secrest  
Graduate Program Assistant  
PO Box 172880  
Reid Hall 215, Bozeman, MT 59717-2880  
Email: margaret.secrest@montana.edu (margaret.secrest@montana.edu)

### Doctor of Philosophy in Educational Leadership

#### Objectives

The PhD in Education is designed for graduate students seeking faculty or research positions in higher education or positions within research organizations that require educational research in highly specialized disciplines. Progress through the degree provides students with opportunities to develop specialized disciplinary content and research knowledge along with scholarly experiences that will provide the foundational knowledge and skills required for success as faculty in higher education and in research organizations.

The PhD in Education with emphasis in Educational Leadership will prepare students to develop knowledge and conduct research related to six major areas of strength among our existing faculty including: (1) Leadership and Policy Analysis, (2) Leader Identity and Authenticity, (3) Leadership for Social Justice and in Indigenous Contexts, (4) Leader Self-Efficacy/School Collective Efficacy, (5) Instructional Leadership in Rural Contexts, and (6) Education Evaluation, Assessment, Research Design and Analysis. Special emphasis in these major research areas will address topics specific to Montana including working with rural communities and Native Americans on state and other educational issues. Graduates of this PhD program in education will be well-positioned to directly and positively affect the data driven culture related to improving the educational systems of Montana and beyond.

#### Program Flow

After being admitted to the PhD program, the student will be assigned a temporary adviser and should then meet with his/her assigned adviser. Actual courses taken during the initial stage will be based on the student’s previous academic work and adviser/committee approval.

The program is designed to be specifically tailored to each doctoral student’s related research interest while providing cutting edge knowledge and skills in research and theory. The program is structured to be completed in 4 to 5 years with full-time tuition support for qualified students provided by the Department of Education.

### Program of Study

#### Core Content - choose 9 credits

- EDLD 605 Higher Education History and Philosophy
- EDCI 604 Advanced Educational Psychology
- EDLD 635 College Teaching
- EDLD 610 Leadership and Organizational Theory
- EDED 643 Leading Social Justice

#### Required Core Content Courses - 4 credits

- EDU 650 Dissertation Seminar
- EDU 691 Doctoral Seminar

#### Educational Leadership Concentration - 15 credits

Electives appropriate to area of specialization & approved by Graduate Advisor. Examples of General Curriculum courses to choose from should be discussed with advisor.

#### Required Research Courses - 9 credits

- EDU 602 Educational Statistics II
- EDU 610 Qualitative Educational Research
- EDU 607 Quantitative Educational Research

#### Advanced Research Electives - choose 9 credits

- EDU 614 Planning Program Assessment
- EDU 606 Mixed Methods Research Design in Education
- EDU 612 Critical Race Theory
- EDU 637 Institutional Research and Assessment
- EDU 606 Mixed Methods Research Design in Education
- EDU 608 Advanced Quantitative Research
- EDU 611
- EDU 613 Indigenous Methodologies in Educational Research
- EDU 615

Electives also may be taken that are appropriate to the research area of specialization and approved by the graduate advisor.

#### Dissertation - 18 credits

- EDED 690 Doctoral Thesis

Total Credits 64

### Residency Requirement

The PhD requires one year of on campus, full-time residency. The residency requirement consists of two consecutive semesters of full-time enrollment (6-9 credits per semester) in PhD coursework.

### Committees

Each doctoral student’s committee must consist of at least four approved members. The chair and one other approved member must be from the Educational Leadership faculty. Two other approved members will be selected based upon their ability to contribute to the student’s studies leading up to and through the dissertation research. These two committee members must have academic credentials in the area of the student’s program of study and be approved by the Head of the Department of
Education and Dean of The Graduate School. For information regarding graduate representatives, please refer to the Graduate School policy.

The student should carefully select his/her chair after thorough conversations with those Educational Leadership faculty members that he/she believes might have an interest in their doctoral research agenda and/or the ability to work with them toward generating a defensible dissertation. The chair will give leadership and approval regarding the balance of the committee’s potential membership. The committee, as a whole, is subject to the approval of the Head of the Department of Education. The chair will facilitate program approval, comprehensive exam planning and clarification, proposal hearing, and dissertation defense. Chairs and members of a student’s committee are subject to change. Revision to the program of study can be made during the course of study with the chair’s approval.

Comprehensive Examinations
As PhD students in Educational Leadership approach the end of their coursework (46 credits completed), and prior to the Dissertation proposal meeting, they will contact their committee chair to discuss the content and format of the required written and oral comprehensive examinations. The comprehensive exams must be completed by the posted Graduate School deadlines.

Additional Requirements
The Doctor of Education degree must meet the minimum requirements in the For Doctoral Students section of the Graduate School’s website. Additional requirements for the PhD degree beyond these minimums are available through the Department of Education. All PhD degree candidates are expected to be familiar with both The Graduate School’s degree requirements listed here: http://www.montana.edu/gradschool/current-grad.html and Department of Education degree requirements listed on the department website.

How to Apply
Application requirements can be accessed through the Department of Education’s Doctor of Philosophy in Educational Leadership Application Process (http://www.montana.edu/education/grad/edlead/applications.html) web page. Apply online through The Graduate School (http://www.montana.edu/gradschool/admissions/apply.html).

Contact Information
Dr. Tena Versland, Program Leader
406-994-6799 Email: tena.versland@montana.edu

Dr. Bill Ruff
406-994-4182 Email: wruff@montana.edu

Dr. David Henderson
406-994-6424 Email: david.henderson3@montana.edu

Dr. Art Bangert
406-994-7424 Email: abangert@montana.edu

Maggie Secrest, Graduate Program Assistant
PO Box 172880
Montana State University
Reid Hall 215
Bozeman, MT 59717-2880
margaret.secrest@montana.edu (margaret.secrest@montana.edu)

Application Process for the PhD in Education, Educational Leadership
Applicants are required to complete the online application and submit the following documentation via the Graduate School Online Application System (http://www.montana.edu/wwwdg/apply.html)

1. Completed Graduate School Application

2. GPA calculation sheet (The form is provided during the application process)

3. Resume/Curriculum Vitae.

4. Documentation of verbal and quantitative skills needed for the degree: Submit official GRE (minimum Verbal 155, Quantitative 150) sent from the testing agency to Montana State University (code 4488).

5. Academic Transcripts: Applicants must provide Official transcripts verifying all Bachelor’s degree and Master’s degree coursework. Unofficial transcripts may be uploaded during the online application process. Official transcripts must be sent from the Institution directly to the Department of Education Graduate Programs Office, 215 Reid Hall, PO Box 172880, Montana State University, Bozeman, MT 59717. Electronic transcripts are also acceptable as long as they arrive directly from the applicants’ certifying university. Please have electronic transcripts sent to margaret.secrest@montana.edu. Transcripts will be evaluated for rigor and academic fit.

6. Personal Essay: Suggested length is 2-3 typed, double-spaced pages. The applicant should briefly describe the following:
   • Education and other educational professional experiences
   • Research interests and experience including alignment with faculty interests and expertise and an example of research experiences using educational theory, research methods, and application.
   • Professional goals

7. Three (3) Professional References: The letters should be from individuals qualified to assess the following: (Note: At least one of the three letters must be from the candidate’s PRESENT direct supervisor in his/her educational field.)
   • Knowledge in chosen field
   • Motivation and perseverance toward goals
   • Ability to work independently
   • Ability to express thoughts in speech and writing
   • Ability/potential for college teaching
   • Ability to plan and conduct research

8. For International Applicants ONLY: In addition to the above, International applicants will be required to submit the following:
   • English proficiency scores: TOEFL [80], IELTS [level 6.5], or PTE [54], are necessary for applicants who are not U.S. citizens and not from countries where English is the official language. This requirement is waived if the applicant has earned an undergraduate or graduate degree from an institution in the U.S. For more information on the International application process, see this link: http://www.montana.edu/gradschool/policy/admissions_intl.html
   • Evidence of Financial Support: International Student Financial Certificate (http://www.montana.edu/international/admissions/graduatefinancialcertificate.pdf)
   • Proof of funds (if self-funded)
   • Copy of applicant’s passport
• Degree certificates as well as an English translation for all non-English academic transcripts and credentials. Photocopies can be used to initiate the application process; however, official transcripts/credentials are still required upon admission.

*Note: Applicants may be contacted for an interview by the program specific applicant review committee.

Application Deadlines
Below is the deadline by which all of the application materials for the PhD in Education must be submitted via the online application system. Students matriculate into the PhD program in the fall semester only. Applications to the PhD programs are reviewed once per year at the April 1 deadline. Applications received after the deadline may be reviewed for acceptance on a case-by-case basis.

• Fall Semester: April 1st

Admission Process
Complete applications will be reviewed by members of the Graduate Admissions Committee who then convene to make final admission decisions. Once a decision has been made the application will be forwarded to The Graduate School for final administrative processing. Please note that the application review process will begin on the application deadline dates and not before.

Contact Information
Maggie Secrest
Graduate Program Assistant
PO Box 172880
Reid Hall 215, Bozeman, MT 59717-2880
Email: margaret.secrest@montana.edu (margaret.secrest@montana.edu)

Education Specialist in Educational Leadership

Objectives
The Education Specialist Degree (EdS) is a practitioner’s degree. Many states require this degree for Superintendent Licensure, however, Montana does not. This degree is particularly valuable for students who see themselves as school system leaders in medium sized to larger school systems. Admission into the Educational Leadership program is required.

Program Flow
The purpose of the EdS Degree is to provide skills and knowledge required for District Superintendent and central office leadership. In addition to improving skill and knowledge, it is the goal of the program to create strong networks among students to support effective practices. To that end, classes are generally offered in a blended format which combines face-to-face delivery and distance delivery. An appropriate balance of theory and practice is a strong consideration in planning for the content of the classes. Typically the Superintendent Core (EDLD 620, EDLD 645, EDLD 650, EDLD 655) is offered every summer on campus during a two-week window in June.

Program of Study

<table>
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<tr>
<th>Specialist Core</th>
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<tbody>
<tr>
<td>EDLD 610 Ldrshp and Organizational Thry</td>
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<tr>
<td>EDLD 620 The School Superintendent</td>
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<tr>
<td>EDLD 630 Supervision &amp; Instruct Ldrshp</td>
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<td>EDLD 645 Personnell and Collective Bargaining in MT</td>
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<td>EDLD 650 MT Finance &amp; Facilities</td>
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<td>EDLD 655 MT Legal &amp; Policy Studies</td>
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<td>EDLD 657 Ed Policy &amp; Politics</td>
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<td>EDLD 643 Leading Social Justice</td>
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Field Experience

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Professional Paper

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<tr>
<td>EDLD 575 Professional Paper &amp; Project</td>
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Total Credits 30

Committees
Candidates will have a three member committee. Candidates should work closely with their committee chair to prepare and submit a program of study immediately upon admission to the program. The chair and one other member must be from the Educational Leadership faculty. The third committee member must have academic credentials in the area of the student’s program of study and be approved by the Head of the Department of Education and Dean of The Graduate School.

Chairs
The student should carefully select his/her chair after thorough conversations with the approved Educational Leadership faculty members. The chair will serve as the student’s primary advisor. The committee, as a whole, is subject to the approval of the Head of the Department of Education. Chairs and members of a student’s committee are subject to change. In addition, revision to the program of study can be made during the course of study with the chair’s approval.

Comprehensive Examination/Professional Paper
The EdS student will develop a professional paper as his/her summative experience. The professional paper will address a specific issue and contextualized problem of practice using appropriate theory and research-based best practices. Specifically the professional paper will: 1) frame the problem; 2) review pertinent research literature; 3) identify appropriate methods used to demonstrate the extent of the problem and the efficacy of the solution employed; and 4) provide recommendations grounded in research to solve the problem.

Additional Education Specialist Requirements
The Education Specialist degree must meet the minimum requirements under the For Doctoral Students section on found in the departmental website with the following two exceptions: 1) no dissertation is required, and 2) courses over seven years old may not be included on the graduate program of study.

Additional requirements for the EdS degree are available through the Department of Education. All EdS degree candidates are expected to be familiar with both departmental and The Graduate School’s requirements.
While many courses for the Education Specialist degree are the same as those for the Doctor of Education degree, it must be clearly understood that admission to one program does not imply admission to the other. Transfer from Doctoral to Education Specialist status will be possible only if the applicant: 1) is in good standing with The Graduate School, and 2) has not failed the doctoral comprehensive exam.

Application Materials for the EdS in Educational Leadership

Prior to applying to the Educational Leadership program, applicants must hold a Class I teaching license, have gained at least three years teaching experience, and possess a 3.0 undergraduate GPA.

Complete the online application through the Graduate School Online Application System (http://www.montana.edu/wwwdg/apply.html)

During the online application process you will be asked to submit the following materials.

1. **GPA calculation form**: The form is provided during the application process. NOTE: We require a GPA of 3.00 for the last two (2) years of undergraduate course work.

2. **Resume/Curriculum Vitae**

3. **Three (3) letters of recommendation**: Candidates must meet the following criteria for one of the three letters of recommendation. 
   a. At least one of the three letters must be from the candidate’s present direct supervisor. That means a school district administrator who (a) is currently administratively certified by Montana Office of Public Instruction or other equivalent state agency; AND (b) has, at some point preceding the date of this application, acted as direct supervisor for the candidate for at least one (1) semester.
   
   If for any reason you cannot secure a letter from your present supervisor, then:
   
   i. At least one of the letters of recommendation must be from a previous direct supervisor. That means a school district administrator who is (a) currently certified by the Montana Office of Public Instruction or other equivalent state agency; AND (b) has, at some point preceding the date of this application, acted as direct supervisor for the candidate for at least one (1) semester. Any applicant who does not have a letter from a present direct supervisor must indicate in the self-nomination letter (see below) the specific reason(s) why they were unable to secure a letter of recommendation from their present supervisor.

4. **Self-Nomination Letter**: The self-nomination letter should be 2 pages, double-spaced, and focus on the following:
   a. Your development and growth as an educator, including professional development;
   b. Your contributions to the school and district;
   c. Your development as a leader. Specific examples are needed that clarify how you have grown as a leader and your leadership activities;
   d. Your specific goals, and why the EdS would be of benefit to you/your school;

5. **Academic Transcripts**: Official transcripts verifying all Bachelor’s Degree course work should be sent to the Department of Education Graduate Programs Office, 215 Reid Hall, PO Box 172880, Montana State University, Bozeman, MT 59717.

6. For International Applicants ONLY:
   - **TOEFL** ([https://www.ets.org/toefl][1] or **ACE level 7** - Applicants who are not U.S. citizens and not from countries where English is the official language are required to take the Test of English as a Foreign Language and score a minimum 213 (paper version- 550, 80 for the iBT). This requirement may be waived if the applicant has earned an undergraduate or graduate degree from an institution in the U.S.
   - **International Student Financial Certificate**

Application Deadlines

Below is the deadline by which all of the application materials for the Education Specialist Programs in Education must be submitted via the online application system.

By submitting materials by the deadline, accepted students may be eligible for early registration. In order for a graduate degree application to be reviewed for admission, all required application documents must be submitted prior to the department’s posted deadline. Applications received after the deadline may be reviewed for acceptance on a case-by-case basis.

- Fall Semester: April 1st
- Spring Semester: April 1st
- Summer Semester: April 1st

Contact Information

Maggie Secrest
Graduate Program Assistant
Montana State University
PO Box 172880
Reid Hall 215, Bozeman, MT 59717-2880
margaret.secrest@montana.edu (margaret.secrest@montana.edu)

Department of Health and Human Development

Department Head
Dr. Deborah C. Haynes
219A Herrick Hall
406 994-3242

Department Main Office
218 Herrick Hall
Bozeman, MT 59717-3540

Graduate programs in the Department of Health and Human Development lead to a Master of Science degree in Health and Human Development with options in counseling, exercise and nutrition sciences, family and consumer sciences, and food, family, and community health sciences. The Master of Education degree is given to those completing the school counseling degree.

Graduate programs are coordinated by a graduate coordinator for the counseling programs or by a graduate coordinator in exercise and nutrition sciences, and food, family, and community health sciences. General descriptions of the graduate options are included below. More detailed information regarding curricula and requirements may be obtained from the respective graduate coordinators listed above. Information may also be obtained on the Department of Health and Human Development website at montana.edu/uhhd.

Graduate programs in the Department of Health and Human Development lead to a Master of Science degree in exercise and nutrition sciences, family and consumer sciences, and food, family, and community health sciences. Both thesis and non-thesis plans are available. Because of professional licensure requirements, a minimum of 60 credits is required for the counseling programs. The school counseling program requires a minimum of 48 credits. Transfer credits may not exceed the limit of nine set by The Graduate School and must be assessed by the respective graduate coordinator before acceptance to the program.
Graduate Coordinators
- Dr. Rebecca Koltz, 210E Herrick Hall, 406 994-3299, rebecca.koltz@montana.edu - Counseling and School Counseling
- Dr. John Seifert, 103E Romney, 406 994-7154, john.seifert@montana.edu - Exercise and Nutrition Sciences, and Food, Family & Community Health Sciences

Program Leaders
- Dr. Katey Franklin, 1501 S. 3rd Ave., 406 994-5993, kathryn.franklin1@montana.edu (Kathryn.franklin1@montana.edu) - Addiction Counseling Certificate Program
- Dr. Deborah Haynes, 217 Herrick Hall, 406 994-5013, dhaynes@montana.edu - Family Financial Planning
- Dr. Rebecca Koltz, 210E Herrick Hall, 406 994-3299, rebecca.koltz@montana.edu - Marriage and Family Counseling
- Dr. Mark Nelson, 121 Herrick Hall, 406 994-3810, markn@montana.edu - School Counseling
- Dr. John Seifert, 103E Romney, 406 994-7154, john.seifert@montana.edu - Exercise and Nutrition Sciences
- Dr. Carmen Byker Shanks, 344 Reid Hall, 406 994-1952, cbshanks@montana.edu - Sustainable Food Systems
- Dr. Adina Smith, 205B Herrick Hall, 406 994-6340, adinas@montana.edu - Mental Health Counseling
- Dr. Craig Stewart, 121A Marga Hosaeus Fitness Center, 406 994-6315, cstewart@montana.edu - Sport and Coaching Sciences
- Dr. Dawn Tarabochia, 210G Herrick Hall, 406 994-2057, dawn.tarabochia@montana.edu - Family and Community Health

Admission
In addition to the requirements listed in the application requirements and admission policies sections, admission requirements for specific options can be obtained from the department website at montana.edu/hhd or by calling 406 994-3242.

Provisional admission as a graduate student is possible if there is a deficiency in one or more of these areas. Students accepted provisionally will be required to:
1. successfully complete the undergraduate prerequisites for graduate-level classes,
2. successfully complete the specific undergraduate or graduate classes needed for acceptance, and/or
3. take a required course load and earn a specific grade point average while on a provisional status.

Financial Assistance
Teaching assistantships may be available within the Department of Health and Human Development. Assistantships are typically nine-month appointments. Counseling assistantships can include a summer appointment in addition to the academic year appointment. Research assistantships may be available with individual faculty members who have funded grants or contracts. Stipends vary depending on the type of appointment, the requirements of the job, the experience of the applicant, and available funding. See the Graduate Assistantships sections of the department website for detailed information on appointment criteria. Assistantships are requested from the student’s home department.

Graduate Programs
M.S. in Health & Human Development with options in:
- Counseling (p. 328)

Counseling Program Options

Graduate certificate program:
- Addiction Counseling (p. 333)

Counseling Program Options
The Department of Health and Human Development offers a Master of Science degree with an option in counseling (marriage and family counseling or mental health counseling) and a Master of Education degree in School Counseling. All three programs, marriage and family counseling, mental health counseling, and school counseling, are accredited by the Council for Accreditation of Counseling and Related Educational Programs (CACREP). The marriage and family and mental health counseling programs are 60 credits and require a minimum of two years of study. The school counseling option is 48 credits. All programs are designed to meet Montana licensure requirements for professional counselors. Students obtain up to 1,500 hours supervised counseling experience and training in core counseling areas. Completed applications must be filed by February 15 as students are expected to begin their graduate program the following summer session. Applications are screened only once each year following the February 15 deadline. A maximum of 25 students shall be admitted into the counseling areas each year.

Interested students may obtain more descriptions by visiting the department website at montana.edu/hhd or by calling 406 994-3241.

Marriage and Family Counseling
The 60-credit marriage and family counseling program prepares counselors to address mental health and relationship problems with individuals, couples, families, and children from a family systems perspective. Students are taught a conceptual framework for assessment and intervention which focuses on the multiple systems and family context of individual development. Emphasis is on a positive, competency-based view of individual and family strengths. This approach examines the larger environments in which individuals and families interact and the plethora of influences (i.e., social, cultural, and economic) that affect human growth and development. Interpersonal issues between family members and the family and outer environmental systems are highlighted.

In addition to family systems theory, students are well grounded in individual and group counseling theories. Collaboration between marriage and family counselors and other mental health care providers is emphasized.

The marriage and family counseling program meets educational licensure requirements for a Licensed Clinical Professional Counselor in the State of Montana. After licensure, graduates of the marriage and family counseling track work in a variety of counseling contexts where they see children, adolescents, individuals, couples, and families. In this program track students are prepared to work with individuals, as well as with couples and families. This extended focus beyond individual counseling provides a well-rounded training experience.

Summer

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
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<tbody>
<tr>
<td>HDCO 502</td>
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<td>HDCO 508</td>
<td>Counseling Theories I</td>
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<td>HDCO 503</td>
<td>Prof Issues in Counseling</td>
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</tr>
<tr>
<td>HDCO 510</td>
<td>Counseling Theories II</td>
<td>3</td>
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</table>
The mental health counseling program meets educational licensure requirements for a Licensed Clinical Professional Counselor in the State of Montana. After licensure, graduates of the mental health program work in a variety of mental health counseling contexts where they see adults.

**Spring**
- HDCO 523 Theory and Practice of Addiction 2
- HDCO 525 Counsel Child & Adolescents 3
- HDCO 550 Counseling Research and Evaluation 2
- HDCO 564 Diagnosis and Mental Health 3
- HDCO 571 Prof Counsel Practicum 3

**Summer**
- HDCO 524 Consultation and Crisis: Theory and Practice 3
- HDCO 551 Appraisal 3
- HDCO 598 Internship 2

**Fall**
- HDCO 554 Develop Theory Across Lifespan 3
- HDCO 563 Multicultural Awareness 3
- HDCO 565 Marital & Relationship Counsel 3
- HDCO 598 Internship 2

**Spring**
- HDCO 569 Advanced Family Counseling 3
- HDCO 598 Internship 2
- Electives 6

Total Credits 60

**Partial List of Electives**
- CHTH 430 Mental Health & Social Issues in Aging 3
- CHTH 435 Human Response To Stress 3
- HDCO 526 Adventure Counseling 3
- HDCO 530 Mind-Body Well-Being Self-Care 3
- HDCO 556 Sexuality Counseling 3
- HDCO 568 Mental Health Methods 3

**Mental Health Counseling**
The 60-credit mental health counseling track prepares counselors to apply principles of human development, counseling theory, learning theory, group dynamics and the etiology of mental illness and dysfunctional behavior in their work at a variety of mental health facilities.

The mental health counseling area of study provides students with 700 hours of supervised experience in appraisal, individual, group counseling, and consultation in primarily clinic and community agencies. The goals of the mental health counseling program are the following: to enhance students’ personal and professional development as counselors; to increase their ability to understand the characteristics and concerns of various client populations and their environments; and to develop their knowledge and skills in use of theory based counseling model.

The mental health counseling program meets educational licensure requirements for a Licensed Clinical Professional Counselor in the State of Montana. After licensure, graduates of the mental health program work in a variety of mental health counseling contexts where they see adults.

**Summer**
- HDCO 502 Cnsl Ethic Prof Orient 2
- HDCO 508 Counseling Theories I 3
- HDCO 558 Career Counseling 2

**Fall**
- HDCO 502 Cnsl Ethic Prof Orient 2

**School Counseling**
The Master of Education in School Counseling is a 48-credit program designed to prepare students to work in public or private schools as professional counselors. Upon completion, students are eligible to apply for certification as a school counselor with the Montana Office of Public Instruction. School counselors in Montana can be certified with a class 6 (specialist) certificate (for those without a Montana teaching certificate), or certified with a Guidance and Counseling endorsement on a Montana teaching certificate.

School counseling students take a common core of counseling and human development courses. This core of course work provides all students with the knowledge and skills necessary to be a professional counselor and follows the standards developed by the American School Counselor Association. The program emphasis strives to provide the necessary self-awareness, knowledge, and skills for counseling students to become competent and capable professional school counselors.

**Summer**
- HDCO 502 Cnsl Ethic Prof Orient 2
Exercise and Nutrition Sciences Option

The Department of Health and Human Development offers a Master of Science degree with an option in exercise and nutrition sciences with two programs of study:

- **Exercise and Nutrition Sciences**
- **Sport and Coaching Sciences**

**Prerequisites**

Ideally, entering graduate students will have completed a bachelor’s degree in exercise science, nutrition, or a closely related field (e.g., biology, pre-physical therapy) with appropriate background course work (e.g., chemistry, biology, anatomy, physiology) to enter the exercise and nutritional sciences program.

For those entering into sport and coaching sciences, students will have a bachelor’s degree in health enhancement or physical education, athletic training, and or appropriate practical experience. For example, athletic coaches and administrators at any level of sport—competitive, developmental, or recreational—athletic trainers, health enhancement or physical education teachers, or those in the private sector who are involved or interested in the application of sport and teaching sciences are welcome.

**Admissions**

Admissions decisions are based on:

1. Undergraduate preparation (GPA and strength of prerequisite course work)
2. GRE combined score from verbal and quantitative tests
3. Goodness of fit and how consistent interests and goals of student align with research and outreach goals of faculty (to be addressed in personal essay)
4. Relevant professional experience
5. Strength of letters of recommendation

The exercise and nutrition sciences program allows students to focus on understanding the determinants of physical activity and energy expenditure, adaptations to exercise that impact human work performance and disease risk, neuromechanics, neurophysiology, and exercise metabolism and nutrition. Although not required, a graduate student may simultaneously complete course work needed to become a Registered Dietitian/Nutritionist. A graduate student may earn a verification statement (http://www.montana.edu/hhd/undergrad/foodandnutrition/dietetics/verification.html) by completing required classes in the MSU dietetics program. The verification statement is **required** in order to apply to an accredited dietetic internship.

The sport and coaching sciences program is designed to meet the need in advanced coaching and sport science abilities at the local, state, national and international levels. Course work includes knowledge pertinent to coaches of all sports at developmental, competitive, and high performance levels as well as sport administrators in both public and private sectors.

**Required Courses for all Exercise and Nutrition Sciences programs:**

**Fall**

- HHD 501 Prof Comm Skills in HHD 3
- KIN 515 Exercise Performance and Nutr 3
- or KIN 545 Graduate Exercise Physiology
- STAT 401 Applied Methods in Statistics 3
- or EDCI 501 Educational Statistics I 3

**Spring**

- HHD 512 Research Methods in HHD 3
- NUTR 511 Exercise Metabolism and Health 3
- or KIN 525 Neuromechanics of Human Movement
- Electives 3-4

**Fall**

- KIN 515 Exercise Performance and Nutr 3
- or KIN 545 Graduate Exercise Physiology
- Electives 3

**Spring**

- KIN 575 Professional Paper and Project 3-10
- or KIN 590 Master’s Thesis
- NUTR 511 Exercise Metabolism and Health 3
- or KIN 525 Neuromechanics of Human Movement
- Electives 3-6

**Total Credits** 30

**Required Courses for Sport and Coaching Sciences program:**

**Fall**

- EDCI 501 Educational Statistics I 3
- HHD 501 Prof Comm Skills in HHD 3
- HTH 455 The Ethic of Care 3
- or KIN 440R Sport Psychology

**Spring**

- HEE 506 Exercise and Chronic Disease 3
- HHD 512 Research Methods in HHD 3
- Electives 3

**Fall**

- COA 405 Advanced Concepts in Coaching 3
- Electives 3

**Spring**
Family & Consumer Sciences

Family Financial Planning

The Family Financial Planning master's degree is a 36-credit distance degree program that is offered through a consortium of eight mid-western and western land-grant universities through Great Plains Interactive Distance Education Alliance (http://www.gpidea.org) (GP-IDEA). The participating land-grant universities are:

- Iowa State University
- Kansas State University
- University of Missouri--Columbia
- University of Nebraska--Lincoln
- Oklahoma State University
- North Dakota State University
- South Dakota State University
- Montana State University

The program is registered with the Certified Financial Planner® Board of Standards and meets the education criteria for individuals who wish to fulfill the education component for obtaining CFP® certification. Students may also take the six core courses to fulfill this CFP® education requirement, rather than the full master’s program. As a participating university in this consortium, Montana State University offers two of the twelve required courses, in addition to a three-credit practicum experience and a three-credit professional paper. The program is designed to be a part-time program for fully or partially employed students.

Applicants apply at their home institution and take approximately two to three 3-credit courses via distance delivery from each of the participating universities, at a uniform tuition rate determined by the consortium. More information is available at www.montana.edu/montanagpidea/faq.htm

Two plans for program completion are available: the professional paper and project course work-only plan.

Professional Paper/Project Plan

This option is appropriate for students who wish to conduct their own original research or to participate in a project of interest. This option is particularly appropriate for students who wish to continue to get a Ph.D. A maximum of six (6) professional paper/project credits can be taken.

If the student is using faculty time or university facilities to work on their professional paper/project, the student must be registered for HDFP 575 credits. The HDFP 575 credits can be graded or taken pass/fail, as negotiated between the student and the professional paper/project faculty adviser.

Course Work-Only Plan

This plan is for family financial planning students who intend to only work as a financial planning practitioner and have no intention of continuing for a Ph.D. A minimum of 36 credits of coursework is required and a practicum is highly recommended for this coursework only option.

Financial Assistance

The program does qualify for financial aid. However, it is a self-supporting program and as such is not eligible for faculty and staff fee waivers through the MUS system.

Required Courses in Family Financial Planning: (subject to change - check with program contact)

<table>
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<th>Course</th>
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<th>Credits</th>
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<td>HDFP 515</td>
<td>Insurance Planning for Families</td>
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<td>HDFP 520</td>
<td>Investing for Family’s Future</td>
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<td>HDFP 525</td>
<td>Retirement Planning, Employee Benefits, and Families</td>
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<td>HDFP 530</td>
<td>Estate Planning for Families</td>
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<td>HDFP 540</td>
<td>Personal Income Taxation</td>
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<td>HDFP 545</td>
<td>Family Theory and Research I</td>
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Electives

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<td>HDFP 550</td>
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<td>HDFP 555</td>
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<td>HDFP 560</td>
<td>Professional Practices in Family Financial Planning</td>
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<td>HDFP 575</td>
<td>Professional Paper</td>
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<td>HDFP 576</td>
<td>Professional Practicum</td>
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<tr>
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Family Financial Planning

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Family Financial Planning

Dr. Deborah Haynes
Department of Health and Human Development
217 Herrick Hall, Bozeman, MT 59717-3540
406-994-5013 Email: dhaynes@montana.edu

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Financial Assistance

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<td>Retirement Planning, Employee Benefits, and</td>
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<td>HDFP 530</td>
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Total Credits: 12

Food, Family and Community Health Sciences Option

The Department of Health and Human Development offers a Master of Science degree with an option in food, family and community health sciences with two programs of study:

- family and community health, and
- sustainable food systems.

The family and community health program offers a skills-based program which integrates theory and critical thinking to assess the needs of individuals, families, and communities. Students learn to plan, implement and evaluate programming designed to promote health, human development and well-being. The sustainable food systems program focuses on sustainable food production, food preparation and processing, distribution, nutrition, and community food security in order for students to better understand how food systems influence health. Interested students may obtain descriptions by calling (406) 994-3242, or visiting the department website at montana.edu/hhd. Depending on the students’ goals, undergraduate degree, and course work, additional courses may be added or deleted to supplement the curriculum.

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<td>- Theories and Models in Health</td>
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<td>CHTH 503</td>
<td>- Community-Based Participatory Research</td>
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<td>- Develop Theory Across Lifespan</td>
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Year Total: 12

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Year Total: 6-12

Total Program Credits: 33-42

Food, Family and Community Health Sciences Option

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Year Total: 6-12

Total Program Credits: 33-42
Electives (other electives can be approved by the advisor)

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<td>CTHH 435</td>
<td>Human Response To Stress</td>
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<td>CTHH 440</td>
<td>Principles Of Epidemiology</td>
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<td>FCS 465R</td>
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<td>NASX 524</td>
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<td>PSCI 559</td>
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<td>SFBS 429</td>
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<td>SFBS 551</td>
<td>Global Food Perspectives</td>
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Sustainable Food Systems Program

Fall
- HHD 501 Prof Comm Skills in HHD 3
- STAT 401 Applied Methods in Statistics 3
- SFBS 552 State of the Environment: Policy, Management, and Practice 3

Spring
- HHD 512 Research Methods in HHD 3
- SFBS 451R Sustainable Food Systems 3

Electives tailored to program 0-3

Fall
- SFBS 541 Culinary Marketing: Farm to Table 3
- SFBS 598 Internship 3
- SFBS 551 Global Food Perspectives 3

Spring
- SFBS 575 Prof Paper & Project 3-10
- or SFBS 590 Master’s Thesis 3

Electives tailored to program 0-3

Total Credits 30

Electives (other electives can be approved by the advisor)

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<tr>
<th>Course Code</th>
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<td>AGSC 465R</td>
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<td>Non-Formal Teaching Methods in Agriculture</td>
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<td>BMGT 410</td>
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<tr>
<td>CTHH 502</td>
<td>Theories and Models in Health</td>
<td>3</td>
</tr>
<tr>
<td>CTHH 503</td>
<td>Community-Based Participatory Research</td>
<td>3</td>
</tr>
<tr>
<td>HDCO 563</td>
<td>Multicultural Awareness</td>
<td>3</td>
</tr>
<tr>
<td>HSTA 409</td>
<td>Food in America</td>
<td>3</td>
</tr>
<tr>
<td>HTH 455</td>
<td>The Ethic of Care</td>
<td>3</td>
</tr>
<tr>
<td>LRES 528</td>
<td>Sust Crop Systems</td>
<td>1</td>
</tr>
<tr>
<td>NASX 415</td>
<td>Native Food Systems</td>
<td>3</td>
</tr>
<tr>
<td>PSCI 406</td>
<td>The Political Economy of Energy</td>
<td>3</td>
</tr>
<tr>
<td>PSCI 456</td>
<td>Politics of Food &amp; Hunger</td>
<td>3</td>
</tr>
<tr>
<td>SFBS 429</td>
<td>Small Business and Entrepreneurship in Food and Health</td>
<td>3</td>
</tr>
</tbody>
</table>

Addiction Counseling

Overview

The Addiction Counseling Certificate program is an online academic preparation program that prepares students to become LAC – eligible in Montana. This program offers all academic graduate coursework needed to pursue internship/licensure with the State of Montana. Significantly, this is a graduate certificate program – not a master’s degree program. Students must have a bachelor’s degree in a relevant field with a GPA of 3.0 to apply. Students must earn 12 credits of addiction specific coursework in order to earn the Addiction Counseling Certificate from MSU. State licensure requirements are different, and students will be advised to take additional MSU addiction specific coursework to meet the State of Montana requirements.

Prerequisite coursework for the State of Montana licensure depends upon your educational background. The MSU Addiction Counseling Certificate program provides individual academic advisement and tailors a program of study based on individual student academic backgrounds.

Requirements

Complete 12 credits from the course list to receive the MSU Addiction Counseling Certificate. State licensure may require all 30 credits depending on students prior academic coursework.

Curriculum

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>LAC 501</td>
<td>Chemical Dependency Counseling (Spring)</td>
<td>3</td>
</tr>
<tr>
<td>LAC 502</td>
<td>Psychopharmacology and Addictions (Spring)</td>
<td>3</td>
</tr>
<tr>
<td>LAC 503</td>
<td>Assessment, Treatment Planning and Ethics of Addiction Counseling (Fall)</td>
<td>3</td>
</tr>
<tr>
<td>LAC 504</td>
<td>Alcohol and Drug Studies (Fall)</td>
<td>3</td>
</tr>
<tr>
<td>LAC 505</td>
<td>Cross Cultural &amp; Ethical Considerations in Addictions Counseling (Summer)</td>
<td>3</td>
</tr>
<tr>
<td>LAC 506</td>
<td>Group Counseling in Addiction Settings (Fall)</td>
<td>3</td>
</tr>
<tr>
<td>LAC 507</td>
<td>Group Counseling in Addiction Settings (Spring)</td>
<td>3</td>
</tr>
<tr>
<td>LAC 508</td>
<td>Counseling Theories in Addiction Settings (Summer)</td>
<td>3</td>
</tr>
<tr>
<td>LAC 509</td>
<td>Assess Treat Plan Addiction II (Spring)</td>
<td>3</td>
</tr>
<tr>
<td>LAC 510</td>
<td>Chem Dependency Counseling II (Fall)</td>
<td>3</td>
</tr>
</tbody>
</table>

For More Information

About the Program

Contact Katey Franklin, Program Director, at kathryn.franklin1@montana.edu or (406) 994-5993.
About the Application Process
Contact Sarah Hendrikx, Program Manager, at sarah.hendrikx@montana.edu or (406) 994-7441.

Explore Further
• Other Montana State Online Degree and Certificate Programs (http://eu.montana.edu/online/degrees)
• Frequently Asked Questions (http://eu.montana.edu/online/faq) concerning online courses
• MSU Department of Health and Human Development (http://www.montana.edu/wwwhhd)
• Is online learning right for you? Find out with our interactive quiz (http://eu.montana.edu/online/quiz).

College of Engineering
Graduate Programs Available

Department of Chemical and Biological Engineering (p. 334)
- M.S. in Chemical Engineering (p. 335)
- M.S. in Environmental Engineering (p. 336)
- Master of Engineering In Chemical Engineering (p. 338)
- Master of Engineering in Bioengineering (p. 338)
- Ph.D. in Engineering (p. 343)
- Ph.D. in Materials and Science (p. 402)

Department of Civil Engineering (p. 338)
- M.S. in Civil Engineering (p. 339)
- M.S. in Environmental Engineering (p. 336)
- Professional Master of Construction Engineering Management (PMSEM) (p. 341)
- Ph.D. in Ecology and Environmental Sciences (Interdisciplinary) (p. 293)
- Ph.D. in Engineering (p. 343)

Department of Computer Science (p. 348)
- M.S. in Computer Science (p. 348)
- Ph.D. in Computer Science (p. 348)

Department of Electrical and Computer Engineering (p. 348)
- M.Eng in Electrical Engineering (p. 350)
- M.S. in Electrical Engineering, Plan A (thesis) (p. 350)
- M.S. in Electrical Engineering, Plan B (professional paper) (p. 350)
- M.S. in Optics, Plan A (thesis) (p. 350)
- M.S. in Optics, Plan B (professional paper) (p. 351)
- Ph.D. in Engineering, Electrical & Computer Engineering option (p. 351)
- Ph.D. in Materials Science (p. 402)

Department of Mechanical and Industrial Engineering (p. 352)
- M.S. in Industrial and Management Engineering (p. 352)
- M.S. in Mechanical Engineering (p. 353)
- M.Eng. in Mechanical Engineering (p. 353)
- Ph.D. in Engineering -- Industrial Engineering and Mechanical Engineering options (p. 343)
- Ph.D. in Materials Science (p. 402)

Research Focus Areas (http://www.coe.montana.edu/research.php)
Research and Extension Centers (http://www.coe.montana.edu/links-res-ext.html)

Dean
Brett Gunnink, Ph.D., P.E.
214 Roberts Hall
406-994-2272 Email:bgunnink@ce.montana.edu

Associate Dean for Research, Faculty & Administration
Anne K. Camper, Ph.D.
214 Roberts Hall
406-994-2272 Email: anne_c@erc.montana.edu

Associate Dean for Student Success
Christine M. Foreman, Ph.D.
2124 Roberts Hall
406-994-2272 Email: cforeman@montana.edu

Department of Chemical and Biological Engineering

Department Head/Assoc. Professor:
Jeff Heys, Ph.D.
Email: jeffrey.heys@coe.montana.edu

Montana State University
310 Cobleigh Hall
PO Box 173920, Bozeman, MT 59717-3920
406-994-2221 Department Email: chbe@montana.edu

Home Page: www.chbe.montana.edu

The department offers graduate programs leading to the Master of Science in Chemical Engineering degree and a Master of Science degree in Environmental Engineering. The department participates in the Doctor of Philosophy degree in Engineering through the College of Engineering, with options available in Chemical Engineering and Environmental Engineering.

Admission (M.S. and Ph.D.)
Students may enter the Master of Science or Doctoral programs with a bachelor’s degree in Chemical Engineering or other engineering or science discipline. Non-chemical engineering students wishing to pursue a master’s program may require limited remedial coursework. Students may be admitted directly to the doctoral program without a master’s degree.

The Department of Chemical and Biological Engineering has the following minimum requirements for admission to the graduate program:
- 3.0 GPA in undergraduate program (based on A=4.0)
- GRE Scores (148 verbal, 144 quantitative)
- International Applicants: TOEFL (internet exam - 80, paper exam - 550, computerized exam - 213) or IELTS score of 7.0 or higher - required for non-native speakers of English

Note: Typical scores for admitted graduate students are well above these minima.

For further information, refer to Admission Policies and Application Requirements section of the department webpage.
Deadlines
Deadline for consideration for Assistantships

- Fall Semester: February 1
- Spring Semester: August 1

Domestic Applicants
- Fall Semester: July 1
- Spring Semester: November 1
- Summer Semester: March 15

International Applicants
- Fall Semester: May 1
- Spring Semester: September 15
- Summer Semester: January 15

Research
This degree involves research in transport phenomena in complex systems, materials, biofilms, biochemical transformation, biotechnology, remediation of hazardous wastes, and environmental engineering. Research topics include extremophilic bioprocessing, in situ biocatalyzed heavy metal biotransformations in natural and engineered biological systems, biomaterials, biochemistry, colloidal system dynamics, durability of materials, surface interactions, membrane materials, composite materials, separations, metabolic engineering, metabolic systems analysis, biofuels processing.

Some departmental research is conducted in collaboration with the Center for Biofilm Engineering, the Thermal Biology Institute and MSU's Surface Science Program. Research also includes materials science and engineering for energy applications including: high temperature corrosion and corrosion protection, advanced physical vapor deposition (PVD) technologies, and sustainable energy.

Financial Assistance
Research and teaching assistantships and scholarships are available on either a 9-month or a 12-month basis; only MS and Ph.D. candidates are eligible.

Degree Offered
- M.S. in Chemical Engineering - Thesis Option (Plan A) (p. 336)
- M.S. in Chemical Engineering - Thesis Option (Plan B) (p. 335)
- M.S. in Chemical Engineering - Non-Thesis Option (Plan B)

General Requirements
- 30 credits total
- (ECHM 575 Research or Prof Paper/Project) is required
- Half of total credits required for degree must be at 5xx level
- 3xx level courses are not allowed
- 4xx level courses may be used
- Courses with grades below C- cannot be used to satisfy graduation requirements
- Three credits (min.) registration required during term of:
  - Comprehensive Examination and Thesis defense
  - Graduation (1 credit with in absentia graduation request on file)

Course Requirements
The following courses are required of each MS student:

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECHM 594</td>
<td>Seminar (can be taken twice)</td>
<td>1</td>
</tr>
<tr>
<td>ECHM 503</td>
<td>Thermodynamics (F)</td>
<td>3</td>
</tr>
<tr>
<td>ECHM 533</td>
<td>Transport Phenomena (Sp)</td>
<td>3</td>
</tr>
<tr>
<td>ECHM 575</td>
<td>Research or Prof Paper/Project</td>
<td>1-4</td>
</tr>
<tr>
<td>EGEN 505</td>
<td>Advanced Engineering Analysis</td>
<td>3</td>
</tr>
<tr>
<td>EGEN 506</td>
<td>Numerical Sol to Engr Problems</td>
<td>3</td>
</tr>
</tbody>
</table>

Examinations
For Non-Thesis Option (Plan B) Students:
- Defense of professional paper
- Comprehensive examination
M.S. in Chemical Engineering - Thesis Option (Plan A)

General Requirements

• 30 credits total (including thesis credits)
• 10 credits (minimum) of ECHM 590 Master’s Thesis
• Half of total credits required for degree must be at 5xx level
• 3xx level courses are not allowed
• 4xx level courses may be used
• Courses with grades below C- cannot be used to satisfy degree requirements
• Three credits (min.) registration required during term of:
  • Comprehensive Examination and Thesis defense
  • Graduation (1 credit with in absentee graduation request on file)

Course Requirements
The following courses are required of each MS student

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECHM 594</td>
<td>Seminar (can be taken twice)</td>
<td>1</td>
</tr>
<tr>
<td>ECHM 503</td>
<td>Thermodynamics</td>
<td>3</td>
</tr>
<tr>
<td>ECHM 533</td>
<td>Transport Phenomena</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Plus, a course in each of the following areas:</td>
<td></td>
</tr>
<tr>
<td>ECHM 510</td>
<td>Reaction Engineering/Modeling</td>
<td>3</td>
</tr>
<tr>
<td>or EBI0 566</td>
<td>Fundamentals of Biofilm Engr</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Advanced Mathematics</td>
<td></td>
</tr>
<tr>
<td>EGEN 505</td>
<td>Advanced Engineering Analysis</td>
<td>3</td>
</tr>
<tr>
<td>or EGEN 506</td>
<td>Numerical Sol to Engr Problems</td>
<td></td>
</tr>
</tbody>
</table>

Each student’s graduate advisor and committee are to work with the student to prepare a Program of Study listing the courses the student is required to take.

Examinations
For Thesis Option (Plan A) students, the thesis defense and comprehensive examination are combined.

Environmental Engineering

Contact
Civil Engineering Department (http://www.coe.montana.edu/ce)
Email: cedep@ce.montana.edu

Chemical and Biological Engineering Department (http://www.chbe.montana.edu)
Email: che_b@coe.montana.edu or

The Environmental Engineering program is an integrated effort of the Departments of Civil and Chemical and Biological Engineering. The vision of the program is to educate students who will develop solutions to environmental and industrial needs for physical/chemical/biological treatment, environmental restoration, and waste management using a cross-disciplinary approach.

The degree of Master of Science in Environmental Engineering is awarded through either the Civil or Chemical and Biological Engineering departments, depending on the student’s background, academic program and research work. Areas of specialty within the program include water quality management, design of water and waste water facilities, and chemical/microbial process analysis and design. Environmental Engineering is also one of the options for the Doctor of Philosophy in Engineering.

Admission
Students entering the Environmental Engineering program must meet the admission requirements for either Civil or Chemical and Biological Engineering. Generally, students with undergraduate degrees in Civil or Chemical and Biological Engineering will apply to the department of their undergraduate discipline. Students with degrees in disciplines other than engineering may be admitted to the program through either department, but may be required to complete remedial coursework. Successful applicants are accepted into both the department and the Graduate School. For further information, refer to the Admission Policies and Application Requirements sections.

Research Opportunities
Research is considered a vital part of the Environmental Engineering program. Many of the students do their research work through the Center for Biofilm Engineering, although avenues through Civil or Chemical and Biological Engineering are also available. Research is used as the basis for a thesis or professional paper, one of which is required for graduation. Current research within the program focuses on both the fundamentals and application of chemical and biological processes relating to water quality management, water and wastewater treatment processes, the remediation of contaminated soils, and groundwater and biofilm processes of industrial relevance.

Financial Assistance
A number of teaching and research assistantships are available in both the Civil and Chemical and Biological Engineering Departments. Additionally, research assistantships are available in the Center for Biofilm Engineering. Students should apply directly to the appropriate department and/or to the Center for Biofilm Engineering for financial assistance. See the Graduate Assistantships sections for more information.

Degree Options
• M.S. in Environmental Engineering - Thesis Option (Plan A) (p. 337)
• M.S. in Environmental Engineering - Non-Thesis Option (Plan B) (p. 336)

M.S. in Environmental Engineering

Degree Options
• M.S. in Environmental Engineering - Thesis Option (Plan A) (p. 337)
• M.S. in Environmental Engineering - Non-Thesis Option (Plan B) (p. 336)

M.S. in Environmental Engineering - Non-Thesis Option (Plan B)

General Requirements
The Degree of M.S., Environmental Engineering is awarded through either the Civil or Chemical and Biological Engineering Departments, depending on the student’s background and professional focus. Degree candidates correspondingly must meet the requirements of the appropriate Department as enumerated below, as well as the requirements of the Graduate School. Each student’s graduate adviser and committee will work with the student to prepare a Program of Study listing the courses the
student will take. This program must be submitted to the The Graduate School before the end of the second semester of study.

Common requirements for both Departments include:

- Minimum 30 credits total (4xx or 5xx-level)
- Maximum of 9 credits taken at the 4xx level may be included in the program of study
- Courses graded below C- cannot be used to satisfy degree requirements
- Defense of professional paper
- Three credits (minimum) registration required during term of:
  - Comprehensive examination
  - Graduation (or 1 credit with in absentia request on file)

Additional specific requirements by department are listed below.

**Civil Engineering Department Specific Requirements**

Curriculum requirements for the M.S. degree in Environmental Engineering in the Civil Engineering Department are highly individualized and established in consultation with and approved by the student’s graduate committee. The courses listed below are often considered when establishing the program of study for a particular student. There are also many other courses offered at MSU that may support a student’s academic goals. The Civil Engineering Department also requires all students to take one credit of graduate seminar - ECIV 594 - during their final semester, which is in addition to the 30 credit minimum.

- EENV 534 Environ Eng Investigation 3
- EENV 540 Water Chemistry for Envir Engr 3
- EENV 561 Environ Eng Reactor Theory 2
- EENV 562 Water Treatment Process/Design 3
- EENV 563 Wastewater Treat Proc/Design 3
- EENV 565 Chem Sens/Instr Envir Biotech 2
- EENV 575 Research or Prof Paper/Project (Required) 1-4
- EENV 591 Special Topics 1-3
- EENV 592 Independent Study 1-3
- EENV 598 Internship 2
- ECIV 529 Groundwater Contamination 3
- ECIV 594 Seminar (Required) 1
- EBIO 566 Fundamentals of Biofilm Engr 3
- ECHM 503 Thermodynamics 3
- ECHM 510 Reaction Engineering/Modeling 3
- ECHM 533 Transport Phenomena 3

**Chemical and Biological Engineering Department Specific Requirements**

Master of Science in Environmental Engineering degree requirements through the Chemical and Biological Engineering Department are:

**Course Requirements**

- ECHM 594 Seminar (may be taken twice for credit) 1
- ECHM 503 Thermodynamics 3
- ECHM 533 Transport Phenomena 3
- EBIO 566 Fundamentals of Biofilm Engr 3
- EENV 561 Environ Eng Reactor Theory 2
- or ECHM 510 Reaction Engineering/Modeling
- EENV 562 Water Treatment Process/Design 3
- EENV 563 Wastewater Treat Proc/Design 3
- EENV 575 Research or Prof Paper/Project 1-4
- or EENV 534 Environ Eng Investigation
- & EENV 575 and Research or Prof Paper/Project
- ECIV 529 Groundwater Contamination 3

Substitutions for these course requirements may be approved by the committee after carefully considering the background and professional goals of the student.

Each student’s graduate adviser and committee are to work with the student to prepare a program of study listing the courses the student will take. This program must be submitted to The Graduate School before the end of the second semester of study. Note: If the student is attempting to graduate in two semesters, the program of study and application for degree must be submitted by the third week of the second semester.

**M.S. in Environmental Engineering - Thesis Option (Plan A)**

This summary is intended to assist students in planning their program of study and presents commonly needed information in this regard. General University degree requirements are fully enumerated in the Graduate School Policies and Procedures. The information presented here is a combination of the general requirements of the Graduate School and specific departmental requirements.

**General Requirements**

The Degree of M.S., Environmental Engineering is awarded through either the Civil or Chemical and Biological Engineering Departments, depending on the student’s background and professional focus. Degree candidates correspondingly must meet the requirements of the appropriate Department as enumerated below, as well as the requirements of the Graduate School. Each student’s graduate adviser and committee will work with the student to prepare a Program of Study listing the courses the student will take. This program must be submitted to The Graduate School before the end of the second semester of study.

Common requirements for both Departments include:

- Minimum 30 credits total (including thesis credits)
- Minimum 20 credits coursework (4xx or 5xx-level)
- Minimum 10 credits: Master’s Thesis (ECHM 590) or Master’s Thesis (EBIO 590) or Master’s Thesis (EENV 590)
- Maximum of 9 credits taken at the 4xx level may be included in the program of study
- Courses graded below C- cannot be used to satisfy degree requirements
- Three credits (minimum) registration required during term of:
  - Comprehensive examination and thesis defense
  - Graduation (or 1 credit with in absentia request on file)

Additional specific requirements by department are listed below.

**Civil Engineering Department Specific Requirements**

Curriculum requirements for the M.S. degree in Environmental Engineering in the Civil Engineering Department are highly individualized and established in consultation with and approved by the student’s graduate committee. The courses listed below are often considered when establishing the program of study for a particular student. There are also many other courses offered at MSU that may support a student’s academic goals. The Civil Engineering Department also requires all students to take one credit...
of graduate seminar - ECIV 594 - during their final semester, which is in addition to the 30 credit minimum.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECIV 529</td>
<td>Groundwater Contamination</td>
<td>3</td>
</tr>
<tr>
<td>EENV 540</td>
<td>Water Chemistry for Envr Engr</td>
<td>3</td>
</tr>
<tr>
<td>EENV 561</td>
<td>Environ Eng Reactor Theory</td>
<td>2</td>
</tr>
<tr>
<td>EENV 562</td>
<td>Water Treatment Process/Design</td>
<td>3</td>
</tr>
<tr>
<td>EENV 563</td>
<td>Wastewater Treat Proc/Design</td>
<td>3</td>
</tr>
<tr>
<td>EENV 565</td>
<td>Chem Sens/Instr Envr Biotech</td>
<td>2</td>
</tr>
<tr>
<td>EENV 590</td>
<td>Master’s Thesis (Required)</td>
<td>10</td>
</tr>
<tr>
<td>EENV 591</td>
<td>Special Topics</td>
<td>1-3</td>
</tr>
<tr>
<td>EENV 592</td>
<td>Independent Study</td>
<td>1-3</td>
</tr>
<tr>
<td>EENV 598</td>
<td>Internship</td>
<td>2</td>
</tr>
<tr>
<td>ECIV 529</td>
<td>Groundwater Contamination</td>
<td>3</td>
</tr>
<tr>
<td>ECIV 594</td>
<td>Seminar (Required)</td>
<td>1</td>
</tr>
<tr>
<td>EBIO 566</td>
<td>Fundamentals of Biofilm Engr</td>
<td>3</td>
</tr>
<tr>
<td>ECHM 503</td>
<td>Thermodynamics</td>
<td>3</td>
</tr>
<tr>
<td>ECHM 510</td>
<td>Reaction Engineering/Modeling</td>
<td>3</td>
</tr>
<tr>
<td>ECHM 533</td>
<td>Transport Phenomena</td>
<td>3</td>
</tr>
</tbody>
</table>

**Chemical and Biological Engineering Department Specific Requirements**

Master of Science in Environmental Engineering degree requirements through the Chemical and Biological Engineering Department are:

**Requirements**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECHM 594</td>
<td>Seminar (may be taken twice for credit)</td>
<td>1</td>
</tr>
<tr>
<td>ECHM 503</td>
<td>Thermodynamics</td>
<td>3</td>
</tr>
<tr>
<td>ECHM 533</td>
<td>Transport Phenomena</td>
<td>3</td>
</tr>
<tr>
<td>EENV 561</td>
<td>Environ Eng Reactor Theory</td>
<td>2</td>
</tr>
<tr>
<td>or ECHM 510</td>
<td>Reaction Engineering/Modeling</td>
<td></td>
</tr>
<tr>
<td>or EBIO 566</td>
<td>Fundamentals of Biofilm Engr</td>
<td></td>
</tr>
<tr>
<td>EENV 562</td>
<td>Water Treatment Process/Design</td>
<td>3</td>
</tr>
<tr>
<td>or EENV 563</td>
<td>Wastewater Treat Proc/Design</td>
<td></td>
</tr>
<tr>
<td>EENV 590</td>
<td>Master’s Thesis (Required)</td>
<td>1-10</td>
</tr>
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</table>

**Additional Recommended Courses**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECIV 529</td>
<td>Groundwater Contamination</td>
<td>3</td>
</tr>
<tr>
<td>EENV 534</td>
<td>Environ Eng Investigation</td>
<td>3</td>
</tr>
</tbody>
</table>

* Substitution for this course requirement may be approved by the committee after carefully considering the professional goals of the student.

Each student’s graduate adviser and committee are to work with the student to prepare a Program of Study listing the courses the student will take. This program must be submitted to The Graduate School before the end of the second semester of study.

**Master of Engineering in Chemical Engineering**

**General Requirements**

- 30 credits total
- at least 18 of the total credits required for degree must be at 5xx level
- 3xx level courses are not allowed
- 4xx level courses may be used
- Courses with grades below C- cannot be used to satisfy graduate requirements
- Three credits (min.) registration required during term of graduation
- Max of 6 credits of individual problems courses (570)

**Course Requirements**

The following courses are required of each ME student:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECHM 594</td>
<td>Seminar (can be taken twice)</td>
<td>1</td>
</tr>
<tr>
<td>ECHM 503</td>
<td>Thermodynamics</td>
<td>3</td>
</tr>
<tr>
<td>ECHM 533</td>
<td>Transport Phenomena</td>
<td>3</td>
</tr>
</tbody>
</table>

Plus, a course in each of the following areas:

- Reaction Engineering
  - ECHM 510 Reaction Engineering/Modeling
  - or EBIO 566 Fundamentals of Biofilm Engr
- Advanced Mathematics
  - EGEN 505 Advanced Engineering Analysis
  - or EGEN 506 Numerical Sol to Engr Problems

**Master of Engineering in Bioengineering**

**General Requirements**

- 30 credits total
- At least 18 of the total credits required for degree must be at 5xx level
- 3xx level courses are not allowed
- 4xx level courses may be used
- Courses with grades below C- cannot be used to satisfy graduation requirements
- Three credits (min.) registration required during term of graduation
- Max of 6 credits of individual problems courses (570)

**Course Requirements**

The following courses are required for each ME student:

<table>
<thead>
<tr>
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<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECHM 594</td>
<td>Seminar (can be taken twice)</td>
<td>1</td>
</tr>
<tr>
<td>ECHM 533</td>
<td>Transport Phenomena</td>
<td>3</td>
</tr>
</tbody>
</table>

Plus, a course in each of the following areas:

- Reaction Engineering
  - EBIO 566 Fundamentals of Biofilm Engr
  - or ECHM 510 Reaction Engineering/Modeling
- Advanced Mathematics
  - EGEN 505 Advanced Engineering Analysis
  - or EGEN 506 Numerical Sol to Engr Problems

**Department of Civil Engineering**

Po Box 173900
Bozeman, MT 59717-3900
406-994-2111 Email: cedept@ce.montana.edu

Home Page: www.montana.edu/ce

The department offers graduate study leading to Master of Science degrees in Civil Engineering, Environmental Engineering, and an interdisciplinary Master of Science degree in Land Rehabilitation. The department also participates in the Doctor of Philosophy in Engineering degree program.
Graduate Programs
- M.S. in Civil Engineering (p. 339)
- M.S. in Environmental Engineering (p. 336)
- M.S. in Land Rehabilitation (p. 286)
- Professional Master of Science and Engineering Management (p. 341) (PMSEM)
- Ph.D. in Engineering (p. 343) (Options: Applied Mechanics, Environmental Engineering, Civil Engineering)

MS in Civil Engineering
Students may pursue the M.S. degree in any of the Civil Engineering Department programs under either Plan A or Plan B. Plan A (thesis) requires completion of a minimum of thirty-one (31) credits of work, including a thesis. Plan B (Professional Paper) requires completion of a minimum of thirty-one (31) credits of work, including a maximum of six (6) credits of Research or Prof Paper/Project (ECIV 575) / Research or Prof Paper/Project (EENV 575). One (1) credit of Seminar (ECIV 594) is required for both Plans A and B.

A research experience, acceptable to the student’s graduate committee, is required of all M.S. students. The Plan A student prepares a thesis that is submitted to the student’s graduate committee and defended at the oral comprehensive examination. A Plan B student prepares a professional paper that is submitted to the student’s adviser and presented at an ECIV 594 seminar.

Candidates for the M.S. degree must pass a written comprehensive examination near the completion of their graduate program. The Plan A student must pass an oral comprehensive examination as well. Students are expected to be familiar with the degree requirements of both the department and The Graduate School. Refer to the For Master’s Students section.

Curriculum requirements are highly individualized and established in consultation with and approved by the student’s graduate committee.

M.S in Environmental Engineering

Degree Options
- M.S. in Environmental Engineering - Thesis Option (Plan A) (p. 337)
- M.S. in Environmental Engineering - Non-Thesis Option (Plan B) (p. 336)

M.S. in Environmental Engineering - Non-Thesis Option (Plan B)

General Requirements
The Degree of M.S., Environmental Engineering is awarded through either the Civil or Chemical and Biological Engineering Departments, depending on the student’s background and professional focus. Degree candidates correspondingly must meet the requirements of the appropriate Department as enumerated below, as well as the requirements of the Graduate School. Each student’s graduate adviser and committee will work with the student to prepare a Program of Study listing the courses the student will take. This program must be submitted to the The Graduate School before the end of the second semester of study.

Common requirements for both Departments include:
- Minimum 30 credits total (4xx or 5xx-level)
Course Requirements

- Maximum of 9 credits taken at the 4xx level may be included in the program of study
- Courses graded below C- cannot be used to satisfy degree requirements
- Defense of professional paper
- Three credits (minimum) registration required during term of:
  - Comprehensive examination
  - Graduation (or 1 credit with in absentia request on file)

Additional specific requirements by department are listed below.

**Civil Engineering Department Specific Requirements**

Curriculum requirements for the M.S. degree in Environmental Engineering in the Civil Engineering Department are highly individualized and established in consultation with and approved by the student’s graduate committee. The courses listed below are often considered when establishing the program of study for a particular student. There are also many other courses offered at MSU that may support a student’s academic goals. The Civil Engineering Department also requires all students to take one credit of graduate seminar - ECIV 594 - during their final semester, which is in addition to the 30 credit minimum.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>EENV 534</td>
<td>Environ Eng Investigation</td>
<td>3</td>
</tr>
<tr>
<td>EENV 540</td>
<td>Water Chemistry for Envr Engr</td>
<td>3</td>
</tr>
<tr>
<td>EENV 561</td>
<td>Environ Eng Reactor Theory</td>
<td>2</td>
</tr>
<tr>
<td>EENV 562</td>
<td>Water Treatment Process/Design</td>
<td>3</td>
</tr>
<tr>
<td>EENV 563</td>
<td>Wastewater Treat Proc/Design</td>
<td>3</td>
</tr>
<tr>
<td>EENV 565</td>
<td>Chem Sens/Instr Envir Biotech</td>
<td>2</td>
</tr>
<tr>
<td>EENV 575</td>
<td>Research or Prof Paper/Project (Required)</td>
<td>1-4</td>
</tr>
<tr>
<td>EENV 591</td>
<td>Special Topics</td>
<td>1-3</td>
</tr>
<tr>
<td>EENV 592</td>
<td>Independent Study</td>
<td>1-3</td>
</tr>
<tr>
<td>EENV 598</td>
<td>Internship</td>
<td>2</td>
</tr>
<tr>
<td>ECIV 529</td>
<td>Groundwater Contamination</td>
<td>3</td>
</tr>
<tr>
<td>ECIV 594</td>
<td>Seminar (Required)</td>
<td>1</td>
</tr>
<tr>
<td>EBIO 566</td>
<td>Fundamentals of Biofilm Engr</td>
<td>3</td>
</tr>
<tr>
<td>ECHM 503</td>
<td>Thermodynamics</td>
<td>3</td>
</tr>
<tr>
<td>ECHM 510</td>
<td>Reaction Engineering/Modeling</td>
<td>3</td>
</tr>
<tr>
<td>ECHM 533</td>
<td>Transport Phenomena</td>
<td>3</td>
</tr>
</tbody>
</table>

**Chemical and Biological Engineering Department Specific Requirements**

Master of Science in Environmental Engineering degree requirements through the Chemical and Biological Engineering Department are:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECHM 594</td>
<td>Seminar (may be taken twice for credit)</td>
<td>1</td>
</tr>
<tr>
<td>ECHM 503</td>
<td>Thermodynamics</td>
<td>3</td>
</tr>
<tr>
<td>ECHM 533</td>
<td>Transport Phenomena</td>
<td>3</td>
</tr>
<tr>
<td>EBIO 566</td>
<td>Fundamentals of Biofilm Engr</td>
<td>3</td>
</tr>
<tr>
<td>EENV 561</td>
<td>Environ Eng Reactor Theory</td>
<td>2</td>
</tr>
<tr>
<td>or ECHM 510</td>
<td>Reaction Engineering/Modeling</td>
<td></td>
</tr>
<tr>
<td>EENV 562</td>
<td>Water Treatment Process/Design</td>
<td>3</td>
</tr>
<tr>
<td>EENV 563</td>
<td>Wastewater Treat Proc/Design</td>
<td>3</td>
</tr>
<tr>
<td>EENV 575</td>
<td>Research or Prof Paper/Project</td>
<td>1-4</td>
</tr>
<tr>
<td>or EENV 534</td>
<td>Environ Eng Investigation</td>
<td></td>
</tr>
<tr>
<td>&amp; EENV 575</td>
<td>and Research or Prof Paper/Project</td>
<td></td>
</tr>
<tr>
<td>ECIV 529</td>
<td>Groundwater Contamination</td>
<td>3</td>
</tr>
</tbody>
</table>

* Substitutions for these course requirements may be approved by the committee after carefully considering the background and professional goals of the student.

Each student’s graduate adviser and committee are to work with the student to prepare a program of study listing the courses the student will take. This program must be submitted to The Graduate School before the end of the second semester of study. Note: If the student is attempting to graduate in two semesters, the program of study and application for degree must be submitted by the third week of the second semester.

**M.S. in Environmental Engineering - Thesis Option (Plan A)**

This summary is intended to assist students in planning their program of study and presents commonly needed information in this regard. General University degree requirements are fully enumerated in the Graduate School Policies and Procedures. The information presented here is a combination of the general requirements of the Graduate School and specific departmental requirements.

**General Requirements**

The Degree of M.S., Environmental Engineering is awarded through either the Civil or Chemical and Biological Engineering Departments, depending on the student’s background and professional focus. Degree candidates correspondingly must meet the requirements of the appropriate Department as enumerated below, as well as the requirements of the Graduate School. Each student’s graduate adviser and committee will work with the student to prepare a Program of Study listing the courses the student will take. This program must be submitted to The Graduate School before the end of the second semester of study.

Common requirements for both Departments include:

- Minimum 30 credits total (including thesis credits)
- Minimum 20 credits coursework (4xx or 5xx-level)
- Minimum 10 credits: Master’s Thesis (ECHM 590) or Master’s Thesis (EBIO 590) or Master’s Thesis (EENV 590)
- Maximum of 9 credits taken at the 4xx level may be included in the program of study
- Courses graded below C- cannot be used to satisfy degree requirements
- Three credits (minimum) registration required during term of:
  - Comprehensive examination and thesis defense
  - Graduation (or 1 credit with in absentia request on file)

Additional specific requirements by department are listed below.

**Civil Engineering Department Specific Requirements**

Curriculum requirements for the M.S. degree in Environmental Engineering in the Civil Engineering Department are highly individualized and established in consultation with and approved by the student’s graduate committee. The courses listed below are often considered when establishing the program of study for a particular student. There are also many other courses offered at MSU that may support a student’s academic goals. The Civil Engineering Department also requires all students to take one credit of graduate seminar - ECIV 594 - during their final semester, which is in addition to the 30 credit minimum.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECIV 529</td>
<td>Groundwater Contamination</td>
<td>3</td>
</tr>
<tr>
<td>EENV 540</td>
<td>Water Chemistry for Envr Engr</td>
<td>3</td>
</tr>
<tr>
<td>EENV 561</td>
<td>Environ Eng Reactor Theory</td>
<td>2</td>
</tr>
</tbody>
</table>
M.S. in Land Rehabilitation

Course work in land rehabilitation is designed to serve students new to the rehabilitation field, as well as to experienced individuals or those already working in land rehabilitation or restoration ecology and who desire further education and training. Montana State University offers core courses in land rehabilitation and restoration ecology, and a very strong array of supporting courses in relevant disciplines. These courses are integrated with the core curriculum to add breadth and depth to the program and to make specialization possible in a given aspect of land rehabilitation. Site revegetation, soil remediation, restoration of riparian zones and stream channels, remediation of contaminated sites, and management of invasive plants are among the many potential areas of study. Emphasis is placed on developing a broad understanding of soil, plant and hydrological processes as foundation to effective applications. With the exception of required core courses, course sequences will be designed to correspond with the specific needs, interests and educational goals of the individual student.

This program emphasizes soil, vegetation and water sciences, and graduates are expected to be well versed in these areas in addition to the student’s particular area of interest.

Core Curriculum

30 credits minimum (10 thesis, 20 course work) required for master’s degree. 2/3 of total credits must be 500 level. Candidates for the M.S. degree in Land Rehabilitation must complete a 8 credit core curriculum. Elective credits will reflect foundational courses as well as student’s special interests. A minimum of 20 credits of coursework must be taken from MSU.

Required Core Courses (8 credits) Credits

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>LRES 563</td>
<td>Restoration Ecology</td>
<td>3</td>
</tr>
<tr>
<td>ENSC 460</td>
<td>Soil Remediation</td>
<td>3</td>
</tr>
<tr>
<td>LRES 562</td>
<td>Land Rehab Field Problem</td>
<td>2</td>
</tr>
</tbody>
</table>

Chemical and Biological Engineering Department Specific Requirements

Master of Science in Environmental Engineering degree requirements through the Chemical and Biological Engineering Department are:

Requirements

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECHM 594</td>
<td>Seminar (may be taken twice for credit)</td>
<td>1</td>
</tr>
<tr>
<td>ECHM 503</td>
<td>Thermodynamics</td>
<td>3</td>
</tr>
<tr>
<td>ECHM 533</td>
<td>Transport Phenomena</td>
<td>3</td>
</tr>
<tr>
<td>EENV 561</td>
<td>Environ Eng Reactor Theory</td>
<td>2</td>
</tr>
<tr>
<td>or ECHM 510</td>
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<td>or EBI 566</td>
<td>Fundamentals of Biofilm Engr</td>
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<td>EENV 562</td>
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<td>3</td>
</tr>
<tr>
<td>or EENV 563</td>
<td>Wastewater Treat Proc/Design</td>
<td>3</td>
</tr>
<tr>
<td>EENV 590</td>
<td>Master’s Thesis</td>
<td>1-10</td>
</tr>
</tbody>
</table>

Additional Recommended Courses

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECIV 529</td>
<td>Groundwater Contamination</td>
<td>3</td>
</tr>
<tr>
<td>EENV 534</td>
<td>Environ Eng Investigation</td>
<td>3</td>
</tr>
</tbody>
</table>

* Substitution for this course requirement may be approved by the committee after carefully considering the professional goals of the student.

Each student’s graduate adviser and committee are to work with the student to prepare a Program of Study listing the courses the student will take. This program must be submitted to The Graduate School before the end of the second semester of study.

Professional Master of Science and Engineering Management (PMSEM)

MSU’s Professional Master of Science and Engineering Management (PMSEM) degree is a 30-credit interdisciplinary graduate program that helps working professionals bridge the gap between science and engineering and business management in the workplace. Students complete 15 credits of foundational coursework and an additional 15 credits based on their educational needs. There is also a 12 credit graduate certificate option available.

This program provides professionals with an alternative to the traditional research-oriented M.S. degree in the sciences or engineering or a strictly business-focused M.B.A. At the core of the program are foundation courses in business and technical management that are relevant to today’s business world and highly valued by industry. Students can choose elective coursework that is most relevant to their career goals. The degree may be completed in two years and is designed to accommodate the unique needs and schedules of working professionals.

Coursework and instructors come from MSU’s renowned Colleges of Business, Engineering and Letters & Science. This program will prepare professionals for success at the management or executive level in the rapidly changing business environment of the 21st Century.

Professional Master of Science and Engineering Management Requirements:

Potential students must have the following:

- Bachelors degree in a science or engineering field
- 2 or more years of full-time employment in a science or engineering industry and a letter of recommendation from the employer OR Graduate Record Exam (GRE) with a minimum score of approximately 300.
- 3.0 undergraduate GPA

To apply to the program fill out a Graduate School Application online (http://www.montana.edu/gradschool/apply.html) (submit a $60 non-refundable application fee). During the online application process, you will be asked to submit the following items:

- Official Transcripts from all post-secondary institutions sent to the Program manager (Transcripts with degrees awarded from MSU are not required).
- 3 letters of recommendation
- Narrative of goals and interest in obtaining PMSEM degree
### Curriculum

#### Required Coursework (15 credits)

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>MSE 501</td>
<td>Leading Human &amp; Fin Ent (Fall)</td>
<td>9</td>
</tr>
<tr>
<td>MSE 502</td>
<td>Leading the Tech Enterprise (Spring)</td>
<td>6</td>
</tr>
</tbody>
</table>

#### Electives (15 credits)

The electives that may be taken depend on the degree track you are accepted into. There are three tracks - Construction Engineering Management, Land Resources Environmental Sciences, and the Independent track. Students must petition to change tracks.

### Construction Engineering Management Track

Students will take 15 credits in topics such as quality management, construction industry law, productivity and more. These courses can be taken fully online.

This track leverages the foundation course topics and further develops the civil or construction engineer’s technical knowledge base. The track’s core courses focus on specific needs of the construction industry and the executive’s role for addressing those needs inside a successful construction company. The 3 credit professional paper is a required capstone course which allows the student to apply concepts learned to their current job situation.

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECIV 504</td>
<td>Construction Productivity</td>
<td>3</td>
</tr>
<tr>
<td>ECIV 505</td>
<td>Quality Assure/Risk Management</td>
<td>3</td>
</tr>
<tr>
<td>ECIV 506</td>
<td>Ad Construction Management</td>
<td>3</td>
</tr>
<tr>
<td>ECIV 507</td>
<td>Law of the Construction Industry</td>
<td>3</td>
</tr>
<tr>
<td>ECIV 575</td>
<td>Research or Prof Paper/Project (Required capstone course)</td>
<td>3</td>
</tr>
<tr>
<td>ECIV 592</td>
<td>Independent Study</td>
<td>3</td>
</tr>
</tbody>
</table>

For more information about the Construction Engineering Management Track, contact:

Penny Knoll  
MSU Civil Engineering  
205 Cobleigh Hall, Bozeman, MT 59717-3900  
Tel: 406-994-6139 Fax: 406-994-6105 E-mail: pennyk@cc.montana.edu

### Land Resources Environmental Sciences Track

Students will take 15 credits in topics such as environmental risk management, watershed hydrology, landscape and ecosystem management and more. These courses can be taken fully online.

Programs are specifically adapted to each graduate student and often address processes at multiple scales through well-integrated, multidisciplinary efforts. Understanding is developed through targeted advanced coursework tailored to the student.

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>AGSC 401</td>
<td>Integrated Pest Management</td>
<td>3</td>
</tr>
<tr>
<td>ENTO 510</td>
<td>Insect Ecology</td>
<td>3</td>
</tr>
<tr>
<td>LRES 507</td>
<td>Environmental Risk Assessment</td>
<td>3</td>
</tr>
<tr>
<td>LRES 510</td>
<td>Biodiversity Methods</td>
<td>3</td>
</tr>
<tr>
<td>LRES 521</td>
<td>Holistic Thought &amp; Management</td>
<td>3</td>
</tr>
<tr>
<td>LRES 540</td>
<td>Ecology Plants &amp; Community</td>
<td>3</td>
</tr>
<tr>
<td>LRES 544</td>
<td>Water Quality</td>
<td>3</td>
</tr>
</tbody>
</table>

### Individually Designed Track

Students will work with their adviser to select elective courses from their field, such as biology, chemistry, computer science, earth sciences, engineering, mathematics, physics, statistics or others deemed relevant. Online courses may be available; depending on the student’s individualized plan, on-campus coursework may be required. Any course from the list below may be included. Other courses may be included with adviser permission.

<table>
<thead>
<tr>
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<tr>
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<td>ECIV 575</td>
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<td>ECIV 592</td>
<td>Independent Study</td>
<td>3</td>
</tr>
<tr>
<td>ECIV 598</td>
<td>Internship</td>
<td>2</td>
</tr>
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<td>ENTO 510</td>
<td>Insect Ecology</td>
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<tr>
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<td>Ecology Plants &amp; Community</td>
<td>3</td>
</tr>
<tr>
<td>LRES 544</td>
<td>Water Quality</td>
<td>3</td>
</tr>
<tr>
<td>MB 527</td>
<td>Toxicology</td>
<td>3</td>
</tr>
</tbody>
</table>

### Certificates

PMSEM graduate certificates are a 12-15 credit option for professionals who would like additional business and science and engineering content but who are not yet looking for the full master's degree. The certificate can be utilized as part of the full master's degree at a later time. Core business services.
coursework in the certificate is online but elective courses may be either online or on campus.

**Graduate Certificate in Science and Engineering Business Management**
The focus of this certificate is business management processes. The 9 credit Leading and Managing the Human and Financial Enterprise course is required. The remaining 6 credits of electives will be determined with adviser approval. The required course is online but electives may require campus attendance.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>MSEM 501</td>
<td>Leading Human &amp; Fin Ent</td>
<td>9</td>
</tr>
<tr>
<td>MSEM 502</td>
<td>Leading the Tech Enterprise</td>
<td>6</td>
</tr>
</tbody>
</table>

**Graduate Certificate in Science and Engineering Project Management**
The focus of this certificate is project management. The 6 credit Leading the Technical Enterprise course is required. The remaining 6 credits of electives will be determined with adviser approval. The required course is online but electives may require campus attendance.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>MSEM 501</td>
<td>Leading Human &amp; Fin Ent</td>
<td>9</td>
</tr>
<tr>
<td>ARCH 510</td>
<td>Leadership in Prof Practice</td>
<td>3</td>
</tr>
<tr>
<td>ARCH 519</td>
<td>Synthesis of Arch Practice</td>
<td>3</td>
</tr>
</tbody>
</table>

**For More Information**
Contact Lisa Brown, Program Manager, at lisa.brown@montana.edu or (406) 994-3062.

**Explore Further**
- Other Montana State Online Degree and Certificate Programs (http://eu.montana.edu/online/degrees)
- Frequently Asked Questions (http://eu.montana.edu/online/faq) concerning online courses.
- College of Engineering (http://www.coe.montana.edu)
- College of Business (http://www.montana.edu/cob)
- Is online learning right for you? Find out with our interactive quiz (http://eu.montana.edu/online/quiz).

**Associate Dean for Student Success**
Christine M. Foreman

The Doctor of Philosophy in Engineering degree is offered through the College of Engineering. The most current information on requirements for the degree can be found at: www.coe.montana.edu/graduate_programs.html

Candidates will be admitted to both the College of Engineering and The Graduate School under one of seven options:

**Applied Mechanics**
This option involves research in areas central to engineering mechanics including solid mechanics, fluid mechanics, thermal mechanics, geomechanics, and structures.

Coordinating Departments: Chemical and Biological Engineering, Civil Engineering, and Mechanical and Industrial Engineering. Typical Research Areas: solid mechanics, fluid mechanics, biomechanics, thermal sciences, structural mechanics.

**Civil Engineering**
This option involves research in geotechnical engineering, structural engineering, transportation engineering, environmental engineering, water resources engineering, and construction management.

Coordinating Departments: Civil Engineering and Mechanical and Industrial Engineering, Typical Research Areas: geosynthetics, seismic response of structures and foundations, innovative structural materials, intelligent transportation systems, transportation operations, transportation planning, recycled pavements and base materials, road ecology and constructed wetlands.

**Chemical Engineering**
This option involves research in transport phenomena in complex systems, biofilms, biological materials, and the chemical and biochemical transformation of materials.

Coordinating Department: Chemical and Biological Engineering.

Typical Research Areas: extremophilic bioprocessing, in situ biocatalyzed heavy metal biotransformations in natural and engineered biological systems, biomaterials, bioremediation, colloidal systems dynamics, metabolic engineering, metabolic systems analysis, biofuels processing, composite materials, durability of materials, surface interactions, catalysis, membrane materials, separations.

**Electrical and Computer Engineering**
This option involves research in electronic component and system hardware, design, development and theory.

Coordinating Department: Electrical and Computer Engineering. Typical Research Areas: communications, digital electronics, computer engineering, microelectromechanical systems, optics and optical electronics, power systems and power electronics, signal processing, systems and controls.

**Environmental Engineering**
This option involves research in all areas of the environment including soil, water, and air, with emphasis on microbial interactions with natural and engineered systems.

Coordinating Departments: Chemical and Biological Engineering and Civil Engineering. Typical Research Areas: bioremediation, wetlands, water treatment, wastewater treatment, solid and hazardous waste treatment, biofilm engineering.
**Industrial Engineering**
This option involves research related to areas of Industrial Engineering.

Coordinating Department: Mechanical and Industrial Engineering. Typical Research Areas: transportation safety, human factors, service systems engineering, virtual reality, health care, ergonomics, leadership and change management, usability engineering, engineering education, and concurrent engineering.

**Mechanical Engineering**
This option involves research in advanced structures and materials, fluid dynamics, and energy systems.


**Application and Admission**
1. Applications can be submitted online through The Graduate School (http://www.montana.edu/gradschool/apply.html) (all information below will be asked during the online application process and a non-refundable $60 application fee will be required prior to submitting your application)

   Minimum College Requirements for Full Admission:
   - At least a 3.0 undergraduate GPA.
   - GRE scores of Verbal >=152 (53%), Quantitative >=153 (56%) and Analytical Writing >=3.5.
   - Favorable letters of recommendation from three references.
   - Graduate GPA (if applicable) of 3.2 or better.
   - International Students: TOEFL scores of 580 (237 for computer test version) or greater or a minimum International English Language Testing System (IELTS) band score of 7.
   - A personal statement of up to 2 pages describing the applicant’s research interests, prior research activities (if applicable), and career goals. If the applicant has no direct research experience, they should describe the experiences and activities they have that they believe have prepared them to undertake research.
   - A two page CV or résumé describing the applicant’s prior background.

2. Department(s) attach summary admission form and circulate application to option coordinator and potential advisers for faculty recommendation.

3. Department Head reviews application in conjunction with faculty recommendation, and exercises one of the following options.
   - Full admission - Forward to The Graduate School.
   - Provisional admission - Determine conditions that candidate will be accepted and notes actions to be taken, then forwards to The Graduate School
   - Reject admission because of academic qualifications.
   - Reject admission based on lack of fit with COE research programs or the lack of a potential adviser.

4. Associate Dean responsible for graduate studies in the College of Engineering reviews applications, returns to department for submission to The Graduate School.

5. The Graduate School reviews application to ensure GS standards are met with the following possible options.
   - Accept
   - Reject
   - Return to Department Head and Associate Dean with recommendation for further consideration.

6. Applicant is informed with a letter of acceptance or rejection by The Graduate School.

Acceptance into the program is not always a guarantee of funding (tuition or stipend). Students should establish a dialogue with their chosen department to determine the availability of funding.

If there are course deficiencies that are identified in the student’s educational background, these must be completed prior to full admission (matriculation).

For those entering without having an adviser/major professor previously identified, students should secure an adviser as early as possible, but no later than the end of the third semester of registration in the Ph.D. program. During the selection process, there should be discussions with the student that include an understanding of funding available to the student and the term of commitment.

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**Degrees Offered**
- Ph.D. in Computer Science (p. 348)
- Ph.D. in Engineering with options in:
  - Applied Mechanics
  - Civil Engineering
  - Chemical Engineering
  - Electrical & Computer Engineering (p. 351)
  - Environmental Engineering
  - Industrial Engineering
  - Mechanical Engineering

**Program Requirements**
To satisfy the requirements for the Ph.D. in Engineering, the student will take a minimum of 60 credits beyond the bachelor’s degree according to the table below. Different options within the Ph.D. in Engineering and individual graduate student committees may require additional coursework beyond the minimum requirements (see Declared Option Coursework section later in this document).

For students entering with a Masters degree, up to 24 graded credits may be applied (see below). However, the Seminar (ENGR 694) and Rsch & Mths in Engineering (ENGR 610) requirements and a minimum of 13 additional graded course credits must still be taken at Montana State University. Depending on option requirements, students may have the option (with approval of the committee) of using some of their M.S. credits toward the advanced mathematics and numerical methods requirements.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENGR 610</td>
<td>Rsch &amp; Mths in Engineering</td>
<td>3</td>
</tr>
<tr>
<td>ENGR 694</td>
<td>Seminar</td>
<td>2</td>
</tr>
<tr>
<td>Advanced Mathematics - see declared option coursework</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Numerical Methods - see declared option coursework</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Other Graded Courses - see declared option coursework</td>
<td>24</td>
<td></td>
</tr>
<tr>
<td>Dissertation</td>
<td>18</td>
<td></td>
</tr>
<tr>
<td>Additional Dissertation or Course credits</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>* Course content must be above and beyond that typically required for an undergraduate degree in the student’s Ph.D. option area.</td>
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<tr>
<td>** ENGR 694 should be taken the semester prior to scheduling the comprehensive exams as this seminar class helps the student to prepare the written proposal for their comprehensive.</td>
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</tbody>
</table>

Total Credits 60
Credits applied from a prior Masters degree must:

- be graded course credits (e.g., not M.S. thesis or independent study credits),
- have a grade of B or higher (or equivalent), and
- be approved by the student’s graduate committee.

Students are expected to attend the COE Seminar Series presentations.

**Note for Students Entering Without a Prior Degree in Engineering**

If a student enters the Ph.D. program without a prior degree in engineering from an accredited program and is interested in pursuing registration as a professional engineer, they should consult with their department head and major professor to determine what coursework and other experiences may be needed to ensure they are on a pathway to seek licensure. These requirements vary with discipline and the state where licensure is sought.

**Examination Requirements**

General information about forms required for completion of examinations can be found on The Graduate School (http://www.montana.edu/gradschool/current-grad.html)’s website.

Ph.D. candidates within the College of Engineering at Montana State University must pass a qualifying examination, a comprehensive examination, and a defense of dissertation. The general rules governing these follow. Options may have more specific requirements; see the specifics under option requirements below.

**Ph.D. Qualifying Examination**

The purpose of the qualifying examination is to determine whether the student has sufficiently mastered the core topics within their chosen area of study. It will be a written examination on undergraduate engineering topics determined by the student’s chosen Ph.D. option area and administered by that option’s committee.

Each Ph.D. Option Committee will offer a qualifying examination annually to students in that option. The qualifying examination will be completed within three semesters but typically within two semesters of full admission (matriculation) into the Ph.D. program. Failure to take the examination in that time period may result in suspension of Ph.D. candidate status, including stipend. The committee will document the results of the examination in a letter to the student, and in the student’s file.

**Ph.D. Comprehensive Examination**

The purpose of the Ph.D. comprehensive examination is to determine whether the student is ready for independent research in their chosen area of study. The comprehensive examination is administered by the student’s graduate committee (including the Graduate Representative assigned by The Graduate School), and must be completed within two years after passing the qualifying examination. It is also recommended that the student has taken 2/3 of their graded coursework. In addition, students should have completed ENGR 694 prior to taking the exam; the course is designed to assist the student in preparing their proposal.

The Ph.D. comprehensive examination is comprised of:

- A written proposal for the student’s Ph.D. dissertation, and
- An oral presentation of the proposal and oral examination.

The candidate will prepare a written proposal associated with the research topic for the Ph.D. dissertation, in a format designated by the Ph.D. Option. The successful proposal will include a significant literature review, preliminary research to date, and the research proposed to complete the Ph.D. The written proposal will be presented to the student’s graduate committee in advance of the oral presentation, by a date agreed to by the student and graduate committee.

The student will then present the dissertation proposal as a public research seminar that has been advertised to the College of Engineering. This will be followed by a closed-session oral examination by the student’s graduate committee on:

- the candidate’s current and proposed research;
- the candidate’s graduate level understanding of option specific engineering principles; and
- additional topics relevant to the proposed research, including fundamentals of other disciplines drawn upon in the research.

The student’s graduate committee will inform the student of the results of the comprehensive examination immediately following the oral examination and committee deliberation, and will document the results on the appropriate form filed with The Graduate School. A student not passing the comprehensive will have one opportunity to retake the comprehensive after a span of six months has passed. Failure to pass the examination on the second attempt is grounds for dismissal from the Ph.D. program.

There may be additional requirements for these exams specified in the option requirements.

**Dissertation Defense**

The dissertation defense will consist of two parts: an open seminar of the research results and a closed session with the student’s committee and the graduate representative. Written notification of the results within one week of the defense must be delivered to The Graduate School and the student. Committee members must approve the dissertation, along with the Department Head, and Vice Provost for Graduate Education. Deadline for the dissertation approval is 14 working days before the end of the term for a given semester.

If failure occurs at the first attempt, a second defense must be held. At least six months must elapse before the second examination takes place, with the time period not to exceed nine months. Failure of the second exam will result in suspension from the program.

**Graduation Application**

An application to graduate is prepared by the student, approved by the major professor, and submitted to The Graduate School through the student’s academic department. Applications are due to The Graduate School September 20th for a Fall Semester graduation, February 5th for a Spring Semester graduation and June 10th for Summer semester graduation.

**Declared Option Requirements**

**Civil Engineering**

Students must meet the overall requirements for the Ph.D. in Engineering. The student’s committee may require additional credits of study based on the student’s background and needs. Specific course selections will be determined by the student and his/her committee to support the student’s area of study. Up to 24 graded course credits can be applied from an M.S. Degree in meeting the Ph.D. credit requirements, at the discretion of the student’s Ph.D. committee.

**Qualifying Examination:** The diversity of backgrounds of students pursuing this option requires that the qualifying examination subject material and to some extent format be responsive to these backgrounds. The
Comprehensive Examination: The proposal should be in the NSF format, in compliance with the current year's grant proposal guidelines (ppg) at www.nsf.gov (http://www.nsf.gov) unless otherwise agreed to by the student's committee. A public oral seminar of 30 to 40 minutes plus 10 minutes of public questions, on the research to date and proposed research to complete the Ph.D., will be given by the Ph.D. candidate. This will be followed by a closed-session oral examination of up to 2 hours administered by the student's Ph.D. committee. A written exam on graduate level environmental engineering topics may be required of graduate students who have a GPA in graduate coursework of less than 3.5.

Applied Mechanics
Requirements include:

- EMEC 530 Advanced Engineering Analysis I 3
- EMEC 550 Continuum Mechanics 3
- EMEC 560 Finite Element Analysis in Engr 3

The remaining credits are to be established by the student and the major professor in consultation with the student's graduate committee.

Qualifying Examination: The qualifying assessment will be a written examination on relevant undergraduate level topics. In the Applied Mechanics Option these areas include: Statics, Dynamics, Mechanics of Materials, Fluid Mechanics, Mathematics, Thermodynamics and an Area of Undergraduate Focus (e.g. Structures, Hydraulics, Geotechnology, Material Science, Heat Transfer) - as specified by the candidate prior to the exam. The exam will be one hour per topic area in an open book, open notes format. Students must satisfactorily address four of the submitted topics. Problems will be graded by the faculty member who presented that topic. Students will be provided an opportunity to examine their results, however, in order to protect the questions from dissemination they will not be permanently returned. A grade for the qualifying examination of Pass (P), Fail (F) or Remediate (R) will be given for each candidate. In cases where remediation in certain topic areas is required, the Ph.D. adviser will develop a problem solving based plan with the Ph.D. candidate to prepare for a retest on the identified topic areas. The retest must occur prior to the following semester and will be overseen by the Ph.D. adviser. Students may apply for a Ph.D. qualifying examination waiver (for instance if they have completed the Master of Science written comprehensive examination at Montana State University in the same sub-discipline as is the focus of their proposed Ph.D. studies).

Chemical Engineering
The advanced mathematics and numerical methods classes are specified:

- EGEN 505 Advanced Engineering Analysis 3
- EGEN 506 Numerical Sol to Engr Problems 3

Requirements include:

- ECHM 503 Thermodynamics 3
- ECHM 533 Transport Phenomena 3
- ECHM 510 Reaction Engineering/Modeling 3

The remaining credits to be established by the student and the major professor in consultation with the student's graduate committee.

Qualifying Examination: The qualifier will be a written examination on undergraduate Chemical Engineering including: mass and energy balances, thermodynamics, separations (mass transfer), heat (energy) transfer, fluids, transport phenomena and chemical reaction engineering. The exam will be 1 hour per topic area question in an open book, open notes format and students will choose 4 subjects which they will solve the problems for, from the 7 problems provided. Each question will be graded by the Faculty member that submitted the question. Students will not be given the test back in order to protect the questions from dissemination. The results will be analyzed by a Committee composed of all Faculty and a grade of Pass (P), Fail (F) or Remediate (R) given each candidate. In cases where remediation in certain topic areas is required, the Ph.D. adviser will develop a problem solving based plan with the Ph.D candidate to prepare for a retest on the identified topic areas. The retest must occur prior to the next fall semester and will be overseen by the Ph.D. adviser. The qualifying exam must be completed within two semesters of matriculation into the Ph.D. program. Failure to take the exam in that time period may result in suspension of Ph.D. candidate status, including stipend. The exam will be administered on the second Tuesday in February of the Spring semester to all students required to take the exam in a year.

Comprehensive Examination: The proposal will be in the NSF format, in compliance with the current year's grant proposal guidelines (ppg) at www.nsf.gov (http://www.nsf.gov). A written exam on graduate level thermodynamics, transport phenomena, mathematical methods, and kinetics and reactor engineering will be required of graduate students who have a GPA in graduate coursework of less than 3.5. A public oral seminar of 40 minutes plus 10 minutes of public questions, on the research to date and proposed research to complete the Ph.D., will be given by the Ph.D. candidate. This will be followed by a closed-session oral examination of 45-90 minutes by the student’s Ph.D. committee.

Electrical and Computer Engineering
Within the course credits, students must take courses in at least 3 of the following 6 areas: Digital Systems, Signals and Controls, Electromagnetic Fields and Optics, Communications, Power and Power Electronics, and MEMS and Electronics. The remaining credits to be established by the student and the major professor in consultation with the student’s graduate committee.

Mechanical Engineering
The advanced mathematics and numerical methods classes are specified:

- EGEN 505 Advanced Engineering Analysis 3
The remaining credits to be established by the student and the major professor in consultation with the graduate committee.

Qualifying Examination: The exam will be administered on the second Tuesday in February of the Spring semester. The undergraduate Mechanical Engineering topics will include: Thermodynamics, Heat (energy) transfer, Fluid Mechanics, Structural Mechanics, Materials, Dynamics and Vibrations, and Mathematics. Students will solve problems in 4 of the 7 topic areas. The exam will be 5 hours duration in an open book, open notes format. Each problem set will be graded by the faculty member that submitted the set. The results will be analyzed by the Mechanical Engineering graduate studies committee, and each candidate will receive a grade of Pass (P), Fail (F) or Remediate (R). Students will not be given the test back in order to protect the questions from dissemination. In cases where remediation in certain topic areas is required, the Ph.D. adviser will develop a problem-solving-based plan with the Ph.D. candidate to prepare for a retest on the identified topic areas. The retest must occur prior to the next fall semester and will be overseen by the Ph.D. adviser.

Comprehensive Examination: The public research seminar will include 40 minutes for the student’s presentation and 10 minutes for questions from the audience. This will be followed immediately by a closed-session oral examination of 45-90 minutes by the student’s Ph.D. committee and additional remediation may be required at this point.

Environmental Engineering

Of the credits in the Option Coursework noted above, 12 credits from the following subset of courses are required, with no more than 6 credits at the 400 level. Equivalent courses from prior MS degrees may be used to satisfy this requirement:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>EGEN 506</td>
<td>Numerical Sol to Engr Problems</td>
<td>3</td>
</tr>
<tr>
<td>EM 525</td>
<td>Continuum Mechanics</td>
<td>3</td>
</tr>
<tr>
<td>Thermo-fluids Mechanics</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Solid Mechanics</td>
<td>3</td>
<td></td>
</tr>
</tbody>
</table>

The diversity of backgrounds of students pursuing this option requires that the qualifying examination subject material and to some extent format be responsive to these backgrounds. The exam will be administered during a 6-hour period of mutual agreement between the adviser, student and Ph.D option coordinator. The student will be given a packet of questions that cover environmental engineering and related topics, each designed to be solved in approximately an hour. The student must submit 4 solutions out of 7 topic areas. The qualifying exam may be on undergraduate Environmental Engineering topics including: Water Quality Parameters, Water Chemistry, Drinking Water Treatment, Wastewater Treatment, Reactors/Kinetics/Stoichiometry, Hydraulics, Porous Media Flow & Groundwater Contamination, Air Pollution Control & Air Quality, Solid & Hazardous Waste Management, Fluid Mechanics, Transport Phenomena, Thermodynamics. The exam will be open book, open notes format. Each question the student chooses to answer will be graded by the Faculty member who submitted the question. The results will be analyzed by a Committee composed of the Environmental Engineering Faculty and a grade of Pass (P), Fail (F) or Remediate (R) will be given to the candidate for each topic. In cases where remediation in certain topic areas is required, the Ph.D. adviser will develop a problem solving based plan with the Ph.D. student to prepare for a retest on the identified topic areas. The retest must occur within six months and will be overseen by the Ph.D. adviser. Students may apply for a Ph.D. qualifying examination waiver (for instance if they have completed the Master of Science written comprehensive examination at Montana State University in Environmental Engineering).

Comprehensive Examination: The proposal should be in the NSF format, in compliance with the current year’s grant proposal guidelines (gpg) at www.nsf.gov unless otherwise agreed to by the student’s committee. A public oral seminar of 30 to 40 minutes plus 10 minutes of public
Department of Computer Science

Graduate Programs

M.S. Degree Program
A Bachelor’s degree in Computer Science is recommended. Students with non-computer science degrees at the Bachelor’s level or above are also encouraged to apply; such students will generally be required to take appropriate courses while enrolling at MSU to make up computer science and related subject matter deficiencies prior to full acceptance into the computer science Master’s program. Factors that the department uses in its admissions process include GRE scores, TOEFL scores (for non-native English speakers), reference letters, GPA and previous coursework. For more information, please refer to www.cs.montana.edu/future-students-masters-program.html.

Details about applying can be found at www.montana.edu/current-students-masters-program.html. Required courses include:

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CSCI 532</td>
<td>Algorithms</td>
<td>3</td>
</tr>
<tr>
<td>CSCI 538</td>
<td>Computability</td>
<td>3</td>
</tr>
<tr>
<td>CSCI 590</td>
<td>Master’s Thesis (thesis option only)</td>
<td>10</td>
</tr>
<tr>
<td>Doctoral Thesis (CSCI 690)</td>
<td></td>
<td>18</td>
</tr>
<tr>
<td>And four courses from the following:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CSCI 520</td>
<td>Distributed Systems</td>
<td>3</td>
</tr>
<tr>
<td>CSCI 540</td>
<td>Advanced Database Systems</td>
<td>3</td>
</tr>
<tr>
<td>CSCI 541</td>
<td>Computer Graphics</td>
<td>3</td>
</tr>
<tr>
<td>CSCI 547</td>
<td>Machine Learning</td>
<td>3</td>
</tr>
<tr>
<td>CSCI 548</td>
<td>Reasoning Uncertainty</td>
<td>3</td>
</tr>
<tr>
<td>CSCI 550</td>
<td>Data Mining</td>
<td>3</td>
</tr>
<tr>
<td>CSCI 551</td>
<td>Adv Computational Biol</td>
<td>3</td>
</tr>
<tr>
<td>CSCI 565</td>
<td>Wireless Networks and Mobile Computing</td>
<td>3</td>
</tr>
<tr>
<td>CSCI 566</td>
<td>Advanced Networking</td>
<td>3</td>
</tr>
</tbody>
</table>

M.S. in Computer Science
An M.S. student must complete a minimum of 30 credits of coursework beyond the Bachelor’s degree. Students may pursue the Master’s degree under a thesis option or a courses only option. For more information, please refer to www.cs.montana.edu/current-students-masters-program.html.

Course’s only Master’s candidates must take a written comprehensive exam near the completion of their graduate program. Thesis Master’s candidates must present and defend their thesis in a public departmental seminar. Required courses include:

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<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>CSCI 532</td>
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<td>CSCI 590</td>
<td>Master’s Thesis (thesis option only)</td>
<td>10</td>
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</tbody>
</table>

Ph.D. Degree Program
The degree is generally intended for students who have a B.S. or M.S. degree in Computer Science and who want to pursue a research and/or college-level teaching career. The program requires coursework, research, exams and the writing of a dissertation.

Admission to the doctoral program follows the requirements of The Graduate School. Factors that the department uses in its admissions process include GRE scores, TOEFL scores (for non-native English speakers), reference letters, GPA and previous coursework. For more information, please refer to www.cs.montana.edu/future-students-phd.html.

Details about applying can be found at www.montana.edu/gradschool/admissions/apply.html. The Computer Science Department encourages applicants to use the online application procedure.

Research Experience
Thesis option master’s degree students gain research experience through their theses and are expected to submit the results of their thesis work to at least one journal or conference. Ph.D. students gain research experience through their doctoral work, journal or conference submissions, and attending conferences.

Research Facilities
Graduate research and coursework can be performed on systems owned and operated by the Computer Science Department. On-campus work is typically performed in laboratories or graduate student offices. A typical machine is a dual boot (Linux / Windows) PC. Intel-based Macs running OSX are also available. Outside the department, the MSU Information Technology Center provides additional computing infrastructure.

Computer Science is housed in MSU’s high technology Engineering and Physical Sciences building.

Financial Assistance
A number of research and teaching assistantships are available for qualified graduate students. These appointments are normally for 20 hours per week during the academic year. Some appointments may also be available during the summer. Assistantships will only be offered to formally admitted graduate students. See the appropriate CS M.S. degree or Ph.D. degree website for more information.

Graduate Programs

• M.S. in Computer Science (p. 348)
• Ph.D. in Computer Science (p. 348)

M.S. in Computer Science
An M.S. student must complete a minimum of 30 credits of coursework beyond the Bachelor’s degree. Beyond the Bachelor’s degree, the student’s Ph.D. committee. A written exam on graduate level environmental engineering topics may be required of graduate students who have a GPA in graduate coursework of less than 3.5.

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Questions, on the research to date and proposed research to complete the Ph.D., will be given by the Ph.D. candidate. This will be followed by a closed-session oral examination of up to 2 hours administered by the student’s Ph.D. committee. A written exam on graduate level environmental engineering topics may be required of graduate students who have a GPA in graduate coursework of less than 3.5.

Ph.D. in Computer Science
A Ph.D. student must complete a minimum of 60 credits of coursework beyond the Bachelor’s degree or a minimum of 36 credits of coursework beyond the Master’s degree. The degree requirements for the Ph.D. degree are found at www.cs.montana.edu/graduate/graduate-programs.html.

Required courses include:

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</tr>
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Department of Electrical and Computer Engineering

610 Cobleigh Hall
PO Box 173780, Bozeman, MT 59717-3780
Tel: 406-994-2505 Fax: 406-994-5958
Email: ecedept@ece.montana.edu
The department offers graduate study and research leading to the Master of Science degree in Electrical Engineering, the Master of Engineering in Electrical Engineering, and the Doctor of Philosophy degree in Engineering, Electrical & Computer Engineering option. Fields in which the student may specialize include communication systems, computation systems, energy and materials, Micro-Electro-Mechanical Systems (MEMS), optical systems and photonics, and sensors and systems. Information regarding active research programs is available at http://ece.montana.edu/research/.

Admission

Admission to our graduate program requires a bachelor’s degree in electrical or computer engineering or a closely related field (for example, physics, computer science, mathematics, etc.). Students with bachelor’s degrees in fields other than electrical and computer engineering (ECE) complete several additional courses to gain proficiency in key undergraduate ECE areas.

All applicants are required to submit scores from the General Test of the Graduate Record Examination (GRE) along with other application materials. A minimum quantitative GRE score of 153 is required, and most students in our program score significantly higher. A minimum verbal GRE score of 152 is recommended.

International students must have a minimum TOEFL score of 600 on the paper-based test, or 250 on the computer-based test, or 100 on the internet-based test, or a minimum IELTS score of 7.0, to be considered for admission with full standing.

Details of the admission requirements and application procedures are available at http://ece.montana.edu/research/applying.htm.

Degree Requirements

Students may pursue the Master of Engineering (M.Eng.) degree, Electrical Engineering option; the Master of Science (M.S.) degree in Electrical Engineering under either Plan A (thesis) or Plan B (professional paper); and the Doctor of Philosophy (Ph.D.) degree in Engineering, Electrical and Computer Engineering option. Please refer to the Program information tab for degree requirement details.

Research Experience

Research experience is required of all Master’s of Science and Doctoral students. This requirement is met by students in the Doctoral program and the MS Plan A program through their thesis work, whereas students in the MS Plan B program must fulfill this requirement through satisfactory participation in an acceptable research or practice-oriented project approved by the student’s adviser. Each student in MS Plan B must register for EELE 575 Research/Prof Paper/Project for three credits.

Research

Faculty and graduate students participate in research in many important fields, including:

- Communication Systems: wireless communication systems, ad-hoc networks, fiber optic communication components and systems, micro-machined mm-wave components, antennas, and atmospheric propagation.
- Energy and Materials: fuel cells, fuel cell materials, fuel cell modeling and control; renewable resource and fuel cell distributed generation systems; fuzzy logic and neural network applications to power system control; load management; reduced-component power electronic design and motor drives.
- Optical Systems and Photonics: Micro-Optical-Electro-Mechanical Systems (MOEMS), micro-machined mirrors and applications in confocal microscopes, spectrometers, and sensors; optics of nanostructures and near-field optical interactions; optical remote sensing systems and applications; lidar development and applications to measuring atmospheric aerosols, clouds, and gases; radiometric and polarimetric imaging system development and calibration; optical sensors for detecting explosives and biological species; optical communication components, systems, and networks.
- Sensors and Systems: MEMS sensors and components; micro-machined sensors; lidars, laser sensors, radiometric and polarimetric imagers (see Optics section above); electronic sensors and systems for data acquisition and optical system control; acoustic and audio sensing of environmental noise and wildlife.

Research facilities in the department include: state-of-the-art electronics laboratories; optics laboratories with a variety of lasers, imagers, and electro-optical measurement tools; the Montana Microfabrication Facility with class 100, 1000, and 10,000 capabilities; a machine shop; a microwave and millimeter-wave electronics laboratory; a power and power electronics research laboratory, fuel cell characterization facilities; an audio and acoustics laboratory; and roof-port and roof-top facilities for optical remote sensing. Students have access to all the leading electronics, electromagnetic, and optical design and analysis software resources.

Financial Assistance

A number of research and teaching assistantships are available for qualified graduate students. All applicants are considered automatically for financial support and do not need to apply separately.

Degrees Offered

- M.Eng in Engineering, Electrical Engineering option (p. 350)
- M.S. in Electrical Engineering Plan A (thesis) (p. 350)
- M.S. in Electrical Engineering Plan B (professional paper) (p. 350)
- M.S. in Optics Plan A (thesis) (p. 350)
- M.S. in Optics Plan B (professional paper) (p. 351)
- Ph.D. in Engineering, Electrical & Computer Engineering option (p. 351)
- Ph.D. in Materials Science (p. 402)

Additional information is available in the Electrical & Computer Engineering Department’s Graduate Student Handbook (http://www.coe.montana.edu/ece/gradbook.pdf).
M.Eng. in Engineering Electrical Engineering option

Degree requirements--30 credits total (credits older than 6 years are not applicable to the degree):

- >= 18 500-600-level credits (no more than 12 credits can be at the 400 level)
- <= 9 credits of non-EELE rubric classes
- <= 6 credits Independent Study (EELE 592)
- <= 3 credits pass/fail
- <= 6 credits challenged
- <= 9 credits credits can be reserved for graduate credit during an undergraduate program.
- No credits of 488, 489, 490, 492, or 589

M.S. in Electrical Engineering Plan A

A written departmental Graduate Study Qualifying Examination is administered to all M.S. students in their first year of work.

Degree requirements--30 credits total:

- 10 credits EELE 590, Master’s Thesis
- 20 course credits:
  - >=10 500-600-level credits (no more than 10 credits can be at the 400 level)
  - <= 4 credits Independent Study (EELE 592)
  - <= 10 credits 592 + seminars (594)
  - <= 3 credits pass/fail (excluding thesis)
  - <= 6 credits challenged
  - No credits of 488, 489, 490, 492, or 589

M.S. in Electrical Engineering Plan B

A written departmental Graduate Study Qualifying Examination is administered to all M.S. students in their first year of work.

Degree requirements--30 credits total:

- 3 credits, EELE 575 (Professional Paper)
- 27 course credits:
  - >= 17 500-600-level credits (no more than 10 credits can be at the 400 level)
  - <= 6 credits Independent Study (EELE 592)
  - <= 10 credits 592 + seminars (594)
  - <= 3 credits pass/fail
  - <= 6 credits challenged
  - No credits of 488, 489, 490, 492, or 589

M.S. in Optics Plan A

The M.S. Degree in Optics and Photonics is an interdisciplinary, cooperative program managed by the Optics Program Committee on behalf of the three participating departments: Physics, Electrical and Computer Engineering, and Chemistry and Biochemistry. Students apply directly to the Optics and Photonics Graduate Program and are admitted through one of the participating departments, selected based on advisor affiliation and student interest.

The Optics and Photonics degree is distinct from the other graduate degrees offered by the participating departments because it requires interdisciplinary coursework involving at least two of the departments. The interdisciplinary program of study allows students to emphasize optics theory and applications in more depth than is possible through degrees in the traditional disciplines. Each optics student will be mentored by a graduate advisor from the faculty of one of the three participating departments, and a graduate supervisory committee made up of faculty from at least two of the three departments in the cooperative program.

The M.S. Plan A requires completion of an acceptable research-based Thesis describing independent research performed by the student with guidance from the advisor and graduate supervisory committee. The Thesis involves considerable effort on the part of the student, and must generate results that are of sufficient quality and significance to be reported in a national or international conference paper or presentation. The Master’s Thesis often serves as the basis for a peer-reviewed manuscript for an archival journal or book chapter.

Choose two key courses (one PHSX and one EELE):

- PHSX 427 Advanced Optics
- PHSX 437 Laser Applications
- EELE 482 Electro-Optical Systems
- EELE 484 Laser Engineering

Choose one specialty course:

- EELE 581 Fourier Optics/Imaging Theory
- EELE 582 Optical Design
- PHSX 531 Nonlinear Optics/Laser Spectroscopy
- CHMY 527 Analytic Optical Spectroscopy
- CHMY 560 Symmetry, Orbitals, and Spectroscopy

Optics electives (choose at least 6 credits):

- EELE 432 Applied Electromagnetics
- EELE 482 Electro-Optical Systems
- EELE 484 Laser Engineering
- EELE 538 Adv Top Electromagnet & Optics
- EELE 581 Fourier Optics/Imaging Theory
- EELE 582 Optical Design
- EELE 583 Remote Sensing Systems
- PHSX 427 Advanced Optics
- PHSX 437 Laser Applications
- PHSX 507 Quantum Mechanics II
- PHSX 515 Advanced Topics In Physics
- PHSX 520 Electromagnetic Theory II
- PHSX 531 Nonlinear Optics/Laser Spectroscopy
- CHMY 421 Advanced Instrument Analysis
CHMY 527  Analytic Optical Spectroscopy  
CHMY 557  Quantum Mechanics  
CHMY 560  Symmetry, Orbitals, and Spectroscopy  
CHMY 564  Adv Quantum Chemistry  
ELE/PSX/CHMY/ 591 Special Topics ¹  
ELE/PSX/CHMY/ 592 Independent Study ¹  
OPTI 594 Optics Seminar ²  

Technical electives (choose at least 5 credits):  
<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECE, Physics, Math, Chemistry, Business, etc. (400-level or above)</td>
<td>5</td>
</tr>
</tbody>
</table>

Master’s Thesis (ELE/PSX/CHMY/ 590)  
Total Credits  
30

Note: At least 20 credits must be at the 500 level.

¹ A maximum of three (3) credits total among these courses is allowed if the subject is directly related to optics, upon approval by the academic advisor and research advisor/instructor.

² A maximum of two (2) credits total of optics seminar is allowed.

### M.S. in Optics Plan B

The M.S. Degree in Optics and Photonics is an interdisciplinary, cooperative program managed by the Optics Program Committee on behalf of the three participating departments: Physics, Electrical and Computer Engineering, and Chemistry and Biochemistry. Students apply directly to the Optics and Photonics Graduate Program and are admitted through one of the participating departments, selected based on advisor affiliation and student interest.

The Optics and Photonics degree is distinct from the other graduate degrees offered by the participating departments because it requires interdisciplinary coursework involving at least two of the departments. The interdisciplinary program of study allows students to emphasize optics theory and applications in more depth than is possible through degrees in the traditional disciplines. Each optics student will be mentored by a graduate advisor from the faculty of one of the three participating departments, and a graduate supervisory committee made up of faculty from at least two of the three departments in the cooperative program.

The Plan B program emphasizes coursework, but also includes preparation of a required Professional Paper. The paper, prepared under the guidance of the student’s advisor, covers a focused aspect of research, design, or engineering education. The Professional Paper is generally not as comprehensive as the research Thesis required for the M.S. Degree Plan A, but it is desirable that the Plan B Professional Paper be of sufficient quality and scope to serve as the basis for a conference paper or presentation.

Choose two key courses (one PSX and one EELE): 6

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>PSX 427 Advanced Optics</td>
<td>2</td>
</tr>
<tr>
<td>PSX 437 Laser Applications</td>
<td>1</td>
</tr>
<tr>
<td>EELE 482 Electro-Optical Systems</td>
<td>3</td>
</tr>
<tr>
<td>EELE 484 Laser Engineering</td>
<td>4</td>
</tr>
</tbody>
</table>

Choose one specialty course: 3

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>EELE 581 Fourier Optics/Imaging Theory</td>
<td>1</td>
</tr>
<tr>
<td>EELE 582 Optical Design</td>
<td>1</td>
</tr>
<tr>
<td>PSX 531 Nonlinear Optics/Laser Spectroscopy</td>
<td>1</td>
</tr>
<tr>
<td>CHMY 527 Analytic Optical Spectroscopy</td>
<td>1</td>
</tr>
<tr>
<td>CHMY 560 Symmetry, Orbitals, and Spectroscopy</td>
<td>1</td>
</tr>
</tbody>
</table>

Optics electives (choose at least 6 credits): 6

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>EELE 432 Applied Electromagnetics</td>
<td>2</td>
</tr>
</tbody>
</table>

Total Credits 30

Note: At least 20 credits must be at the 500 level.

¹ A maximum of three (3) credits total among these courses is allowed if the subject is directly related to optics, upon approval by the academic advisor and research advisor/instructor.

² A maximum of two (2) credits total of optics seminar is allowed.

### Ph.D. in Engineering Electrical and Computer Engineering Option

Ph.D. students earn at least 60 post-baccalaureate credits, including at least 18 credits of dissertation work. In progressing toward this degree, the student must pass the following examinations:

1. A written departmental Graduate Study Qualifying Examination administered to all M.S. and Ph.D. students in their first year of work.
2. A comprehensive examination to be taken within two years of the qualifying examination and after completing two-thirds of their total coursework.
3. A final oral examination and defense of a dissertation based on the student’s research.

There is no foreign language requirement for the degree.

#### Degree requirements--60 credits total:

- 3 credits Research & Experimental Methods in Engineering (ENGR 610) in 1st semester
- 2 credits Seminar (ENGR 694), taken just before the comprehensive examination
- 3 credits Advanced Math (committee approved)
- 3 credits Numerical Methods (committee approved)
- 18 credits Doctoral Thesis (EELE 690)
- At least 31 additional credits (400 and graduate level) comprising:
Notes:

- With the approval of the student’s doctoral committee, up to 24 credits of prior coursework with grade of B or better from a previously earned master’s degree can be applied toward the required coursework of the ECE Ph.D. With committee approval, master’s degree courses can be used to satisfy the Advanced Math and Numerical Methods course requirements.
- Applicable coursework taken beyond the master’s degree may include no more than 9 credits at the 400-level.
- All PhD credits no more than ten (10) years old at time of graduation (this limit does not apply to courses counted from a previously earned master’s degree).
- A minimum of 30 credits applicable to the degree must be taken at MSU (i.e., up to 30 credits can be transfer credits, if acceptable to the student’s committee).
- Regardless of how many course credits are applied from a previously earned master’s degree, the PhD program of study must include at least 12 credits of courses in the major area taken at Montana State University.
- ≤ 6 credits Independent Study (EELE 592)
- ≤ 9 credits pass/fail (excluding dissertation)
- ≤ 9 credits challenged
- No credits of 488, 489, 490, 492, 575, or 589 are allowed

Department of Mechanical and Industrial Engineering

Contact Information

Department Head
Daniel A. Miller, Ph.D.
220 Roberts Hall; (406) 994-2203
danmiller@montana.edu

Graduate Program Coordinator
Sarah Codd, Ph. D.
314 Roberts Hall; (406) 994-1944
scoddd@montana.edu

Application Deadlines

- Fall: July 1
- Spring: November 15

Note: International applicants must submit their applications two months prior to the above dates.

Research Facilities

The laboratories of the department are well equipped for research in all areas supported by the department. Flexible manufacturing systems, robotics, machine vision, and computer-aided manufacturing are supported by a computer integrated manufacturing laboratory. Extensive facilities for destructive and non-destructive testing of advanced materials and structures are available. Advanced manufacturing facilities for composite materials and structures are continually expanding. An ergonomics/human factors laboratory concentrates on industrial ergonomics with equipment to address biomechanical and physiological aspects of industrial tasks. Facilities for decision support systems, facilities design, and expert systems are undergoing expansion. Arrangements can also be made for graduate students to use the research facilities of other University departments. State-of-the-art computer facilities are available at the department, college, and university levels. Research is sponsored by industry and governmental agencies.

Examinations

All Mechanical Engineering and Industrial and Management Engineering master’s degree students must follow the degree requirements listed in the Steps to Completing a Master’s Degree (http://www.montana.edu/gradschool/current-grad.html) section.

Doctoral candidates are required to pass three examinations: Ph.D. qualifying examination, Ph.D. comprehensive examination, and Ph.D. thesis defense. Refer to the Steps to Completing a Doctoral Degree (http://www.montana.edu/gradschool/current-grad.html) and Ph.D. in Engineering sections for additional information.

Students are expected to be familiar with department, college and Graduate School requirements.

Financial Assistance

Both teaching and research assistantships are available on a competitive basis. Teaching assistantships involve assisting professors with the conduct of their classes, including preparation and grading. Research assistantships provide the opportunity for work on a research grant or industry sponsored project under the direction of a faculty member. Interested applicants should make inquiry directly to the Graduate Program Coordinator in I&ME or ME.

See the Graduate Assistantships (http://www.montana.edu/gradschool) sections for detailed information on appointment criteria.

Graduate Programs

- M.S. in Industrial and Management Engineering (p. 352)
- M.S. in Mechanical Engineering (p. 353)
- M.Eng. in Mechanical Engineering (p. 353)
- Ph.D. in Engineering -- Industrial Engineering and Mechanical Engineering options (p. 343)
- Ph.D. in Materials Science (p. 402)

Industrial and Management Engineering

The Master of Science degree in Industrial and Management Engineering degree may be accomplished under Plan A (thesis required) or Plan B
(project or professional paper). Under either plan, a program of study is arranged for each student according to his/her particular goal.

**Admission**

**Industrial and Management Engineering**

The minimum requirement for admission is a Bachelor of Science degree and evidence of an ability to maintain a minimum 3.0 grade point average while pursuing a graduate degree. Applicants without a degree in Industrial Engineering (or similar) are eligible to apply, but may be required to make up subject matter deficiencies upon admission. For complete information, refer to the Admission Policies and Application Requirements sections in the department website. Successful applicants are accepted into both the department and The Graduate School.

Below are the GRE and TOEFL scores the graduate committee is looking for. They will consider lower scores with other excellent qualifications, but these higher scores will give you a better chance of success in this program.

- GRE average scores: GRE-V = 149, GRE-Q = 155, GRE-A = 3.7
- GRE preferred scores: GRE-V = 152, GRE-Q = 156, GRE-A = >3.8
- TOEFL average score: 84
- TOEFL preferred score: 99
- IELTS minimum score: 6.5

**Research Requirements**

**Industrial and Management Engineering**

Research experience is required for the M.S. degree in Industrial and Management Engineering, Plan A only. Areas of study include operations research, engineering economy, computer modeling, applied statistics, simulation, logistics, management engineering, human factors, ergonomics, computer integrated manufacturing, quality control, and production planning and scheduling.

Master’s students following Plan B (project or professional paper) choose additional coursework and a graduate project in lieu of completing a thesis. Plan B students complete a graduate project, under the supervision of a professor, in the student’s particular area of interest, and demonstrate their ability to define, organize, and follow through on a small research investigation. The project requires both oral and written reports.

**Plan A - Thesis Option**

If you earned an Industrial Engineering undergraduate degree, then you take the following:

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>I&amp;ME 500-level courses**</td>
<td>12 (min.)</td>
</tr>
<tr>
<td>I&amp;ME 400-level (or 400 level non-I&amp;ME courses)*</td>
<td>9 (max.)</td>
</tr>
<tr>
<td>EIND 590 Master’s Thesis</td>
<td>10</td>
</tr>
</tbody>
</table>

If you earned a Non-Industrial Engineering undergraduate degree, then you take the following:

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>I&amp;ME 500-level courses**</td>
<td>12 (min.)</td>
</tr>
<tr>
<td>I&amp;ME 400-level courses*</td>
<td>9 (max.)</td>
</tr>
<tr>
<td>EIND 590 Master’s Thesis</td>
<td>10</td>
</tr>
</tbody>
</table>

**Plan B - Non-Thesis Option**

If you earned an Industrial Engineering undergraduate degree, then you take the following:

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>I&amp;ME 500-level courses***</td>
<td>21 (min.)</td>
</tr>
<tr>
<td>I&amp;ME 400-level (or 400 level non-I&amp;ME courses)*</td>
<td>12 (max.)</td>
</tr>
</tbody>
</table>

If you earned a Non-Industrial Engineering undergraduate degree, then you take the following:

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>I&amp;ME 500-level courses***</td>
<td>21 (min.)</td>
</tr>
<tr>
<td>I&amp;ME 400-level courses*</td>
<td>12 (max.)</td>
</tr>
</tbody>
</table>

* A maximum of three credits of EIND 592 may be applied to satisfy 400 level requirement.

**Mechanical Engineering**

**Degrees Offered**

- Master of Science In Mechanical Engineering (MSME)
- Master of Engineering in Mechanical Engineering (M.Eng. ME)
- Ph.D. in Engineering -- Industrial Engineering and Mechanical Engineering Options

**Admission**

Normally, applicants must present evidence of graduation with a bachelor’s degree in engineering with ability to maintain a "B" average. Graduates in other fields may be accepted, but generally these students have to make up background material in certain subject areas. Refer to the Admission Policies and Application Requirements sections for detailed admission and application requirements. Successful applicants are accepted into both the Department and The Graduate School.

Below are the GRE and TOEFL scores the graduate committee is looking for. They will consider lower scores with other excellent qualifications, but these higher scores will give you a better chance of success in this program.

- GRE average scores: GRE-V = 149, GRE-Q = 155, GRE-A = 3.7
- GRE preferred scores: GRE-V = 152, GRE-Q = 156, GRE-A = >3.8
- TOEFL average score: 84
- TOEFL preferred score: 99
- IELTS minimum score: 6.5

For a M.S. in Mechanical Engineering, research is required in Plan A only. Students following Plan B or the Master of Engineering (M.Eng. ME) are not required to write a thesis, and will fill a total of 30 credits with coursework.

**Research Requirements**

For a M.S. in Mechanical Engineering, research is required in Plan A only.

**Plan A - Thesis Option (MSME)**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>EGEN 505 Advanced Engineering Analysis</td>
<td>3</td>
</tr>
<tr>
<td>EGEN 506 Numerical Sol to Engr Problems</td>
<td>3</td>
</tr>
</tbody>
</table>
Plan B - Non-Thesis Option
The Plan B option substitutes an archival journal submission paper (3-4 credits) and additional coursework in lieu of the 10 thesis credits. This option is reserved for students enroute to a Ph.D.

Master of Engineering in Mechanical Engineering (M.Eng. ME) - Non-Thesis Option
Two major curricular/program components distinguish the Master of Engineering degree from the Master of Science degree:

- No professional paper or thesis is required for the M. Eng. M. Eng. students are likely to either be practicing engineers or continuing students who wish to acquire credits required for professional licensure. In the first case, the students have experience in practical engineering and the concepts involved in a capstone experience. In the latter case, all senior engineering students at Montana State University have completed a senior design project that is of the same depth as most professional papers, and this is also true of practically all accredited undergraduate engineering programs. Eliminating the thesis or professional paper requirement provides students the opportunity for more coursework in an area of interest.

- The M. Eng. has no comprehensive examination. Because this is a courses-only degree that requires students to maintain a 3.0 GPA, there will be no further proof of proficiency. The intent is to provide education for practicing professionals.

Students will be supervised by an option coordinator, not by a three-member committee typical for M.S. degrees.

General Requirements
- 30 credits total
- At least 18 of the total credits required for degree must be at 5xx level
- 3xx level courses are not allowed
- 4xx level courses may be used (maximum allowed is 12 credits)
- Courses with grades below C cannot be used to satisfy graduation requirements
- Three credits (min.) registration required during term of graduation (1 credit with in absentia graduation request on file)
- A maximum of six credits of individual problems courses (570) are allowed
- In addition to the required courses, the Master of Engineering requires additional coursework in lieu of the 10 thesis credits.

Required Courses
EGEN 505 Advanced Engineering Analysis 3
EGEN 506 Numerical Sol to Engr Problems 3
EMEC 525 Conduction Heat Transfer (Choose at least one approved course from each topic:) 3

Choose at least one approved course from each topic:

- Materials 3
- Thermo/Fluids 3
- Solid Mechanics 3

For a total of 30 credits, additional coursework must come from the approved list of 400 and 500 level courses.

Total Credits 30

Link to M.Eng. home page for More Information (http://www.coe.montana.edu/m_eng.html#ME).
• Graduate Certificate in Statistics (p. 367)

Department of Microbiology and Immunology (p. 371)
• M.S. in Immunology and Infectious Diseases (p. 288)
• M.S. in Microbiology (Plan A) (p. 288)
• M.S. in Microbiology (Plan B) (p. 289)
• Ph.D. in Microbiology (p. 289)
• Ph.D. in Immunology and Infectious Diseases (p. 290)

Department of Native American Studies (p. 372)
• M.A. in Native American Studies (p. 373)
• Online certificate in Native American Studies (p. 389)

Department of Physics (p. 375)
• M.S. in Physics (p. 376)
• Ph.D. in Physics (p. 376)

Department of Political Science (p. 377)

Department of Psychology (p. 378)
• Ph.D. in Psychology (with an emphasis on psychological science) (p. 379)

American Studies Program
PO Box 172320, Bozeman, MT 59717
Tel: 406-994-4396 Fax: 406-994-7420
Location: Wilson Hall 2-155
Email: americanstudies@montana.edu

Dean
Nicol C. Rae
Contact: nicol.rae@montana.edu

Director
Susan Cohen
Contact: scohen@montana.edu

Program Administrator/Advisor
Contact: kathryn.yaw@montana.edu

Admission Requirements
• Baccalaureate degree in American Studies or closely related field
• 3.0 Grade Point Average
• Official undergraduate transcripts from all universities attended
• Three letters of recommendation
• Letter of application that addresses the applicant’s areas of intended study and the applicant’s qualifications for Master’s level work.
• Writing sample

Applications can be obtained on line from The Graduate School (http://www.montana.edu/wwwdg/apply.html).

Incomplete applications cannot be considered.

Applications for students wishing to be considered for a teaching assistantship for the Fall semester will normally be due by March 1. Applications for Fall semester will be accepted until July 15. Applications for candidates wishing to begin in Spring semester are due by November 1. International degree and non-degree seeking applications are due April 15 for Fall semester and September 1 for Spring semester.

Programs
• Ph.D. of Philosophy in American Studies (p. 355)
• M.A. in American Studies (p. 356)

American Studies offers the degrees of Master of Arts and Doctor of Philosophy, with a special focus on the American West. Major fields include American Arts, American History, American Literature, American Pluralism, and Public History.

Focus Areas
American Arts
Explore how visual and performing arts have shaped and reflected American culture, both past and present.

American History
MSU is internationally recognized for its strength in American history from the colonial period through the present.

American Literature
MSU offers a breadth and depth literary theory of past and present American Literature.

American Pluralism
Explore why American is considered a “nation of nations” by drawing on expertise from faculty in the departments of Anthropology, Latin American Studies, Native American Studies, Religious Studies, and Women’s Studies.

Public History
Develop research interests and critical theory dedicated to understanding the roles of museums, historical sites, and heritage tourism in American culture.

Doctor of Philosophy in American Studies
Course Requirements
The program is built upon research and intensive course work that will normally require four years of full-time work. Students must complete a minimum of 60 credit hours post-baccalaureate, of which at least 18 must be dissertation credits.

All students are required to take AMST 501 Methods in American Studies and AMST 502 Research in American Studies. Additional coursework will be selected from by the student in conjunction with his or her committee chair and committee members.

Major Field
All students must declare a major field of emphasis, by the third semester of study. The major field will normally require at least 12 credits of coursework. The major fields are:
• American Arts
• American History
• American Literature
• American Pluralism
• Public History

Supporting Area
All students must declare a supporting area, which will normally be acquired through three courses (9 credits) and a four-hour written examination administered by the supporting area adviser. The supporting area will be a thematic field, for example, Native American Studies, Technology and Culture, Women’s Studies.
**Foreign Language Requirement**
PhD students are required to demonstrate reading knowledge of at least one foreign language. Competency will be determined by an examination administered by the program, normally in conjunction with the Department of Modern Languages and Literatures. The foreign language requirement must be completed successfully before a student can present the dissertation proposal.

**Financial Support**
Currently, the only form of financial support available through the program is the Graduate Teaching Assistantship. A small number of teaching assistantships will normally be awarded each academic year, based on merit, as determined by the Graduate Committee. Interested students should apply for a teaching assistantship by submitting a letter of interest to the Program Director.

For information about general scholarship opportunities and Financial Aid, please see the "resources for students" link.

**Master of Arts in American Studies**

**Five-Year M.A.**
Qualified students can complete a bachelor's and master of arts in five years.

**Course Requirements**
The Master of Arts degree requires completion of 30 credits, of which no more than 9 can be at the 400-level. Students who enter the program after receiving their baccalaureate degree will normally require two years of full-time work to complete it.

The program includes a 10-credit Master's Thesis (Plan A) option, and an all course-work (Plan B) option. All students are required to take AMST 501 Methods in American Studies, and AMST 502 Research in American Studies. Additional course work will be selected by the student in conjunction with his or her committee chair and committee members. Under Plan A, students must register for a minimum of 10 credits of AMST 590 Master's Thesis and defend their thesis in an oral examination. The format of thesis work is determined by The Graduate School.

**Graduate Committee**
A student's committee will consist of a chair and two additional members. The committee must be formed by the end of the second semester of attendance.

**Financial Support**
Currently, the only form of financial support available through the program is the Graduate Teaching Assistantship. A small number of teaching assistantships will normally be awarded each academic year, based on merit, as determined by the Graduate Committee. Interested students should apply for a teaching assistantship by submitting a letter of interest to the Program Director.

For information about general scholarship opportunities and Financial Aid, please see the "resources for students" link.

**Department of Agricultural Economics and Economics**

**Department Head**
Dr. Wendy Stock  
P.O. Box 172920  
306 Linfield Hall, Bozeman, MT  59717-2920  
Tel: 406-994-3701  Fax: 406-994-4838  
Email: ageconadvising@montana.edu

Our Master of Science degree in Applied Economics encourages students to develop and apply their skills in economic analysis and examine a wide array of economic and political issues. Learning takes place through coursework in economic theory, quantitative methods and econometrics, through collaborative work with departmental faculty, and through an intensive research thesis that addresses an important economic issue selected by the student.

**Admission**
Core graduate courses are taught at a level that requires entering students to have successfully completed courses in intermediate microeconomic and macroeconomic theory, calculus, matrix algebra, and statistics. Applicants who have not completed the prerequisite material, but who have apparent potential for graduate study, may be admitted to the program on a provisional basis. A math review course is offered prior to Fall semester each year for all incoming graduate students. Applicants must submit Graduate Record Examination (GRE) scores, official transcripts of all degree coursework, three letters of recommendation, and an application fee of $60. A personal statement is recommended, but is not required. Foreign applicants must also include English proficiency test scores from: TOEFL [80], IELTS [level 6.5] or PTE [54]; this test is necessary for applicants who are not U.S. citizens and not from countries where English is the official language. To apply for the M.S. in Applied Economics, use this link: www.montana.edu/gradschool/apply.html

**Degree Requirements**
A core of economic theory and quantitative methods courses (or equivalent) is required. Students are required to maintain a 3.0 grade point average overall in their core courses and the courses in their graduate program. Failure to meet these requirements, as well as receipt of more than one grade less than a "B-" in the core courses will be grounds for termination. See Program Requirements on the department website for course information.

**Student Graduate Committee**
Faculty members in our Department have expertise in a wide variety of fields. Some examples of graduate topics taught by our faculty are advanced economic theory, static and dynamic optimization models in economics, the dynamic effects of fiscal & monetary policy on the macroeconomy, theory and use of regression analysis, public policy, and research methodology. Our faculty takes an active interest in our students, and this one-on-one contact with faculty in our department is consistently given high praise among our students.

**Financial Assistance**
A number of research and teaching assistantships are available for graduate students and are awarded on a competitive basis. Late applications will be considered as space and funding become available. To ensure full consideration for assistantship awards for Fall semester, applications should be received by January 15. For further information, refer to the Graduate Assistantships sections on the department website.

**Degree Offered**
- M.S. in Applied Economics (p. 284)

**M.S. in Applied Economics**

**Program Requirements**
A core of economic theory and quantitative methods courses (or equivalent) is required. Students are required to maintain a 3.0 grade point average overall in their core courses and the courses in their graduate program. Failure to meet these requirements, as well as receipt of more than one
the scheduled date of their examination. The examination for Option to present a typed draft, in final form, of the thesis or research paper to committee and is open to all members of the faculty. Students are expected (Option B). The oral examination is administered by the student's graduate microeconomic theory and their application. each year; it will consist of questions covering the fundamental concepts of is offered early spring semester, and may be offered one additional time administered by the Department's Graduate Affairs Committee. The exam required to pass a Microeconomics Theory Core Exam – a written exam receive final approval by the Department Head.

In addition to theory and quantitative methods core courses, students will successfully complete ECNS 569 Research Methodology. Supplementary coursework and research may focus on agricultural economics, natural resource economics, or general applied economics. Through continued discussions with the advisor and other faculty, students will select additional courses and either a thesis topic (Plan A) or research paper topic (Plan B) to complete a program of study consistent with their interests.

Students may choose to study special problems on an individual basis. Students desiring "Individual Problem" credit as either ECNS 592 Independent Study, AGBE 592 Independent Study, or AGBE 591 Special Topics should consult with a faculty member and agree upon a plan of study before the beginning of the semester in which the credits are to be undertaken. The Graduate School must approve all such courses, and limits the number of credits applicable toward degree requirements as: maximum of 3 credits for Option A or 6 credits for Option B.

Under Plan A, required minimums are: 20 semester credits (including the core courses of graduate coursework), and 10 semester credits of thesis. For those who have satisfied coursework prerequisites, the required degree coursework should be completed in two semesters. The thesis must be acceptable to the student’s graduate committee and to The Graduate School, and it must demonstrate independent and original research.

Under Plan B, a thesis is not required. This option includes at least 30 semester credits of graduate coursework. Students who select Option B are required to include a Professional Paper and Project (ECNS 575); maximum of 4 credits in a semester and a maximum of 6 credits for the program) as part of their program. For those who have satisfied coursework prerequisites, the required degree coursework (other than the research paper) should be completed in two or three semesters. The paper must be original, of professional quality (meet style and format requirements set forth in The Graduate School Guide for Preparation of Thesis and Professional Papers), be acceptable to the student’s graduate committee, and receive final approval by the Department Head.

Two examinations complete degree requirements. Each student is required to pass a Microeconomics Theory Core Exam – a written exam administered by the Department’s Graduate Affairs Committee. The exam is offered early spring semester, and may be offered one additional time each year; it will consist of questions covering the fundamental concepts of microeconomic theory and their application.

In addition to the Core Exam, each student is required to pass an oral examination in defense of their thesis (Option A) or research paper (Option B). The oral examination is administered by the student’s graduate committee and is open to all members of the faculty. Students are expected to present a typed draft, in final form, of the thesis or research paper to each member of their graduate committee at least seven days prior to the scheduled date of their examination. The examination for Option

A students should not be scheduled until the student’s thesis committee agrees that the thesis is essentially in a form acceptable to the University Library (that is, copies of the typed draft should be readable and have a table of contents, list of tables and figures, chapter titles, section headings, bibliography, and consecutively numbered pages). The examination for Option B students should not be scheduled until the paper is in a form that satisfies style and format requirements.

**Department of Cell Biology and Neuroscience**

**Department Head**

Frances Lefcort, Ph.D.

**Graduate Coordinator**

Behrad Noudoost, Ph.D.

Montana State University
510 Leon Johnson Hall, Bozeman, MT 59717
406-994-6494 Email: bnoudoost@montana.edu

The Department of Cell Biology and Neuroscience offers exciting opportunities to work with nationally and internationally recognized faculty on a wide range of research topics, including cognitive neuroscience, neurophysiology, developmental biology, cell biology and biophysics. It is the goal of the faculty to prepare our students for successful careers in academic research, government, and/or the biotechnology industry. Successful applicants to the program will have already established a commitment to excellence through academic achievements and prior research experience.

We offer Ph.D. or M.S. degrees in Neuroscience or Biological Science to our graduate students. The Ph.D. Degree Program is designed for students who are committed to a scientific research career and are willing to commit an average of 5 to 6 years in pursuit of the training that is necessary to qualify for this degree. **Prospective student should secure a faculty sponsor prior to applying for admission.**

The M.S. degree is for students who wish to increase their knowledge base in basic research through an intensive 2- to 3-year training period. Students must identify a faculty sponsor prior to application to the CBN Graduate Program.

**Admission**

A Bachelor’s degree in an area of Biology, Chemistry, Physics, Applied Math or Psychology is recommended. Students with Bachelor’s degrees outside these areas are also encouraged to apply; such students will generally be required to complete appropriate courses while enrolled at MSU to make up subject matter deficiencies prior to full acceptance into the Ph.D. and Masters programs. Factors that the department uses in its admissions process include GRE scores, TOEFL scores (for non-native English speakers), reference letters, GPA and previous coursework and research experience.

The department of Cell Biology and Neuroscience also participates in the Molecular Biosciences Program at MSU (http://mbprogram.montana.edu/index.asp). This is an interdisciplinary graduate training program that includes faculty from a wide range of departments specializing in aspects of biology on the MSU campus. For more information, and details about applying, please refer to http://www.montana.edu/cbn/.
Research Facilities
Graduate research will be performed primarily in the laboratory of the student’s thesis adviser. Additional facilities will be available from the department and in laboratories collaborating with the student’s adviser. Cell Biology and Neuroscience is housed in the 5th floor of Leon Johnson Hall, the basement of Lewis Hall and in the Cooley Laboratories.

Financial Assistance
A number of research and teaching assistantships are available for qualified graduate students. These appointments are normally for half-time assignments (20 hours per week) during the academic year. Some appointments may also be available during the summer. Assistantships will only be offered to formally admitted graduate students. Fellowships are available through MBS program.

Degrees Offered
• Master of Science in Biological Sciences (p. 358)
• Master of Science in Neuroscience (p. 358)
• Doctor of Philosophy in Biological Sciences (p. 358)
• Doctor of Philosophy in Neuroscience (p. 358)

Program Requirements
M.S. Degree
Students may pursue the Master’s degree under either Plan A or Plan B. Plan A requires the completion of 20 credits of acceptable graduate-level coursework and 10 credits of thesis. Under Plan B, a 4-credit project and 26 credits of acceptable graduate-level coursework must be completed. For more information, please refer to http://www.montana.edu/cbn/Graduate_Program.html.

Master’s candidates must take an oral comprehensive exam near the completion of their graduate program. Required curriculum will be tailored to the needs and interests of each student in consultation with their graduate adviser and committee.

Ph.D. Degree
A Ph.D. student must complete a minimum of 35 dissertation credits and a minimum of either 25 credits of graduate-level coursework beyond the Bachelor’s degree or 10 credits of graduate-level coursework beyond the Master’s degree. Accepted students will be assigned an advisory committee upon entering the program to assist them in tailoring a curriculum that best fits their educational needs, research interests, and career plans.

Research Experience
Plan A (thesis option) Master’s degree students gain research experience through their thesis and are expected to submit the results of their thesis work to at least one journal or conference.

Plan B (project option) Master’s degree students gain some research experience in the context of their project.

M.S. in Neuroscience
Students may pursue the Master’s degree under either Plan A or Plan B. Plan A requires the completion of 20 credits of acceptable graduate-level coursework and 10 credits of thesis. Under Plan B, a 4-credit project and 26 credits of acceptable graduate-level coursework must be completed. Master’s candidates must take an oral comprehensive exam near the completion of their graduate program. Required curriculum will be tailored to the needs and interests of each student in consultation with their graduate adviser and committee.

M.S. in Biological Sciences
Students may pursue the Master’s degree under either Plan A or Plan B. Plan A requires the completion of 20 credits of acceptable graduate-level coursework and 10 credits of thesis. Under Plan B, a 4-credit project and 26 credits of acceptable graduate-level coursework must be completed. Master’s candidates must take an oral comprehensive exam near the completion of their graduate program. Required curriculum will be tailored to the needs and interests of each student in consultation with their graduate adviser and committee.

Research Experience
Plan A (thesis option) Master’s degree students gain research experience through their thesis and are expected to submit the results of their thesis work to at least one journal or conference.

Plan B (project option) Master’s degree students gain some research experience in the context of their project.

Ph.D. in Biological Sciences
A Ph.D. student must complete a minimum of 35 dissertation credits and a minimum of either 25 credits of graduate-level coursework beyond the Bachelor’s degree or 10 credits of graduate-level coursework beyond the Master’s degree. Accepted students will be assigned an advisory committee upon entering the program to assist them in tailoring a curriculum that best fits their educational needs, research interests, and career plans.

Research Experience
Ph.D. students will gain research experience through their doctoral work, journal or conference submissions, and attending conferences

Ph.D. in Neuroscience
After admission, students will be assigned an advisory committee upon entering the program to assist them in tailoring a curriculum that best fits their educational needs, research interests, and career plans.

As a general guideline, Ph.D. students are required to complete 60 credits. Cell Biology and Neuroscience doctoral students complete 35 dissertation credits and either 25 credits of graduate-level coursework beyond the Bachelor’s degree or 10 credits of graduate-level coursework beyond the Master’s degree. However, the exact proportion of the above-mentioned credits will be determined for each student by their advisory committee.

Department of Chemistry and Biochemistry
Departmental Office:
PO Box 173400, Bozeman , MT 59717
Tel: 406-994-4801 Fax: 406-994-5407

The Department of Chemistry and Biochemistry offers research-oriented programs culminating in the Doctor of Philosophy degree. The faculty in the department have expertise in a broad range of specialty areas including synthesis, structure, spectroscopy, and mechanism. In each of these fields, the strength of MSU Chemistry and Biochemistry Department has been recognized at the international level. MSU is a growing and dynamic university of 16,000 students. MSU is rapidly increasing in research prominence and is now ranked among the nation’s 100 leading research universities by the Carnegie Foundation. The Department of Chemistry and Biochemistry has the largest and best-funded doctoral program on campus. Our doctoral students receive world-class mentoring in a
spectacular northern Rocky Mountain setting and graduate to superb career opportunities.

Graduate programs in chemistry and biochemistry are designed to provide students with a solid and broad foundation on which to base their careers. An appropriate combination of coursework and independent investigation is planned with individual faculty advisors. In consultation with their graduate advisor, graduate students can tailor their program to their own needs and interests. We believe that at the conclusion of their graduate education at Montana State University, students should have a professional command of the fundamentals of their disciplines. We cultivate the ability to think independently and to critically analyze scientific problems that span disciplinary boundaries. A high level of creativity and originality in research is expected of candidates for the Ph.D.

Admissions
An entering graduate student is expected to have had a solid chemistry background, including general, analytical, organic, and physical chemistry courses; Mathematics through calculus; and college level physics. A student less well prepared may be provisionally admitted provided he or she can attain an acceptable background proficiency within one year. Applicants are strongly encouraged to take the GRE subject test appropriate to their area.

Applicants must be formally admitted to The Graduate School. See the Admission Policies and Application Requirements sections for additional information at www.montana.edu/wwwdg/.

Program Requirements
All entering graduate students are required to demonstrate proficiency in three of the six chemistry areas (analytical, biochemical, inorganic, organic, physical, and structural and molecular biology) within the first year. The exams are offered during August, November, February and April of the academic year.

During the second semester, each student selects a major adviser who assists the student in selecting other faculty members for the student’s graduate committee. This committee will offer the major guidance and direction to the student’s degree program and bears the prime responsibility for decisions that affect that program.

For the Doctor of Philosophy in Chemistry or Biochemistry, students must satisfy the proficiency requirement, complete a core program of coursework, advance to candidacy by passing the comprehensive examination, conduct independent research and analysis in their discipline and write and defend a dissertation based on the student’s research.

The comprehensive examination consists of written and oral parts. Most students satisfy the written examination by writing an original proposal describing the candidate’s planned dissertation research. The second part of the comprehensive examination is an oral defense of the proposal. The student is admitted to Ph.D. candidacy upon successful completion of the written and oral portions.

For the Master of Science Plan A in chemistry or biochemistry, the minimum requirements are twenty (20) credit hours of appropriate courses, ten (10) credit hours of Master’s Thesis (BCH 590) BCH 590/BCH 590/BCH 590 (Master’s Thesis (CHMY 590) CHMY 590/CHMY 590/CHMY 590) and an acceptable thesis based on the student’s research and a satisfactory oral defense of the thesis. Plan A candidates must present a seminar in addition to the final thesis defense, which constitutes the comprehensive examination. For the Master of Science Plan B in chemistry or biochemistry, the requirements are thirty (30) credit hours of appropriate courses, a seminar, and satisfactory performance in an oral comprehensive examination during the last term of residency for the degree.

Course Requirements
To earn a Ph.D. in chemistry or biochemistry, a student must successfully complete at least six, three-credit courses maintaining a “B” average or better. Four of these must be Department of Chemistry and Biochemistry courses and at least three must be in the student’s area of specialization.

The Graduate Program and Admissions Committee will advise entering students on course selection. The listed courses can provide guidance in planning the first year’s courses.

Biochemistry

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>BCH 524</td>
<td>Mass Spectrometry</td>
<td>3</td>
</tr>
<tr>
<td>BCH 526</td>
<td>Adv Protein NMR Spectroscopy</td>
<td>3</td>
</tr>
<tr>
<td>BCH 543</td>
<td>Proteins</td>
<td>3</td>
</tr>
<tr>
<td>BCH 544</td>
<td>Molecular Biology</td>
<td>3</td>
</tr>
<tr>
<td>BCH 545</td>
<td>Advanced Physical Biochemistry</td>
<td>3</td>
</tr>
<tr>
<td>BCH 547</td>
<td>Bioinorganic Chemistry</td>
<td>3</td>
</tr>
<tr>
<td>BCH 550</td>
<td>X-ray Crystallography</td>
<td>3</td>
</tr>
<tr>
<td>BCH 575</td>
<td>Professional Paper</td>
<td>1-6</td>
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</table>

Inorganic

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<tr>
<th>Course</th>
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<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>CHMY 515</td>
<td>Structure and Bonding in Inorganic Chemistry</td>
<td>3</td>
</tr>
<tr>
<td>CHMY 516</td>
<td>Mechanisms and Dynamics in Inorganic Chemistry</td>
<td>3</td>
</tr>
<tr>
<td>CHMY 525</td>
<td>Chemical Reactions</td>
<td>3</td>
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Organic

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<thead>
<tr>
<th>Course</th>
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<th>Credits</th>
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<tbody>
<tr>
<td>CHMY 523</td>
<td>Organic Reaction Mechanisms</td>
<td>3</td>
</tr>
<tr>
<td>CHMY 533</td>
<td>Physical Organic Chemistry</td>
<td>3</td>
</tr>
<tr>
<td>CHMY 535</td>
<td>Reagent Chemistry</td>
<td>3</td>
</tr>
<tr>
<td>CHMY 540</td>
<td>Organic Synthesis</td>
<td>3</td>
</tr>
<tr>
<td>CHMY 554</td>
<td>Organometallic Chemistry</td>
<td>3</td>
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</table>

Physical/Analytical

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<tr>
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<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHMY 557</td>
<td>Quantum Mechanics</td>
<td>3</td>
</tr>
<tr>
<td>CHMY 558</td>
<td>Classical &amp; Star Thermodynamic</td>
<td>3</td>
</tr>
<tr>
<td>CHMY 559</td>
<td>Kinetics &amp; Dynamics</td>
<td>3</td>
</tr>
<tr>
<td>CHMY 564</td>
<td>Adv Quantum Chemistry</td>
<td>3</td>
</tr>
</tbody>
</table>

* Students can take a 400 level course provided that it is outside of their specific area of interest. (For example, students may be served well by Advanced Instrument Analysis (CHMY 421) or one of the 400-level organic classes).

Research Facilities
The Department of Chemistry and Biochemistry at Montana State University provides students, faculty, and staff with access to the state-of-the-art instrumentation that is required to stay at the forefront of research. We have the region’s best mass spectrometers for proteomics, metabolomics, chemical composition, and imaging. Current MS techniques that are ideal for many projects in chemical biology include ultra high pressure LCMS, ion traps with CID and ECD, chip and standard nanoflow ESI, MALDI-TOF-TOF, and ultra-high resolution Q-TOF MS/MS. Chemists and biochemists benefit from excellent NMR Instrumentation, which includes 600, 500, and 300 MHz NMR spectrometers. These
instruments are used in routine analysis of small molecules and also protein structural determination. Our instrumentation for dynamic light scattering, zeta potential, isothermal titration microcalorimetry, cryogenic electron microscopy, and stopped flow spectrophotometry is also state of the art. Two protein crystallographers have all the necessary equipment for macromolecular crystal structure determination. Protein-protein interactions can be studied using surface plasmon resonance (Biacore), quartz crystal microbalance with dissipation (Q-Sense), and a fluorescence lifetime microplate reader.

The department has some of the nation’s most advanced facilities for time-resolved laser spectroscopy on time scales from femtoseconds to seconds. Multiple Ti:sapphire-based ultrafast laser systems provide tunable laser pulses from UV to mid-IR wavelengths, enabling a rich array of transient absorption and emission spectroscopies. Investigations of high-energy gas-phase and gas-surface molecular interaction are conducted using a molecular beam apparatus that was originally designed by Nobel Laureate, Y. T. Lee, for crossed-beam studies of elementary reaction dynamics. Other advanced instrumentation includes CW and pulsed multifrequency EPR, Raman, FTIR, circular dichroism and fluorescence spectrometers.

In addition to the equipment housed in our department, campus microscopy capabilities include transmission electron microscopy (TEM), scanning electron microscopy with cryogenics (SEM), atomic force microscopy (AFM), confocal imaging, and laser micro dissection and capture.

The National NSF Center for Biofilm Engineering is located at Montana State University. Several faculty and students have collaborative research projects with staff associated with this Center and those listed below.

**Center for Computational Biology (CCB)**

The CCB is an interdisciplinary academic unit supporting research, training and technology transfer in the general area of Computational Biology, combining state-of-the-art experimental techniques with state-of-the-art computer-based analysis and modeling capabilities. The research and training environment in the CCB encourage partnerships between experimentalists, theorists and engineers in diverse fields, providing opportunities to establish genuine research partnerships between students and scientists at many different institutions around the world.

**MSU Optical Technology Center (OpTeC)**

OpTeC is an interdisciplinary center with research groups from three university departments: Physics, Chemistry & Biochemistry, and Electrical & Computer Engineering. Each of the ten research groups is led by a faculty principal investigator and specializes in a different area of optical research. Collaborating teams profit from a multidisciplinary approach to problems. The primary goals of OpTeC are to foster collaboration with local industry and economic growth of the state. OpTeC promotes research on optical materials, lasers and optoelectronic devices, sensors, micro-optical systems, holography, and coherent optics. For more information, visit www.optec.montana.edu.

**Thermal Biology Institute**

The Thermal Biology Institute conducts and promotes research and education focused on the biology and interrelated physical and chemical processes of geothermal environments in the Greater Yellowstone Ecosystem. For more information visit http://tbi.montana.edu/index.html.

**NASA Astrobiology Biogeocatalysis Research Center (ABRC)**

The major research theme of the ABRC is in the area of prebiotic chemistry and specifically the role for iron-sulfur mineral motifs in the transition between the non-living and the living world. The project has three major thrusts including:

1. iron-sulfur mineral catalysis,
2. iron-sulfur enzyme catalysis, and
3. biomimetic approaches to bridging iron-sulfur mineral and iron-sulfur enzyme structure and reactivity.

These projects are highly integrated and the characterization of the unique iron-sulfur centers of nitrogenase and hydrogenase provide the inspiration to examine the structure determinants for effective nitrogen reduction and reversible hydrogen oxidation catalysis. For more information visit www.chemistry.montana.edu/john.peters/research.html#abrc.

**Molecular Biosciences Program**

The Molecular Biosciences Program offers numerous graduate research and training opportunities in Basic and Applied Life Sciences. Internationally recognized interdisciplinary research programs and Research Centers of Excellence provide students excellent career development opportunities.

The MB Program provides students with the opportunity to view faculty involved in life science research divided into research areas. The new approach should be easier for the prospective student to find a faculty conducting the research of most interest to them. For More Information visit www.mbprogram.montana.edu/index.asp

**Financial Assistance**

Graduate students in the program are supported continuously throughout their studies by stipends that average between $22,000 and $24,000 per year and by tuition waivers. First-year students are supported as graduate teaching assistants, while most students in their second and later years are appointed to grant-funded projects as graduate research assistants. Funding per investigator in the Department of Chemistry and Biochemistry is at a very high level found at only a small number of departments nationwide.

**Degrees Offered**

- M.S. in Chemistry (p. 360)
- M.S. in Biochemistry (p. 360)
- Ph.D. in Chemistry (p. 361)
- Ph.D. in Biochemistry (p. 361)

**M.S. in Biochemistry**

The Departmental Master’s Program is available ONLY to students who wish to obtain a Masters Degree en route to the Doctoral Degree, or in lieu of a terminal doctorate to which they had originally subscribed. Graduate students are attracted to the MSU program in biochemistry because of the strength of the research program, the collaborative nature of the faculty, and the beautiful setting of the new research building in a mountain environment.

**M.S. in Chemistry**

The Departmental Master’s Program is available ONLY to students who wish to obtain a Masters Degree en route to the Doctoral Degree, or in lieu of a terminal doctorate to which they had originally subscribed. Graduate students are attracted to the MSU program in chemistry because of the strength of the research program, the collaborative nature of the faculty, and the beautiful setting of the new research building in a mountain environment.
Ph.D. in Biochemistry

The Department of Chemistry and Biochemistry offers a Ph.D. in Biochemistry that is designed to provide students with a solid and broad foundation on which to base their careers. An appropriate combination of coursework and independent investigation is planned with individual faculty advisers. In consultation with their graduate adviser, graduate students can tailor their program to their own needs and interests. At the conclusion of their graduate education in chemistry, students will have a professional command of the fundamentals of their discipline. They will be able to critically analyze scientific problems that span disciplinary boundaries and will be able to perform research with a high level of creativity and originality.

Ph.D. in Chemistry

The Department of Chemistry and Biochemistry offers a Ph.D. in Chemistry that is designed to provide students with a solid and broad foundation on which to base their careers. An appropriate combination of coursework and independent investigation is planned with individual faculty advisers. In consultation with their graduate adviser, graduate students can tailor their program to their own needs and interests. At the conclusion of their graduate education in chemistry, students will have a professional command of the fundamentals of their discipline. They will be able to critically analyze scientific problems that span disciplinary boundaries and will be able to perform research with a high level of creativity and originality.

Department of Earth Sciences

PO Box 173480
226 Traphagen Hall, Bozeman, MT 59717-3480
Tel: 406-994-3331, Fax: 406 994 6923
Email: earth@montana.edu
Home Page: http://www.montana.edu/wwwes/

Contact Information for graduate coordinators:
Jean Dixon, jean.dixon@montana.edu
or
David Varricchio, djv@montana.edu

Earth Sciences offers M.S. and Ph.D. degrees in Earth Sciences (Geography, Geology, and Geobiology content areas). We stress independent thesis research with some supporting course work. Our expertise spans most of the subfields of Earth Sciences. Our Geography faculty includes specialties including historical and cultural geography, settlement geography, resource geography (energy and water), economic geography, planning, bioclimatology, applications of GIS and snow science. The interests of our Geology faculty include composition and structure of the crust, quantitative geomorphology, sedimentation and stratigraphy. Our Geobiology faculty have research interests in vertebrate paleontology, paleoecology, biogeography, paleoclimatology, and geomicrobiology. Our program strengths are in basin analysis and energy resources, dinosaur paleontology, geography of the northern Rocky Mountains, architecture and composition of the lithosphere, snow science and cryospheric processes, and climate change. Examples of thesis titles can be found on the Department of Earth Sciences web page (see above).

Admission

The department generally expects applicants to have a GPA of 3.0 or higher and GRE Scores better than the 50th percentile and a strong academic background in Earth Sciences (Geography, Geology, or Geobiology). Foreign students must have a TOEFL score better than 550 for the paper test and 231 for the computer test. The department does not accept general applicants to our graduate program. An applicant should identify a major advisor from the list of faculty (found on the department website above), contact that individual, and determine whether there is space available in that adviser's program.

For applicants who wish to study geography, the department requires the equivalent of a geography minor (eight semester geography courses including map skills, world regional, human, and physical geography) as background. A geography undergraduate degree is preferred and coursework and practical experience involving geographic skills such as cartography, field methods, aerial photograph interpretation, remote sensing, GIS and quantitative methods are considered a desirable part of an applicant’s background.

For applicants who wish to study geology, the department expects him/her to have a year each of calculus, physics and chemistry as well as physical geology, mineralogy, petrology, historical geology, geomorphology, sedimentation, stratigraphy, structural geology, and a field geology course which emphasizes mapping. These requirements are typically met by an undergraduate degree in geology. Applicants who have not completed all requirements may be admitted, but are expected to make up deficiencies during the first year of graduate study.

For applicants who wish to study geobiology, the department expects an applicant to have a degree in geology, biology or a closely related field. The most competitive applicants have significant upper-division course work in both geology and biology.

For optimum course scheduling, applicants are accepted into the graduate program only at the start of Fall semester. However, an applicant desiring to take courses to strengthen qualifications for the graduate program may be admitted as a non-degree student at the beginning of either the Spring or Summer term. Successful applicants must be accepted both by the department and by The Graduate School.

Program Requirements

Students are expected to develop a solid curricular foundation in geography, geology or geobiology. Graduate programs include a core of geography, geology, or geobiology courses and are further tailored in consultation with the advisor and graduate committee to the specific talents and interests of the individual student. Coursework in disciplines outside the department is encouraged to support and enhance specific research areas in the Earth Sciences.

Graduate and 400-level (senior) courses in earth science include: snow dynamics, geobiology, geomicrobiology, Quaternary Environments of the Western US, Quaternary paleoecology, and Quaternary environments. Graduate and 400-level (senior) courses of study in geography include: historical geography, geographic thought, population geography, water and society, vulnerability and environmental hazards, advanced topics in resource geography, topics in political ecology, mountain geography, applied GIS and spatial analysis, tourism planning, advanced regional geography, East Asia in the global system, GIS research fundamentals, settlement geography, and land use planning. All graduate students with a concentration in Geography are required to complete a 1-credit (500 level) course entitled Current Research and Applications in Geography in the Fall of their first year. Graduate and 400-level (senior) courses of study in geology include: tectonics, igneous petrology, metamorphic petrology, sedimentary petrology, graduate structural geology, volcanology glacial geology, advanced stratigraphy, elastic sedimentology, ancient ocean systems, tectonics of sedimentary basins, petroleum geology, depositional systems, vertebrate paleontology, macroevolution and the fossil record, taphonomy, comparative vertebrate anatomy, geology of the northern Rocky Mountains.
Facilities
The primary research facility is the northern Rocky Mountain field laboratory which includes Yellowstone National Park, and the Greater Yellowstone GeoEcoSystem. Field work is also done in China, Argentina, Chile, and New Zealand. Field-based research in the Rocky Mountains is a component of many Earth Sciences graduate students’ study. Field equipment includes tools for location and altitude (from conventional compasses and altimeters to auto levels, a total station and GPS ground stations), sampling devices including suspended and bedload sediment samplers, current meters paleomagnetic rock drills, hammer seismograph, auto level, total station, snow density kits, U.S. Federal Snow samplers, ram sondes, shear frames, lake-sediment coring equipment and the like. Field work is supplemented by laboratory analysis in several facilities across campus. The Department has crushers, Franz magnetic-susceptibility separator, balances, rock saws, lap wheels, and a paleontology preparation laboratory. The Department also has several high-quality (Leitz and Nikon) transmitted and reflected light research petrographic microscopes with photo microscopy and cathode luminescence capability and computer-driven image analysis capabilities. There is an MSU Paleozoology Lab under the direction of Cathy Whitlock, a geomicrobiological/geochemical laboratory under the direction of Mark Skidmore, a structural geology laboratory under the direction of David Lageon, a stratigraphic and basin analysis laboratory under the direction of Michael Gardner, a snow and avalanche laboratory under the direction of Jordy Hendrikx, and a geochemistry wet laboratory under the direction of Jean Dixon.

There are other laboratories on campus that Earth Scientists use. The MSU Spatial Sciences Center under the direction of Rick Lawrence provides instruction and research opportunities for faculty and students interested in Global Positioning Systems, GIS and remote sensing. This center supports ARC/INFO and ERDAS on workstations, pARC/INFO and IDRISI and IMAGINE on PCs, and a variety of digitizers, scanners, printers and plotters for data input and output.

The Imaging and Chemical Analysis Laboratory (ICAL) contains analytical equipment which includes a scanning electron microscope (with EDS, BSE, and CL spectrometers), automated powder X-ray diffraction, X-ray photoelectron spectroscopy, Auger electron spectroscopy, and time-of-flight SIMS.

The Subzero Science and Engineering Laboratory under the direction of Ed Adams has a variety of cold rooms for research on snow and ice including a flume laboratory for the study of ice in streams and lakes, and laboratories with radiation and thermal pulses to examine snow and ice properties under varying weather and climatic regimes.

The vertebrate (dinosaur) paleontology laboratory of the Museum of the Rockies, under the curation of Jack Horner, contains state-of-the-art microscopic and computerized image-enhancement equipment for the study of dinosaur bones, as well as other chemical and mechanical equipment for the preparation and analysis of fossilized vertebrates.

Graduate students in Geography may also work closely with faculty and facilities in the Departments of Political Science, Native American Studies, Sociology and Anthropology, Agricultural Economics and Economics, and History and Philosophy.

Assistance
Graduate students in Earth Sciences have been successful with National Science Foundation Fellowships and research grants from Geological Society of America, the American Association of Petroleum Geologists, the Society for Sedimentary Geology, the U.S. Forest Service, and Sigma Xi, and have won University-wide and regional awards for thesis research.

Teaching and research assistantships are available each year. Graduate scholarships are awarded annually on a competitive basis in the second year of residence to assist with thesis research. See the Earth Sciences website or contact the department for more information.

Degree Offered
- M.S. in Earth Sciences (p. 362)
- M.S. in Land Rehabilitation (p. 286) (Interdisciplinary degree)
- Ph.D. in Earth Sciences (p. 362)

M.S. in Earth Sciences
Students are expected to develop a solid curricular foundation in geography, geology or geobiology. Graduate programs include a core of geography, geology, or geobiology courses and are further tailored in consultation with the advisor and graduate committee to the specific talents and interests of the individual student. Coursework in disciplines outside the department is encouraged to support and enhance specific research areas in the Earth Sciences.

Graduate and 400-level (senior) courses in earth science include: snow dynamics, physiography, geobiology, geomicrobiology, Quaternary Environments of the Western US, Quaternary paleoecology, and Quaternary environments. Graduate and 400-level (senior) courses of study in geography include: historical geography, geographic thought, population geography, water and society, vulnerability and environmental hazards, advanced topics in resource geography, topics in political ecology, mountain geography, applied GIS and spatial analysis, tourism planning, advanced topics in resource geography, topics in political ecology, mountain geography, applied GIS and spatial analysis, tourism planning, advanced regional geography, East Asia in the global system, GIS research fundamentals, settlement geography, and land use planning. All graduate students with a concentration in Geography are required to complete a 1-credit (500 level) course entitled Current Research and Applications in Geography in the Fall of their first year. Graduate and 400-level (senior) courses of study in geology include: glacial geology, sedimentology, applied geological hydrology, advanced stratigraphy, clastic sedimentology, ancient ocean systems, tectonics of sedimentary basins, petroleum geology, depositional systems, vertebrate paleontology, macroevolution and the fossil record, taphonomy, comparative vertebrate anatomy, Hell Creek paleontology, geology of the northern Rocky Mountains, structural analysis, tectonics, igneous geochemistry, igneous geochemistry, and volcanology.

Ph.D. in Earth Sciences
Program Requirements
Students are expected to develop a solid curricular foundation in geography, geology or geobiology. All graduate students in the Earth Sciences Department are required to take Seminar (ERTH 594)-001 (Thesis Design) for one credit in the fall of their first year. Graduate programs include a core of geography, geology, or geobiology courses and are further tailored in consultation with the adviser and graduate committee to the specific talents and interests of the individual student. Coursework in disciplines outside the department is encouraged to support and enhance specific research areas in the Earth Sciences.

Graduate and 400-level (senior) courses in earth science include: surface water resources, ground-water resources, snow dynamics, physiography, geobiology, geomicrobiology, Quaternary Environments of the Western US, Quaternary paleoecology, and Quaternary environments. Graduate and 400-level (senior) courses of study in geography include: historical geography, geographic thought, population geography, water and society, vulnerability and environmental hazards, advanced topics in resource geography, topics in political ecology, mountain geography, applied GIS and spatial analysis, tourism planning, advanced regional geography, East Asia in the global system, GIS research fundamentals, settlement geography, and land use planning. All graduate students with a concentration in Geography are required to complete a 1-credit (500 level) course entitled Current Research and Applications in Geography in the Fall of their first year. Graduate and 400-level (senior) courses of study in geology include: glacial geology, sedimentology, applied geological hydrology, advanced stratigraphy, clastic sedimentology, ancient ocean systems, tectonics of sedimentary basins, petroleum geology, depositional systems, vertebrate paleontology, macroevolution and the fossil record, taphonomy, comparative vertebrate anatomy, Hell Creek paleontology, geology of the northern Rocky Mountains, structural analysis, tectonics, igneous geochemistry, igneous geochemistry, and volcanology.
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All graduate students with a concentration in Geography are required to complete a 1-credit (500 level) course entitled Current Research and Applications in Geography in the fall of their first year.

Graduate and 400-level (senior) courses of study in geography include: glacial geography, sedimentology, applied geological hydrology, advanced stratigraphy, clastic sedimentology, ancient ocean systems, tectonics of sedimentary basins, petroleum geology, depositional systems, vertebrate paleontology, macroevolution and the fossil record, taphonomy, comparative vertebrate anatomy, Hell Creek paleontology, geology of the northern Rocky Mountains, structural analysis, tectonics, igneous geochemistry, igneous geochemistry, and volcanology.

Department of Ecology

310 Lewis Hall, Bozeman, MT 59717-3460
Email: ecology@montana.edu
Tel: 406-994-4548  Fax: 406-994-3190

The department offers advanced work leading to Master of Science degrees in biological sciences and fish and wildlife management. The Master’s degree generally requires a thesis and research publication. At the doctoral level, the Doctor of Philosophy degree is offered in ecology and environmental sciences, biological sciences and in fish and wildlife biology. At both the Master’s and Doctoral level the following areas of study are available: terrestrial and aquatic ecology, fish and wildlife management, evolutionary biology, quantitative ecology, and conservation biology. Successful applicants are accepted into both the department and The Graduate School.

Admission

Only a limited number of graduate students are admitted to our program each year. We accept students into the program based on their academic performance, graduate record examination scores, recommendation letters, experience, and potential for scientific and professional excellence. Students must meet the minimum entrance requirements for the department to recommend admission. In exceptional cases, at the request of a faculty member, the Department Head may waive one of the qualifications. The following is a list of admission requirements:

- A composite of the applicant’s letters of recommendation must indicate the student has good prospects of success in graduate school.
- The applicant should have at least the equivalent of three-fourths of the science courses required in the undergraduate curriculum at Montana State University in the option chosen for graduate study.
- Official Graduate Record Examination (GRE) General Test scores must be submitted at the time the student submits the full application. The sum of the verbal and quantitative scores should be at least 1100 for GRE scores before July, 2011. The sum for the verbal and quantitative scores should be a minimum of 300 for the current GRE tests.
- The applicant should have maintained the following minimal undergraduate grade-point averages: 3.0 average in all biology courses; 3.0 average in all courses taken during the junior and senior years; and 2.5 average in all chemistry, physics and mathematics courses.

All qualified students must secure an agreement from a faculty member who is willing to serve as major professor, or graduate academic advisor, to be considered for admissions. We do not accept students into the program unless a department faculty member confirms an agreement to mentor a student’s degree completion. Generally the major professor will have identified a research project and possible sources of funding before seeking a new graduate student.

Program Requirements

The minimum credit requirement for a master’s degree is 30 credits, and at least 20 credits must be from course work other than thesis work. A minimum of 10 thesis credits must be successfully completed. Minimum thesis registration is one (1) credit for a semester. There are two (2) one credits courses required for all master’s candidates: BIOE 554 Foundations of Ecology & Mgmt and BIOE 555 Communication in Ecol Sciences. Students are required to choose from a specific list of electives for part of the credits. The remainder of the program of study is determined by the graduate committee following The Graduate School guidelines.

The minimum credit requirement for a doctoral degree is 60 credits beyond the bachelor’s degree, and at least 42 credits must be from course work other than thesis work. A minimum of 18 thesis credits must be successfully completed. A maximum of 30 credits from a previously earned master’s degree may be applied toward the 60 credit requirement. No specific courses are required for a doctoral degree. The program of study is determined by the graduate committee following The Graduate School guidelines.

Financial Assistance

Available Graduate Teaching Assistant (GTA) appointments are assigned in the semester before the teaching semester and reflect teaching needs and financial assistance available. GTAs receive tuition fee waivers and a stipend (in 2013/14 this was a total of $5134/semester). Part of stipend may be used for medical insurance which is not provided directly by the department. For further graduate school expenses, consult the MSU fee schedules as provided in the Graduate Catalog. A Graduate Research Assistant (GRA) appointment is project-specific and is awarded by individual faculty as funds are available. GRA stipends have a considerable range of amounts, and some fee waivers and health insurance may be available with GRAs depending upon funding sources.

Degree Offered

- M.S. in Biological Sciences (p. 363)
- M.S. in Fish and Wildlife Management (p. 364)
- Ph.D. in Fish and Wildlife Biology (p. 365)
- Ph.D. in Biological Sciences (p. 364)
- Ph.D. in Ecology and Environmental Sciences (p. 364) (interdisciplinary)

M.S. in Biological Sciences

The M.S. in Biological Sciences covers a broad array of ecological topics and serves the needs of students whose thesis research addresses basic, fundamental ecological principles or of those conducting applied research not involving fish or wildlife management. It may be a terminal degree leading to professional employment as an ecologist, but may also lead to a Ph.D. in Biological Sciences or other discipline. Coursework associated with this degree tends to emphasize fundamental principles of ecology.

The student’s graduate committee will work with the student following a required oral qualifying exam during the second semester in attendance to finalize the following required plan of study. The committee may require additional electives for completing a Master’s degree in the Department of Ecology. Statistics courses may be recommended as electives.
### Courses

#### Ecology Program
- **BIOE 554** Foundations of Ecology & Mgmt 1
- **BIOE 555** Communication in Ecol Sciences 1
- Choose one 3
  - **BIOE 521** Conservation Biology
  - **BIOE 548** Conservation Genetics
  - **BIOE 532** Physiological Plant Ecol
  - **WILD 501** Applied Population Ecology
- Choose one 3-4
  - **BIOE 542** Community Ecology
  - **BIOE 515** Landscape Ecol & Mgmt
  - **LRES 568** Ecosystem Biogeochem

**Electives (minimum)** 11-12

**Thesis** 10

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### M.S. in Fish and Wildlife Management

The M.S. in Fish and Wildlife Management serves the needs of students whose thesis research addresses an applied fish or wildlife management problem. It may be a terminal degree leading to professional employment as a fisheries or wildlife biologist, but may also lead to a Ph.D. in Fish and Wildlife Biology or other discipline. Coursework associated with this degree tends to emphasize applied fish and wildlife management.

The student’s graduate committee will work with the student following a required oral qualifying exam during the second semester in attendance to finalize one of the following required plans of study. The committee may require additional electives for completing a Master’s degree in the Department of Ecology. Statistics courses may be recommended as electives.

#### Courses

**Wildlife Interest Program**
- **BIOE 554** Foundations of Ecology & Mgmt 1
- **BIOE 555** Communication in Ecol Sciences 1
- Choose two 6-7
  - **BIOE 515** Landscape Ecol & Mgmt
  - **BIOE 521** Conservation Biology
  - **WILD 501** Applied Population Ecology
  - **WILD 504** Wildlife-Habitat Relationships
  - **WILD 525** Human Dimensions of Fisheries and Wildlife Management

**Electives (minimum)** 11-12

**Thesis** 10

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**Fisheries Interest Program**
- **BIOE 554** Foundations of Ecology & Mgmt 1
- **BIOE 555** Communication in Ecol Sciences 1
- Choose two 6
  - **WILD 510** Fisheries Science
  - **WILD 513** Fisheries Habitat Management
  - **WILD 525** Human Dimensions of Fisheries and Wildlife Management

**Electives (minimum)** 12

**Thesis** 10

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### Ph.D. in Biological Sciences

The Ph.D. in Biological Sciences covers a broad array of ecological topics and serves the needs of students whose dissertation research addresses basic, fundamental ecological principles or of those conducting applied research not involving fish or wildlife management. It serves the interests of students primarily interested in research careers in federal or state agencies or in academic careers in ecology departments. Coursework associated with this degree tends to emphasize fundamental principles of ecology.

All students earning a doctoral degree from Montana State University must complete a minimum of 60 credit hours post-baccalaureate, of which 18-28 of must be dissertation credits. (This may include 10 thesis credits from a master’s degree program.) A maximum of 30 credits from a previously earned master’s degree (from MSU or another accredited University) may be applied toward the 60 credit minimum required for the doctoral degree.

1. **Special Topics (591):** Credits allowed toward degree requirements for Special Topics (591) courses may not exceed the number defined by each degree program.
2. **Individual Problems (592):** Not more than six credits of Individual Problems (592) courses may be included on a doctoral Program of Study.
3. **Pass/Fail Credits:** A maximum of nine credits (excluding dissertation) may be included on a doctoral Program of Study. 4XX level courses may be used on a Program of Study: a maximum of 9 credits are allowed.
4. **Limit on Age of Courses:** The age of courses at the time of graduation for a doctoral degree may not exceed 10 years.
5. **Courses from a master’s program:** The graduate Program of Study lists those courses the student’s committee feels are required to earn the doctoral degree.
6. **Resident Credit Requirements:** A minimum of thirty (30) credits applicable to the degree must be taken from MSU.
7. **Dissertation Credit Requirements:** All Ph.D. candidates are required to register for and complete a minimum of eighteen dissertation (690) credits. An unlimited number of 690 credits may be taken to finish a dissertation; however, only the 18-28 690 credits are applicable toward degree requirements.

Courses taken while in a master’s degree program at MSU, **beyond** those listed on the graduate Program of Study, may be used on an additional master’s program or a doctoral program at a later time.

### Ph.D. in Ecology and Environmental Sciences (interdisciplinary)

The Ph.D. in Ecology and Environmental Sciences (https://www.montana.edu/eces) was developed jointly by the Departments of Ecology and Land Resources & Environmental Sciences as a broad interdisciplinary Ph.D. program open to graduate students in several departments in the Colleges of Letters & Science and Agriculture. The degree program was approved by the MUS Board of Regents in 2006, and now meets the interests of graduate students in Ecology in a broad array of subjects. Other participating departments include Animal and Range Sciences, Earth Sciences, Microbiology and Immunology, Plant Science and Plant Pathology, and the College of Nursing.

Because of the substantial diversity in disciplinary and multidisciplinary foci within the EES doctoral program, there is no universal required core curriculum. The student’s individual coursework program will be developed in partnership with the major advisor and graduate committee usually following the Department of Ecology’s required oral qualifying exam during the third semester in attendance. The plan must be consistent with all of the home department and the Graduate School guidelines and
requirements. A minimum of 30 credits of resident coursework must be taken from MSU.

There is an extensive list of potential courses (http://www.montana.edu/ees/courses.html) that may be applied to this interdisciplinary degree program and other helpful information on the degree website, http://www.montana.edu/ees/.

**Ph.D. in Fish and Wildlife Biology**

The Ph.D. in Fish and Wildlife Biology serves the needs of students whose dissertation research addresses an applied fish or wildlife management problem. It serves the interests of students primarily interested in research careers in federal or state fish and wildlife agencies or in academic careers in fish and wildlife departments. Coursework associated with this degree tends to emphasize applied fish and wildlife management.

All students earning a doctoral degree from Montana State University must complete a minimum of 60 credit hours post-baccalaureate, of which 18-28 must be dissertation credits. (This may include 10 thesis credits from a master’s degree program.) A maximum of 30 credits from a previously earned master’s degree (from MSU or another accredited University) may be applied toward the 60 credit minimum required for the doctoral degree.

### 1. Special Topics (591)

Credits allowed toward degree requirements for Special Topics (591) courses may not exceed the number defined by each degree program.

### 2. Individual Problems (592)

Not more than six credits of Individual Problems (592) courses may be included on a doctoral Program of Study.

### 3. Pass/Fail Credits

A maximum of nine credits (excluding dissertation) may be included on a doctoral Program of Study. 4XX level courses may be used on a Program of Study: a maximum of 9 credits are allowed.

### 4. Limit on Age of Courses

The age of courses at the time of graduation for a doctoral degree may not exceed 10 years.

### 5. Courses from a Master's program

The graduate Program of Study lists those courses the student’s committee feels are required to earn the doctoral degree.

### 6. Resident Credit Requirements

A minimum of thirty (30) credits applicable to the degree must be taken from MSU.

### 7. Dissertation Credit Requirements

All Ph.D. candidates are required to register for and complete a minimum of eighteen dissertation (690) credits. An unlimited number of 690 credits may be taken to finish a dissertation; however, only the 18-28 690 credits are applicable toward degree requirements.

Courses taken while in a master’s degree program at MSU, beyond those listed on the graduate Program of Study, may be used on an additional master’s program or a doctoral program at a later time.

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**Department of English**

PO Box 172300
2-176 Wilson Hall, Bozeman MT 59717-2300
Tel: 406-994-3768 Fax: 406-994-2110
Email: english@msu.montana.edu

**Director of Graduate Studies**

Susan Kollin
2-291 Wilson Hall, Bozeman, MT 59717
Tel: 406-994-5184 Email: susan.kollin@msu.montana.edu (english@msu.montana.edu)

**Department Chair**

Kirk Branch

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2-176 Wilson Hall, Bozeman MT 59717
Tel: 406-994-3768 Email: kirk.branch@montana.edu

The Master of Arts in English focuses on the interconnectedness of writing, teaching, and literary studies. At the heart of the program is a concern for the integrated interests of students and teachers in all branches of the field. Teachers, scholars, and writers in the program gain a better understanding of their own practices by seeing the extent to which each writer is also a literary critic, each teacher is also a writer and reader of literature, and all critics and readers are teachers and writers. The program is designed to extend and deepen the intellectual rigor of customary approaches to literature by examining issues these approaches often leave unaddressed, such as the history and institutionalization of the discipline; the relationship between theory and the practices of writing, teaching and textual studies; and the processes by which knowledge in the field of English has been and is constructed. The program responds to changing perspectives in the humanities and expands the professional options of its graduate students through a broadly conceived course of study and an integrated curriculum providing instruction in the areas of literary criticism, rhetoric and composition studies, and literary history. The program also allows students flexibility to design part of their program in consultation with their graduate adviser.

**Financial Assistance**

Graduate students may apply for departmental teaching assistantships, which are awarded on a competitive basis. To apply for an assistantship, discuss your interest in teaching in the personal essay you will submit as part of your application packet.

**Graduate Program**

- M.A. English (p. 365)

**M.A. in English**

The Master of Art in English focuses on the interconnectedness of writing, teaching, and literary studies. Students may elect to complete either the Plan A (thesis) or the Plan B (professional paper) option. At the heart of the program is a concern for the integrated interests of students and teachers in all branches of the field. Teachers, scholars, and writers in the program gain a better understanding of their own practices by seeing the extent to which each writer is also a literary critic, each teacher is also a writer and reader of literature, and all critics and readers are teachers and writers. The program is designed to extend and deepen the intellectual rigor of customary approaches to literature by examining issues these approaches
often leave unaddressed, such as the history and institutionalization of the discipline, the relationship between theory and the practices of writing, teaching, and textual studies; and the process by which knowledge in the field of English has been and is constructed.

Program Requirements
The Master of Arts degree requires the minimum completion of 30 course credits. Students will select one of two options, either the professional paper or the thesis. The first option involves 24 hours of course work and 6 hours of professional paper, the latter 20 hours of course work and 10 hours of thesis. Students are expected to have completed the equivalent of a baccalaureate degree in English. Students with undergraduate degrees other than English are encouraged to apply; however, they may be required to take additional English courses as a condition of their acceptance.

Required Core Courses

<table>
<thead>
<tr>
<th>Required Core Courses</th>
<th>ENGL 510</th>
<th>ENGL 530</th>
<th>Choose one of the following:</th>
<th>ENGL 575</th>
<th>ENGL 590</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Studies in Critical Theory (Max 6 credits)</td>
<td>Writing Theory and Practice (Max 6 credits)</td>
<td>Professional Paper (Max 6 credits (Plan B Only))</td>
<td>Master’s Thesis (1-10 credits (Plan A Only))</td>
<td></td>
</tr>
</tbody>
</table>

Electives

| ENGL 505 | Teaching College Composition | 2 |
| ENGL 520 | Pedagogy Theory and Practice (Max 6 credits) | 3 |
| ENGL 550 | Focused Research Seminar (Max 6 credits) | 3 |
| ENGL 592 | Independent Study | 1-4 |
| ENGL 598 | Internship | 1-12 |
| ENGL 580 | Special Topics (Max 9 credits) | 1-4 |

Total Credits 30

Department of History and Philosophy

2-155 Wilson Hall
Bozeman, Montana 59717
406-994-4397
www.montana.edu/history/

Dr. Susan Cohen
2-155 Wilson Hall, Bozeman, MT 59717
406-994-4397

Financial Assistance
The primary form of financial support available through the Department is the teaching assistantship, which is awarded on a competitive basis. There are sometimes other opportunities available for financial support, such as grading, research assistantships with individual faculty members, and tutoring positions.

Degree Offered
• MA in History (p. 366)
• PhD in History (p. 366)

MA in History

Master of Arts Degree, History
The Department of History and Philosophy Graduate Program at MSU is designed to train students to think historically, to conduct research effectively, and to write lucidly. Students research and write in seminar settings as well as individually under the guidance of a faculty committee. The program seeks to expand students’ intellectual horizons and expose students to the variety of roles played by historians in academic and public life through seminar discussions, classroom instruction, teaching assistantships, and internships.

The department offers concentrated training in three particular areas: the history of science, technology and society; environmental history; and history of the American West. While the degrees offered by the Department are grounded in American history, the faculty is committed to familiarizing students with critical theoretical concerns, the history of women in a multicultural context, and to encouraging students to think about the history of the United States in a global context.

The MA degree requires a total of 30 credit hours. The following required courses have been created to serve as the core of each graduate student’s program. Students may also take 400-level courses in history or in related disciplines, such as historical geography. Internships at museums and historical societies may also count for credit.

Required Core Courses

| HIST 503 | America Before 1860 | 3 |
| HIST 505 | U.S History 1860-Present | 3 |
| HIST 512 | Topics in World History | 3 |
| HIST 540 | History Methods | 3 |

PhD in History

The PhD in History requires a minimum of 25 course credit hours above the MA degree and a minimum of 18 credits of HIST 690 Doctoral Thesis. Note that the precise credit/course requirement will be determined by the student’s doctoral committee chair in consultation with the student and the other committee members.

All students will declare a Major Field of emphasis and two Minor Areas. Major Fields include: a. History of Science and Technology; b. Environmental History; c. U.S. History. Minor Fields include a. gender; b. race; c. class, labor and economy; d. religious studies; e. imperialism; f. historical theories and methodologies; g. comparative frontiers; h. science and technology; i. environmental studies; j. philosophy of science; k. museum studies; l. American west.

The PhD program in History offers students the opportunity to obtain an area of concentration in Public History. To obtain the area of concentration, students are expected to take an additional 15 credits that
include Public History (HIST 502). Students are normally expected to complete at least 9 credits of History Internship (HIST 598).

The Graduate Program is designed to train students to think historically, to conduct research effectively, and to write lucidly. Students research and write in seminar settings as well as individually under the guidance of each student’s graduate committee. The program seeks to expand students’ intellectual horizons and expose students to the variety of roles played by historians in academic and public life through seminar discussions, classroom instruction, teaching assistantships, and internships.

Admission Requirements
- M.A. degree in history or related field
- Letter of application that addresses the applicant’s areas of intended study and the applicant’s qualifications for doctoral-level work
- Three academic letters of recommendations
- Writing Sample (major research paper or M.A. thesis chapter)
- Official undergraduate and graduate transcripts

Contact Information
For more information about the History and Philosophy Department Graduate programs, please contact Tim LeCain, Director of Graduate Studies, tlecain@montana.edu, or call the main History Department office: (406) 994-4395.

Department of Mathematical Sciences
PO Box 172400
Wilson Hall 2-214
406-994-3601

The Department offers graduate study leading to the degree of Master of Science in either Mathematics or Statistics. The M.S. in Mathematics degree is available with two options: Mathematics and Mathematics Education. The Doctor of Philosophy degree is offered in Mathematics and Statistics. The Ph.D. in Mathematics is available with two emphases: Mathematics and Mathematics Education. The Ph.D. in Statistics is available with two emphases: Statistics and Statistics Education. The Department also offers a Graduate Certificate in Applied Statistics.

Admission
For regular admission to either the M.S. or the Ph.D. degree program, a student should have completed at least eighteen (18) credits of mathematics or statistics beyond calculus. For mathematics majors, this should include a year of advanced calculus. For statistics majors, it should include theory courses in probability and mathematical statistics and applied courses in statistical methods and data analysis. Admission to the mathematics education program is determined on an individual basis. Successful applicants are accepted into both the Department and The Graduate School.

Financial Assistance
Graduate assistantships are available to qualified graduate students in Mathematics, Mathematics Education, Statistics, or Statistics Education. Graduate Teaching Assistantships (GTA) usually require teaching one course each semester. Graduate Research Assistantships (GRA) may also be available to qualified students. GRA time requirements are similar to those for teaching assistantships. See the Graduate Assistantships section on the department website for detailed information on appointment criteria.

Degrees Offered
- M.S. in Mathematics (p. 367)
- M.S. in Mathematics (Mathematics Education Option) (p. 387)
- M.S. in Statistics (p. 368)
- Ph.D. in Mathematics (p. 369)
- Ph.D. in Mathematics - Education Specialization (p. 370)
- Ph.D. in Statistics (p. 371)
- Graduate Certificate in Applied Statistics (p. 367)

Graduate Certificate in Statistics
Training in statistical methods is a required part of the education of graduate students in engineering and the sciences. The Graduate Certificate in Statistics is designed to provide additional education in statistical thinking and methodology over and above the basic coursework taken by the typical graduate student. This transcriptable certificate will provide a clear record of additional training in statistics for future graduate programs or employers. The Graduate Certificate will also be of interest to those currently employed in technical fields that utilize statistics in the and to post-baccalaureate students.

Current graduate students must:

Course Requirements

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>STAT 511</td>
<td>Methods of Data Analysis I &amp; STAT 512</td>
<td>6 &amp; 6</td>
</tr>
<tr>
<td>Choose two from the following, at least one of which must be either STAT 446 or STAT 541</td>
<td></td>
<td></td>
</tr>
<tr>
<td>STAT 446</td>
<td>Sampling</td>
<td>6</td>
</tr>
<tr>
<td>STAT 431</td>
<td>Nonparametric Statistics</td>
<td></td>
</tr>
<tr>
<td>STAT 436/536</td>
<td>Introduction to Time Series Analysis</td>
<td>6</td>
</tr>
<tr>
<td>STAT 437</td>
<td>Introduction to Multivariate Analysis</td>
<td>6</td>
</tr>
<tr>
<td>STAT 439</td>
<td>Introduction to Categorical Data Analysis</td>
<td>6</td>
</tr>
<tr>
<td>STAT 548</td>
<td>Mixed Effects Models</td>
<td></td>
</tr>
<tr>
<td>STAT 525</td>
<td>Biostatistics</td>
<td></td>
</tr>
<tr>
<td>STAT 528</td>
<td>Statistical Quality Control</td>
<td></td>
</tr>
<tr>
<td>STAT 541</td>
<td>Experimental Design</td>
<td></td>
</tr>
</tbody>
</table>

Total Credits: 12

- Obtain the approval of the department head/graduate coordinator of the student’s major department and the Department of Mathematical Sciences.
- Obtain a grade of B or better in all coursework counted toward the certificate.

Non degree seeking students must:
- Obtain the approval of the department head/graduate coordinator of the Department of Mathematical Sciences and the Graduate School.
- Obtain a grade of B or better in all coursework.

M.S. in Mathematics

Requirements
The Master of Science degrees are offered under Plan A (Thesis) and Plan B (Non-thesis). Of the required thirty (30) credit minimum, at least eighteen (18) credits of 500-level course work must be taken under either plan.

Available under Plan B is a comprehensive master’s degree in either mathematics or statistics. Although no thesis is required in this plan, a sound knowledge of several areas of mathematics and/or statistics is expected. Also available under Plan B is a master’s degree in mathematics with an option in mathematics education. This option is designed primarily for secondary teachers and is offered as a combination of on-line academic
year course work and summer sessions. The mathematics education option requires completion of a program portfolio through a series of seminars.

For further information, refer to the For Master’s Students section. Students are expected to be familiar with both the Department and the Graduate School degree requirements.

Program Guidelines
The Master of Science degree in mathematics at Montana State University is designed to prepare students for further graduate work or for employment in academic, industrial, business, or government forums. Upon entrance, each student meets with the department’s Graduate Program Committee to discuss career objectives and first year course work. During the second semester in the program each student forms a Graduate Committee and together they outline the student’s degree program. The prerequisites for the master’s degree program in mathematics consist of the following courses or their equivalent: Linear Algebra (M 333), Introduction to Analysis I (M 383)-Introduction to Analysis II (M 384). Students who have not completed these courses or their equivalent may still enter the master’s program but it is suggested that these courses then be taken.

Both non-thesis and thesis plans are offered for the M.S. in Mathematics – Mathematics Option degree:

Non-Thesis Plan
This plan requires both completing the course work and passing the written comprehensive exam. At least 30 credits of course work are required. Of these, at least 18 credits must be numbered 500 or higher. Regardless, all of the following core courses must be completed:

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>M 503</td>
<td>Advanced Linear Algebra</td>
<td>3</td>
</tr>
<tr>
<td>M 504</td>
<td>Abstract Algebra</td>
<td>3</td>
</tr>
<tr>
<td>M 505</td>
<td>Principles of Mathematical Analysis</td>
<td>3</td>
</tr>
<tr>
<td>M 511</td>
<td>General Topology</td>
<td>3</td>
</tr>
</tbody>
</table>

Additionally, students must fulfill a breadth requirement by completing at least two of the following:

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>M 441</td>
<td>Numerical Linear Algebra &amp; Optimization</td>
<td>3</td>
</tr>
<tr>
<td>M 450</td>
<td>Applied Mathematics I</td>
<td>3</td>
</tr>
<tr>
<td>M 454</td>
<td>Introduction of Dynamical Systems I</td>
<td>3</td>
</tr>
<tr>
<td>STAT 421</td>
<td>Probability Theory</td>
<td>3</td>
</tr>
</tbody>
</table>

Either or both of these two required courses may be replaced by the corresponding semester of the appropriate 500 level course: M 581 Numerical Solution of Partial Differential Equations I, M 560 Methods of Applied Mathematics I, M 595 Dynamical Systems I, or STAT 501 Intermediate Probability and Statistics, respectively.

Any other exceptions to the course requirements must be approved by the student’s graduate committee and adhere to the minimum policy requirements set forth in the Graduate Catalog (Plan B).

Requirements for the written comprehensive exam are listed separately below.

Thesis Plan
This plan requires completing the course work, writing a thesis, and an oral defense of the thesis. At least 30 credits must be completed of which 10 must be thesis credits. Students must also complete both the core and breadth course requirements described in the Non-Thesis Plan above. Any exceptions to the course requirements must be approved by the student’s graduate committee and adhere to the minimum policy requirements set forth in the Graduate Catalog (Plan A). Thesis and oral defense requirements must be arranged with and approved by the student’s graduate committee.

M.S. in Mathematics Comprehensive Exam
The M.S. comprehensive exam for mathematics is a written exam administered in two disjoint 3-hour components, one on Analysis (M 505) and one on Linear Algebra (M 503). Each component is graded as pass or fail. To pass the comprehensive exam a student must pass both components within two examination periods.

The examinations are typically given in August and January with the specific dates and times for each component determined by the department. Typically, the students take the exams in August before their third semester of study.

If the student fails one or more components in the first examination period, a failure will be reported to The Graduate School. The student must then pass the remaining required components in a second examination period. If the student has not passed the remaining required components after the second examination period, a second failure of the comprehensive exam will be reported to The Graduate School and the student will be dismissed from the program.

If the student fails one or more components in the first examination period, a failure will be reported to The Graduate School. The student must then pass the remaining required components in a second examination period. If the student has not passed the remaining required components after the second examination period, a second failure of the comprehensive exam will be reported to The Graduate School and the student will be dismissed from the program.

For more information, refer to the Department of Mathematical Sciences (http://www.math.montana.edu).

M.S. in Statistics

Program Guidelines
The Master of Science degree in statistics at Montana State University gives students a solid background in the applications as well as the theory of statistics. Students in this program prepare either for further graduate work or for academic, industrial, business, or government employment. Upon entrance, each student meets with the department’s Graduate Program Committee to discuss career objectives and first year course work. During the second semester in the program each student forms a Graduate Committee and together they outline the student’s degree program. The prerequisites for the master’s degree program in statistics consist of the following semester courses or their equivalent: Multivariable Calculus (M 273Q), Linear or Matrix Algebra (M 221), Methods of Data Analysis (STAT 411 and STAT 412), Probability (STAT 421), and Mathematical Statistics (STAT 422). Students who have not completed these courses may be accepted into the master’s program with the understanding they should make up these courses by adding one or two additional semesters to their program of study.

Either Plan A (thesis and 20 credits of course work) or Plan B (30 credits of course work) can be chosen. In either case, all courses on a graduate program must be numbered 400 or higher and STAT courses must be numbered 408 or higher. The specific program of study depends on the student’s previous training and experience. Regardless of the plan chosen, (i) at least half of the required non-thesis credits must be STAT courses, (ii) at least two-thirds of the required non-thesis credits must be numbered 500 or higher, and (iii) the following core course credits are required.

M.S. in Statistics Required Courses (16 semester credits)

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>STAT 501</td>
<td>Intermediate Probability and Statistics</td>
<td>6</td>
</tr>
<tr>
<td>&amp; STAT 502</td>
<td>and Intermediate Mathematical Statistics</td>
<td></td>
</tr>
<tr>
<td>STAT 505</td>
<td>Linear Models</td>
<td>6</td>
</tr>
<tr>
<td>&amp; STAT 506</td>
<td>and Advanced Regression Analysis</td>
<td></td>
</tr>
</tbody>
</table>

Statistical Consulting Seminar (STAT 510); take two semesters (1 credit a semester)
The M.S. in Statistics degree requires completion of either a thesis or a writing project.

1. The M.S. in Statistics degree requires completion of either a thesis or a writing project.
   a. Thesis (Plan A): The Plan A thesis typically requires at least 400 hours of work. The student must register for at least 10 Master's Thesis (STAT 590) in addition to the required 20 credits of course work. The student must give an oral defense or his/her thesis.
   b. Writing Project (Plan B): The Plan B writing project typically requires at least 90 hours of work, for which the student earns 2 credits of Professional Paper and Project (STAT 575). With permission from the student's committee, additional credits of STAT 575 (no more than 4 total) may be earned. Students should enroll in STAT 575 in their final Spring semester, and must give a seminar on the writing project before graduating.

2. Experience in data collection – either through a course such as Sampling (STAT 446) or Experimental Design (STAT 441)/Experimental Design (STAT 541), or a course taken in a former degree program, or real-life experience.

3. For either Plan A or Plan B, the student must pass a comprehensive examination.

**M.S. in Statistics Comprehensive Exam**

The M.S. comprehensive exam consists of a written exam over material from Intermediate Probability and Statistics (STAT 501), Intermediate Mathematical Statistics (STAT 502), Linear Models (STAT 505), and Advanced Regression Analysis (STAT 506).

The exam is given in August with the specific date determined by the department. Examinees will be informed of the results within five working days of taking the exam. The M.S. comprehensive exam may be repeated once.

**Ph.D. in Mathematics**

Students in mathematics are expected to develop competence in real and complex analysis and at least two areas chosen from applied mathematics, dynamical systems, functional analysis, numerical analysis, partial differential equations, probability, topology or other topics the student's committee may approve.

The student’s graduate committee determines additional requirements. Degree candidates are expected to be familiar with both departmental and Graduate School degree requirements.

**Course Requirements**

- A minimum of 30 credit hours beyond the M.S. degree are required (see the Graduate Catalog for Ph.D. Students for details).
- A minimum of 18 credit hours of Doctoral Thesis (M 690) must be taken.
- The Ph.D. student’s Program of Study listing their intended coursework must be approved by all committee members.
- The student must take a minimum of 4 credits of the M 594 seminar series.

Typically, a Ph.D. student takes 18 credits of mathematics in courses numbered 500 or higher to prepare for their comprehensive examination. Students are encouraged to begin some form of doctoral reading or research (either informally or in the form of M 689 credits) with a committee member by their second year of study.

**Ph.D. Comprehensive Exam**

The Ph.D. Comprehensive examination consists of both a written and an oral comprehensive examination. The candidate must pass the written comprehensive exam before taking the oral comprehensive examination.

**Written Comprehensive Exam**

How a student may choose and retake exam components is determined by all of the following:

1. The written comprehensive exam consists of 4-hour exam components graded as Pass or Fail.
2. The candidate must pass three components to pass the written comprehensive examination though they may attempt more.
3. If a candidate fails a component it may be attempted at most one more time.
4. The candidate must pass the following "required" components:
   a. Measure Theory (M 547) - Complex Analysis (M 551)
5. Normally the remaining components are from the following list of "standard" components:
   a. General Topology (M 511) - Geometry & Algebraic Topology (M 512)
   b. Dynamical Systems I (M 595) - Dynamical Systems II (M 596)
   c. Functional Analysis I (M 584) - Functional Analysis II (M 585)
   d. Numerical Solution of Partial Differential Equations I (M 581) - Numerical Solution of Partial Differential Equations II (M 582)
   e. Partial Differential Equations I (M 544) - Partial Differential Equations II (M 545)
   f. Methods of Applied Mathematics I (M 560) - Methods of Applied Mathematics II (M 561)
   g. Measure Theory (M 547) - Probability Theory (M 586)
6. At most one "nonstandard" component not from the "standard" components (list above) may be taken. To take such a component, a petition form must be completed.

**Oral Comprehensive Exam**

After passing the written comprehensive exam the candidate must pass an oral comprehensive exam at a date agreed upon by the candidate's committee. Normally the oral comprehensive exam is a thesis topic proposal where the candidate's ability to conduct research on the proposal is assessed. When this is not the case, the candidate will be informed of the nature of
the oral comprehensive exam by their committee. The candidate has at most two attempts to pass the oral comprehensive examination.

**Ph.D. in Mathematics Dissertation Requirements**

Once the Ph.D. candidate has passed the comprehensive exam (both written and oral parts) the student has at most five years to submit an acceptable dissertation and pass their final defense. The first three committee members listed on a candidate’s Program of Study must be given a dissertation draft at least two weeks prior to the Final Defense. Regardless, all committee members must have access to a dissertation draft at least one week prior to the Final Defense. The dissertation should embody the results of extended research by the candidate, be an original contribution to knowledge, and include new material worthy of publication. The dissertation must be submitted as an electronic dissertation, in final form to the Graduate School not later than 14 working days before the end of the term in which graduate work is completed.

**Ph.D. in Mathematics Final Defense**

Department policies on the final defense and all other administrative procedures regarding the degree completion are exactly those as set out by The Graduate School.

**Ph.D. in Mathematics - Education Specialization**

**Program Overview**

The Ph.D. in Mathematics with a specialization in mathematics education combines study in mathematics, mathematics education, and quantitative and qualitative research methods in education. This pathway is designed for candidates who plan a future of teaching, research, and service focused on mathematics education in K-12 settings. The program focuses on the teaching and learning of K-12 mathematics including curriculum, instruction, assessment, and teacher preparation or professional development in the K-12 education system. Graduates typically go on to faculty positions in mathematics departments that involve teacher preparation and research in K-12 mathematics education. Applicants are expected to possess K-12 teaching experience or to gain such experience through internships.

**Admission (preferred qualifications)**

- An earned master’s degree in mathematics, statistics, or mathematics education, including graduate-level mathematics coursework such as Advanced Calculus, Abstract Algebra, and Analysis. (Applicants with a strong undergraduate degree in mathematics or mathematics teaching may also be considered for an extended version of the program.)
- One of the following:
  - Teacher certification with a mathematics endorsement
  - Two years K-12 teaching experience
  - Two years college teaching experience

**Required Equivalencies (upon completion of coursework)**

**Provisional License:** All graduates of this program are expected to acquire a minimum level of competency in secondary mathematics instruction, comparable to satisfying the requirements for Montana’s provisional license to teach mathematics. This includes a Bachelor of Science degree in mathematics and at least six credit hours of education coursework. Ph.D. candidates who fall short of the six-credit requirement will select courses from the following:

- Complete either Standards-Based Math for Teachers (M 520), Mathematics Learning Theory for Teachers (M 521), or another approved course.

**K-12 Classroom Experience:** Students who lack sufficient exposure to instruction at the elementary or secondary level will be required to complete school-based internships prior to beginning dissertation research. Each internship calls for 135 hours of field experience as well as participation in a spring seminar that may address reviews of research, lesson study, analysis of student work, and reflection on classroom experiences.

- Elementary internship: teach, tutor, and observe students in a K-8 classroom
- Secondary internship: teach one or more courses at high school level

**Required Course Work (60 credits)**

<table>
<thead>
<tr>
<th>Educational Statistics and Research Methods - required (9 credits)</th>
</tr>
</thead>
<tbody>
<tr>
<td>STAT 511 Methods of Data Analysis I</td>
</tr>
<tr>
<td>STAT 512 Methods of Data Analysis II</td>
</tr>
<tr>
<td>EDCI 507</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Mathematics Education - required (15 credits)</th>
</tr>
</thead>
<tbody>
<tr>
<td>M 528 Curriculum Design</td>
</tr>
<tr>
<td>M 529 Assessment Models and Issues</td>
</tr>
<tr>
<td>M 534 Research in Mathematics Education</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Internships - (may be waived based on prior experience)</th>
</tr>
</thead>
<tbody>
<tr>
<td>M 576 Internship (Elementary - 3 credits)</td>
</tr>
<tr>
<td>M 576 Internship (Secondary - 3 credits)</td>
</tr>
</tbody>
</table>

Coursework approved by committee may replace internships (0 to 6 credits)

<table>
<thead>
<tr>
<th>Mathematics - selected from the following (15 credits)</th>
</tr>
</thead>
<tbody>
<tr>
<td>M 503 Advanced Linear Algebra</td>
</tr>
<tr>
<td>M 504 Abstract Algebra</td>
</tr>
<tr>
<td>M 505 Principles of Mathematical Analysis</td>
</tr>
<tr>
<td>M 511 General Topology</td>
</tr>
<tr>
<td>M 512 Geometry &amp; Algebraic Topology</td>
</tr>
<tr>
<td>M 544 Partial Differential Equations I</td>
</tr>
<tr>
<td>M 545 Partial Differential Equations II</td>
</tr>
<tr>
<td>M 547 Measure Theory</td>
</tr>
<tr>
<td>M 551 Complex Analysis</td>
</tr>
<tr>
<td>M 560 Methods of Applied Mathematics I</td>
</tr>
<tr>
<td>M 561 Methods of Applied Mathematics II</td>
</tr>
<tr>
<td>M 581 Numerical Solution of Partial Differential Equations I</td>
</tr>
<tr>
<td>M 582 Numerical Solution of Partial Differential Equations II</td>
</tr>
<tr>
<td>M 584 Functional Analysis I</td>
</tr>
<tr>
<td>M 585 Functional Analysis II</td>
</tr>
<tr>
<td>M 586 Probability Theory</td>
</tr>
<tr>
<td>M 591 Topics in Applied Math I</td>
</tr>
<tr>
<td>M 592 Topics in Applied Math II</td>
</tr>
</tbody>
</table>

Or another approved 500 level M or STAT course

**Dissertation - required (21 credits)**

<table>
<thead>
<tr>
<th>Doctoral Reading &amp; Research</th>
</tr>
</thead>
<tbody>
<tr>
<td>M 689</td>
</tr>
<tr>
<td>Doctoral Thesis</td>
</tr>
<tr>
<td>M 690</td>
</tr>
</tbody>
</table>
Comprehensive Examinations

Graduates of the program earn the equivalent of a master’s degree in mathematics, and must complete a doctoral-level comprehensive examination in one area of mathematics. Two additional examinations address knowledge related to K-12 mathematics teaching and learning and educational research design.

- One comprehensive 4-hour component of the Ph.D. exam in Mathematics. This is administered according to the guidelines for mathematics.
- One comprehensive exam in Topics in Mathematics Education. This exam is developed and scored by the current (or most recent) instructors of Curriculum Design (M 528) and Assessment Models and Issues (M 529).
- One comprehensive exam in Mathematics Education Research. This exam is collaboratively developed by the current (or most recent) instructor of Research in Mathematics Education (M 534) and appropriate research methods faculty in Statistics and Education.

Dissertation Research Component

The dissertation is a study in mathematics education. Scholarship in mathematics education examines teaching and learning, with roots in the disciplines of mathematics and educational theory and practice. It is grounded in mathematics content through the study of curriculum and mathematical practice and is generally carried out through social science research methods, including both qualitative and quantitative analysis. Mathematics education research at Montana State University adopts an applied approach, and research efforts often focus on the development and ongoing support of K-12 mathematics teachers. Doctoral students conduct research in areas relevant to current faculty research interests or funded projects.

Ph.D. in Statistics

Ph.D. in Statistics Program Requirements

The Ph.D. program in Statistics at Montana State University prepares students for academic, industrial, business, or government employment. To earn a Ph.D. in Statistics, a student must pass a qualifying exam, pass written and oral Ph.D. comprehensive exams, and write and defend a Ph.D. dissertation. The exams are described below. The dissertation must be an original contribution to statistical science and must include new research in areas relevant to current faculty research interests or funded projects.

- A Ph.D. student typically takes at least 30 credits of statistics in courses numbered 500 and higher. Credits from graduate courses taken from another department can be included in the Program of Study with the approval of the student’s Ph.D. Graduate Committee. Additional course work in statistics and/or mathematics may be necessary, depending on the candidate’s chosen area of specialization and background. For example, a Ph.D. student is expected to have completed all courses required for the M.S. degree in statistics and may need to make-up one or more of these courses if deficient.

Once admitted to the Ph.D. program, the Ph.D. student will participate in the Statistical Consulting Seminar (STAT 510). Through this participation, the student will gain important experience in practical problem solving, computational statistics and statistical report writing. A minimum of two credits of Statistical Consulting Seminar (STAT 510) are required.

Also, it is expected that a Ph.D. student will take a directed study course in Doc Reading & Research (STAT 689) in his/her area of specialty before taking the written and oral comprehensive exams followed by Doctoral Thesis (STAT 690).

Qualifying Exam

The Ph.D. qualifying exam is identical to the statistics M.S. comprehensive exam except that the exam must be passed at what is deemed to be at a Ph.D. level (i.e., Ph.D. pass). A student who earned an M.S. in Statistics from MSU need not take the PhD qualifying exam if the M.S. comprehensive exam was passed at the Ph.D. level. Other prospective students are expected to take the Ph.D. qualifying exam as soon as relevant course work has been completed. Two post-master’s attempts to pass the qualifying exam are allowed.

Comprehensive Exam

The comprehensive exam has two components: written and oral. The topics and format of the written comprehensive exam for the Ph.D. in Statistics will be determined by the student’s committee. They are given each August, with a specific date determined by the student’s Ph.D. Committee. Once the written comprehensive examination has been passed, the student must pass the oral comprehensive examination. The student has 2 chances to pass each exam. The written part of the Ph.D. comprehensive exam will consist of several components. These will typically include:

- A general review/summary related to the proposed research area.
- Reading and critiquing at least one journal article related to the proposed research area.
- Performing a data analysis with a written summary. The data analysis will be related to coursework taken by the student.
- A component related to Bayesian statistics and/or other relevant coursework determined by the student’s Ph.D. Graduate Committee.

The student will be given several days to submit her/his written summaries.

Each student must devise areas of concentrated study. The requirements associated with each component are flexible, however the concentration areas must be approved by the student’s committee and must include an amount of material equivalent to at least 6 graduate level courses. An area could involve course material from a discipline outside the department. That is, the Ph.D. Graduate Committee will determine the exact details of each component with the goal of assessing the student’s potential for performing independent research in the proposed research area.

Department of Microbiology and Immunology

Microbiology and Immunology office:
PO Box 173520
Tel: 406-994-2902 Fax: 406-994-4926
Email: Mbi@montana.edu

The Department of Microbiology and Immunology (MBI) conducts one of the premier infectious disease research programs in the Northwest, as demonstrated by the success of our faculty in competing nationally for extramural grant funding and publishing high-impact papers. Research funding comes from a range of sources such as the National Institutes of Health, US Department of Agriculture, National Science Foundation and the Montana Agricultural Experimental Station among others. Over the past five years, MBI averaged over $6 million for annual research expenditures. MBI is also home to an NIH Center of Biomedical Research Excellence in Zoonotic and Emerging Infectious Diseases, which provides substantial core facilities and training opportunities for junior investigators. MBI is housed in a state-of-the-art facility with core laboratories for flow cytometry, cell biology, and molecular sciences, as well as pathogen
containment facilities for small (BSL-3) and large animal research (ABSL-2). Instrumentation suites house equipment for DNA sequencing, genomic analysis, flow cytometry and cell sorting, and confocal microscopy.

We are truly unique in our close proximity to Yellowstone National Park. On our doorstep is one of the most exciting microbial ecosystems in North America, ripe with opportunities to discover new microbial life forms and contribute to major biotechnological advances. Many of our undergraduate and graduate students conduct research in the Park under the mentoring of our distinguished faculty.

Weekly seminars are offered by the department and the Frank N. Nelson Distinguished Lecture Series brings many accomplished scientists to Montana State University.

Admission
For detailed information, refer to the Admission Policies and Application Requirements sections. The MBI Graduate Committee will screen all applications and make recommendations to the Graduate Dean for acceptance to the MBI graduate program. Successful applicants are accepted into both the Department and The Graduate School.

In addition to the documents required in the Application Requirements section, the Graduate Committee will consider the applicant’s research experience and the potential of the applicant to complete an appropriate program of study and an independent research project. The final disposition of each application will also take into account other factors, such as the availability of research positions (stipends).

The Graduate Committee, MBI faculty, and the MBI head will decide on the acceptability of all applicants. The Graduate Committee will serve as the adviser for all students accepted into the program during their first year of study.

Research
The research problem will be chosen in consultation with the student’s thesis or dissertation advisor. Research areas include microbiology, molecular biology and immunology, bacteriology, cell biology, mycology, parasitology, protozoology, physiology, genetics, biochemistry, ultrastructural cytology, virology, immunopathology, and a strong focus on biomedical research. Specialized equipment and facilities include large and small animal isolation units, a flow cytometry core facility, automated DNA sequencers, proteomics and genomics instrumentation, a microscopy core, numerous analytical equipment, multiple tissue-culture and histopathology laboratories.

Our research facilities at MSU include modern, well-equip laboratories and specialized state of the art equipment for instruction and research. In addition, the Department hosts three major university facilities, currently supported through Montana IDeA Network of Biomedical Research Excellence (INBRE) program, including:

- Functional Genomics Core Facility (http://inbre.montana.edu/functional_genomics.php)
- Bioinformatics Teaching and Research Facility (http://inbre.montana.edu/bioinformatics_facility.php)
- Community Based participatory Research (CBPR) and Health Disparities Core Facility (http://inbre.montana.edu/cbpr_core.php)
- Cooley Laboratory (http://www.montana.edu/wwmb/index.php?page=cooley-lab)

Financial Assistance
Students of high scholastic caliber are encouraged to contact the Department of Microbiology and Immunology for information about teaching and research assistantships, and fellowships. Most of our graduate students are supported financially throughout their graduate training. Both assistantships and fellowships are awarded for one-year periods but are renewable if the graduate student’s progress has been satisfactory. See the Graduate Assistantships sections of the departmental website for detailed information on appointment criteria.

Graduate Programs
- M.S. in Microbiology and Immunology (Plan A) (p. 288)
- M.S. in Microbiology and Immunology (Plan B) (p. 289)
- Ph.D. in Microbiology and Immunology (p. 289)

Department of Native American Studies
P.O. Box 172340
2-179 Wilson Hall, Bozeman, MT 59717-2340
406- 994-3881 Email: nas@montana.edu

Montana State University has an American Indian enrollment of approximately 560 students. There is an active American Indian Student Council (AIC) as well as chapter of the American Indian Science and Engineering Society (AISES) and the Society of American Indian Graduate Students (SAIGS). NAS houses the Native American Student Center and the American Indian and Alaska Native Student Support Services office, with staff providing Native students with academic advising, counseling, and mentoring. The Student Center offers tutorial assistance, telephone and fax access, and a computer lab.

Admission
Candidates are not required to complete the Graduate Record Examination (GRE) General Test, but may do so if they feel it will strengthen their applications. The closing date for receipt of completed applications for admission is April 15 for Summer, July 15 for Fall, and November 15 for Spring, although we encourage an earlier submission.

A bachelor’s degree or equivalent from an accredited institution is required for admission to the master’s program in Native American Studies. The Graduate School recommends that prospective applicants reach out to the Native American Studies Department by email or phone call in order to ascertain the suitability of the program for the applicant.

Each applicant must submit the following during the online application process (http://www.montana.edu/gradschool/admissions/apply.html):
1. Application to MSU-Bozeman (link above): application process includes a non-refundable $60 application fee.
2. Official transcripts from all institutions attended: applicants must have a minimum GPA of 3.00 for the last two years of undergraduate study. If the applicant received their degree from MSU; transcripts are not necessary.
3. A 2-5 page statement of purpose and goals: this paper includes the applicant’s experience and knowledge of historical and contemporary American Indian issues, work background, how the M.A. in NAS will help the applicant reach long range goals, and benefit American Indian peoples/communities.
4. Two academic writing samples (demonstrating the applicant’s research and writing capabilities).
5. Three letters of recommendation: each recommender will address the applicant’s potential as a graduate student. The letters, preferably from previous faculty, must be signed and sealed in envelopes or emailed by the faculty member (once prompted during the online process).
6. A current curriculum vita or résumé.
Limited slots are available, and admissions are competitive.

**Deadlines**
For applicants also applying for graduate teaching assistantships, the deadline is April 15 for the following academic year.

Applicants must be formally accepted by The Graduate School with departmental endorsement from Native American Studies.

**Financial Assistance**
Graduate Teaching Assistantships, awarded on a competitive basis, are available in NAS to formally admitted graduate students. The GTA includes a 6 credit tuition waiver and stipend. Selected graduate students will teach two recitation sections of Introduction to Native American Studies and/or other NAS courses. A prerequisite for application is the successful completion of NASX 530 Federal Indian Law and Policy. See the Graduate Assistantships sections on the Graduate School website for detailed information on appointment criteria.

**Graduate classes in Native American Studies**
The following upper division and graduate level courses are offered in Native American Studies:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>NASX 405</td>
<td>Gender Issues in Native American Studies</td>
<td>3</td>
</tr>
<tr>
<td>NASX 415</td>
<td>Native Food Systems</td>
<td>3</td>
</tr>
<tr>
<td>NASX 430</td>
<td>American Indian Education</td>
<td>3</td>
</tr>
<tr>
<td>NASX 440</td>
<td>Montana Indian Literature</td>
<td>3</td>
</tr>
<tr>
<td>NASX 450</td>
<td>History of American Indians</td>
<td>3</td>
</tr>
<tr>
<td>NASX 476</td>
<td>American Indian Policy and Law</td>
<td>3</td>
</tr>
<tr>
<td>NASX 490R</td>
<td>Undergraduate Research</td>
<td>1-6</td>
</tr>
<tr>
<td>NASX 490Z</td>
<td>Undergraduate Research</td>
<td>1-6</td>
</tr>
<tr>
<td>NASX 491</td>
<td>Special Topics</td>
<td>1-4</td>
</tr>
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<td>NASX 492</td>
<td>Independent Study</td>
<td>1-3</td>
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<tr>
<td>NASX 494</td>
<td>Seminar</td>
<td>1</td>
</tr>
<tr>
<td>NASX 498</td>
<td>Internship/Cooperative Educ</td>
<td>2-12</td>
</tr>
<tr>
<td>NASX 505</td>
<td>Proseminar Native Amer Studies</td>
<td>3</td>
</tr>
<tr>
<td>NASX 515</td>
<td>Native Food Systems</td>
<td>3</td>
</tr>
<tr>
<td>NASX 520</td>
<td>Fem/Gender Theories IN NAS</td>
<td>3</td>
</tr>
<tr>
<td>NASX 521</td>
<td>Tribal Government: Yesterday &amp; Today</td>
<td>3</td>
</tr>
<tr>
<td>NASX 523</td>
<td>Am Indians/Minority in High Ed</td>
<td>3</td>
</tr>
<tr>
<td>NASX 524</td>
<td>Contemporary Issues in American Indian Studies</td>
<td>3</td>
</tr>
<tr>
<td>NASX 525</td>
<td>Indigen Phil/Sacred Ecologies</td>
<td>3</td>
</tr>
<tr>
<td>NASX 530</td>
<td>Federal Law and Indian Policy</td>
<td>3</td>
</tr>
<tr>
<td>NASX 540</td>
<td>Theoretical Positions in NAS</td>
<td>3</td>
</tr>
<tr>
<td>NASX 541</td>
<td>Critical Approach to NAS Methods</td>
<td>3</td>
</tr>
<tr>
<td>NASX 550</td>
<td>Native Americans: Dispelling the Myths</td>
<td>3</td>
</tr>
<tr>
<td>NASX 551</td>
<td>American Indian Art Survey</td>
<td>3</td>
</tr>
<tr>
<td>NASX 552</td>
<td>Indigenous Nations of Montana</td>
<td>3</td>
</tr>
<tr>
<td>NASX 553</td>
<td>Indigenous Literature and the West</td>
<td>3</td>
</tr>
<tr>
<td>NASX 560</td>
<td>Native American Lit Tradition</td>
<td>3</td>
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<td>NASX 575</td>
<td>Professional Paper</td>
<td>1-6</td>
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<tr>
<td>NASX 589</td>
<td>Graduate Consultation</td>
<td>1-3</td>
</tr>
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<td>NASX 590</td>
<td>Master’s Thesis</td>
<td>1-10</td>
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<td>NASX 591</td>
<td>Special Topics</td>
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<td>NASX 592</td>
<td>Independent Study</td>
<td>1-3</td>
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<td>NASX 594</td>
<td>Seminar</td>
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</tr>
<tr>
<td>NASX 598</td>
<td>Internship</td>
<td>1-6</td>
</tr>
</tbody>
</table>

**Further Information**
For further information regarding the program, contact Native American Studies at (406) 994-3881 or e-mail Francesca Pine at francesca.pine@montana.edu. In addition, applicants may refer questions to The Graduate School or find the graduate catalog and policies on-line (http://www.montana.edu/gradschool/policy). All applicants are expected to be familiar with the degree requirements of both the department and The Graduate School. Also see the MSU University home page (http://www.montana.edu) or the home page for Native American Studies (http://www.montana.edu/wwwnas).

**Graduate Programs**
- M.A. in Native American Studies (p. 373)
- Online certificate in Native American Studies (p. 389)

**M.A. in Native American Studies**
Native American Studies offers a Master of Arts (MA) degree in Native American Studies with an inter-disciplinary approach which makes the best possible use of university resources. The program allows each graduate student the opportunity to select a course of study that combines Native American Studies and a student’s particular area of interest (e.g., history, business, literature, political science). The 30/31-credit program is designed so that each graduate student could complete the program within three to four semesters of concentrated work. Students will be expected to attend at least two full semesters on campus. Students who have completed the graduate certificate in Native American Studies may transfer 9 credits of classwork to the Master’s degree. The program’s mission, purpose, and objective emphasis is to graduate, in a timely manner, knowledgeable professionals and academicians well grounded in Native American issues and scholarship.

The Master’s program offers two plans: **Plan A – Thesis Option** or **Plan B –Professional Paper/Project Option**.

**Plan A** requires course work, oral defense of a research prospectus, a written thesis, and an oral defense of the thesis. This option is preparation for doctoral work in Native American Studies or a related field of study.

**Plan B** requires course work, oral defense of a research prospectus, and completion of a professional paper or project. The non-thesis option is preparation for employment in tribal, state, or federal government, a small or large business, and/or a tribal college.

**Admission**
Candidates are not required to complete the Graduate Record Examination (GRE) General Test, but may do so if they feel it will strengthen their applications. The closing date for receipt of completed applications is April 15 for Summer, July 15 for Fall, and November 15 for Spring. For detailed Graduate School requirements, please see the Policies and Procedures (http://www.montana.edu/gradschool/policy/dates-deadlines.html) online. Successful applicants must have their applications accepted by The Graduate School (with departmental endorsement) before an individual is considered a graduate student at MSU.
A bachelor's degree or equivalent from an accredited institution is required for admission to the Master’s program in Native American Studies. The Graduate School recommends that prospective applicants reach out to the Native American Studies Department by email or phone call in order to ascertain the suitability of the program for the applicant.

Each applicant must submit the following during the online application process (http://www.montana.edu/gradschool/admissions/apply.html) through The Graduate School (which includes a non-refundable $60 application fee):

1. The Graduate Record Exam (GRE) is optional for students who feel it may strengthen their application.
2. Official transcripts from all institutions attended (students must have a minimum GPA of 3.00 for the last two years of undergraduate study). The applicant does not need to submit transcripts from a degree awarded from MSU.
3. Two academic writing samples, demonstrating the applicant’s graduate-level research and writing capabilities.
4. A 2-5 page statement of purpose and goals which includes applicant’s experience and knowledge of historical and contemporary American Indian issues, work background, and how the M.A. in NAS will help the applicant reach long range goals, and benefit American Indian peoples/communities.
5. Three letters of recommendation addressing the applicant’s potential as a graduate student, preferably by academic sources. The applicant will be prompted to submit contact information of their recommenders directly in the online application.
6. A current curriculum vita or résumé.
7. International Applicants ONLY: Mandatory English proficiency test score are required for all applicants who are not U.S. Citizens are are not from countries where English is the “official” language. Minimum scores required are as follows: TOEFL [80], IELTS [level 6.5] or PTE [54].

Limited slots are available, and admissions are competitive.

Deadlines & Assistantships
For students applying for graduate teaching assistantships, the application deadline is April 15 for the following academic year.

For all other applicants, the deadline is July 15 for fall and November 15 for spring semester. Applicants must be formally accepted by The Graduate School with departmental endorsement from Native American Studies.

Financial Assistance
Graduate Teaching Assistantships, awarded on a competitive basis, are available in NAS to formally admitted graduate students. The GTA includes a 6 credit tuition waiver and stipend. Selected graduate students will teach a section of Introduction to Native American Studies and/or other NAS courses. A prerequisite for application is the successful completion of NASX 530 Federal Law and Indian Policy. See the Graduate Assistantships sections on the Graduate School website for detailed information on appointment criteria.

Further Information
For further information regarding the program, contact Native American Studies at (406) 994-3881 or e-mail Francesca Pine at francesca.pine@montana.edu. In addition, you may refer questions to The Graduate School (http://www.montana.edu/gradschool). Students are expected to be familiar with the degree requirements of both the department and The Graduate School.

Master’s Degree Requirements
Plan A – Thesis Option, 31 credits required:
- 10 credits minimum Thesis (590) credits
- ½ of total credits must be at 500 level
- Maximum of four (4) Independent Study (592) credits

Plan B – Non-thesis - Professional Paper or Project, 30 credits required:
- Maximum of 6 Professional Paper/Project (575) credits
- 15 credits minimum at 500 level
- Maximum of six (6) 570 credits
- Maximum of six (6) Independent Study (592) credits
- Pass/Fail – Maximum of 3 credits allowed (excluding thesis)

Requirements for both Plan A and Plan B:
- 490, 492/470, 494/400, 498/476, 588, 589 credits – Not allowed on the program of study
- 594/500, 598/576, 592/570 credits – May not exceed 1/3 of total credits required for degree (10 credits)
- Non-Degree/Reserved credits – Maximum of six (6) to nine (9) credits allowed depending upon admissibility at the time the course(s) were taken. (See graduate catalog)
- All Course work credits may not be more than six (6) years old at time of graduation.
- Transfer credits – May not exceed 9 total credits on program.
- Grade performance for courses on Program of Study – Grades below “C-“ must be repeated. “I” grades must be resolved before graduation.
- 3 credits (minimum) Registrar Registration required during term of comprehensive exams, defense of thesis, and graduation.
- 3 credits (minimum) Registrar Registration required for continuous enrollment. Continuous enrollment applies to all master’s students who have passed a comprehensive examination or students who have completed program content coursework (excludes thesis credits).

Required Content Courses
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>NASX 505</td>
<td>Proseminar Native Amer Studies</td>
<td>3</td>
</tr>
<tr>
<td>NASX 530</td>
<td>Federal Law and Indian Policy</td>
<td>3</td>
</tr>
<tr>
<td>NASX 540</td>
<td>Theoretical Positions in NAS</td>
<td>3</td>
</tr>
<tr>
<td>NASX 541</td>
<td>Critical Approach to NAS Methods</td>
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Graduate classes in Native American Studies
The Following upper division and graduate level courses are offered in Native American Studies:

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<td>NASX 440</td>
<td>Montana Indian Literature</td>
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<td>NASX 450</td>
<td>History of American Indians</td>
<td>3</td>
</tr>
<tr>
<td>NASX 476</td>
<td>American Indian Policy and Law</td>
<td>3</td>
</tr>
<tr>
<td>NASX 490R</td>
<td>Undergraduate Research</td>
<td>1-6</td>
</tr>
<tr>
<td>NASX 490Z</td>
<td>Undergraduate Research</td>
<td>1-6</td>
</tr>
<tr>
<td>NASX 491</td>
<td>Special Topics</td>
<td>1-4</td>
</tr>
<tr>
<td>NASX 492</td>
<td>Independent Study</td>
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<tr>
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<td>NASX 505</td>
<td>Proseminar Native Amer Studies</td>
<td>3</td>
</tr>
</tbody>
</table>
Degrees Offered

M.S. Physics: The Department of Physics grants the Master of Science Degree under two options: Plan-A (thesis required), and Plan-B (without thesis).

Ph.D. Physics: The Physics Ph.D. degree has an option to obtain an M.S. degree en route to a Ph.D.

Department Head
Yves Idzerda, Ph.D
Professor, Department Head & Graduate Program Coordinator
EPS Room 264C, Bozeman MT, 59717-3840
406-994-7838

Research

Research programs in the Department of Physics are currently focused in several areas: optical science and laser technology, condensed matter physics, gravitational physics, astrophysics, solar physics, and science education. The MSU Gravity Group studies extreme astrophysical phenomena, such as the inspiral and merger of black holes and neutron stars, to further our understanding of astrophysics and fundamental physics. Our programs in astrophysics and relativity are directed toward a fundamental understanding of the behavior of matter and energy on the astrophysical scale. Our solar physics group studies phenomena such as solar flares and prominences associated with the sun nearest us, the sun. Our research in the physics of lasers and condensed matter systems such as solar flares and prominences associated with the star nearest us, the sun. Our research in the physics of lasers and condensed matter systems - such as magnetic and dielectric materials, semiconductor and metal surfaces and thin films, microwave photonic devices, laser materials and superconducting solids - enlarges the knowledge base on which future advances in technology are founded. Our research in science education aims to improve the understanding of how students can best learn science in the schools, colleges, and universities. Faculty working with the most advanced techniques on current topics carry their research experience into the classrooms at all levels.

Our research groups foster interactions among the faculty, undergraduate and graduate students, research scientists, visiting scientists, and other departments and centers. Our research facilities at the Engineering and Physical Science (EPS) Building include state-of-the-art laboratories and equipment. External collaborations bring national and international experts to the department and open opportunities for research to be conducted at other world-class laboratories around the globe. On-campus, interdisciplinary research include collaborations with the departments of Chemistry and Biochemistry, Electrical and Computer Engineering, Mechanical Engineering, and several research centers and institutes on campus including the Space Science and Engineering Laboratory (SSEL), the Imaging and Chemical Analysis Laboratory (ICAL), Montana Space Grant Consortium (MSGC), the Optical Technology Center (OpTeC), and the Spectrum Lab and interdisciplinary academic programs, such as Material Science and Optics and Photonics undergraduate and graduate degree programs. Research collaborations with local industries are numerous and actively pursued. For more information on each research program, look at the departmental Research and Programs (http://www.physics.montana.edu/research/resgroups.htm) page.

Application Deadline & Financial Assistance Information

Fall admission: June 1st of each year. New graduates are accepted for Fall term only. Applications received before January 1st will be acted upon and notification of admission given by March 15th. Applications received after January 1st will be treated individually on a “space-available” basis.

Most physics graduate students demonstrating satisfactory progress are awarded financial aid throughout their graduate program in the form of

Faculty

Chair
Walter Fleming
PhD

Associate Professors
Matthew Herman
PhD
Kristin Ruppel
PhD

Assistant Professors
Gail Small
JD
Gina Stuart-Richard
PhD

Professor Emeritus
Wayne Stein
EdD

Department of Physics

Physics Graduate Programs
Details of Physics graduate program and department overview can be found at www.physics.montana.edu

Direct links the physics graduate program and admissions process are given below.

Physics Graduate Program Overview (http://www.physics.montana.edu/grad/gradoverview.htm)

Physics Graduate Admissions & Application (http://www.physics.montana.edu/grad/gradapp.htm)
research and teaching assistantships, fellowships, health insurance, and tuition and fee waivers.

**Masters in Optics**

The M.S. Degree in Optics and Photonics is an interdisciplinary, cooperative program managed by the Optics Program Committee on behalf of the three participating departments: Physics, Electrical and Computer Engineering, and Chemistry and Biochemistry. Students apply directly to the Optics and Photonics Graduate Program and are admitted through one of the participating departments, selected based on advisor affiliation and student interest.

The Optics and Photonics degree is distinct from the other graduate degrees offered by the participating departments because it requires interdisciplinary coursework involving at least two of the departments. The interdisciplinary program of study allows students to emphasize optics theory and applications in more depth than is possible through degrees in the traditional disciplines. Each optics student will be mentored by a graduate advisor from the faculty of one of the three participating departments, and a graduate supervisory committee made up of faculty from at least two of the three departments in the cooperative program.

**Ph.D. in Material Science**

MSU is part of a collaborative Ph.D. program with UMT and MTech in materials science (MatSci). At MSU, the Ph.D program involves multiple departments, faculty, courses, and research infrastructure. Research specialties are focused in biomaterials; electronic, photonic, and magnetic materials; materials for energy storage, conversion, and conservation; and materials synthesis, processing, and fabrication. The curriculum integrates a broad range of physical science and engineering disciplines with an even broader range of applications: from health and medicine to nanotechnology to energy, environment, and natural resources. Each student will complete original, independent research culminating in a dissertation.

**Degrees Offered**

- M.S. in Physics (p. 376)
- Ph.D. in Physics (p. 376)
- Ph.D. in Materials and Science (p. 402)
- M.S. in Optics Plan A (thesis) (p. 350)
- M.S. in Optics Plan B (professional paper) (p. 351)

**M.S. in Physics**

The Department of Physics grants the Master of Science Degree under two options: Plan-A (thesis required), and Plan-B (without thesis).

### Plan-A Requirements

<table>
<thead>
<tr>
<th>Coursework</th>
<th>Total Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHSX 594 Seminar (01 - Teaching Seminar)</td>
<td>1</td>
</tr>
<tr>
<td>PHSX 594 Seminar (15 - Research Introduction Seminar)</td>
<td>1</td>
</tr>
<tr>
<td>PHSX 501 Advanced Classical Mechanics</td>
<td>3</td>
</tr>
<tr>
<td>PHSX 506 Quantum Mechanics I</td>
<td>3</td>
</tr>
<tr>
<td>PHSX 519 Electromagnetic Theory I</td>
<td>3</td>
</tr>
<tr>
<td>PHSX 566 Mathematical Physics I</td>
<td>3</td>
</tr>
<tr>
<td>Electives (see electives)</td>
<td>6</td>
</tr>
</tbody>
</table>

**Thesis**

- PHSX 590 Master’s Thesis (An acceptable thesis and at least 10 credits of this course are required) 10

**Examination**

- A written comprehensive examination is required. A final oral examination is also required, covering the thesis and related areas.

| Total Credits | 30 |

---

### Plan-B Requirements

<table>
<thead>
<tr>
<th>Coursework</th>
<th>Total Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHSX 594 Seminar (01 - Teaching Seminar)</td>
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</tr>
<tr>
<td>PHSX 594 Seminar (15 - Research Introduction Seminar)</td>
<td>1</td>
</tr>
<tr>
<td>PHSX 501 Advanced Classical Mechanics</td>
<td>3</td>
</tr>
<tr>
<td>PHSX 506 Quantum Mechanics I &amp; PHSX 507 and Quantum Mechanics II</td>
<td>6</td>
</tr>
<tr>
<td>PHSX 519 Electromagnetic Theory I &amp; PHSX 520 and Electromagnetic Theory II</td>
<td>6</td>
</tr>
<tr>
<td>PHSX 566 Mathematical Physics I</td>
<td>3</td>
</tr>
<tr>
<td>Electives (see electives)</td>
<td>10</td>
</tr>
</tbody>
</table>

**Thesis**

- None Required

**Examinations**

- A written comprehensive examination is required

| Total Credits | 30 |

---

### Comprehensive Examination

- A student attempting to obtain the M.S. degree is allowed two attempts to pass this written examination at the M.S. Comprehensive level.

- A student who has passed the Ph.D. written Comprehensive Examination will be deemed to have passed the M.S. Comprehensive Examination.

- Details concerning the physics Comprehensive Examination and dates of exam can be found at [http://www.physics.montana.edu/](http://www.physics.montana.edu/)

### Ph.D. in Physics

**Requirements**

<table>
<thead>
<tr>
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<th>Total Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHSX 594 Seminar (01 - Teaching Seminar)</td>
<td>1</td>
</tr>
<tr>
<td>PHSX 594 Seminar (15 - Research Introduction Seminar)</td>
<td>1</td>
</tr>
<tr>
<td>PHSX 501 Advanced Classical Mechanics</td>
<td>3</td>
</tr>
<tr>
<td>PHSX 506 Quantum Mechanics I &amp; PHSX 507 and Quantum Mechanics II</td>
<td>6</td>
</tr>
<tr>
<td>PHSX 519 Electromagnetic Theory I &amp; PHSX 520 and Electromagnetic Theory II</td>
<td>6</td>
</tr>
<tr>
<td>PHSX 535 Statistical Mechanics</td>
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<tr>
<td>PHSX 566 Mathematical Physics I &amp; PHSX 567 and Mathematical Physics II</td>
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</tr>
<tr>
<td>Electives</td>
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</tbody>
</table>

**Thesis**

- Doctoral Thesis (PHSX 690): minimum of 20 credits is required in addition to the courses listed above

**Examinations**

- A written comprehensive examination and an oral comprehensive examination are required. A final oral examination is also required, covering the thesis and related areas.

| Total Credits | 60 |
Electives Requirements
All elective courses must be approved by the student’s Graduate Committee and the Physics Department Head. This approval will ensure that the electives represent a coherent block of study of substantial relevance to Physics. The following limitations normally apply to Elective Courses which may be listed on the Graduate Program for the M.S. or Ph.D. degree in Physics:

1. No more than half of the Elective credits in the above Course Requirements may be at the 400 level in a student’s Graduate Program for any graduate degree in Physics. The remaining Elective credits must be at the 500 level.

2. The Electives will include courses in Physics and minor or supporting fields. At least half of the elective credits must be in Physics.

3. PHSX 490, PHSX 491, PHSX 492, PHSX 494, PHSX 589, PHSX 590, PHSX 689, and PHSX 690 cannot be used as Electives in any Physics Graduate Program.

4. PHSX 592 is allowed as an Elective to a maximum of 3 credits for an M.S. Program and 6 credits for a Ph.D. Program.

5. No more than 2 credits of non-required seminar courses are applicable as Electives in any Physics Graduate Program.

Comprehensive Examination
The Ph.D. Comprehensive Examination has written and oral portions that are considered separate examinations, and each must be passed separately. Details concerning the physics Ph.D. Comprehensive Examination and dates of exam can be found at http://www.physics.montana.edu/grad/programinfo.htm#phd

Department of Political Science
Master of Public Administration
Welcome!

Thank you for visiting the web page for the Master of Public Administration Program at Montana State University. Our program has a long and rich history, and our graduates have gone on to distinguished careers at all levels of government and in a wide range of public, non-profit and private organizations. We are proud to have built a program that focuses on smaller, live and in-person classes where students have the opportunity for rich interaction with our faculty and each other. We have created a strong community of learning and a culture of collaboration among the students and faculty, with explicit attention to the development of skills necessary for immediate professional success, and the normative awareness for career and professional development well into the future. We’re excited about the opportunities here at MSU’s MPA program, and we hope you will be too.

Please don’t hesitate to contact me with any inquiries about the program.

Sincerely,
Dr. Eric K. Austin
MPA Coordinator
406-994-5168
eaustin@montana.edu

Program Description
The MPA degree is a professional degree designed to prepare both pre- and mid-career professionals and administrators for supervisory, analytical support and policy-making positions in public sector agencies, and non-profit organizations, at local, state and federal levels. The program stresses sound preparation in wide range of administrative competencies. MPA coursework includes studies in public administration theory, human resource management, public budgeting, leadership, ethics, organization dynamics, and research methods for public administrators. Available courses support specialization in local government, non-profit management, administration of Native American affairs, education leadership, planning and other subspecialties. For early career students, practical experience is gained through a supervised internship with an agency of the student’s choosing.

Upon graduation, MPA students are expected to have built their capacities in the following areas:

• To lead and manage in public governance;
• To participate in and contribute to the policy process;
• To analyze, synthesize, think critically, solve problems and make decisions;
• To articulate and apply a public service perspective;
• To communicate and interact productively with a diverse and changing workforce and citizenry.

Admissions Requirements
To be admitted to the MPA program, prospective degree candidates must have completed a bachelor’s degree at an accredited college or university with a 3.0 GPA (grade point average) earned during the last two years of their undergraduate education. A score of 150 on the Verbal Reasoning or a combined score of 300 on the Verbal and Quantitative sections of the Graduate Record Examination (GRE) is expected. Because of the language intensity of the MPA program, the verbal score is the more important of the Verbal and Quantitative sections. Applicants should also submit a Personal Statement. This Personal Statement is an opportunity for applicants to describe personal and professional objectives, research interests, applicable experience or any other information relevant to the admissions review. Lastly, applicants must submit three letters of recommendation from individuals who can attest to the applicant’s ability to be successful as a graduate student.

Upon review of the application materials, the Political Science Department makes a recommendation to The Graduate School regarding admission. The Graduate School then makes the final admissions decision. Applications may be obtained through the Graduate School website at www.montana.edu/wwwdg/. Information and scheduling of the (GRE) may be obtained from MSU’s Testing Service at 406-994-6984, or on-line at http://www.montana.edu/ehhd/centers/testing/index.html.

Application Deadlines
Applications for regular, Fall admissions must be received by April 15th. Applications received after April 15th will be considered on a rolling, space available basis until July 15th. Applicants interested in Graduate Assistantships, or departmentally awarded financial aid must apply by April 15th. A supplemental application for Departmental aid can be obtained from Dr. Austin upon request.

A very limited number of applications for Spring admission will be considered under some circumstances, though applicants should be aware that the curriculum is designed to be started in the Fall. Applications for the Spring semester must be received by November 15th.
Admissions Outcomes

Full graduate status: is granted to students who have demonstrated a high quality of performance in prior academic preparation and have otherwise met university and departmental standards on the criteria listed above.

Provisional Admission: may be granted to a student whose application shows reasonable potential for effective graduate work even though the applicant’s record may be deficient in some area. A decision to recommend provisional admission to The Graduate School for an applicant may be based on prior work experience, success in another academic field, completion of supplemental course work, or other criteria pertinent to academic success. A provisionally admitted student will be informed of any special requirements that must be met in order to be granted full graduate status. Upon meeting the specified requirements, recommendations of the Political Science Department, and with approval of the Dean of Graduate Education, a student on provisional status may be advanced to full graduate standing. Full graduate standing is usually considered only after completion of nine or more credits of satisfactory graduate work.

Non-degree Status: Students who desire to take courses of interest but who do not wish to pursue a graduate degree, or those who have not yet been accepted into the program by the Graduate School, may enroll with non-degree status. Graduate credits earned while in non-degree status will not automatically be applied toward graduate degree requirements if the student later applies for and is admitted into the MPA program. Montana State University will allow no more than nine credits of non-degree course work. Furthermore, these credits may only be applied toward the degree if the student would have met all the criteria for admission into full graduate status at the time of entering as a non-degree student.

Degree Requirements

The degree requirements given below are effective for students admitted to the program in the Fall Semester of 2010 or after. The curriculum is structured so that full time students (those taking 9 credits per semester) should be able to graduate in two academic years. Students taking 6 credits per semester can graduate in three years.

The MPA degree requires completion of 36 credits.

Core Required Courses (24 credits):

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>PSCI 551</td>
<td>Research Methods for Public Administrators</td>
<td>3</td>
</tr>
<tr>
<td>PSCI 552</td>
<td>Public Policy Processes</td>
<td>3</td>
</tr>
<tr>
<td>PSCI 554</td>
<td>Foundations of Public Administration</td>
<td>3</td>
</tr>
<tr>
<td>PSCI 555</td>
<td>Human Resources Management</td>
<td>3</td>
</tr>
<tr>
<td>PSCI 557</td>
<td>Public Budgeting &amp; Finance</td>
<td>3</td>
</tr>
<tr>
<td>PSCI 558</td>
<td>Organization Dynamics</td>
<td>3</td>
</tr>
<tr>
<td>PSCI 520</td>
<td>Government Leadership &amp; Administration</td>
<td>3</td>
</tr>
<tr>
<td>PSCI 560</td>
<td>Ethics and Public Service</td>
<td>3</td>
</tr>
</tbody>
</table>

Electives (9 credits)

Students will select three elective courses that support both their intellectual interests as well as their professional and career objectives. We encourage students to explore the Political Science course catalog as well as course offerings from other departments to identify potential electives. Elective courses will be selected in cooperation with either the MPA Director or the student’s Professional Paper Chairperson. Pre-career students (those entering the program with fewer than two years of progressively responsible professional work experience) will be required to complete a 3 credit, 300 work-hour internship as one of the three elective courses. Elective courses may be taken outside the Political Science Department and may include one 400 level course.

Professional Paper (3 credits)

The Professional Paper course (PSCI 574) is taken during the student’s last semester of course work. The purpose of the Professional Paper is to allow MPA students an opportunity to effectively integrate underlying theories, concepts, themes, and patterns found throughout the program’s course work into a final original research project. A formal presentation of the Professional Paper will be given to Public Administration and Political Science faculty, student peers, and other interested parties. All MPA students in the program are expected to attend these presentations. Completion of the Professional Papers must occur in the Fall or Spring semester, not during the summer.

Comprehensive Exams

Comprehensive Exams are administered the semester before the student graduates. If graduating in the spring, comprehensive exams are taken in the fall. Comprehensive exams are not administered in the summer. The purpose of the comprehensive exam is to verify the student’s mastery of the general concepts derived from the course of study, the integration of those concepts across course topics and the ability to apply the material to real-world administrative problems.

Transfer of Credits

Acceptance/transfer of up to nine credit hours of academic course work performed at other institutions is possible by The Graduate School upon recommendation by the Political Science Department. All such credits must have been earned while in graduate status at an accredited college or university.

Department of Psychology

Dr. Ian Handley - Graduate Coordinator
PO Box 173440, Bozeman, MT 59717-3440
406-994-6508

Admission

The Graduate School application process can be completed online (http://www.montana.edu/gradschool/apply.html). Prior to starting the online application process, applicants should visit the Psychology Department’s Application Page (http://www.montana.edu/psychology/gradprogram/application.html) which contains information about what materials applicants should prepare for the online application process. Review this information before applying. Please note, applicants must include a 1-2 page personal statement that summarizes one’s academic background in psychology or related field, career plans, research experience, research interests, and why the applicant is applying to Montana State University’s Ph. D. program in Psychological Science.

Overall, the Psychology department requires the following application materials during the online application process:

1. GRE scores; subject test not required*  
2. All previous college/university transcripts (official transcripts only); MSU graduates do not need to supply official transcripts  
3. Three letters of recommendation (be prepared to supply your recommender’s contact information)  
4. A Personal statement

* The Psychology Department requires that applicants submit Graduate Record Exam Scores (General test, which yields a Verbal and Quantitative score). The GRE Psychology Subject Test is not required, but recommended, especially for applicants who did not major in psychology as an undergraduate. Please arrange to have scores sent to Montana State University (code: 4488). All successful candidates must
demonstrate knowledge of the fundamentals of psychology, as well as undergraduate-level training in statistics and research methods.

**Deadline**
The closing date for receipt of completed applications is January 1. For detailed admission requirements, review the Admission Policies and Application Requirements sections on The Graduate School website. Successful applicants must have their applications accepted by The Graduate School (with departmental endorsement) before an individual is considered a graduate student at MSU.

**Financial Assistance**
Teaching Assistantships or Research Assistantships, which are awarded on a competitive basis, are usually available to formally admitted graduate students during their two years of study. See the Financial Support (http://www.montana.edu/psychology/gradprogram/financial.html) for Graduate Students section on the departmental home page for more information (assistantships are requested by the student’s home department).

**Graduate Program**

- Ph.D. in Psychological Science (p. 379)

The Department of Psychology at Montana State University offers a research-oriented Ph.D. degree in Psychological Science. Psychological Science is a broad term for scientific research in the core academic areas of psychology. These areas include cognitive, developmental, health, learning, physiological, and social psychology. Psychologists conducting psychological research work in a wide range of settings such as colleges and universities, health care facilities, federal & state government, small & large businesses, and many other places.

The goal of our graduate program is to train students to think critically about theory and evidence, to understand and use statistical procedures, and to design, conduct, and publish psychological research. The psychology department at MSU does not have graduate faculty who specialize in clinical, counseling, community, or school psychology. Moreover, we are not a practitioner-oriented program. We are a program for students who want to conduct research and pursue research-oriented careers, academic or otherwise.

To satisfy the degree requirements, students must work intensively with their advisor to complete a research project culminating in a written master’s thesis by their second year, complete qualifying exams by the beginning of the fourth year, and complete an advanced research project culminating in a written dissertation within or after the fourth year. Students must complete at least 3 graduate-level psychology courses on statistics/research methods, 2 credits of a teaching course, and 8 content course. General areas of faculty research interest include: cognitive psychology, physiological psychology, social psychology, health psychology, applied statistics, and research methods.

The psychology faculty at MSU uses an individualized mentorship approach to graduate training. Students and their advisors work together to devise a program of coursework and research best suited for the students’ career goals. The opportunity to conduct research with a faculty member is a unique component of our graduate program as it provides training useful for the ultimate pursuit of a doctoral degree or work in various organizations.

**PDF Table of Contents**

**Ph.D. in Psychological Science**

**Program Requirements**
The Ph.D. program requires a minimum of 63 credit hours of graduate level coursework. The required coursework is designed to provide students with a strong foundation in statistics, research methods, and teaching, and the elective coursework provides overviews of specific content areas. An Overview of the Ph.D. Program in Psychological Science can be found at the Department of Psychology (p. 378) page.

**Required Courses**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>PSYX 501</td>
<td>Adv Rach Design &amp; Analysis</td>
<td>3</td>
</tr>
<tr>
<td>PSYX 502</td>
<td>Advanced Design/Stat I</td>
<td>3</td>
</tr>
<tr>
<td>PSYX 505</td>
<td>Teaching of Psychology</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>1 additional graduate-level research methods/statistics course from either the Psychology department or outside the department with approval of the mentoring committee.</td>
<td>3</td>
</tr>
</tbody>
</table>

**Elective Courses**

Students must complete 8 courses (24 credits) of elective courses. Up to 9 of these elective credits can be taken outside of the Psychology Department. Electives must be approved by the students faculty advisor. Also, at least 9 Psychology credits must be taken beyond completion of the M.S. requirements.

**Research**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>PSYX 590</td>
<td>Master’s Thesis</td>
<td>1-10</td>
</tr>
<tr>
<td>PSYX 690</td>
<td>Doctoral Thesis</td>
<td>18</td>
</tr>
<tr>
<td></td>
<td><strong>Total Credits</strong></td>
<td><strong>63</strong></td>
</tr>
</tbody>
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**Below are courses we typically offer:**

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<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>PSYX 501</td>
<td>Adv Rach Design &amp; Analysis</td>
<td>3</td>
</tr>
<tr>
<td>PSYX 502</td>
<td>Advanced Design/Stat I</td>
<td>3</td>
</tr>
<tr>
<td>PSYX 505</td>
<td>Teaching of Psychology</td>
<td>1</td>
</tr>
<tr>
<td>PSYX 510</td>
<td>Topics in Psychological Science</td>
<td>3</td>
</tr>
<tr>
<td>PSYX 539</td>
<td>Physiological Processes</td>
<td>3</td>
</tr>
<tr>
<td>PSYX 541</td>
<td>Cognitive Processes</td>
<td>3</td>
</tr>
<tr>
<td>PSYX 542</td>
<td>Learning</td>
<td>3</td>
</tr>
<tr>
<td>PSYX 543</td>
<td>Memory</td>
<td>3</td>
</tr>
<tr>
<td>PSYX 544</td>
<td>Social Psychology</td>
<td>3</td>
</tr>
<tr>
<td>PSYX 546</td>
<td>Social Cognition</td>
<td>3</td>
</tr>
<tr>
<td>PSYX 575</td>
<td>Professional Paper and Project</td>
<td>1-6</td>
</tr>
<tr>
<td>PSYX 589</td>
<td>Graduate Consultation</td>
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</tr>
<tr>
<td>PSYX 590</td>
<td>Master’s Thesis</td>
<td>1-10</td>
</tr>
<tr>
<td>PSYX 591</td>
<td>Special Topics</td>
<td>1-4</td>
</tr>
<tr>
<td>PSYX 592</td>
<td>Independent Study</td>
<td>1-3</td>
</tr>
<tr>
<td>PSYX 594</td>
<td>Seminar</td>
<td>3</td>
</tr>
</tbody>
</table>

We plan to add several new elective courses over the next few years. **EXAMPLES of POSSIBLE Future Elective Courses include:**

- Anxiety and Emotion Regulation
- Attention & Cognitive Control
- Attitudes & Persuasion
- Cognitive Aging
- Collective Memory
- Developmental Psychopathology
- Disparities In Mental & Physical Health
- Stereotypes & Prejudice
- The Self

**College of Nursing**

**Graduate Program**

Donna A. Williams, PhD
Associate Dean for Research and Graduate Education
Montana State University  
125 Sherrick Hall  
PO Box 173560, Bozeman , MT 59717-3560  
406-994-3783  Email: dwilliams@montana.edu

Masters of Nursing (MN)

The Masters of Nursing (MN) graduate degree program is fully accredited by the Commission on Collegiate Nursing Education (CCNE). Students are prepared to take certification examinations as a Clinical Nurse Leader (CNL). MN graduate students are educated to be leaders at the bedside with a broad range of opportunities to influence health practices.

Doctor of Nursing Practice (DNP)

The Doctor of Nursing Practice (DNP) degree program focuses on educating nurses to the highest standards of the profession to care for people living in Montana and beyond and lead change in health care systems. Two areas of specialty are available for the DNP degree seeking student at MSU: Family / Individual or Psychiatric / Mental Health.

Non Degree Options

The Certificate in Nursing Education is available to graduate nursing students and nurses with at least a BSN.

Program Synopsis

Students are admitted for either a MN degree (Clinical Nurse Leader, CNL) or DNP degree. For the DNP degree, students select one specialty: Family/Individual or Psych/Mental Health. Each student completes courses in advanced health assessment, advanced pathophysiology, advanced pharmacotherapeutics, evidenced based practice, ethics, and finance and budgeting of health care systems. Remaining courses are determined by specialty. The graduate student’s experience culminates in a professional or scholarly paper.

The graduate program curriculum is taught by faculty in the College of Nursing. Rich clinical opportunities exist in Montana for nurses seeking to expand their outreach and grow to the level of an advanced generalist, MN degree (CNL role), or advanced practice nurse, DNP (Family/Individual or Psych/Mental Health). Faculty with systems and leadership foci guide MN (CNL) students and advanced practice nurse practitioners, who are certified and experienced, guide DNP students through clinical education. Students choose from over twenty faculty in the college who hold doctorates in nursing to lead their professional (MN) or scholarly (DNP) projects in concert with course work and clinical experiences. The college provides educational preparation plus exciting opportunities to practice in rural and frontier areas of Montana. Nursing faculty are recognized nationally for their broad and wide-ranging expertise.

Graduate courses are offered primarily online with teleconference and video conference used to supplement content. Travel to Bozeman is required at the beginning of Fall semester. A description of the teaching methods is available at http://www.montana.edu/nursing/academic/teaching_methods.htm

Admission Requirements*

1. Minimum undergraduate GPA of 3.0.
2. A baccalaureate degree in nursing from a nationally accredited upper division program, which included supervised clinical practice in a variety of nursing settings, including community/public health and management.
3. Successful completion of undergraduate courses in physical assessment, community/public health, research, statistics (which included inferential statistics), and an undergraduate psych/mental health course for the DNP (Psych/Mental Health).
4. Current unencumbered licensure as a registered nurse. If clinical educational experiences are to be completed in Montana, licensure in Montana is required.
5. Favorable recommendation from the College of Nursing admissions committee.
6. International applicants only: TOEFL score of 580 or computer equivalent, if applicable.

*Applicants must be admitted formally to The Graduate School.

Clinical Experience Preferred

In general, one year of clinical experience is preferred for DNP (Family/Individual) and DNP (Psych/Mental Health) degree applicants. There are no clinical experience preferences for MN degree (Clinical Nurse Leader).

Steps to Apply

Application Deadline February 15th

1. Fill-out the Graduate School application (online (http://www.montana.edu/gradschool/apply.html))
2. During the online process, complete the Cumulative Undergraduate Grade Point Average and Grade Point Average for Final Two Years Undergraduate Work forms.
3. Three recommendation forms; be prepared to provide contact information during the online process.
4. Finally, have official transcripts and test scores mailed to:
   College of Nursing, Attn: Graduate Program  
   PO Box 173560  
   Bozeman, MT 59718-3560

Further Information

For further information contact: Graduate Program Assistant, College of Nursing, 122 Sherrick Hall, 406-994-3500

Degree Offered

ADRN to MN Distance Graduate Education (MN)  
Degree (http://www.montana.edu/nursing/graduate/teaching_methods.html)

A track to a Masters in Nursing (MN) degree has been designed for Associate Degree Registered Nurses (ADRNs).

Master of Nursing (MN) Graduate Degree (p. 381)

The focus of the MN degree (Clinical Nurse Leader, CNL) is to prepare graduates with advanced leadership skills to be applied in the healthcare delivery system across a wide range of settings. Functions of the CNL include client advocacy, team manager, information manager, outcomes manager, systems analyst/risk anticipator, educator, and active professional.

Doctor of Nursing Practice (DNP) Graduate Degree (p. 381)

The DNP prepares advanced practice nurses who demonstrate clinical expertise, judgment, scholarship, and leadership to provide the highest level of nursing practice in the primary health care setting.

Online Certificate Program (Non-Degree Option) (p. 390)

The Certificate in Nursing Education program consists of four theory courses (total of 10 credits) that prepare students for careers in nursing education. These courses are open to all graduate nursing students and also
to nurses with at least a BSN who are interested in taking such coursework for personal enrichment or professional advancement.

**Clinical Nurse Leader**

**Master of Nursing (MN) Graduate Degree**

**Focus**
The focus of the MN degree (Clinical Nurse Leader, CNL) is to prepare graduates with advanced leadership skills to be applied in the healthcare delivery system across a wide range of settings. Functions of the CNL include client advocacy, team manager, information manager, outcomes manager, systems analyst/risk anticipator, educator, and active professional.

**Educational Objectives**
1. Effect change through advocacy for the client, interdisciplinary health care team and the profession.
2. Communicate effectively to achieve quality client outcomes and lateral integration of care for a cohort of clients.
3. Pursue knowledge and skills as the CNL role, needs of clients, and the health care delivery system evolve.
4. Delegate and utilize the nursing team resources (human and fiscal) and serve as a leader and partner in the interdisciplinary health care team.
5. Identify clinical and cost outcomes that improve safety, effectiveness, timeliness, efficiency, quality, and the degree to which they are client-centered.
6. Use information systems and technology at the point of care to improve health care outcomes.
7. Participate in systems review to critically evaluate and anticipate risks to client safety to improve quality of client care delivery.
8. Assume accountability for healthcare outcomes for a specific group of clients within a unit or setting recognizing the influence of the meso-system and macro-system on the microsystem.
9. Assimilate and apply research-based information to design, implement and evaluate clients' plans of care.
10. Synthesize data, information and knowledge to design, implement and achieve optimal client and care environment outcomes.
11. Use appropriate teaching learning principles and strategies as well as current information, materials and technologies to facilitate the learning for clients, groups, and other health care professionals.
12. Complete and successfully defend a professional project appropriate to the role and scope of the Clinical Nurse Leader.

**Montana State University**

**Doctor of Nursing Practice (DNP)**

**Focus**
The DNP prepares advanced practice nurses who demonstrate clinical expertise, judgment, scholarship, and leadership to provide the highest level of nursing practice in the primary health care setting.

**DNP (Family/Individual) Educational Objectives**
1. Integrate nursing science and theory, biophysical, psychosocial, ethical, analytical, and organizational sciences as the foundation for the highest level of nursing practice.
2. Analyze complex health care systems to assess strengths and weaknesses and facilitate organization-wide changes in practice delivery.
3. Synthesize, interpret, and apply knowledge from nursing practice, research, theory, and informatics to evaluate outcomes and sustain evidence-based advanced nursing practice.
4. Advocate for health care policy addressing issues of social justice and equality in the delivery of advanced practice nursing services.
5. Enact leadership and effective communication in inter- and intra-professional collaborator relationships to facilitate and improve outcomes for individuals, populations, and health care systems.
6. Assess epidemiological, financial, sociopolitical, occupational, and organizational forces in the development, implementation, and evaluation of clinical prevention and population health.
7. Integrate professional standards, values, accountability, and ongoing self-reflection into role acquisition as an advanced practice nurse.
8. Influence health outcomes by providing advanced independent comprehensive health care services including health promotion and counseling, health assessment and diagnosis, disease prevention, and management of health and illness of individuals and families throughout the lifespan.
9. Complete and successfully defend a scholarly project appropriate to the role and scope of the doctorally prepared advanced practice registered nurse.
BSN to DNP (Family/Individual) 3 Year Program of Study

see http://www.montana.edu/nursing/academic/fnp.htm for the 4 Year Program of Study

<table>
<thead>
<tr>
<th>Year 1</th>
<th>Credits</th>
<th>Fall</th>
<th>Spring</th>
<th>Summer</th>
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<tbody>
<tr>
<td>NRSG 601 - Advanced Health Assessment</td>
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<tr>
<td>NRSG 602 - Adv Physio/Pathophysiology</td>
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<tr>
<td>NRSG 604 - Evidence Based Practice I</td>
<td>4</td>
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<tr>
<td>NRSG 606 - Statistical Applications</td>
<td>2</td>
<td></td>
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<td></td>
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<tr>
<td>NRSG 603 - Advanced Pharmacology I</td>
<td>2</td>
<td></td>
<td></td>
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<tr>
<td>NRSG 605 - Evidence Based Practice II</td>
<td>3</td>
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<tr>
<td>NRSG 607 - Diagnostic Reasoning</td>
<td>3</td>
<td></td>
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<tr>
<td>NRSG 608 - Design H C Delivery Systems</td>
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<tr>
<td>NRSG 674 - DNP Scholarly Project Seminar</td>
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<td>NRSG 609 - Adv Practice Nrsng Ldrshp</td>
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<td>NRSG 620 - Adv Pharm II</td>
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<td>NRSG 621 - Advanced Clinical I-FI</td>
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<tr>
<td>NRSG 675 - Professional Paper and Project</td>
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<td>Year Total:</td>
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<tbody>
<tr>
<td>NRSG 610 - Health Care Informatics</td>
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<tr>
<td>NRSG 622 - Advanced Clinical II Primary Care for Midlife Families</td>
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<tr>
<td>NRSG 675 - Professional Paper and Project</td>
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<tr>
<td>NRSG 611 - Program Planning &amp; Evaluation, Outcomes, &amp; Quality Improvement</td>
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<tr>
<td>NRSG 612 - Ethics, Law, and Policy for Advocacy in Healthcare</td>
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<td>NRSG 613 - Finance &amp; Budget H C Systems</td>
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<tr>
<td>NRSG 623 - Advanced Clinical III Primary Care for Aging Families</td>
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<th>Credits</th>
<th>Fall</th>
<th>Spring</th>
<th>Summer</th>
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<tbody>
<tr>
<td>NRSG 614 - Vulnerability and Health Care in Diverse Communities</td>
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<td>NRSG 615 - Translational Research Adv Pte</td>
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<tr>
<td>NRSG 675 - Professional Paper and Project</td>
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<tr>
<td>NRSG 624 - Advanced Clinical IV (NP, Family/Individual) Primary Care Clinical Preceptorship</td>
<td>7</td>
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<tr>
<td>Year Total:</td>
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</tbody>
</table>

Total Program Credits: 83
Total Clinical Hours: 1125 (25 cr x 3 = 75 x 15 wks = 1125)

DNP (Psych/Mental Health) Educational Objectives
1. Integrate nursing science and theory, biophysical, psychosocial, ethical, analytical, and organizational sciences as the foundation for the highest level of nursing practice.
2. Analyze complex health care system to assess strengths and weaknesses to facilitate organization-wide changes in practice delivery.
3. Synthesize, interpret, and apply knowledge from nursing practice, research, theory, and informatics to evaluate outcomes and sustain evidence-based advanced nursing practice.
4. Advocate for health care policy addressing issues of social justice and equality in the delivery of advanced practice nursing services.
5. Enact leadership and effective communication in inter- and intra-professional collaborator relationships to facilitate and improve outcomes for individuals, populations, and health care systems.
6. Assess epidemiological, financial, sociopolitical, occupational, and organizational forces in the development, implementation, and evaluation of clinical prevention and population health.
7. Integrate professional standards, values, accountability, and ongoing self-reflection into role acquisition as an advanced practice nurse.
8. Influences health outcomes by providing advanced independent comprehensive health care services including health promotion and counseling, health assessment and diagnosis, and disease prevention and management of health and illness of individuals and families throughout the lifespan.
9. Complete and successfully defend a scholarly project appropriate to the role and scope of the doctorally prepared advanced practice registered nurse.

BSN to DNP (NP, Psych/Mental Health) 3-Year Program of Study

see http://www.montana.edu/nursing/academic/fpmhnp.htm for the 4 Year Program of Study

<table>
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<tr>
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<td>NRSG 602 - Adv Physio/Pathophysiology</td>
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<td>NRSG 604 - Evidence Based Practice I</td>
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<tr>
<td>NRSG 606 - Statistical Applications</td>
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<td>NRSG 603 - Advanced Pharmacology I</td>
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<td>NRSG 607 - Diagnostic Reasoning</td>
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<td>NRSG 608 - Design H C Delivery Systems</td>
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<td>Year 1</td>
<td>Fall</td>
<td>Spring</td>
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<tr>
<td>NRSG 675 - Professional Paper and Project</td>
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<td>NRSG 611 - Program Planning &amp; Evaluation, Outcomes, &amp; Quality Improvement</td>
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<td>NRSG 675 - Professional Paper and Project (1 lec; 1 clinical lab)</td>
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<tr>
<td>NRSG 675 - Professional Paper and Project (1 lec; 1 clinical lab)</td>
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<td>NRSG 614 - Vulnerability and Health Care in Diverse Communities (2 lec; 1 clinical lab)</td>
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<td>NRSG 675 - Professional Paper and Project (1 lec; 1 clinical lab)</td>
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<td>NRSG 612 - Ethics, Law, and Policy for Advocacy in Healthcare</td>
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<td>Year Total:</td>
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</table>

Total Program Credits: 83

Total Clinical Hours: 1125 (25 cr x 3 = 75 x 15 wks = 1125)

**Scholarship**

Each student completes a scholarly project developed in collaboration with a faculty advisor and committee. Examples of exciting and innovative student projects include: development of mental health outreach programs to the rural elderly; examination of alternative health practices for healing; establishment of pediatric cancer support groups for the rural client; and development of a school based clinic. A comprehensive exam (written and oral components) and oral defense of the scholarly project is required for DNP students.

**Montana State Online**

Montana State Online is a central location for information about online programs, online tuition, applications, registration, adding and dropping online courses, and grades. Montana State Online is also a central location for online student and faculty resources.

**Admission**

To take any online courses or to enter an online degree program an applicant needs to apply formally to MSU Graduate School for admission.

- Learn [here](http://www.montana.edu/wwwdg/cat_appl&deadlines.html) about applying to MSU as a degree or non-degree seeking student.

**How do I register for an online course?**

The applicant must be accepted into MSU as either a degree or non-degree student before registering. Once accepted, the student will...
receive information about how and when to register. Please note that many courses have particular prerequisites. Students may need to talk to an academic adviser before proceeding. Students will register online with the MSU MyInfo (https://atlas.montana.edu/30000/pls/bzagent/twbkwbis.P_GenMenu?name=homepage) system.

Online course System
Online courses at MSU utilize the Brightspace (https://ecat1.montana.edu) system.

Do I have to be immunized before I can register?
Montana State University requires all newly accepted graduate and undergraduate students, whether degree-seeking or non-degree, to show proof of immunization (http://www.montana.edu/health/immunization.php) against certain diseases before registration. Students who are taking only courses at a distance are exempt. Therefore, the requirement may be waived. If a student falls under this category, please call Student Health Services at 406-994-2311 if an immunization hold is preventing registration or other student administrative functions. Immunizations holds are reinstated in November and April. If you are a continuing online student, you may have to contact Student Health Services each fall and spring.

Please note that if a student registers for an MSU on-campus course at a later date, he/she must meet the immunization requirement.

For more Information
Request Information: distance@montana.edu
1-866-540-5660
1-406-994-6683

Montana State Online - Graduate Programs
- M.S. in Agricultural Education (p. 384)
- M. Ed in Curriculum and Instruction (p. 308)
- M. Ed in Educational Leadership (p. 312)
- M.S. in Family and Financial Planning (p. 331)
- M.S. in Land Resources and Environmental Sciences Online (p. 386)
- M.S. in Mathematics - Mathematics Education Option (p. 387)
- Nursing MN - Clinical Nurse Leader (p. 380)
- Nursing DNP - Doctor of Nursing Practice (p. 380)
- Professional Master of Science and Engineering Management (p. 341) (PMSEM)
- M.S. in Science Education (p. 388)

Montana State Online - Graduate Certificates
- Addiction Counseling (p. 333)
- Native American Studies (p. 389)
- Nursing Education (non-degree option) (p. 390)
- Professional Practice of Architecture (p. 390)
- School Library Media Graduate Endorsement (p. 305)
- Science and Engineering Management (p. 341)
- Science Teaching (p. 392)

Montana State Online - Licensure
- Northern Plains Transition to Teaching (NPTT) (p. 394)

M.S. in Agricultural Education
The graduate program in Agricultural Education at Montana State University is designed to prepare graduates for entry into or advancement in formal and non-formal teaching careers. This program also provides development of professional leadership skills for other careers in agribusiness, government service, extension, or adult education.

The master’s degree program in Agricultural Education, with its various options, provides a program that can be tailored to meet each student’s career goals. In addition to the wide variety of professional courses in agricultural education, offerings are also available from all academic Departments in the College of Agriculture, including agricultural economics, animal and range sciences, land resources and environmental sciences, plant sciences and plant pathology, and veterinary molecular biology. Specialization areas such as adult education, educational administration, career education, and curriculum coordination are also available through cooperation with the College of Education, Health and Human Development. Plan A (thesis), Plan B (project or professional paper), and an online option are available.

Program Requirements
The program offers considerable flexibility to students to help them meet their professional and personal objectives. Plan A requires a thesis. A minimum of 30 credit hours must be completed, 20 credits of course work and 10 credits of thesis preparation. Students who choose Plan B are required to complete a professional paper based on a current research issue related to the student’s emphasis area. Students will take a minimum of 30 hours of course work (no thesis credits). The final selection of the student’s research activity will be the student’s responsibility in collaboration with the advisor and the graduate committee.

The requirements for students in the on-line program are similar to those for students following the Plan B program. Taking a minimum of 6 credits per semester, students will take a minimum of 30 semester hours of graduate coursework. Their coursework must include: Research Methods (AGED 506), Program Planning and Evaluation (AGED 507), Graduate Seminar (AGED 594) each year of the program, and Special Topics (AGED 591). A final written exam and a professional paper are required in lieu of a thesis.

Required Core Courses
AGED 506 Research Methods 3
AGED 507 Program Planning and Evaluation 3
AGED 594 Graduate Seminar 1
AGED 591 Special Topics 3

Professional Educator Option
Objectives
Students who complete the Professional Educator option of the Curriculum & Instruction Master’s degree are expected to demonstrate the knowledge, skills, and dispositions of a Master Teacher.

Four options are available:
- Elementary (K-8) Teachers
- Secondary (6-12) Teachers
- K-12 Music Teachers
- Library Media Certificate Core

Graduates will exhibit:
1. Deep understanding of student development, diversity, and learning processes;
2. Content mastery of the subjects they teach and how to teach those subjects to students;
3. Skill in managing, monitoring, and assessing student learning;
4. Systematic reflection regarding their professional practice and experience; and
5. Commitment to membership in a community of learners.

**Program of Study for Elementary (K-8) Teachers**

**Signature Content - 12 credits**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
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<tbody>
<tr>
<td>EDCI 504</td>
<td>Assessment and Evaluation in Education</td>
</tr>
<tr>
<td>EDCI 506</td>
<td>Applied Educational Research</td>
</tr>
<tr>
<td>EDCI 514</td>
<td>Mentoring New Teachers</td>
</tr>
<tr>
<td>EDCI 531</td>
<td>Contemporary Issues in Education</td>
</tr>
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</table>

**Core Content - 15 credits; choose from the following**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
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<tbody>
<tr>
<td>EDCI 510</td>
<td>Issues and Trends in Social Studies Instruction</td>
</tr>
<tr>
<td>EDCI 520</td>
<td>Visual Arts and Learning</td>
</tr>
<tr>
<td>EDCI 525</td>
<td>Improvement of Instruction in Science</td>
</tr>
<tr>
<td>EDCI 533</td>
<td>Middle Years School</td>
</tr>
<tr>
<td>EDCI 534</td>
<td>Literacy Assessment and Instruction</td>
</tr>
<tr>
<td>EDCI 540</td>
<td>American Indian Studies for Ed</td>
</tr>
<tr>
<td>EDCI 551</td>
<td>Education Technology: Teaching, Learning, and Leadership</td>
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</table>

EDEL 533
- Or Electives relevant to licensure area and approved by graduate advisor

**Master’s Capstone - 3 credits**

<table>
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<tr>
<th>Course Code</th>
<th>Course Title</th>
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<tbody>
<tr>
<td>EDCI 575</td>
<td>Professional Paper and Project</td>
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</table>

**Total Credits**

30

**Program of Study for Secondary (6-12) Teachers**

**Signature Content - 12 credits**

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<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
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<tbody>
<tr>
<td>EDCI 504</td>
<td>Assessment and Evaluation in Education</td>
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<tr>
<td>EDCI 506</td>
<td>Applied Educational Research</td>
</tr>
<tr>
<td>EDCI 514</td>
<td>Mentoring New Teachers</td>
</tr>
<tr>
<td>EDCI 531</td>
<td>Contemporary Issues in Education</td>
</tr>
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</table>

**Core Content - 15 credits; choose from the following**

<table>
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<tr>
<th>Course Code</th>
<th>Course Title</th>
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<tbody>
<tr>
<td>EDU 610</td>
<td>Qualitative Educational Research</td>
</tr>
<tr>
<td>EDCI 604</td>
<td>Advanced Educational Psychology</td>
</tr>
<tr>
<td>EDCI 532</td>
<td>General School Curriculum</td>
</tr>
<tr>
<td>EDCI 540</td>
<td>American Indian Studies for Ed</td>
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</table>

Or Electives relevant to licensure area and approved by graduate advisor

**Master’s Capstone - 3 credits**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
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<tbody>
<tr>
<td>EDCI 575</td>
<td>Professional Paper and Project</td>
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**Total Credits**

30

**Program of Study for K-12 Music Teachers**

**Signature Content - 12 credits**

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<tr>
<th>Course Code</th>
<th>Course Title</th>
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<tbody>
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<td>EDCI 504</td>
<td>Assessment and Evaluation in Education</td>
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<td>EDCI 506</td>
<td>Applied Educational Research</td>
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<td>EDCI 514</td>
<td>Mentoring New Teachers</td>
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<tr>
<td>EDCI 531</td>
<td>Contemporary Issues in Education</td>
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</table>

**Core Content - 9 credits**

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<td>MUSI 504</td>
<td>Studies in Hist and Analysis</td>
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<tr>
<td>MUSE 530</td>
<td>Music, Society, Education</td>
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**Program of Study for Library Media Certificate**

**Core**

A student must apply to the full MEd program either initially or before 9 credits of Library Media coursework have been completed.

**Signature Content - 21 credits**

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<tr>
<td>EDCI 522</td>
<td>Info Resources &amp; Services</td>
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<tr>
<td>EDCI 545</td>
<td>Organization of Information in School Library Media Centers</td>
</tr>
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<td>EDCI 546</td>
<td>School Library Media Specialist</td>
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<tr>
<td>EDCI 547</td>
<td>Info Inquiry &amp; Ed Change</td>
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<td>EDCI 548</td>
<td>Management of Information &amp; Resources</td>
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<tr>
<td>EDCI 549</td>
<td>Applications of Literature for Children and Young Adults</td>
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<td>EDCI 598</td>
<td>Internship</td>
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**Master’s Content and Capstone - 9 credits**

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<td>Contemporary Issues in Education</td>
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<tr>
<td>EDCI 506</td>
<td>Applied Educational Research</td>
</tr>
<tr>
<td>EDCI 575</td>
<td>Professional Paper and Project</td>
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</table>

**Total Credits**

30

**Educational Researcher Option**

**Objectives**

Students who complete the Educational Researcher option of the Curriculum & Instruction Master’s degree are expected to demonstrate the knowledge, skills, and dispositions of a professional researcher.

**Program of Study**

**Signature Content - 9 credits; choose from the following**

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<td>EDU 602</td>
<td>Educational Statistics II</td>
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<td>EDCI 506</td>
<td>Applied Educational Research</td>
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<td>EDU 610</td>
<td>Qualitative Educational Research</td>
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<td>EDU 607</td>
<td>Quantitative Educational Research</td>
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</table>

**Core Content - 12 credits**

Four courses appropriate to student’s area of specialization and approved by graduate advisor

**Thesis - 9 credits**

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<th>Course Code</th>
<th>Course Title</th>
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<tr>
<td>EDCI 590</td>
<td>Master’s Thesis</td>
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**Total Credits**

30
**Master’s Thesis**
Students pursuing the Educational Researcher option of the Curriculum & Instruction Master’s degree will complete a Master’s Thesis. See the Graduate School’s Defense of Thesis (http://www.montana.edu/gradschool/policy/degreq_masters.html#degreq_mast_def) website.

**Written Comprehensive Exam - Thesis**
As MEd students in the Educational Researcher option approach the end of their first year of study, they will contact their committee chair to discuss the format, content, and time frame of their Master’s Thesis. The content of the Master’s Thesis will be an original research project determined by consultation between the chair and the student and must be approved by the student’s Master’s Committee. Students are required to complete the Master’s Thesis using APA format.

The completed Master’s Thesis will be submitted to the student’s committee for evaluation. Committee members will have approximately two weeks to read and evaluate the content and written competency (quality, thoroughness, and completeness of the research) of the thesis.

**Oral Comprehensive Exam - Thesis Defense**
When the committee members have read and evaluated the thesis, the student will give a 1-2 hour oral presentation and thesis defense to the Master’s Committee. Students can be queried about all areas of program content during the oral presentation and thesis defense. The presentation will be evaluated for research content and oral competency.

The committee chair will facilitate the meeting and the order of questioning. Committee members can ask follow-up and clarifying questions in all areas. At the completion of the questioning and in the absence of the student, the entire committee will discuss their evaluation of the oral presentation and thesis defense. The chair will lead the committee to a determination regarding the passing or failing of both the written and oral components of the thesis.

The thesis defense is graded with either a passing or failing grade - determined by a majority committee vote. The student will officially pass the written and oral components of the thesis by demonstrating evidence of knowledge of pertinent literature, academic and theoretical grounding, development of professional skills, and the ability to conduct effective educational research.

A “fail” occurs when a majority of the committee determines that a student has not demonstrated sufficient evidence of knowledge of pertinent literature, academic and theoretical grounding, development of professional skills, or the ability to conduct effective educational research. A failure on either portion of the thesis is considered to be a failed exam. A failed defense may be repeated once. At least two months must elapse before the second defense takes place.

Failure to pass a second thesis defense results in termination of graduate study and dismissal from the academic program. Students who are dismissed from the program due to a failed thesis are ineligible to reapply to the same degree program at any time.

**Technology Education Option**

**Objectives**
Students who complete the Technology Education option of the Curriculum & Instruction Master’s degree are expected to demonstrate the knowledge, skills, and dispositions of a Master Teacher.

**Program of Study**

<table>
<thead>
<tr>
<th>Core Content - 12 credits</th>
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<tbody>
<tr>
<td>EDCI 504 Assessment and Evaluation in Education</td>
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<tr>
<td>EDCI 506 Applied Educational Research</td>
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<tr>
<td>EDCI 514 Mentoring New Teachers</td>
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<tr>
<td>EDCI 531 Contemporary Issues in Education</td>
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<td>TE 501 History and Philosophy of Technology Education</td>
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<td>TE 530 3D Modeling &amp; Animation</td>
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<td>TE 594 Seminar</td>
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<td>EDCI 532 General School Curriculum</td>
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<tr>
<td>EDCI 555 Technology, Instructional Design, and Learner Success</td>
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<tr>
<td>EDCI 571 In-Service Education</td>
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Electives relevant to licensure area and approved by graduate advisor

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<tr>
<th>Master’s Capstone - 3 credits</th>
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<tbody>
<tr>
<td>EDCI 575 Professional Paper and Project</td>
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</tr>
</tbody>
</table>

Total Credits 30

**Contact Information**
Dr. Gilbert Kalonde
406-994-5775 kalonde@montana.edu

**M.S.in Land Resources and Environmental Sciences Online**

**Overview**
The online M.S. program in Land Resources and Environmental Sciences is designed to provide outstanding graduate training opportunities across a substantial breadth of disciplinary interests. Programs are specifically adapted to each graduate student and often address processes at multiple scales through well-integrated, multi-disciplinary efforts. Student projects are directed toward improving understanding of principles and processes important to land resources and environmental sciences, with opportunities for direct ties to management.

Understanding is developed through targeted advanced coursework tailored to the student. Professional papers may involve, but are not limited to, topics such as watershed hydrology, integrated management of invasive plant species, soil nutrient management, bioremediation, land reclamation, restoration ecology, fluvial systems ecology and restoration, riparian ecology, microbial ecology of natural systems, chemical fate and transport, water quality, crop diversification, precision agriculture, environmental risk assessment, remote sensing and GIS applications, and climate variability.
Requirements
A minimum of 30 credits:

• 27 credits course work from 400/500 level courses from the electives list
• 3 credits professional paper requirement

Prerequisites
• Bachelor’s degree in a related field, or a strong science background
• undergraduate GPA of 3.0 or better
• GRE combined score of greater than 300 (current scale) or 1,000 (prior scale: pre-2011).
• show significant promise for success in a graduate program
• TOEFL (Test of English as a Foreign Language) score of 550 (paper-based test), 231 (computer-based test), and 80 (internet-based test)—required only for international students whose native language is not English

Meeting the minimum department standards does not ensure admission to the program. The minimum GPA and GRE scores are not absolute thresholds. Admission to Montana State University graduate programs is based on a number of factors, including prior academic and professional experience and the personal statement.

Curriculum
The flexible and interdisciplinary nature of this program allows you to select online courses to fit your professional goals and interests.

Elective Courses (27 credits will be from this list of courses)

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>AGSC 401</td>
<td>Integrated Pest Management</td>
<td>3</td>
</tr>
<tr>
<td>ENTO 510</td>
<td>Insect Ecology</td>
<td>3</td>
</tr>
<tr>
<td>LRES 507</td>
<td>Environmental Risk Assessment</td>
<td>3</td>
</tr>
<tr>
<td>LRES 510</td>
<td>Biodiversity Methods</td>
<td>3</td>
</tr>
<tr>
<td>LRES 521</td>
<td>Holistic Thought &amp; Management</td>
<td>3</td>
</tr>
<tr>
<td>LRES 534</td>
<td>Environmental Data Analysis</td>
<td>3</td>
</tr>
<tr>
<td>LRES 540</td>
<td>Ecology Plants &amp; Community</td>
<td>3</td>
</tr>
<tr>
<td>LRES 544</td>
<td>Water Quality</td>
<td>3</td>
</tr>
<tr>
<td>LRES 565</td>
<td>Environmental Biophysics</td>
<td>3</td>
</tr>
<tr>
<td>LRES 569</td>
<td>Ecol of Invasive Plants in GYE</td>
<td>2</td>
</tr>
<tr>
<td>LRES 571</td>
<td>Landscape &amp; Ecosys Ecology</td>
<td>3</td>
</tr>
<tr>
<td>LRES 573</td>
<td>Remote Sensing Env Sci</td>
<td>3</td>
</tr>
<tr>
<td>LRES 591</td>
<td>Special Topics (Soil Ecosystems and Processes)</td>
<td>3</td>
</tr>
<tr>
<td>LRES 591</td>
<td>Special Topics (Applied Watershed Hydrology)</td>
<td>3</td>
</tr>
<tr>
<td>LRES 591</td>
<td>Special Topics (Ecology of Invasive Plants in the GYE II)</td>
<td>3</td>
</tr>
<tr>
<td>LRES 592</td>
<td>Independent Study</td>
<td>3</td>
</tr>
<tr>
<td>LRES 598</td>
<td>Internship</td>
<td>3</td>
</tr>
<tr>
<td>PSPP 546</td>
<td>Herbicide Physiology</td>
<td>3</td>
</tr>
<tr>
<td>MB 527</td>
<td>Toxicology</td>
<td>3</td>
</tr>
</tbody>
</table>

***LRES 592 and LRES 598 may not be used as a course on students program of study.

Required Course - all students must take the 3 credit professional paper course at the end of your program of study

LRES 575 Prof Paper & Project 3

For More Information
• Scott Powell, Assistant Professor and Program Coordinator, at spowell@montana.edu or (406) 994-5017
• Lisa Brown, Program Manager, at lisa.brown@montana.edu or (406) 994-3062

M.S. in Mathematics - Mathematics Education Option (MSMME)
The MSMME program emphasizes the teaching and learning of secondary mathematics, offering a blend of courses addressing key topics in mathematics content and pedagogy. The MSMME curriculum incorporates problem-based and active learning and aligns with the NCTM Principles and Standards for School Mathematics as well as the Common Core State Standards for Mathematics. The 30-credit-hour degree includes a set of required content foundation courses, required pedagogy courses from among several choices, and a variety of elective courses. Completing the program typically requires taking a series of online courses over two academic years and attending 2 three-week summer sessions in Montana. Embedded in the required coursework are classroom-based research projects that involve addressing specific challenges in teaching, experimenting with new instructional strategies, or designing, teaching, and assessing lessons in a specific topic area.

Admission
Preference will be given to applicants who have:
1. Earned BS or BA degree from a mathematics or mathematics teaching program
2. Certification in at least one state to teach secondary mathematics
3. A current position in secondary teaching
4. Two or more years of teaching experience
5. An undergraduate GPA of 3.0 or higher

Consideration will be given to other applicants as space allows:
• Secondary teachers with a significant mathematics background but not holding secondary mathematics certification (e.g., private school teachers)
• Certified secondary mathematics teachers not currently teaching but who intend to teach secondary mathematics in the near future
• Mathematics teachers at other levels with appropriate background and experience (reviewed on a case-by-case basis)

Special Notes:
• GRE scores are NOT required for admission to the MSMME program.
• The MSMME Program is approved under the Western Regional Graduate Program (WRGP), which allows teachers from Western states to pay in-state resident tuition. The participating states are Alaska, Arizona, California, Colorado, Hawaii, Idaho, Montana, Nevada, New Mexico, North Dakota, Oregon, South Dakota, Utah, Washington, and Wyoming.
Program Requirements

1. Core Content Courses (required):
   - M 518 Statistics For Teachers 3
   - M 524 Linear Algebra for Teachers 3
   - M 525 Analysis for Teachers 3
   - M 527 Geometry for Teachers 3

2. Pedagogy Courses (required):
   Choose at least 2 of 4: 6
   - M 520 Standards-Based Math for Teachers
   - M 521 Mathematics Learning Theory for Teachers
   - M 528 Curriculum Design
   - M 529 Assessment Models and Issues

3. Electives - The 4 courses listed above also serve as electives. 12
   Additional courses are offered on demand.
   - M 517 Advanced Mathematical Modeling for Teachers
   - M 523 Number Structure for Teachers
   - M 526 Discrete Mathematics for Teachers
   - M 577 Improving Mathematics Edu. Through Action Research

Total Credits 30

MSMME Program Portfolio:

Graduates of the MSMME program must demonstrate a thorough understanding of the standards that guide their profession and how these standards undergird their own professional growth. In addition, they are expected to continuously reflect on their learning; to recognize personal gains in content knowledge and pedagogical skills; and to engage in classroom research experiences. To meet these capstone requirements, teachers build a program portfolio throughout their course of study and present a summative reflection upon completion of coursework. This portfolio, which must be publicly presented and discussed with committee members, represents the capstone event of the program and replaces a comprehensive examination.

Master of Science in Science Education

451 Reid Hall, Bozeman, Montana 59717
406-994-5679
Home Page: www.montana.edu/msse

Program Director
Peggy S. Taylor

Admission

Entrance requirements include: a bachelor’s degree in an area of science, science education, or related area; at least two years of science teaching in educational settings; and an undergraduate GPA of 3.0 or higher. Students with a GPA of less than 3.0 have the opportunity to begin the program as a non-degree student to earn admissions.

Applications are accepted throughout the fall, spring, and summer sessions. Application documents include official transcripts, three letters of recommendation, essay, and resume. For more information about the application process, visit the MSSE website (http://www.montana.edu/msse).

Program Features

- Designed for science educators by experienced science, science education, and mathematics faculty with the collaboration of outstanding classroom teachers
- Over 80% of the courses may be taken on-line by asynchronous, computer-mediated communication
- The opportunity to work at home without frequent trips to campus
- The chance to participate in classes when it is most convenient for you
- Popular on-campus summer field and lab experiences that vary in length from one to two weeks
- Personalized science education capstone project for each student
- Interdisciplinary/inter-college program
- Large selection of science content courses
- Self-paced program

Online graduate courses are offered during the fall, spring, and summer sessions; however, Montana-based field and lab graduate courses are offered during the summer session, only.

In addition to completing a group of core courses (14 credits total) which includes the 3-credit capstone project, students develop interdisciplinary combinations of science courses (12 credits minimum) from offerings in biology, chemistry, earth science, microbiology, plant sciences, physics, and other related areas. The final 4 credits in the 30-credit program are electives selected from education and/or science courses.

Interdisciplinary efforts and incorporation of both science content and pedagogy have been encouraged during the development of courses. Each student seeking the degree is advised by a three-person faculty committee, and programs are designed taking into account the student’s background, interests, and career goals.

Instructors

The MSSE degree program was developed by Montana State University faculty members who are active in science, science education, and mathematics. The program is a unique, cooperative effort of several colleges and departments. Faculty members of the departments of Biology, Chemistry and Biochemistry, Earth Science, Education, Health and Human Development, Land Resources and Environmental Science, Mathematics, Microbiology, Plant Science and Environmental Science, Physics, and other related areas such as Engineering will teach most courses. Faculty members of other departments and units will play a major role in some courses. Science courses are offered through the appropriate science content department.

Program Requirements

The program of study may begin with distance learning courses in any semester or summer classes at the MSU-Bozeman campus. Study continues with distance learning courses that students take from their homes or workplaces, and ends with a campus visit for presentation of the results of a personalized science education capstone project. Over 80% of the courses and credits may be taken off-campus by asynchronous, computer-mediated communication. Thirty semester credits are required for the degree. Students typically will complete the degree in two or three years.

All students seeking the MSSE degree complete core courses (14 credits) in education which includes a three-credit capstone project. For the remaining credits (16), students select interdisciplinary combinations of science content courses (12 credits minimum) from offerings in biology, chemistry, earth science, land resources and environmental science, microbiology, physics, and plant science. Interdisciplinary efforts and incorporation of both science content and pedagogy have been encouraged during the
development of courses. The final four credits in the thirty-credit program are electives selected from education and/or science courses.

**Required Core Courses**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>MSSE 501</td>
<td>Inquiry Sci Eng Prac</td>
<td>2</td>
</tr>
<tr>
<td>EDCI 504</td>
<td>Assessment and Evaluation in Education</td>
<td>3</td>
</tr>
<tr>
<td>EDCI 505</td>
<td>Foundation of Action Research in Teaching and Learning</td>
<td>3</td>
</tr>
<tr>
<td>EDCI 509</td>
<td>Implementing Action Research in Teaching and Learning</td>
<td>3</td>
</tr>
<tr>
<td>EDCI 575</td>
<td>Professional Paper and Project</td>
<td>1-4</td>
</tr>
</tbody>
</table>

**Addiction Counseling**

**Overview**

The Addiction Counseling Certificate program is an online academic preparation program that prepares students to become LAC – eligible in Montana. This program offers all academic graduate coursework needed to pursue internship/licensure with the State of Montana. Significantly, this is a graduate certificate program – not a master’s degree program. Students must have a bachelor’s degree in a relevant field with a GPA of 3.0 to apply.

Students must earn 12 credits of addiction specific coursework in order to earn the Addiction Counseling Certificate from MSU. State licensure requirements are different, and students will be advised to take additional MSU addiction specific coursework to meet the State of Montana requirements.

Prerequisite coursework for the State of Montana licensure depends upon your educational background. The MSU Addiction Counseling Certificate program provides individual academic advisement and tailors a program of study based on individual student academic backgrounds.

**Requirements**

Complete 12 credits from the course list to receive the MSU Addiction Counseling Certificate. State licensure may require all 30 credits depending on students prior academic coursework.

**Curriculum**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>LAC 501</td>
<td>Chemical Dependency Counseling (Spring)</td>
<td>3</td>
</tr>
<tr>
<td>LAC 502</td>
<td>Psychopharmacology and Addictions (Spring)</td>
<td>3</td>
</tr>
<tr>
<td>LAC 503</td>
<td>Assessment, Treatment Planning and Ethics of Addiction Counseling (Fall)</td>
<td>3</td>
</tr>
<tr>
<td>LAC 504</td>
<td>Alcohol and Drug Studies (Fall)</td>
<td>3</td>
</tr>
<tr>
<td>LAC 505</td>
<td>Cross Cultural &amp; Ethical Considerations in Addictions Counseling (Summer)</td>
<td>3</td>
</tr>
<tr>
<td>LAC 506</td>
<td>Group Counseling in Addiction Settings (Fall)</td>
<td>3</td>
</tr>
<tr>
<td>LAC 507</td>
<td>Group Counseling in Addiction Settings (Spring)</td>
<td>3</td>
</tr>
<tr>
<td>LAC 508</td>
<td>Counseling Theories in Addiction Settings (Summer)</td>
<td>3</td>
</tr>
<tr>
<td>LAC 509</td>
<td>Assess Treat Plan Addiction II (Spring)</td>
<td>3</td>
</tr>
<tr>
<td>LAC 510</td>
<td>Chem Dependency Counseling II (Fall)</td>
<td>3</td>
</tr>
</tbody>
</table>

**For More Information**

**About the Program**

Contact Kacey Franklin, Program Director, at kathryn.franklin1@montana.edu or (406) 994-5993.

**About the Application Process**

Contact Sarah Hendrikx, Program Manager, at sarah.hendrikx@montana.edu or (406) 994-7441.

**Explore Further**

- Other Montana State Online Degree and Certificate Programs (http://eu.montana.edu/online/degrees)
- Frequently Asked Questions (http://eu.montana.edu/online/faq) concerning online courses
- MSU Department of Health and Human Development (http://www.montana.edu/wwwhhd)
- Is online learning right for you? Find out with our interactive quiz (http://eu.montana.edu/online/quiz).

**Online Certificate in Native American Studies**

The graduate certificate in Native American Studies requires 12 semester credits, fully available through online classes. Although other courses may be developed and offered during any semester, the classes presently available are:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>NASX 515</td>
<td>Native Food Systems</td>
<td>3</td>
</tr>
<tr>
<td>NASX 524</td>
<td>Contemporary Issues in American Indian Studies</td>
<td>3</td>
</tr>
<tr>
<td>NASX 530</td>
<td>Federal Law and Indian Policy</td>
<td>3</td>
</tr>
<tr>
<td>NASX 550</td>
<td>Native Americans: Dispelling the Myths</td>
<td>3</td>
</tr>
<tr>
<td>NASX 551</td>
<td>American Indian Art Survey</td>
<td>3</td>
</tr>
<tr>
<td>NASX 553</td>
<td>Indigenous Literature and the West</td>
<td>3</td>
</tr>
<tr>
<td>NASX 554</td>
<td>Indian Education for All: A Model for Culturally Responsive Pedagogy in Practice</td>
<td>3</td>
</tr>
<tr>
<td>NASX 591</td>
<td>Special Topics</td>
<td>3</td>
</tr>
</tbody>
</table>

Total Credits: 12

We will also accept EDCI 540 Amer Indian Studies for Ed

If the student wishes to continue in Native American Studies and obtain a Master’s degree, 9 credits, less than 6 years old, earned under the Graduate Certificate may be transferred to the MA program. The Master’s program is not wholly available online, requiring at least two semesters (one fall term, one spring term) on campus.

Our online classes generally are on the same schedule as the in-person classes; here is a link to registration and detailed information for online classes: http://btc.montana.edu/courses/aspx/credit.aspx?NASX

Certificate students who reside in Bozeman may fulfill the certificate with in-person classes.

**Admission**

Each applicant must submit the following:

1. Application to MSU-Bozeman through the Graduate School (https://www.applyweb.com/msug) online application process (http://www.montana.edu/gradschool/admissions/apply.html) (which includes a non-refundable $60 application fee).
2. Official transcripts from all institutions attended (students must have a minimum GPA of 3.00 for the last two years of undergraduate study) (MSU graduates do not need to submit MSU transcripts).

3. Two academic writing samples, demonstrating the applicant’s graduate-level research and writing capabilities.

4. A 2-5 page personal statement and goals which includes applicant’s experience and knowledge of historical and contemporary American Indian issues, work background, how the Graduate Certificate in NAS will help the applicant reach long range goals, and benefit American Indian peoples/communities.

5. A current curriculum vita or résumé.

All application materials should be uploaded during the online application process. If there are any additional materials or official documents, they may be submitted to:

The Department of Native American Studies
Montana State University
2-179 Wilson Hall, Bozeman, MT 59717
Attn: Francesca Pine

Or e-mailed to: francesca.pine@montana.edu

Upon admission, students should be aware of the following administrative requirements:

After acceptance, you will need to contact MSU Student Health to clear immunization holds that will prevent you from registering for classes - it is easily taken care of. Call (406) 994-2311 for further information, or visit the Student Health website: http://www.montana.edu/health/immunization.php. Even distance students are required to clear this hold.

BEFORE YOU ARE FINISHED WITH YOUR FIRST SEMESTER, The Graduate School requires that you file a Program of Study form.

BEFORE YOU ARE FINISHED WITH YOUR FOURTH CLASS, The Graduate School requires that you file an Application for Advanced Degree form.

Complete instructions and forms can be found on the Graduate School webpage for Certificate students, found here: http://www.montana.edu/gradschool/policy/degreq_certificate.html

Costs associated with the certificate:

The cost of classes varies slightly, but currently our online graduate courses are $975.15 for Montana residents, and $1,255.05 for non-residents per class, and four classes are required to graduate. There are additional administrative fees assessed by the registrar and Graduate School offices:

- Application process: $60 Grad School application fee (one time)
- per semester: $30 Registration fee
- Graduation process:
  - Application for Graduate Admissions $60.00 nonrefundable application fee
  - Program of Study & Committee Form A one-time $50.00 processing fee will be charged to your student account for processing this form.
  - Application for Advanced Degree $20.00 audit fee will be assessed to the student’s account each semester an application is submitted (this fee must be paid through the Student Accounts Office).

A certificate of completion signed by the Native American Studies Department Head will be awarded upon confirmation by the Graduate School that all requirements have been met.

Further Information

For further information regarding the program, contact Native American Studies at (406) 994-3881 or e-mail Francesca Pine at francesca.pine@montana.edu or Dr. Kristin Ruppel, at 406-994-5261, or via email at ktruppel@montana.edu.

For most recent information please visit: http://www.montana.edu/nativeamerican/online.html

In addition, you may refer questions to The Graduate School or find the graduate catalog and policies on-line at http://www.montana.edu/gradschool/. Students are expected to be familiar with the degree requirements of the department, The Graduate School and Extended University.

Online Certificate in Nursing Education (non-degree)

The Certificate in Nursing Education program consists of four theory courses (total of 10 credits) that prepare students for careers in nursing education. These courses are open to all graduate nursing students and to nurses with at least a BSN (those interested in coursework for personal enrichment or professional advancement). Nursing educators work in a variety of settings, the most common being schools/colleges of nursing or larger health care agencies. The courses offered in the online program are excellent for individuals planning a career with an educational focus; either now or in the future.

<table>
<thead>
<tr>
<th>Year 1</th>
<th>Credits</th>
<th>Fall</th>
<th>Spring</th>
<th>Summer</th>
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<tbody>
<tr>
<td>NRSG 503 - Curriculum Development* or NRSG 504 - Assmnt and Eval of Education</td>
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<tr>
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</table>

<table>
<thead>
<tr>
<th>Year 2</th>
<th>Credits</th>
<th>Fall</th>
<th>Spring</th>
<th>Summer</th>
</tr>
</thead>
<tbody>
<tr>
<td>NRSG 501 - Tchg Concepts Nursing Educator</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NRSG 502 - Effective Clinical Teaching</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NRSG 503 - Curriculum Development or NRSG 504 - Assmnt and Eval of Education</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Year Total:</td>
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<td>2</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Total Program Credits:</td>
<td>10</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* NRSG 503 Curriculum Development is offered in even years and NRSG 504 Assmnt and Eval of Education is offered in odd years.
** NRSG 574 Teaching Practicum is a 1-4 variable credit elective clinical practicum offered during any semester. Prerequisite: NRSG 504 Assmnt and Eval of Education or the consent of instructor.

Certificate of Professional Practice Objectives

The Professional Practice of Architecture graduate certificate is designed to build the next generation of leaders in the professional practice of architecture through creative skills for managing people, projects and budgets. This 9 month, 15-credit online program will give a student
the foundation of solid business skills while enabling them to explore creative and visionary ways to think about the contemporary practice of architecture.

Program Flow
The program follows an academic-year model. Students begin the program in August and end the following May. After acceptance, the student should register for the course(s) offered in the upcoming semester through the Extended University website.

**Fall: August-December (20 week course)**

- MSEM 501 Leading Human & Fin Ent
- Program Objectives
- This online course presents leadership strategies in the professional practice of architecture, how architecture fits among associated professionals and the opportunities for professional engagement relative to the encapsulated expertise of an architectural office. The course topics will be delivered in an integrated fashion using multiple instructors and guest interviews with expertise in several areas.

**Spring: March-May (8 weeks)**

- ARCH 519 Synthesis of Arch Practice
- *This course is online, however it will conclude with face-to-face presentation of the capstone project to a diverse audience of industry leaders. It is also the capstone of the Professional Practice of Architecture Graduate Certificate Program and is intended to synthesize the learning acquired in the two previous courses (Leading and Managing the Human and Financial Enterprise and Leadership in Professional Practice) in a manner that culminates in the development of a transformative business plan for existing or anticipated architectural practice opportunities. The course topics will be delivered in an integrated fashion using multiple instructors and guest interviews with expertise in several areas.

For More Information
Contact Lisa Brown, Program Manager, at lisa.brown@montana.edu or 406-994-3062

Explore Further
- Other Montana State Online Degree and Certificate Programs (p. 384)
- Frequently Asked Questions (http://eu.montana.edu/online/faq) concerning online courses
- Is online learning right for you? Find out with our interactive quiz (http://eu.montana.edu/online/quiz).

School Library Media Graduate Certificate

**Program Objectives**
This program is geared toward licensed teachers who want to obtain the school library media endorsement. This certification program/endorsement can only be added to an existing teaching license.

We have received official approval from accreditation officials in Alaska, Colorado, Idaho, Montana, Oregon, South Dakota, North Dakota, Washington, and Wyoming. Many other states accept our program as well. Contact your state’s Department of Education to ensure that the program is accepted. Our education programs are accredited by the Montana Board of Public Education, the Teacher Education Accreditation Council/Council for the Accreditation of Educator Preparation (TEAC/CAEP), and we participate in the National Association of State Directors of Teacher Education and Certification’s (NASDTEC) Interstate Contract.

Additionally, the Library Media program offers an option to earn a Master’s degree (MEd) in Curriculum & Instruction after completion of all Library Media coursework. The Master’s portion involves completion of 9 additional credits past the 21 required by the Library Media Certificate program, and these courses are also offered online. A student must apply to the full MEd program either initially or before 9 credits of Library Media coursework have been completed. See Master of Education in Curriculum & Instruction - Professional Educator Option (p. 310).

**Program Flow**
Following admission, the student should register for the course(s) offered in the upcoming semester. Two to three courses are typically offered each semester.

This is a fully online program. Therefore, students must have reliable Internet access. Students also need:

1. Basic understanding of word processing and email applications
2. Familiarity with spreadsheet and database applications and software
3. Basic knowledge of the Web, search engines, and experience using different browsers and online databases
4. Experience with software downloads and multimedia plug-ins

**Program of Study**

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>EDCI 522</td>
<td>Info Resources &amp; Services</td>
<td>3</td>
</tr>
<tr>
<td>EDCI 545</td>
<td>Organization of Information in School Library Media Centers</td>
<td>3</td>
</tr>
<tr>
<td>EDCI 546</td>
<td>School Library Media Specialist</td>
<td>3</td>
</tr>
<tr>
<td>EDCI 547</td>
<td>Info Inquiry &amp; Ed Change</td>
<td>3</td>
</tr>
<tr>
<td>EDCI 548</td>
<td>Management of Information &amp; Resources</td>
<td>3</td>
</tr>
<tr>
<td>EDCI 549</td>
<td>Applications of Literature for Children and Young Adults</td>
<td>3</td>
</tr>
<tr>
<td>EDCI 598</td>
<td>Internship</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Total Credits</td>
<td>21</td>
</tr>
</tbody>
</table>

**Contact Information**
Dr. Ann Ewbank, Program Leader
406-994-5788 Email: aewbank@montana.edu
(ann.ewbank@montana.edu)

Application Process for the Library Media Certificate Program
Prior to applying for the Library Media Certificate program applicants must hold a teaching license and have gained at least one year teaching experience.

1. Complete the online application through the Graduate School Online Application System (http://www.montana.edu/wwdga/apply.html)
2. Provide official transcripts from all higher education institutions attended to the Department of Education Graduate Programs Office, 215 Reid Hall, PO Box 172880, Montana State University, Bozeman, MT 59717.
**Science Teaching**

**Application Deadlines**
The following are the preferred application deadline dates by which all of the application materials must be submitted via the Graduate School Online Application System (http://www.montana.edu/wwwdg/apply.html):

- Fall Semester: April 1st
- Spring Semester: November 1st
- Summer Semester: April 1st

The following are the absolute application deadline dates. If an applicant is unable to submit all application materials via the online application system by the preferred dates listed above, he or she can submit the materials by the date listed below, as there will be a second review.

- Fall Semester: July 15th

**Contact Information**
Maggie Secrest  
Graduate Program Assistant  
Montana State University  
PO Box 172880  
Reid Hall 215, Bozeman, MT 59717-2880  
margaret.secrest@montana.edu (margaret.secrest@montana.edu)

**Science Teaching**
Montana State University’s online graduate certificates help science educators gain knowledge and competence in specialized Science Teaching, in the following areas:

- Chemistry
- Earth Science
- Elementary School Science
- Life Science
- Physics

**Program Features**
- Certificates are offered through MSU Extended University, creator of the National Teachers Enhancement Network. NTEN has been known since 1993 for high-quality online science courses.
- Science certificates are designed for teachers of all backgrounds; fellow students will be K-12 teachers, community college instructors, museum professionals and informal science educators. Students will learn along with peers from around the world; absorbing new ideas and fresh perspectives.
- Courses are rigorous, content-focused and specially designed for teachers. NTEN’s model pairs university professors with in-service teachers during course development.
- Instructors are experts in their fields; having been specially trained in online teaching.
- Courses are 100% online without the need to come to the MSU campus. However, there are several field experience courses available.
- Courses are asynchronous; allowing students to log in at any time of the day or night. In order to maximize interaction among students, instructors will set weekly schedules and assignment deadlines.
- Our Extended University team offers fast, friendly, one-on-one support from the application process to certificate completion.

**Time to Complete**
Most students will complete the Certificate in 1-2 years. Because students have different responsibilities at work and home, not all students will progress in the program at the same pace. However, all coursework for each Certificate must be completed within a 3-year window of time.

Students may transfer into the program a maximum of 3 graduate credits from MSU NTEN or Masters of Science in Science Education (MSSE) courses. All transfer credit is subject to approval.

Graduate Science Teaching certificates are not licensing and/or endorsement programs. Students interested in initial licensure should check with the Department of Education in their states for local certification policies. Graduate Science Teaching certificate coursework could be used toward licensure/endorsements depending on the requirements of individual states.

**For More Information**
Kelly Boyce, Program Manager  
Montana State University/Extended University  
200 Culbertson Hall  
PO Box 172200, Bozeman, MT 59717-2200  
Tel: 406-994-6812, Toll free: (800) 282-6062  
Fax: 406-994-6546  
Email: distance@montana.edu

**Courses of Study**
- Graduate Certificate in Science Teaching in Chemistry (p. 392)
- Graduate Certificate in Science Teaching in Earth Science (p. 393)
- Graduate Certificate in Science Teaching in Elementary School Science (p. 393)
- Graduate Certificate in Science Teaching in Life Science (p. 393)
- Graduate Certificate in Science Teaching in Physics (p. 394)

**Certificate in Science Teaching in Chemistry**
The Certificate in Science Teaching in Chemistry covers the broad field of chemistry. These courses are high-energy, high-interest courses; increasing a students content knowledge and confidence when teaching chemistry in the classroom. The subject matter can be used as an introduction to chemistry or to strengthen one’s current knowledge.

Complete 12 credits selected from the following list:

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHMY 505</td>
<td>Critical Concepts in Chemistry</td>
<td>3</td>
</tr>
<tr>
<td>CHMY 506</td>
<td>Integrating Computers into Laboratory Instruction</td>
<td>2</td>
</tr>
<tr>
<td>CHMY 591</td>
<td>Special Topics (An Atoms-First Primer for AP/IB Chemistry Teachers)</td>
<td>3</td>
</tr>
<tr>
<td>CHMY 591</td>
<td>Special Topics (Chemistry of the Environment, Water, Air, and Earth)</td>
<td>3</td>
</tr>
<tr>
<td>CHMY 591</td>
<td>Special Topics (Environmental Measurement: Sensors &amp; Electronics)</td>
<td>3</td>
</tr>
<tr>
<td>CHMY 591</td>
<td>Special Topics (Examining Life in Extreme Environments)</td>
<td>2</td>
</tr>
<tr>
<td>CHMY 591</td>
<td>Special Topics (Exploring Biochemistry for Teachers)</td>
<td>3</td>
</tr>
<tr>
<td>CHMY 591</td>
<td>Special Topics (Exploring Biochemistry II: Metabolism)</td>
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Complete 12 credits selected from the below list:

<table>
<thead>
<tr>
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<th>Course Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>CHMY 591</td>
<td>Special Topics (Exploring Chemistry for Middle &amp; High School Teachers)</td>
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<tr>
<td>CHMY 591</td>
<td>Special Topics (Exploring Organic Chemistry for Teachers)</td>
<td>3</td>
</tr>
<tr>
<td>CHMY 591</td>
<td>Special Topics (Special Topics in Chemistry: Kinetics, EQuilibrium, &amp; Thermodynamics)</td>
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<tr>
<td>CHMY 594</td>
<td>Seminar (Science Lab Safety &amp; Risk Management)</td>
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</table>

**Certificate in Science Teaching in Earth Science**

The Certificate in Science Teaching in Earth Science offers courses ranging from geology and landforms to hydrology and paleontology. Also included and recommended while earning this certificate is a broad scoped course listed as Earth System Science.

Complete 12 credits selected from the below list:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>ERTH 512</td>
<td>Mtn &amp; Plns Riparian Proc</td>
<td>2</td>
</tr>
<tr>
<td>ERTH 516</td>
<td>North Rocky Mt Geology</td>
<td>2</td>
</tr>
<tr>
<td>ERTH 591</td>
<td>Special Topics (Understanding Climate Change)</td>
<td>3</td>
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<tr>
<td>ERTH 591</td>
<td>Special Topics (Fundamentals of Oceanography)</td>
<td>3</td>
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<tr>
<td>ERTH 591</td>
<td>Special Topics (Geology of Glacier National Park)</td>
<td>2</td>
</tr>
<tr>
<td>ERTH 591</td>
<td>Special Topics (Geology of the Moon)</td>
<td>3</td>
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<tr>
<td>ERTH 591</td>
<td>Special Topics (Historical Geology for Educators)</td>
<td>3</td>
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<tr>
<td>ERTH 591</td>
<td>Special Topics (K-14 Earth System Science)</td>
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<tr>
<td>ERTH 591</td>
<td>Special Topics (Teaching Middle School Earth System Science)</td>
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<tr>
<td>ERTH 591</td>
<td>Special Topics (Weather and Climate for Teachers)</td>
<td>3</td>
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<tr>
<td>ERTH 594</td>
<td>Seminar (Geology Seminar)</td>
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<tr>
<td>GEO 521</td>
<td>Dinosaur Paleontology</td>
<td>2</td>
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<tr>
<td>GEO 560</td>
<td>Geology Yellowstone Volcanic</td>
<td>2</td>
</tr>
<tr>
<td>GEO 591</td>
<td>Special Topics (Advanced Paleontology for Teachers)</td>
<td>2</td>
</tr>
<tr>
<td>LRES 591</td>
<td>Special Topics (Streamside Science: Hands-On Approaches to Water Quality Education)</td>
<td>3</td>
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<tr>
<td>LRES 591</td>
<td>Special Topics (The Twelve Principles of Soil Science)</td>
<td>3</td>
</tr>
<tr>
<td>LRES 591</td>
<td>Special Topics (Water Quality in the Classroom: A characterization of the Science and issues)</td>
<td>3</td>
</tr>
</tbody>
</table>

**Certificate in Science Teaching in Life Science**

This certificate offers a broad spectrum of courses. From these, students can create a diverse program that includes anatomy and physiology, nutrition, ecology, plants, microbiology, insects and slime, or focus in on a specific area of interest.

Complete 12 credits selected from the below list:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ARNR 529</td>
<td>Yellowstone Wildlife Habitat Ecology</td>
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<tr>
<td>BIOL 591</td>
<td>Special Topics (Alpine Ecology)</td>
<td>2</td>
</tr>
<tr>
<td>BIOL 591</td>
<td>Special Topics (Anatomy &amp; Physiology - An Inquiry Based Approach for Teachers)</td>
<td>3</td>
</tr>
<tr>
<td>BIOL 591</td>
<td>Special Topics (Ecology of Trout Streams)</td>
<td>2</td>
</tr>
<tr>
<td>BIOL 591</td>
<td>Special Topics (Examining Life in Extreme Environments)</td>
<td>2</td>
</tr>
<tr>
<td>BIOL 591</td>
<td>Special Topics (Land Use Issues in the Greater Yellowstone Ecosystem)</td>
<td>2</td>
</tr>
<tr>
<td>BIOL 591</td>
<td>Special Topics (Teaching Evolution)</td>
<td>3</td>
</tr>
<tr>
<td>BIOE 513</td>
<td>Terrestrial Ecology of Plains and Prairies</td>
<td>1</td>
</tr>
<tr>
<td>BIOE 519</td>
<td>Riparian Zones/Wetlands</td>
<td>2</td>
</tr>
<tr>
<td>BIOE 520</td>
<td>Animal Biodiversity in GYE</td>
<td>2</td>
</tr>
<tr>
<td>BIOE 522</td>
<td>Birds of Prey</td>
<td>2</td>
</tr>
<tr>
<td>BIOE 523</td>
<td>Wildlife Ecology</td>
<td>2</td>
</tr>
<tr>
<td>BIOE 591</td>
<td>Special Topics (Advanced Ecology)</td>
<td>2</td>
</tr>
<tr>
<td>BIOE 591</td>
<td>Special Topics (Ecology &amp; Conversation of the World’s Marine Ecosystems - An Online Course for Teachers)</td>
<td>3</td>
</tr>
<tr>
<td>LRES 557</td>
<td>Thermal Biology in YNP</td>
<td>2</td>
</tr>
<tr>
<td>LRES 569</td>
<td>Ecol of Invasive Plants in GYE</td>
<td>2</td>
</tr>
<tr>
<td>LRES 591</td>
<td>Special Topics (Yellowstone Lake Ecology)</td>
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</tr>
<tr>
<td>MB 536</td>
<td>Exploring Microbiology</td>
<td>3</td>
</tr>
<tr>
<td>MB 538</td>
<td>Cell &amp; Molecular Biol</td>
<td>2</td>
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<tr>
<td>MB 539</td>
<td>Infection and Immunity</td>
<td>3</td>
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<tr>
<td>MB 540</td>
<td>Environmental Microbiology</td>
<td>3</td>
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<tr>
<td>MB 541</td>
<td>Microbial Genetics</td>
<td>3</td>
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<tr>
<td>MB 542</td>
<td>Microbial Ecology</td>
<td>3</td>
</tr>
<tr>
<td>MB 591</td>
<td>Special Topics (Biofilms: The Biodiversity of Slime)</td>
<td>3</td>
</tr>
<tr>
<td>MB 591</td>
<td>Special Topics (Special Topics in Microbiology)</td>
<td>3</td>
</tr>
</tbody>
</table>
Certificate in Science Teaching Physics

From the study of basic forces to investigating the farthest reaches of the universe, this certificate allows the student to meet varying interests or focus on a single area, such as mechanical physics or astronomy.

Complete 12 credits selected from the below list:

- ECI 591: Special Topics (Snow and Avalanche Physics for Science Educators) 3
- EELE 591: Special Topics (Solar Cell Basics for Science Teachers) 2
- PHSX 401: Physics by Inquiry I 3
- PHSX 402: Physics by Inquiry II 3
- PHSX 403: Physics by Inquiry III 3
- PHSX 501: Special Relativity Online 3
- PHSX 511: Astronomy for Teachers 3
- PHSX 512: General Relativity Online 3
- PHSX 513: Quantum Mechanics Online 3
- PHSX 514: Comparative Planetology Online 3
- PHSX 582: Astrobiology for Teachers Online 3
- PHSX 583: Special Topics (Physics of Renewable Energy) 3
- PHSX 591: Special Topics (The Science of Sound) 1
- PHSX 591: Special Topics (The World of Motion) 1
- PHSX 591: Special Topics (Conceptual Physics) 3
- PHSX 591: Special Topics (Electric Circuits & Magnetism) 2
- PHSX 591: Special Topics (Teaching Electricity and Magnetism Using Research-Based Curriculum) 2
- PHSX 591: Special Topics (Teaching Mechanics Using Research-Based Curriculum) 2
- PHSX 591: Special Topics (The World of Forces) 1

What is the Northern Plains Transition to Teaching Program?

- **Teacher Preparation & Licensure**: NPTT prepares adults with college degrees in relevant content areas to prepare for a career in secondary teaching.
- **100% Online**: NPTT coursework is 100% online, and designed to fit into the schedules of busy people who are already working. Distance is no longer a barrier. It takes two to three years to complete all requirements but you can be teaching as early as your second year of the program. (See website for details).
- **Masters Degree**: Coursework is graduate level, and leads to both a Masters of Education (M.Ed.) degree and a professional license to teach.
- **Compact & Rigorous**: All courses are designed specifically for the online environment and for an academically accomplished audience. Each course is eight weeks long offered back to back to accommodate working professionals.
- **Flexible; Asynchronous**: Students move through the program in cohort type learning communities, but daily engagement can be done at any time, and does not require specific log in time (coursework is entirely “asynchronous” within the weekly cycle of activities.
- **Field Experiences**: Early field experiences ensure understanding of classroom realities in preparation for the practicum (student teaching or internship).
- **Practicum**: The NPTT program culminates in a teaching practicum -- either in a traditional student teaching (EDCI 598 - 6 cr.) or an internship (EDCI 598 - 3 cr.) for those candidates who are able to secure a paid teaching position in the second year.
- **Nationally Accredited**: NPTT is fully accredited by the state of Montana and by the Teacher Education Accreditation Council (TEAC/CAEP).

Program Requirements

NPTT consists of a 31 to 36 credit, 10 course sequence plus a teaching practicum (either 3 or 6 credits) to earn the Master of Education degree. Students must also take and pass the appropriate Praxis II exam.

Admissions

Admissions are conducted on a rolling basis and typically take five to ten working days to complete. Please see this link (http://www.montana.edu/nptt/faq).

Application Process

Apply online through The Graduate School (http://www.montana.edu/gradschool/apply.html) (there will be a $60 non-refundable application fee). Be prepared to submit the following materials during the online application process:

1. **Personal Statement**: Describe your previous work history, academic preparation, and work with children or adolescents. Describe the unique characteristics, academic abilities, and personal traits that qualify you to become a teacher. Describe why you want to enter the teaching profession, and what you expect to encounter as a teacher. The combined essays should be at least 5-8 pages, double spaced, with standard margins in 12 point serif font (Times New Roman or similar), and properly edited.

2. **Curriculum Vitae or Resume**: The information should be current and inclusive of all experiences. Please ensure that large gaps in time are accounted for in the document. Please indicate what subject/
endorsement area you intend to pursue licensure in (based on the content area options offered through NPTT in the TEPP section) as part of your objective statement in the resume/vita.

3. Three letters of recommendation: Recommendations should be from individuals qualified to assess your ability and potential as a graduate student and individuals able to attest to your work ethic and professionalism. Examples of individuals qualified to assess your potential as a graduate student are professors in your major field, technical supervisors, department heads, or deans from your baccalaureate institution. We do realize, however, that in some cases applicants will not be able to provide a university reference due to time out of higher education. Examples of individuals qualified to assess your abilities in the job place are your most recent employer or supervisor. References from relatives are not acceptable. Please be prepared to provide contact information for your recommenders during the online application process.

4. Completed TEPP forms (http://www.montana.edu/nptt/about/teachable.html) (See Teachable Subjects here (http://www.montana.edu/nptt/about/teachable.html)).

5. Official academic transcripts from all institutions attended (An applicant does not need to submit transcripts for a degree awarded at MSU).

6. Criminal Records (http://www.montana.edu/nptt/backgroundcheck.html) (Disclosure)

7. International applicants: must submit the same application materials as US applicants. Additionally, the applicant must hold a four year bachelor’s degree equivalent.

Application Deadlines
NPTT accepts rolling applications for four start dates per year. Please contact the NPTT office for details (http://www.montana.edu/nptt). Please speak with the Northern Plains Transition to Teaching staff about the M.Ed. application process during your initial application question and answer session.

Other Information
Program Costs
Tuition is based on Montana State University’s fee schedule for online only graduate students. This information is available here: http://www.montana.edu/online/cost/

Financial Assistance
Financial aid is available to NPTT students most (but not all) semesters. In order to qualify, you are required to file the FASFA form and to follow MSU (http://www.montana.edu/wwwfa) procedures for applying for financial aid.

Master of Education
Curriculum and Instruction
The M.Ed. is earned through successful completion of the 30 or 36 credit Northern Plains Transition to Teaching program course sequence and the Teaching Practicum and associated credits (4 or 6). When completed, NPTT students will earn a Master of Education degree in Education, with an option in Curriculum and Instruction.

Required Courses

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>EDCI 552</td>
<td>Human Development and the Psychology of Learning</td>
<td>3</td>
</tr>
<tr>
<td>EDCI 553</td>
<td>Diversity, Special Needs, and Classroom Discipline</td>
<td>3</td>
</tr>
<tr>
<td>EDCI 554</td>
<td>Curriculum Design, Pedagogy, &amp; Assessment</td>
<td>3</td>
</tr>
</tbody>
</table>

Interdisciplinary and Other Programs

Graduate Programs Available:
- Doctor of Philosophy in Ecology and Environmental Sciences (p. 293)
- Master of Science in Environmental Engineering (p. 341)
- Master of Science in Health Science (p. 395)
- Master of Science in Science Education (p. 388)
- Molecular BioSciences Program (p. 398)
- Professional Master of Science and Engineering Management (p. 341)
- Post Baccalaureate Pre-Medical Certificate (p. 399)
- Doctor of Philosophy in Materials Science (p. 402)
- WIMU Regional Program in Veterinary Medicine (p. 403)
- WWAMI Medical Education Program (p. 403)

Master of Science in Health Sciences
The intent of the MS in Health Sciences program is to provide students with an opportunity to diversify or further enhance their educational foundation through graduate education that can be applied to any of several career paths in the health care field. The program supports and formalizes the educational endeavors of MSU graduates, Post Baccalaureate Pre-Medical Certificate (p. 399) students, and other students who attend MSU to better prepare for matriculation into health care-related professional schools. The MS in Health Sciences program was approved in early 2009 and the first students matriculated in August 2009. The program requires at least two consecutive semesters and the class size is capped at 30 students.

The MS in Health Sciences program can be combined with the Post Baccalaureate Pre-Medical Certificate program to provide a continuous and more in-depth degree program and educational experience. For those students applying to health professional school, the MS in Health Sciences can be completed during the application ‘glide’ year.

Additionally, students who have a solid science background, and thus do not qualify for the Certificate program, can be eligible to enter directly into the one year MS in Health Sciences program. The pre-requisites are such that students are able to build on a substantial foundation in the basic sciences and broaden their academic experience.
Coordinator:
Sheila Nielsen, PhD (http://www.montana.edu/hpa/drn.html)

Assistant:
Kathy Weaver
Health Professions Advising
317 Leon Johnson Hall, Bozeman, MT 59717
Tel: 406 994-1670 Fax: 406 994-4398
Email: hpa@montana.edu
Home page for HPA (http://www.montana.edu/hpa)

How to Apply
1. An online application for the MS in Health Sciences can be found at The Graduate School (http://www.montana.edu/gradschool/apply.html).
2. Follow application instructions carefully to ensure timely submission, application processing, and committee review.
   a. For Educational Goals/Admission Type, select "Master Degree"
   b. For Program Selection, select "Master of Science in Health Sciences"
3. Applications are accepted Oct 1 - Feb 28. Applications are reviewed throughout the cycle by the admissions committee and decisions are made and communicated to the applicant as quickly as possible.
4. Pre-requisites include a year each of general chemistry, organic/biochemistry, biology, and physics. A year of math to include one semester of statistics is also required.
5. Please email our office at hpa@montana.edu to make us aware that you have submitted an application.

Program Specifics
- Available to students is a clinical observation course (MEDS 541 Clinical Practicum) and a health-care focused, graduate-level journal club (MEDS 594 Seminar).
- Students will choose an emphasis among Molecular Medical, Community Health, International, or Health and Medicine.
- Students will complete a scholarly project and present in a public forum and provide a written report (MEDS 575 Professional Paper and Project).
- Students are encouraged to participate in a semester-long application preparation process (Prep2Apply) for health professional school, if appropriate.
- Students who successfully complete program will receive their degree during the spring graduation ceremony.

Recommended Courses:

Molecular Medicine

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>BIOH 405</td>
<td>Hematology</td>
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<tr>
<td>BIOH 422</td>
<td>Genes and Cancer</td>
<td>3</td>
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<tr>
<td>BIOH 425</td>
<td>Sensory Neurophysiology</td>
<td>3</td>
</tr>
<tr>
<td>BIOH 435</td>
<td>Cognitive Neuroscience</td>
<td>3</td>
</tr>
<tr>
<td>BIOH 455</td>
<td>Molecular Medicine</td>
<td>3</td>
</tr>
<tr>
<td>BIOH 411</td>
<td>Adv Human Anatomy</td>
<td>4</td>
</tr>
<tr>
<td>BCH 441</td>
<td>Biochemistry of Macromolecules</td>
<td>3</td>
</tr>
<tr>
<td>BCH 545</td>
<td>Proteins</td>
<td>3</td>
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<tr>
<td>BIOB 410</td>
<td>Immunology</td>
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<tr>
<td>BIOB 438</td>
<td>Developmental Mechanisms</td>
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<tr>
<td>BIOB 524</td>
<td>Ethical Practice of Science</td>
<td>3</td>
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<tr>
<td>BIOO 412</td>
<td>Animal Physiology</td>
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</tr>
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<td>BIOL 409</td>
<td>Advanced Human Torso Anatomy</td>
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<td>BIOL 510</td>
<td>Topics in Neurobiology</td>
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<td>BIOM 400</td>
<td>Medical Microbiology</td>
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<tr>
<td>BIOM 431</td>
<td>Medical Bacteriology</td>
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</tr>
<tr>
<td>BIOM 435</td>
<td>Virology</td>
<td>3</td>
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<td>BIOM 441</td>
<td>Eukaryotic Pathogens</td>
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</tr>
<tr>
<td>MB 520</td>
<td>Microbial Physiology</td>
<td>3</td>
</tr>
<tr>
<td>MB 525</td>
<td>Advanced Immunology</td>
<td>3</td>
</tr>
<tr>
<td>MB 528</td>
<td>Advanced Genetics</td>
<td>3</td>
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<tr>
<td>MB 537</td>
<td>Advance in Molecular Evol</td>
<td>3</td>
</tr>
<tr>
<td>MB 530</td>
<td>Virology</td>
<td>3</td>
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<td>IMID 501</td>
<td>Expres Immunology/Pathology</td>
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<tr>
<td>IMID 505</td>
<td>Eukaryotic Gene Regulation</td>
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<td>NUTR 421</td>
<td>Macronutrient Metabolism</td>
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<td>NUTR 422</td>
<td>Micronutrient Metabolism</td>
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<td>HSTR 419</td>
<td>Modern Science</td>
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<td>HSTR 417</td>
<td>Early Modern Science</td>
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Community Health

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<th>Course Title</th>
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<tr>
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<tr>
<td>NASX 525</td>
<td>Indigen Phil/Sacred Ecologies</td>
<td>3</td>
</tr>
<tr>
<td>CHTH 428</td>
<td>Health Disparities</td>
<td>3</td>
</tr>
<tr>
<td>CHTH 502</td>
<td>Theories and Models in Health</td>
<td>3</td>
</tr>
<tr>
<td>HTH 455</td>
<td>The Ethic of Care</td>
<td>3</td>
</tr>
<tr>
<td>HSTA 412H</td>
<td>American Thought and Culture</td>
<td>3</td>
</tr>
<tr>
<td>HSTA 416</td>
<td>Race and Class in America</td>
<td>3</td>
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<tr>
<td>NRSG 418</td>
<td>Hlth Policy/Hlth Care Econ Cln</td>
<td>2</td>
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<tr>
<td>NRSG 550</td>
<td></td>
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<td>NRSG 553</td>
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<td>NRSG 560</td>
<td></td>
<td>4</td>
</tr>
<tr>
<td>NRSG 565</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>PSCI 436</td>
<td>Politics of Food &amp; Hunger</td>
<td>3</td>
</tr>
<tr>
<td>PSCI 554</td>
<td>Foundations of Public Administration</td>
<td>3</td>
</tr>
<tr>
<td>PSCI 560</td>
<td>Ethics and Public Service</td>
<td>3</td>
</tr>
<tr>
<td>PSYX 477</td>
<td>Science of Psych Well-Being</td>
<td>3</td>
</tr>
<tr>
<td>PSYX 481</td>
<td>Judgment &amp; Decision Making</td>
<td>3</td>
</tr>
<tr>
<td>PSYX 544</td>
<td>Social Psychology</td>
<td>3</td>
</tr>
<tr>
<td>ECNS 501</td>
<td>Microeconomic Theory</td>
<td>3</td>
</tr>
<tr>
<td>EIND 513</td>
<td>Human Factors in the Safety of Complex Systems</td>
<td>3</td>
</tr>
<tr>
<td>SFBS 551</td>
<td>Global Food Perspectives</td>
<td>3</td>
</tr>
<tr>
<td>NASX 515</td>
<td>Native Food Systems</td>
<td>3</td>
</tr>
</tbody>
</table>

International

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>SFBS 451R</td>
<td>Sustainable Food Systems</td>
<td>3</td>
</tr>
<tr>
<td>SFBS 551</td>
<td>Global Food Perspectives</td>
<td>3</td>
</tr>
<tr>
<td>PSCI 436</td>
<td>Politics of Food &amp; Hunger</td>
<td>3</td>
</tr>
<tr>
<td>PSCI 439</td>
<td>International Human Rights</td>
<td>3</td>
</tr>
<tr>
<td>NASX 515</td>
<td>Native Food Systems</td>
<td>3</td>
</tr>
<tr>
<td>NASX 525</td>
<td>Indigen Phil/Sacred Ecologies</td>
<td>3</td>
</tr>
<tr>
<td>AGSC 465R</td>
<td>Health, Agriculture, Poverty</td>
<td>4</td>
</tr>
<tr>
<td>ECNS 501</td>
<td>Microeconomic Theory</td>
<td>3</td>
</tr>
<tr>
<td>EIND 513</td>
<td>Human Factors in the Safety of Complex Systems</td>
<td>3</td>
</tr>
<tr>
<td>CHTH 428</td>
<td>Health Disparities</td>
<td>3</td>
</tr>
</tbody>
</table>
Program Features

- Designed for science educators by experienced science, science education, and mathematics faculty with the collaboration of outstanding classroom teachers
- Over 80% of the courses may be taken on-line by asynchronous, computer-mediated communication
- The opportunity to work at home without frequent trips to campus
- The chance to participate in classes when it is most convenient for you
- Popular on-campus summer field and lab experiences that vary in length from one to two weeks
- Personalized science education capstone project for each student
- Interdisciplinary/inter-college program

Online graduate courses are offered during the fall, spring, and summer sessions; however, Montana-based field and lab graduate courses are offered during the summer session, only.

In addition to completing a group of core courses (14 credits total) which includes the 3-credit capstone project, students develop interdisciplinary combinations of science courses (12 credits minimum) from offerings in biology, chemistry, earth science, microbiology, plant sciences, physics, and other related areas. The final 4 credits in the 30-credit program are electives selected from education and/or science courses.

Interdisciplinary efforts and incorporation of both science content and pedagogy have been encouraged during the development of courses. Each student seeking the degree is advised by a three-person faculty committee, and programs are designed taking into account the student’s background, interests, and career goals.

Instructors

The MSSE degree program was developed by Montana State University faculty members who are active in science, science education, and mathematics. The program is a unique, cooperative effort of several colleges and departments. Faculty members of the departments of Biology, Chemistry and Biochemistry, Earth Science, Education, Health and Human Development, Land Resources and Environmental Science, Mathematics, Microbiology, Plant Science and Environmental Science, Physics, and other related areas such as Engineering will teach most courses. Faculty members of other departments and units will play a major role in some courses. Science courses are offered through the appropriate science content department.

Program Requirements

The program of study may begin with distance learning courses in any semester or summer classes at the MSU-Bozeman campus. Study continues with distance learning courses that students take from their homes or workplaces, and ends with a campus visit for presentation of the results of a personalized science education capstone project. Over 80% of the courses and credits may be taken off-campus by asynchronous, computer-mediated communication. Thirty semester credits are required for the degree. Students typically will complete the degree in two or three years.

All students seeking the MSSE degree complete core courses (14 credits) in education which includes a three-credit capstone project. For the remaining credits (16), students select interdisciplinary combinations of science content courses (12 credits minimum) from offerings in biology, chemistry, earth science, land resources and environmental science, microbiology, physics, and plant science. Interdisciplinary efforts and incorporation of both science content and pedagogy have been encouraged during the development of courses. The final four credits in the thirty-credit program are electives selected from education and/or science courses.

Required Core Courses

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>MSSE 501</td>
<td>Inquiry Sci Eng Prac</td>
<td>2</td>
</tr>
<tr>
<td>EDCI 504</td>
<td>Assessment and Evaluation in Education</td>
<td>3</td>
</tr>
<tr>
<td>EDCI 505</td>
<td>Foundation of Action Research in Teaching</td>
<td>3</td>
</tr>
<tr>
<td>EDCI 509</td>
<td>Implementing Action Research in Teaching</td>
<td>3</td>
</tr>
<tr>
<td>EDCI 575</td>
<td>Professional Paper and Project</td>
<td>1-4</td>
</tr>
</tbody>
</table>

Master of Science in Science Education

451 Reid Hall, Bozeman, Montana 59717
406-994-5679
Home Page: www.montana.edu/msse

Program Director

Peggy S. Taylor

Admission

Entrance requirements include: a bachelor’s degree in an area of science, science education, or related area; at least two years of science teaching in educational settings; and an undergraduate GPA of 3.0 or higher. Students with a GPA of less than 3.0 have the opportunity to begin the program as a non-degree student to earn admissions.

Applications are accepted throughout the fall, spring, and summer sessions. Application documents include official transcripts, three letters of recommendation, essay, and resume. For more information about the application process, visit the MSSE website (http://www.montana.edu/msse).

CHTH 502 | Theories and Models in Health | 3  
HTH 455 | The Ethic of Care | 3

Health and Medicine

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOB 524</td>
<td>Ethical Practice of Science</td>
<td>3</td>
</tr>
<tr>
<td>PSYX 477</td>
<td>Science of Psych Well-Being</td>
<td>3</td>
</tr>
<tr>
<td>PSYX 541</td>
<td>Cognitive Processes</td>
<td>3</td>
</tr>
<tr>
<td>PSYX 544</td>
<td>Social Psychology</td>
<td>3</td>
</tr>
<tr>
<td>NUTR 411</td>
<td>Nutrition for Sports/Exercise</td>
<td>3</td>
</tr>
<tr>
<td>NUTR 421</td>
<td>Macronutrient Metabolism</td>
<td>3</td>
</tr>
<tr>
<td>NUTR 422</td>
<td>Micronutrient Metabolism</td>
<td>3</td>
</tr>
<tr>
<td>NUTR 425</td>
<td>Medical Nutrition Therapy I</td>
<td>3</td>
</tr>
<tr>
<td>NUTR 511</td>
<td>Exercise Metabolism and Health</td>
<td>3</td>
</tr>
<tr>
<td>EIND 513</td>
<td>Human Factors in the Safety of Complex</td>
<td>3</td>
</tr>
<tr>
<td>NRS 550</td>
<td>Microeconomic Theory</td>
<td>3</td>
</tr>
<tr>
<td>CTH 435</td>
<td>Human Response To Stress</td>
<td>3</td>
</tr>
<tr>
<td>CTH 440</td>
<td>Principles Of Epidemiology</td>
<td>3</td>
</tr>
<tr>
<td>HTH 455</td>
<td>The Ethic of Care</td>
<td>3</td>
</tr>
<tr>
<td>KIN 515</td>
<td>Exercise Performance and Nutr</td>
<td>3</td>
</tr>
<tr>
<td>CTH 502</td>
<td>Theories and Models in Health</td>
<td>3</td>
</tr>
<tr>
<td>HEE 506</td>
<td>Exercise and Chronic Disease</td>
<td>3</td>
</tr>
<tr>
<td>KIN 545</td>
<td>Graduate Exercise Physiology</td>
<td>3</td>
</tr>
</tbody>
</table>
Molecular Biosciences Program

Program Chair
Matthew Fields
113A Lewis Hall
P.O. Box 172580, Bozeman, MT 59717-2580
406-994-6652 Email: mbprogram@montana.edu

Program Description
The Molecular BioSciences Program offers an interdisciplinary program towards a Doctorate in Philosophy. You are able to pursue your science in a research area across departmental boundaries. Our integrated curriculum provides you with broad academic training necessary to excel in life science research. You will be able to participate in a first-year rotation in three different laboratories in your chosen research area.

Research Areas:
• Biofilm Sciences & Engineering (http://mbprogram.montana.edu/dept.asp?in_id=1)
• BioInspired Materials (http://mbprogram.montana.edu/dept.asp?in_id=5)
• Bioinformatics/Genomics/Proteomics (http://mbprogram.montana.edu/dept.asp?in_id=3)
• Biomedical Sciences (http://mbprogram.montana.edu/dept.asp?in_id=7)
• Cell, Developmental, & Molecular Biology (http://mbprogram.montana.edu/dept.asp?in_id=2)
• Chemical Biology (http://mbprogram.montana.edu/dept.asp?in_id=4)
• Environmental Microbiology (http://mbprogram.montana.edu/dept.asp?in_id=11)
• Ecology & Environmental Sciences (http://mbprogram.montana.edu/dept.asp?in_id=14)
• Immunology & Infectious Disease (http://mbprogram.montana.edu/dept.asp?in_id=8)
• Life in Extreme Environments (http://mbprogram.montana.edu/dept.asp?in_id=10)
• Plant Sciences (http://mbprogram.montana.edu/dept.asp?in_id=12)
• Neuroscience (http://mbprogram.montana.edu/dept.asp?in_id=15)
• Virology (http://mbprogram.montana.edu/dept.asp?in_id=6)

Our program offers students a common but rigorous educational experience for the first year, and continued challenge as you begin to specialize during your second year. MB Program students participate in seminar series, program retreats, teaching, and may attend scientific meetings. In the second year once you have chosen a research advisor based on your first-year rotation process, you will be formally admitted to one of the eleven participating departments to conduct a research project leading to the awarding of a Doctorate in Philosophy.

Professors
This interdisciplinary program brings together faculty from over eleven basic science departments: Cell Biology and Neuroscience; Chemical and Biological Engineering; Chemistry and Biochemistry; Computer Science; Earth Sciences; Ecology; Immunology and Infectious Disease; Land Resources and Environmental Sciences; Mathematics; Microbiology; Plant Sciences and Plant Pathology; and three research centers: Center for Biofilm Engineering, Center for BioInspired Materials and the Thermal Biology Institute to provide students with the didactic and laboratory instruction they require to become successful research scientists. Members of the MB Program faculty are internationally recognized for their research. We have over 68 participating faculty (http://mbprogram.montana.edu) for the above mentioned departments and centers.

Admission
Ph.D. Degree Program
It is recommended that applicants for the Ph.D. program have a Bachelor’s or Master’s degree with a solid foundation of science courses

Admission to the doctoral program follows the requirements of The Graduate School. Factors that the department uses in its admissions process include GRE scores, TOEFL scores (for non-native English speakers), reference letters, GPA, research experience and previous coursework.

Details about applying can be found at http://mbprogram.montana.edu/application.asp. The Molecular BioSciences Program encourages applicants to use the online application procedure.

Financial Assistance
The Molecular BioSciences Program at Montana State University is offering outstanding students a fellowship of $22,000 plus tuition per year to fund their Ph.D. graduate education in the life sciences.

Program Requirements
Ph.D. Program First-Year
A Ph.D. student must complete a minimum of 6 credits of coursework each semester their first-year. Required courses include:

Fall Semester
MBSP 594 Molecular Biosci Prgm Sem 1
MBSP 561 Molec Biosci Lab Rotation I 1
MBSP 562 Molec Biosci Lab Rotation II 1

Spring Semester
MBSP 594 Molecular Biosci Prgm Sem 1
MBSP 563 Molec Biosci Lab Rotation III 1
MBSP 564 Molec Biosci Lab Rotation IV 1

Ph.D. Degree in Ecology and Environmental Sciences
This cross-college doctoral degree represents a broad collaboration among departments and faculty from across MSU. It provides the opportunity for motivated students to integrate our world-class faculty research programs in diverse aspects of ecology and environmental sciences, often within the unparalleled natural laboratory that is the Greater Yellowstone Ecosystem. Particular program strengths include terrestrial and aquatic ecology, environmental biogeochemistry, evolutionary biology, hydrology and watershed analysis, quantitative ecology, agroecology, environmental risk assessment, invasive plant ecology and management, conservation biology,
The Post Baccalaureate Pre-Medical Certificate Program is a career-changing opportunity afforded to students by Montana State University through the Health Professions Advising office. As a ‘career-changing’ program, students accepted into this program have earned a non-science bachelor’s degree and have often been employed prior to deciding to pursue a career in medicine or health care. The Certificate program was approve in 2005 as a ‘career-changing’ program and the first students matriculated in May 2006.

The program is 12-15 months (or up to 4 semesters) in length, begins during summer session, and the class size is capped at 20 students.

**Director**
Sheila Nielsen, PhD (http://www.montana.edu/hpa/drnp.html)

**Assistant**
Kathy Weaver
317 Leon Johnson Hall, Bozeman, MT 59717
Home Page for HPA (http://www.montana.edu/hpa)
Email: hpa@montana.edu
Tel: 406 994-1670 Fax: 406 994-4398

**Certificate of Completion**
Certificate of Completion is awarded to students who complete a minimum of 36 credits during the program and will be awarded at the Spring Gala in April.

Students will need to submit and have approved both the Program of Study and Application for Graduation forms (http://www.montana.edu/gradschool/forms.html), the Certificate will be included on the student’s transcript.

**How to Apply**
1. Application for the Post Baccalaureate Pre-Medical Certificate can be found online at The Graduate School (http://www.montana.edu/gradschool/apply.html).
2. Follow application instructions carefully to ensure timely submission, application processing, and committee review.
   a. For Educational Goal/Admission Type, select "Non-Degree Certificate"
   b. For Program Selection, select "Post Baccalaureate Pre-Medical Certificate"
3. Admission is rolling and applications are accepted Oct 1- Feb 28. Applications are reviewed monthly by the admissions committee and decisions are made and communicated to the applicant as quickly as possible.
4. Competency in math, as defined by MSU Math Level 4 or successful completion of College Algebra within the last 5 years, is required at the time of course registration and matriculation. If the appropriate Math is not indicated on your transcripts, please reference in your application how you plan to meet this pre-requisite.
5. Please email our office at hpa@montana.edu to make us aware that you have submitted an application.

**Program Specifics**
While at MSU students complete professional school pre-requisites and prepare for a competitive application.

- Curriculum typically consists of 1 year each of biology, general chemistry, organic chemistry, physics and a semester of biochemistry. Additional courses such as statistics, calculus, psychology, and sociology may be recommended depending on undergraduate coursework completed.
- Available to students is a clinical observation course (MEDS 541 Clinical Practicum) and a health-care focused, graduate-level journal club (MEDS 594 Seminar).
- Most courses are taken at the undergraduate level and with the undergraduate students. The exceptions are the two graduate level courses listed above.
• Students are encouraged to participate in a semester-long application preparation process (Prep2Apply).
• The didactic portion of the Certificate program can be tailored to prepare the student to apply to any among a broad range of professional schools, including, but not limited to medical, dental, physician assistant and pharmacy.

Students apply to professional school at the end of the Certificate program and, therefore, experience an application glide year. We encourage students to consider the 1-year Master of Science in Health Sciences (p. 395) program during the glide year to further enhance their academic foundation prior to professional school matriculation.

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**Recommended Schedule of Courses**

**Summer Sessions (2)**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Title</th>
<th>Credits</th>
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<tr>
<td>CHMY 141</td>
<td>College Chemistry I</td>
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<tr>
<td>CHMY 143</td>
<td>College Chemistry II</td>
<td>4</td>
</tr>
<tr>
<td>PHSX 205</td>
<td>College Physics I</td>
<td>4</td>
</tr>
<tr>
<td>PHSX 207</td>
<td>College Physics II</td>
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**Fall Semester**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Title</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>CHMY 321</td>
<td>Organic Chemistry I</td>
<td>4</td>
</tr>
<tr>
<td>BIOB 260</td>
<td>Cellular and Molecular Biology</td>
<td>4</td>
</tr>
<tr>
<td>STAT 216Q</td>
<td>Introduction to Statistics</td>
<td>3</td>
</tr>
<tr>
<td>Elective</td>
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**Spring Semester**

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</thead>
<tbody>
<tr>
<td>CHMY 323</td>
<td>Organic Chemistry II</td>
<td>4</td>
</tr>
<tr>
<td>BIOB 375</td>
<td>General Genetics (or)</td>
<td>3</td>
</tr>
<tr>
<td>BIOH 320</td>
<td>Biomedical Genetics</td>
<td>3</td>
</tr>
<tr>
<td>Electives</td>
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</table>

**Summer Session (1)**

<table>
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</thead>
<tbody>
<tr>
<td>BCH 380</td>
<td>Biochemistry</td>
<td>5</td>
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</tbody>
</table>

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**Professional Master of Science and Engineering Management (PMSEM)**

MSU’s Professional Master of Science and Engineering Management (PMSEM) degree is a 30-credit interdisciplinary graduate program that helps working professionals bridge the gap between science and engineering and business management in the workplace. Students complete 15 credits of foundational coursework and an additional 15 credits based on their educational needs. There is also a 12 credit graduate certificate option available.

This program provides professionals with an alternative to the traditional research-oriented M.S. degree in the sciences or engineering or a strictly business-focused M.B.A. At the core of the program are foundation courses in business and technical management that are relevant to today’s business world and highly valued by industry. Students can choose elective coursework that is most relevant to their career goals. The degree may be completed in two years and is designed to accommodate the unique needs and schedules of working professionals.

Coursework and instructors come from MSU’s renowned Colleges of Business, Engineering and Letters & Science. This program will prepare professionals for success at the management or executive level in the rapidly changing business environment of the 21st Century.

---

**Professional Master of Science and Engineering Management Requirements:**

Potential students must have the following:

- Bachelors degree in a science or engineering field
- 2 or more years of full-time employment in a science or engineering industry and a letter of recommendation from the employer OR Graduate Record Exam (GRE) with a minimum score of approximately 300.
- 3.0 undergraduate GPA

To apply to the program fill out a Graduate School Application online (http://www.montana.edu/gradschool/apply.html) (submit a $60 non-refundable application fee). During the online application process, you will be asked to submit the following items:

- Official Transcripts from all post-secondary institutions sent to the Program manager (Transcripts with degrees awarded from MSU are not required).
- 3 letters of recommendation
- Narrative of goals and interest in obtaining PMSEM degree
- Resume

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**Curriculum**

**Required Coursework (15 credits)**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>MSEM 501</td>
<td>Leading Human &amp; Fin Ent (Fall)</td>
<td>9</td>
</tr>
<tr>
<td>MSEM 502</td>
<td>Leading the Tech Enterprise (Spring)</td>
<td>6</td>
</tr>
</tbody>
</table>

**Electives (15 credits)**

The electives that may be taken depend on the degree track you are accepted into. There are three tracks - Construction Engineering Management, Land Resources Environmental Sciences, and the Independent track. Students must petition to change tracks.

**Construction Engineering Management Track**

Students will take 15 credits in topics such as quality management, construction industry law, productivity and more. These courses can be taken fully online.

This track leverages the foundation course topics and further develops the civil or construction engineer’s technical knowledge base. The track’s core courses focus on specific needs of the construction industry and the executive’s role for addressing those needs inside a successful construction company. The 3 credit professional paper is a required capstone course which allows the student to apply concepts learned to their current job situation.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECIV 504</td>
<td>Construction Productivity</td>
<td>3</td>
</tr>
<tr>
<td>ECIV 505</td>
<td>Quality Assure/Risk Management</td>
<td>3</td>
</tr>
<tr>
<td>ECIV 506</td>
<td>Ad Construction Management</td>
<td>3</td>
</tr>
<tr>
<td>ECIV 507</td>
<td>Law of the Construction Industry</td>
<td>3</td>
</tr>
<tr>
<td>ECIV 575</td>
<td>Research or Prof Paper/Project (Required capstone course)</td>
<td>3</td>
</tr>
<tr>
<td>ECIV 592</td>
<td>Independent Study</td>
<td>3</td>
</tr>
</tbody>
</table>

For more information about the Construction Engineering Management Track, contact:

Penny Knoll
MSU Civil Engineering
205 Cobleigh Hall, Bozeman, MT 59717-3900
Land Resources Environmental Sciences Track

Students will take 15 credits in topics such as environmental risk management, watershed hydrology, landscape and ecosystem management and more. These courses can be taken fully online.

Programs are specifically adapted to each graduate student and often address processes at multiple scales through well-integrated, multi-disciplinary efforts. Understanding is developed through targeted advanced coursework tailored to the student.

AGSC 401 Integrated Pest Management 3
ENTO 510 Insect Ecology 3
LRES 507 Environmental Risk Assessment 3
LRES 510 Biodiversity Methods 3
LRES 521 Holistic Thought & Management 3
LRES 540 Ecology Plants & Community 3
LRES 544 Water Quality 3
LRES 565 Environmental Biophysics 3
LRES 569 Ecol of Invasive Plants in GYE 2
LRES 571 Landscape & Ecosys Ecology 3
LRES 573 Remote Sensing Env Sci 3
LRES 575 Prof Paper & Project 3
LRES 591 Special Topics (Applied Watershed Hydrology) 3
LRES 591 Special Topics (Soil Ecosystems and Processes) 3
LRES 591 Special Topics (Soil Ecosystems and Processes) 3
LRES 592 Independent Study 1-3
PSPP 546 Herbicide Physiology 3
MB 527 Toxicology 3

Individually Designed Track

Students will work with their adviser to select elective courses from their field, such as biology, chemistry, computer science, earth sciences, engineering, mathematics, physics, statistics or others deemed relevant. Online courses may be available; depending on the student’s individualized plan, on-campus coursework may be required. Any course from the list below may be included. Other courses may be included with adviser permission.

ECIV 504 Construction Productivity 3
ECIV 505 Quality Assurance/Risk Management 3
ECIV 506 Ad Construction Management 3
ECIV 507 Law of the Construction Industry 3
ECIV 575 Research or Prof Paper/Project 3
ECIV 592 Independent Study 3
ECIV 598 Internship 2
AGSC 401 Integrated Pest Management 3
ENTO 510 Insect Ecology 3
LRES 507 Environmental Risk Assessment 3
LRES 510 Biodiversity Methods 3
LRES 521 Holistic Thought & Management 3
LRES 540 Ecology Plants & Community 3
LRES 544 Water Quality 3
LRES 565 Environmental Biophysics 3
LRES 569 Ecol of Invasive Plants in GYE 2

For More Information
Contact Lisa Brown, Program Manager, at lisa.brown@montana.edu or (406) 994-3062.
Explore Further

- Other Montana State Online Degree and Certificate Programs (http://eu.montana.edu/online/degrees)
- Frequently Asked Questions (http://eu.montana.edu/online/faq) concerning online courses.
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Ph.D. in Materials Science

Participating Departments:
Chemistry and Biochemistry, Physics, Chemical and Biological Engineering, Mechanical and Industrial Engineering, and Electrical and Computing Engineering.

Program Director
Professor Robert Walker
Department of Chemistry and Biochemistry

Information Contact
Doreen Brown Ed.D
Department of Chemistry and Biochemistry
Tel: 406-994-4802 Fax: 406-994-5407

Link to home page for General information (http://www.mtmatsci.org)

Overview

MSU is part of a collaborative Ph.D. program with UMT and MTech in materials science (MatSci). At MSU, the Ph.D program involves multiple departments, faculty, courses, and research infrastructure. Research specialties are focused in biomaterials; electronic, photonic, and magnetic materials; materials for energy storage, conversion, and conservation; and materials synthesis, processing, and fabrication. The curriculum integrates a broad range of physical science and engineering disciplines, and allows a student to further broaden his or her education through the use of an even broader range of applications: from health and medicine to nanotechnology to energy, environment, and natural resources. Each student will complete original, independent research culminating in a dissertation.

Admission

To enter the Ph.D. program, the student must have earned a B.S. or a B.A degree (or equivalent) in materials science, materials engineering, physics, chemistry, metallurgy, or related science or engineering field. The student’s academic record must provide evidence of a strong performance in the fundamentals of science and/or engineering principles. A student with such a background, who has not passed certain undergraduate courses, that are prerequisites for their required or elective graduate courses, must remedy this gap as expeditiously as possible, either by taking the prerequisite undergraduate course or through independent study and “credit by examination.”

Applicants must be formally admitted to The Graduate School. See the Admission Policies and Application Requirements sections for additional information at www.montana.edu/wwwdg/.

Financial Assistance

Degree Requirements and Curriculum

The MatSci Ph.D. curriculum is designed to be flexible, but still provide students with an exceptionally strong and broad understanding of the foundational concepts and skills in the field of materials science and engineering. All students in the program—regardless of specialty—will understand how classes of materials derive their properties from the atomic to the macroscopic level and be familiar with the growing set of materials fabrication, assembly, processing, and characterization tools and techniques. Furthermore, students will be aware of and committed to the professional and ethical standards of the field. Students are also expected to become aware of the economic, societal, and other broader impacts of materials and materials research. Through their dissertation research, students will demonstrate that they can conceive, plan, design, conduct, analyze, defend, publish, and communicate original and creative research that advances understanding in an area important to MatSci.

The MatSci Ph.D. will require a minimum of 60 semester credits beyond the bachelor’s degree. Of the 60 credits, at least 18 credits must be obtained for dissertation research, and at least 32 credits must be earned for coursework.

In addition to the core curriculum, each student must earn at least 12 credits of electives within or related to the chosen specialty. Typically, this coursework would be completed by the end of the student’s second year. Additional elective courses intended to provide a student with specialized expertise and/or skills relevant to their dissertation research may be recommended by the individual student’s advisor and committee.

Other Requirements

Other requirements include the qualifying exam, the candidacy exam, the dissertation, participation in the program’s annual summer symposium, annual meetings with a student’s advisory committee, and an optional internship.

Core Courses

- MTSI 501 Advanced Materials Science I
- MTSI 502 Adv Materials Science II
- MTSI 511 Thermodynamics of Materials
- MTSI 512 Kinetics Phase Transformations
- MTSI 551 Adv Material Character I/ MTSI 552 Adv Material Character II
- MTSI 594 Seminar
- MTSI 690 DISSERTATION RESEARCH

Electives

- MTSC 580 SPECIAL TOPICS
- MTSC 589 COLLABORATIVE PROJECT

Other Electives

Elective courses will be available, allowing students to deepen their understanding and research skills in the program’s focus areas:

1. biomaterials;
2. materials for energy storage, conversion, and conservation;
3. electronic, magnetic, and photonic materials; and
4. materials synthesis, processing, and fabrication.

Some electives will be developed specifically for the MatSci Ph.D. program, others would be graduate courses from other related graduate programs at the three campuses. Courses in mathematics, statistics, and numerical modeling would be recommended for students with special interests in theory and simulation.

Graduate students in the program are supported continuously throughout their studies by stipends that average between $22,000 and $24,000 per
year and by tuition waivers. First-year students are supported as graduate teaching assistants, while most students in their second and later years are appointed to grant-funded projects as graduate research assistants.

**WIMU Regional Program in Veterinary Medicine**

**Why WIMU Regional Program in Veterinary Medicine?**

Montana State University (MSU) has joined the University of Idaho (UI) and Utah State University (USU) as partners with Washington State University (WSU) in its Regional Program in Veterinary Medical Education to serve the states of Washington, Idaho, Montana, and Utah. This innovative and highly successful program, now known as the Washington-Idaho-Montana-Utah (WIMU) Regional Program, has served hundreds of students in the Northwest and northern Rockies for nearly 40 years.

The WIMU regional program serves students with interests in all facets of the veterinary profession, whether they are interested in companion animals, horses or livestock, in private practice, industry or academia, or whether they are unsure. The opportunities available for DVM education in the WIMU regional program prepares graduates for entry into any of the exciting dimensions of veterinary medicine.

Up to ten Montana students will spend their first year in Bozeman at Montana State University.* MSU faculty members from several different departments will teach the 1st year curriculum which includes Anatomy, Histology, Physiology, Neuroscience, Immunology, General Pathology, Professionalism and Ethics, Introduction to Clinics, and Introduction to Surgery. Several have taught in the long-standing WWAMI Medical Education Program of the University of Washington and are very experienced health science educators. Combining some instructional efforts for DVM and MD students will lead to opportunities for students to be educated in a One Health context, where veterinary medicine and human medicine intersect to greatly affect public health and the safety of our food supply.

Classroom and clinical study will continue in years 2 and 3 on WSU’s Pullman campus. Students then have the opportunity to learn in a wide network of clinical placements throughout the four-state region in the 4th year before graduating as part of the Class of 2019.

*Montana continues to support nine WICHE positions in veterinary medicine

Please see our prospective student website (http://dvm.vetmed.wsu.edu/prospective-students) for more information on the WIMU Regional Program through the Washington State University College of Veterinary Medicine.

**Hands-on Experience**

Students in the Regional Program gain hands-on experience early in the program. Courses in client communication, diagnostic challenges, and business skills, give our students the tools they need to succeed.

- Local practitioners will provide personal hands-on experience for students on the Montana State University campus.
- Montana specialists in internal medicine, pathology, radiology, surgery, lab animal medicine, and clinical practice will participate and enrich the first year curriculum.
- Courses in client communication, diagnostic challenges, and business skills, give our students the tools they need to succeed. All students participate in the Cougar Orientation Leadership Experience (COLE), an off-site retreat designed to promote leadership skills and team building. COLE brings students from different places and sets the foundation for cooperation and teamwork over the next four years.
- The MSU hands-on approach will continue because the Pullman faculty encourages and welcomes students to get all they can out of time spent in the Veterinary Teaching Hospital and with faculty on educational trips outside of the program.
- As part of the Regional Program Montana students will have more choices to study in a wider network of clinical practice sites throughout the region as we add more Montana practices and facilities to our fourth year curriculum.

**WWAMI Medical Education Program**

**Director**

Martin Teintze, Ph.D.
310 Leon Johnson Hall
Email: mteintze@montana.edu
Home Page: www.montana.edu/wwwwami

**Program Manager**

Ashley Siemer
308 Leon Johnson Hall
Tel: 406-994-4411, email: ashley.siemer@montana.edu

**Program Description**

Sponsored by the University of Washington School of Medicine and leading to an M.D. degree from that school, the WWAMI program is designed to provide medical education for citizens of the participating states (Washington, Wyoming, Alaska, Montana and Idaho), to provide a
Physician workforce for these states, and to encourage physicians to practice in locations where they are most needed.

WWAMI is a medical school program, not a premedical program. The program is supported by the State of Montana and guarantees that 30 qualified Montana residents can be admitted to the Medical School at the University of Washington School of Medicine each year.

Students who enter the program complete their Foundations Phase (18 months) at the participating university in their home state. First year programs exist at University of Washington-Seattle, and Spokane, the University of Wyoming-Laramie, the University of Alaska in Anchorage, Montana State University-Bozeman, and the University of Idaho-Moscow. The curriculum at each site has been standardized and is compatible with the University of Washington School of Medicine curriculum which integrates the basic and clinical sciences, and includes rural health care at an early time in medical education.

Course subject matter at MSU includes seven, 3-10 week Blocks and five Threads that will continue throughout the 18th month foundations phase.

At the conclusion of the foundations phase, students enter the Patient Care Phase of their education. During this phase students have the opportunity to complete their third year and part of their fourth year of medical school at either Billings, Bozeman or Missoula. Students receive training from physicians in the communities where the physicians live and practice (community phase). These “Clerkships” are established for a given educational need (e.g., pediatrics, family medicine). Clerkship sites have been established all over the State:

- Billings: Chronic Care, Emergency Medicine, Family Medicine, Internal Medicine, Neurology, OB/GYN, Pediatrics, Psychiatry and Surgery
- Bozeman: Emergency Medicine, Family Medicine, Internal Medicine, OB/GYN, Pediatrics and Surgery
- Butte: Family Medicine
- Dillon: Internal Medicine
- Great Falls: Internal Medicine, Neurology, Pediatrics
- Helena: OB/GYN, Pediatrics & Psychiatry
- Kalispell: Family Medicine, OB/GYN, Surgery
- Lewistown: Family Medicine
- Libby: Family Medicine
- Missoula: Anesthesiology, Family Medicine, Internal Medicine, Neurology, OB/GYN, Ophthalmology, Pediatrics, Psychiatry and Surgery
- Whitefish: Family Medicine

To be eligible for the Montana State University WWAMI program, the prospective medical student must be certified by the Montana University System as a resident of Montana and must satisfy the admission requirements of the University of Washington School of Medicine. It is not necessary for a student to complete the premedical (undergraduate) education at MSU in order to be eligible for the WWAMI program. Students are selected by the Admissions Office at the University of Washington School of Medicine and are registered at the University of Washington School of Medicine as well as at their home institution for the first year and a half of the program.

**Foundations Medical School Curriculum**

The following courses are completed in Bozeman over an 18-month period from August in the first year through December of the following year. Student then study for and take Step I of their National Board exams and then continue to the Patient Care Phase of the curriculum.

**Required Courses: First Fall Semester**

**Block I: Molecular & Cellular Basis of Disease (MCBD)**

**MEDS 510**

This course teaches the principles of cell and molecular biology, biochemistry, and genetics. Aspects include the organization of the genome and units of heredity, properties of macromolecules, and cytoarchitecture.

Students will gain an understanding of intracellular communication, cell-cell interactions, properties of differentiated cells, and the diversity of their physiological properties and functions. Introduction to anatomy, histology and pharmacology content will be incorporated into the course.

**Block II: Invaders & Defenders**

**MEDS 520**

This course will involve integrated content in immune system, microbial biology, infectious diseases, inflammation and repair, and skin and connective tissue. Introduction to anatomy, histology and pharmacology content will be incorporated into the course.

**Required Courses: Spring Semester**

**Block III: Circulatory Systems (CPR)**

**MEDS 530**

Circulatory systems will present students with an integrated approach to the key supply chain and waste management systems of the body.

Students will follow the movement of oxygen from the environment to the tissues, and movement of waste products of metabolism along the opposite path, examining the coordinated roles of the lungs, heart and kidney in the control and regulation of these processes. Introduction to anatomy, histology and pharmacology content will be incorporated into the course.

**Block IV: Blood & Cancer**

**MEDS 540**

This course familiarizes students with the basic pathophysiologic mechanisms leading to disturbances of red cell, white cell, and platelet production, as well as abnormalities of hemostasis presenting clinical problems, with an emphasis on pathophysiology. Additionally, this course will include relevant fundamental scientific principles in anatomy, pathology, and pharmacology.

**Required Courses: Summer Term**

**Block V: Energetics & Homeostasis**

**MEDS 550**

This course will involve integrated content in metabolism, nutrition, obesity, diabetes, gastrointestinal/liver physiology, and endocrinology. Additionally, this course includes relevant fundamental scientific principles in anatomy, pathology, and pharmacology.

**Required Courses: Second Fall Semester**

**Block VI: Mind, Brain & Behavior**

**MEDS 560**

In this course, students will learn the fundamental scientific principles of the structure and function of the normal human nervous system in situ, define major neurologic, psychiatric and behavioral disorders, and develop a systematic approach to their differential diagnosis and management.

**Block VII: Lifecycle & Reproduction**

**MEDS 570**

This course will cover normal and abnormal human development, reproductive functions including formation and maturation of ova and sperm, menstruation, normal pregnancy, and labor and delivery.
Additionally, this course includes relevant fundamental scientific principles in pelvic anatomy, pathology, and pharmacology.

**Threads**

Anatomy, Pathology, Pharmacology, Foundations of Clinical Medicine and a Primary Care Practicum in which students are paired up with a local physician throughout the entire foundations phase.

**Further Information**

Contact Ashley Siemer (WWAMI Program Manager) at MSU or follow the URL http://www.montana.edu/wwamini for the complete application, admissions, and program requirements.

**Jake Jabs College of Business & Entrepreneurship**

**Dean**

Kregg Aytes, Ph.D.
302 Jabs Hall, Bozeman, MT 59717
406-994-4423

**Program Director**

Marc Giullian, Ph.D.
424 Jabs Hall, Bozeman, MT 59717
406-994-1965 Email: busgrad@montana.edu

The mission of the MPAc program is to prepare students for professional careers in accounting. Candidates for the degree will build on the broad general and business education obtained at the undergraduate level to gain more advanced competencies in the practice and theory of financial accounting, auditing, taxation, law, and other business and professional areas. Students will also be introduced to research methods and resources used by accounting professionals. The MPAc program’s goals include:

- To produce graduates who will have long-term success in their accounting careers
- To prepare our graduates to meet the educational requirements recommended by the American Institute of Certified Public Accountants
- To provide our students with access to professional opportunities through career placement services

**Master of Professional Accountancy (MPAc)**

The Jake Jabs College of Business & Entrepreneurship (JJCBE) offers the Master of Professional Accountancy degree. This highly regarded program, in which students consistently pass the CPA exam at rates above the national average, should be considered by students who are interested in pursuing CPA certification or advanced financial positions. When students enter our program, they will have the opportunity to work closely with our nationally-recognized accounting and business faculty, using state-of-the-art technology. With the assistance of the Director of the MPAc program, students will formulate a graduate program of study that will integrate their educational background, areas of interest, and career path.

This emphasis on excellence has created a strong demand for our accounting graduates. Companies from most states in the western United States recruit on campus. Our graduates are employed by international public accounting firms, regional and local public accounting firms, corporations, and federal and state government entities.

**Admission**

A bachelor’s degree in accounting or business from an accredited college or university provides the best foundation for this program. Applicants who have undergraduate course deficiencies may be provisionally admitted while attending to subject matter deficiencies. To apply, see Application Process below. Applicants must be formally admitted by The Graduate School after the preliminary recommendation for admission is reached by the JJCBE. Refer to The Graduate School’s Admission Policies webpage for additional information at: http://www.montana.edu/gradschool/admissions/.

**Dates & Deadlines**

- **Fall term:** June 15th (June 1, international applicants)
- **Spring term:** November 15th (November 1, international applicants)
- **Summer term:** April 15 (April 1, international applicants)

**Priority Deadlines:** Priority deadlines are important for students applying for scholarships and Graduate Teaching Assistantships.

- **Fall term:** March 15th (March 1, international applicants)
- **Spring term:** October 15th (August 1, international applicants)
- **Summer term:** March 15 (January 1, international applicants)

**Application Process**

Applicants to the MPAc program must complete an online Application for Graduate Admission, which can be accessed at: http://www.montana.edu/gradschool/apply.html.

The following documents are required in order for your application to be considered complete and eligible for review:

- Application (http://www.montana.edu/gradschool/apply.html) and the non-refundable $60 application fee
- Official transcripts from each university attended (MSU transcripts past 1988 need not be submitted)
- Official entrance exam scores (GRE or GMAT)
- Three letters of recommendation. Applicants will be prompted to submit contact information for each recommender during the online application process. The applicant should ask people who are able to judge the applicants ability to succeed in graduate school (e.g., one’s undergraduate accounting professors, a CPA who served as a supervisor during an internship, other faculty). Please do not ask for letters of recommendation from family members, friends, roommates, etc.
- One page essay about one’s motivations for entering the program
- International students must also submit official TOEFL or IELTS scores, a financial certificate with supporting documents, and degree certificates.

The MPAc program is highly selective, with a limited number of openings available to qualified students. The MPAc Advisory Council will admit those students whose previous academic performance and/or work experience indicate a desire and ability to excel. Test scores and records of academic performance (with close scrutiny of grades earned in 300 & 400-level accounting courses) are evaluated individually in the admissions procedure. Of equal importance, however, are the applicant’s personal qualifications, accomplishments, and letters of recommendation. The applicant’s entire file is reviewed in order to ensure the admission of those with the highest aptitude, motivation, and qualifications.

For priority consideration, a complete application package must be received by the deadlines noted above. Applications received after the priority deadline may be considered, depending on a variety of factors. Contact

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Montana State University 405
the MPAC Director immediately to determine if circumstances will permit consideration of your late application.

Applicants with non-accounting bachelor degrees, please review this section: http://www.montana.edu/business/accounting/MPAC/FAQ.html#non-accounting

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**Financial Assistance**
The Jake Jabs College of Business & Entrepreneurship (JJCBE) offers scholarships for graduate students. A scholarship application is made available during the month of November only, and is an electronic application (a paper copy is not available).

**Frequently Asked Questions**
For a list of frequently asked questions, please see the MPAC webpage within the JJCBE website at: http://www.montana.edu/business/accounting/MPAC/FAQ.html

**Degree Offered**
The Master of Professional Accountancy (MPAC) degree is designed to prepare students for professional careers in accounting. With the assistance of the MPAC Director, students will formulate a graduate program of study that will integrate their educational background, areas of interest, and career path.

**Program Requirements**
At least 30 credits of acceptable coursework must be completed. Of those, at least 21 credits must be taken at MSU-Bozeman. Elective credits are selected by the student, with approval from the MPAC Director. Students are required to maintain at least a 3.0 semester grade point average, and at least a 3.0 cumulative grade point average at all times while in the MPAC program.

**Required Courses**

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACTG 521</td>
<td>Advanced Auditing</td>
<td>3</td>
</tr>
<tr>
<td>ACTG 525</td>
<td>Accounting Theory and Complex Issues in Accounting</td>
<td>3</td>
</tr>
<tr>
<td>ACTG 526</td>
<td>Advanced Taxation</td>
<td>3</td>
</tr>
<tr>
<td>ACTG 528</td>
<td>Legal Issues for Accountants</td>
<td>3</td>
</tr>
<tr>
<td>ACTG 529</td>
<td>Research in Accounting</td>
<td>3</td>
</tr>
<tr>
<td>ACTG 536</td>
<td>Advanced Accounting</td>
<td>3</td>
</tr>
</tbody>
</table>

Approved Electives: 12 credits

**Total Credits**: 30

For a complete list of approved electives offered, please refer to the MPAC curriculum information within the JJCBE website at: http://www.montana.edu/cob/Accounting/MPAC/curriculum.html.

Refer to The Graduate School’s Policies and Procedures webpage for additional degree requirements at: http://www.montana.edu/gradschool/policy/index.html. Students are expected to be familiar with the degree requirements of both the Jake Jabs College of Business & Entrepreneurship (JJCBE) and The Graduate School.
Course Descriptions

ACT - Activities: General

ACT 104. Beginning Bowling. 1 Credit. (1 Lab; 3 cr max) F,S
Bowling fundamentals will be stressed along with bowling etiquette and equipment. Fee required.

ACT 109. Beginning Racquetball. 1 Credit. (1 Lab; 3 cr max) F,S
This class is designed for beginning to intermediate skill levels. Students will develop the skills, rules and terminology necessary to play recreational racquetball and to appreciate this lifetime sport. Students will also learn singles, doubles, 3 player and a variety of serves and shots.

ACT 110. Beginning Weight Training. 1 Credit. (1 Lab; 3 cr max) F,S
Learn proper weight lifting techniques, how to create a personalized weight training program, and the basics of anatomy/physiology as they relate to weight lifting.

ACT 114. Fund. of Rock Climbing. 1 Credit. (1 Lec) F,S
PREREQUISITES: Comfortable with heights. This course is a basic introduction to the fundamentals of rock climbing through skill sessions, demonstrations, and practical experience. Emphasis will be placed on skill development, health and fitness climbing, and safety in the sport of climbing.

ACT 115. Soccer. 1 Credit. (1 Lab) F
Learn rules and regulations of soccer, basic skills of dribbling, passing, shooting, and play small-sided and full II versus II games.

ACT 116. Wallyball. 1 Credit. (1 Lab) F,S
Introduces wallball skills, techniques, strategies, rules and scoring.

ACT 122. Skiing, Snowboarding, and Telemarking. 1 Credit. (1 Lab; 3 cr max) S
Instruction at all levels of skill from beginner to advanced. Fee required. Transportation, tickets, and equipment not included.

ACT 129. Circuit Training. 1 Credit. (1 Lab; 3 cr max) S
Learn different modes of fitness utilizing a timed sequence of exercises. This includes instruction on weight training and aerobic training. Students will gain knowledge on how to improve muscular strength, body composition, and cardiovascular endurance.

ACT 140. Beginning Basketball. 1 Credit. (1 Lab; 3 cr max) F,S
PREREQUISITE: ACT 140 or played a minimum of 3 years High School basketball. In this beginning course, one will learn the rules, skills, different types of recreational play/games, strategy, and coaching principles of basketball.

ACT 150. Beginning Yoga. 1 Credit. (1 Lab; 3 cr max) F,S,Su
This class is designed for the beginning yoga student. Students will learn to demonstrate basic knowledge of yoga postures and philosophy, identify basic anatomy and principles of alignment and identify the values of mind-body fitness toward a healthy lifestyle. Pass/Fail.

ACT 151. Beginning Billiards. 1 Credit. (1 Lab; 3 cr max) F
Pocket billiard fundamentals, most popular games, and appropriate rules will be stressed. Fee required.

ACT 156. Beginning Aikido. 1 Credit. (1 Lab; 3 cr max) On Demand
The fundamentals of Japanese Aikido as taught by the World Aikido Headquarters will be explored.

ACT 158. Beginning Taekwondo. 1 Credit. (1 Lab; 3 cr max) F,S
To teach basic Taekwondo skills including kicking, punching, foothwork, training routines, and philosophy. The curriculum fulfills requirements by the World Taekwondo Federation for the rank of 7th gup yellow belt.

ACT 163. Race Training 5/10 K. 1 Credit. (1 Lab; 3 cr max) F,S,Su
Learn about running mechanics, modes of training, and achieve that goal a 5K or 10K! Pass/Fail.

ACT 165. Power Cycling: Indoors. 1 Credit. (1 Lab; 3 cr max) F,S
This is a course designed to introduce proper form and safe cycling techniques. Participants will retain knowledge on basic bike fit principles and biking drills. Pass/Fail.

ACT 169. Beginning Tennis. 1 Credit. (1 Lab; 3 cr max) F,S,Su
Students will learn the rules of tennis and how to play singles and doubles. The instructor will teach the basic tennis strokes including forehand, backhand, overhead, volley, and the serve.

ACT 170. Beginning Swimming. 1 Credit. (1 Lab; 3 cr max) F,S
This class designed for the non-swimmer or weak swimmer. Students will learn to develop the skills, breathing, body awareness to learn how to swim, feel safe and comfortable in and around water. Must be able to swim 100 yards without stopping. Swim assessment on first day. Pass/Fail.

ACT 173. Beg Fly Fishing/Fly Tying. 1 Credit. (1 Lab) On Demand
Basic skills and knowledge of fly fishing including: casting, entomology, habitat, stream ethics, tackle, tactics, and strategy.

ACT 176. Fundamentals of Whitewater Rafting. 1 Credit. (1 Lec) F,S
PREREQUISITES: Students entering the course should have minimum swimming ability to be able to traverse lengthwise the university pool (unassisted at least twice). Whitewater rafting is potentially hazardous and each student is responsible for making certain he or she has adequate swimming ability and comfort with moving water to participate in the field based portion of the class. Ability to attend all classroom and field sessions. Introduction to Whitewater Rafting by spending time on the river the students are immersed in the learning environment. Students will be introduced to the basic components of this activity including: Equipment, hydrology & feature terminology, river safety & scenarios and rescue techniques.

ACT 177. Fundamentals of Kayaking. 1 Credit. (1 Lec) F,S
PREREQUISITES: Ability to swim, comfortable in water. Introduction to the fundamentals of Whitewater Kayaking. Including the components of kayaks, basic strokes, rescue and eskimo roll. Introduction to kayaking on moving water and boating safety will be emphasized. On-River field component included.

ACT 178. Beginning Basketball. 1 Credit. (1 Lab) F,S
In this beginning course, one will learn the rules, skills, different types of recreational play/games, strategy, and coaching principles of basketball.

ACT 180. Beginning Volleyball. 1 Credit. (1 Lab; 3 cr max) F,S
This class is designed for beginning to intermediate skill levels. Students will develop the skills, rules and terminology necessary to play recreational volleyball and to appreciate this lifetimes sport. Students will learn the rules for 6v6, 3v3 and beach variations. Students will also learn how to set, pass, spike, dig, block, and rotate.

ACT 191. Special Topics. 1 Credit. (1 Lab; 4 cr max) On Demand
Special Activity classes offered as needed using the unique skills of the instructional faculty in any given semester. May be repeated.

ACT 201. Power Cycling 2: Advanced. 1 Credit. (1 Lab) F,S
Advanced indoor cycling instruction: progressive training techniques and intensities, exercises necessary to improve cycling form, transition from indoor training to outdoor riding, and develop cycling workouts and class structure.

ACT 202. Intermediate Racquetball. 1 Credit. (1 Lab) F,S
PREREQUISITE: ACT 109 or intermediate skill/knowledge in shot selection, strategy, games. Provide the student with intermediate level skills and knowledge in techniques, safety, strategy, and strokes of racquetball.

ACT 209. Intermediate Volleyball. 1 Credit. (1 Lab) F,S
PREREQUISITE: Must have previously taken ACT 180 or played on a Varsity high school team. Students will learn advanced offenses, team concepts, combination drills, and a variety of playing styles.

ACT 210. Intermediate Weight Training. 1 Credit. (1 Lab) F,S
PREREQUISITE: ACT 110 or experience/safety knowledge of how to weight train. This course is designed to help students identify and understand the benefits of weight training, how weight training affects the body, and learn intermediate level training routines for complete muscular development.

ACT 224. Skiing, Cross Country. 1 Credit. (1 Lab) S
The course provides instruction in preparation and execution of the various skills involved in cross country skiing from the beginner through advanced depending on the student’s ability and skill level. Fee required.

ACT 230. Intermediate Yoga. 1 Credit. (1 Lab) F,S
PREREQUISITE: Must previously have been involved in any yoga class 1 time/week. One will learn intermediate yoga principles and postures and will be educated in the core aspects of yoga philosophy.

ACT 232. Argentine Tango. 1 Credit. (1 Lab) F,S
Learn the fundamentals of the movement art of Argentine Tango dancing, techniques, philosophies, connection and improvisational expression to experience the true nature and beauty of this social dance, --.

ACT 236D. Dance as Cultural Expression. 3 Credits. (3 Lec)
Dance as Cultural Expression.

ACT 240. Intermediate Basketball. 1 Credit. (1 Lab) F,S
PREREQUISITE: Played a minimum of 3 years High School basketball or taken ACT 140 This course will teach intermediate basketball skills: skill development, rules, terminology, and specific strategies for basketball.

ACT 250. Pilates. 1 Credit. (1 Lab) F,S
A Pilates-based mat class combining core alignment, posture, and flexibility exercises to build strength and to improve flexibility, agility, body awareness and posture.
ACT 256. Intermediate Taekwondo. 1 Credit. (1 Lab) F,S
PREREQUISITE: ACT 158 or achieved a yellow belt or higher in a martial art. Review the basic and intermediate Taekwondo skills including kicking, punching, footwork, training routines, and philosophy.

ACT 270. Intermediate Swimming. 1 Credit. (1 Lab) F,S
PREREQUISITE: Must have previously taken ACT 170 or intermediate skills in breast stroke/front crawl. Learns skills to swim laps more efficiently. Refine the basic swim strokes.

ACT 272. Advanced Yoga. 1 Credit. (1 Lab; 3 cr. max) F,S
PREREQUISITE: Must have previously taken ACT 230 or practiced yoga 2 times/week for the last year. For those with previous yoga experience and ready to establish an advanced practice and deeper comprehension of yoga, including more understanding of anatomy, alignment, challenging postures, Ayurveda, and therapeutics. University Activity Programs.

ACTG - Accounting

ACTG 101. Accounting Procedures I. 4 Credits. (4 Lec) F,S
Offered by Gallatin College. This first course in financial accounting covers the complete accounting cycle including creating source documents, journalizing transactions, posting to ledgers, preparing work sheets and basic financial statements. This includes the income statement and balance sheet, end of period closing activities, and special journals for service and merchandising businesses. The accrual basis of accounting will be emphasized though other accounting methods will be addressed.

ACTG 102. Accounting Procedures II. 4 Credits. (4 Lec) S
Offered by Gallatin College. PREREQUISITE: ACTG 101. This financial accounting course is a continuation of Accounting Procedures I. Topics include accounts receivable and uncollectible accounts, notes payable and notes receivable, plant assets and depreciation, partnership accounting, corporate organization, capital stock, taxes, dividends and bonds, statements of cash flows, financial statement analysis, and manufacturing accounting.

ACTG 122. Accounting & Business Decision. 3 Credits. (3 Lec) S
Offered by Gallatin College. PREREQUISITE: ACTG 101. Introduces the use of accounting information by managers to make operational and financial decisions in a business entity. Topics covered include selecting a financial entity, registering with the tax authorities, applying ethical behavior to professional situations, financial statement analysis, product cost allocation, cost behavior, and budgeting. The planning, organizing, and control functions of management will be constantly addressed throughout the course.

ACTG 125. QuickBooks. 3 Credits. (3 Lec) S
Offered by Gallatin College. PREREQUISITE: ACTG 101. Using QuickBooks, an accounting system for small-business owners and bookkeepers, students will complete a variety of accounting projects. Topics of this course include creating a company, setting up company lists, editing a preset chart of accounts, entering opening balances, entering sales and invoices, receiving payments and making deposits, handling expenses and bills, working with bank accounts, analyzing financial data, tracking and paying sales tax, managing inventory, and preparing payroll.

ACTG 180. Payroll Accounting. 4 Credits. (4 Lec) F,S
Offered by Gallatin College. Students will become knowledgeable in the payroll records required to comply with various federal and state laws affecting payroll. The Federal Fair Labor Standards Act and the Montana Wage/Hour laws are studied. Offered by Gallatin College. Payroll Accounting. 4 Credits. (4 Lec) F,S
PREREQUISITE: ACTG 101. Federal income taxes as applied to individuals and their businesses with emphasis on income and expense recognition, individual taxation, deferred income taxes, pensions, leases, accounting changes, error analysis, the statement of cash flows and full disclosure in financial accounting.

ACTG 201. Principles of Financial Acct. 3 Credits. (3 Lec) F,S,Su
PREREQUISITE: M 121Q or level of 4 or 5 math course. An introduction to the principles of financial accounting for students of all business curricula. Specific topics include key accounting concepts, accounting transaction recording, financial statement preparation, accounting systems overview, business entity structures and financial statement analysis.

ACTG 202. Principles of Managerial Accounting. 3 Credits. (3 Lec) F,S,Su
PREREQUISITE: ACTG 201. An introduction to the principles of managerial accounting. The majority of the semester will address managerial accounting, the process of providing information to managers for use in planning, control and decision making. Managerial accounting topics include product costing, cost-volume-profit analysis, budgeting, variance analysis, and decision analysis tools. The managerial accounting coverage is preceded by a brief continuation of study of selected principles of financial accounting.

ACTG 205. Computerized Accounting. 3 Credits. (3 Lec) S
Offered by Gallatin College. PREREQUISITE: ACTG 101, CAPP 156. COMPUTERIZED ACCOUNTING (ACTG 102, ACTG 122). Studies how computers are used in today’s accounting environments through the use of an integrated accounting software package. Uses a hands-on approach to complete the accounting cycle for merchandise or service businesses as well as entries for voucher systems, departmentalized accounting, financial statement analysis, depreciation, inventory, and payroll.

ACTG 220. Survey of Accounting. 3 Credits. (3 Lec) On Demand
A survey of the basic accounting model, accounting records, recording business transactions, preparation and analysis of financial statements, and elementary income tax issues in a small business environment. This course is intended for non-business majors and may not substitute for any required business course.

ACTG 223. Principles of Accounting II. 3 Credits. (3 Lec) F,S
PREREQUISITE: ACTG 201. A continuation of the financial accounting topics introduced in ACTG 201. The course helps students learn how to prepare and analyze financial statements, and understand the role that accounting plays in business decisions. Additional topics include: stock and bond investments, cash flow reporting, and a study of the conceptual framework and process by which accounting standards are established.

ACT 209R. Undergraduate Research. 1-6 Credits. (1-6 Ind; max unlimited) F,S
Directed undergraduate research/creative activity which may culminate in a written work or other creative project. Course will address responsible conduct of research. May be repeated.

ACT 291. Special Topics. 1-4 Credits. (1-4 Lec, 12 cr max) On Demand
PREREQUISITE: None required but some may be determined necessary by each offering. Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

ACT 292. Independent Study. 1-3 Credits. (1-3 Ind; 6 cr max) On Demand
PREREQUISITE: Consent of instructor and approval of Associate Dean. Directed research and study on an individual basis. Not to be used as a substitute for a required course.

ACTG 321R. Act Information Systems I. 3 Credits. (3 Lec) F,S
PREREQUISITE: ACTG 223 and BMIS 211. For business majors: Formal admission to the College of Business. A study of how organizations capture, record, store, protect, analyze, and report accounting information. Topics include business processes, transaction processing, internal controls, data security, systems documentation, information technology, and software applications.

ACTG 327. International Financial Accounting and Reporting I. 3 Credits. (3 Lec) F,S
PREREQUISITE: ACTG 223. An in-depth study of the theory of financial accounting and reporting and its application to: cash, current and long-term receivables, inventories, plant assets, natural resources, intangible assets, asset impairments, current liabilities, long-term debt, and contingencies. Fair value concepts, present value measurements, and comparisons between US and international accounting standards will be incorporated.

ACTG 328. Inter Fin Acct & Reporting II. 3 Credits. (3 Lec) F,S
PREREQUISITE: ACTG 327. For business majors: formal admission to the College of Business. The theory and practice of financial accounting and reporting. A study of stockholders’ equity, dilutive securities, earnings per share, investments, revenue recognition, deferred income taxes, pensions, leases, accounting changes, error analysis, the statement of cash flows and full disclosure in financial accounting.

ACTG 401. Principles of Federal Taxation-Individuals. 3 Credits. (3 Lec) F,S
PREREQUISITE: ACTG 202 or ACTG 223. For business majors: formal admission to the College of Business. Federal income taxes as applied to individuals and their businesses with emphasis on income and expense recognition, individual taxation, property transactions, investments, compensation, retirements, home ownership, tax research and tax return preparation.

ACTG 410. Cost Management Accounting I. 3 Credits. (3 Lec) F,S
PREREQUISITE: ACTG 327 and ACTG 202. For business majors: formal admission to the College of Business. Focus on cost accounting concepts, with emphasis on developing and evaluating information that management needs to plan, make key decisions, and monitor business performance. Key topics include cost typology and behavior and how each impacts decision-making process and product costing, cost-volume-profit analysis, flexible budgeting, incremental decision analysis, and performance evaluation.
ACTG 411. Auditing I. 3 Credits. (3 Lec) S
PREREQUISITE: ACTG 328. For business majors: formal admission to the College of Business. Practice and theory of auditing financial statements. A study of most of the major activities performed during the conduct of a financial statement audit, from client acceptance to issuance of an audit report with a focus on auditing standards generally accepted in the United States.

ACTG 415. Government and Nonprofit Accounting I. 3 Credits. (3 Lec) S
PREREQUISITE: Senior standing, and ACTG 328 as pre- or co-requisite. For business majors: formal admission to the College of Business. A study of the accounting principles and financial reporting unique to the governmental and not-for-profit sectors of the U.S. economy.

ACTG 420. Cost Management Accounting II. 3 Credits. (3 Lec) S
PREREQUISITE: ACTG 410. For business majors: formal admission to the College of Business. Advanced topics in cost/managerial accounting. This course examines cost and managerial accounting issues from both technical and applied perspectives. Students will utilize cost accounting and decision analysis tools to evaluate the impacts of managerial decision making.

ACTG 421. Accounting Information Systems II. 3 Credits. (3 Lec) F
PREREQUISITE: Junior standing and completion of ACTG 321R. For business majors: formal admission to the College of Business. Contemporary issues in information systems. Emphasis on the practical application of information technology to improve business efficiency and effectiveness.

ACTG 431. Tax Assistance. 1 Credit. (1 Lab) S
PREREQUISITE: ACTG 401. For business majors: formal admission to the College of Business. Development of knowledge, skills, and organizational methods needed to prepare Federal and State income tax returns. Preparation of income tax returns for low-income clients through the Volunteer Income Tax Assistance Program.

ACTG 436. Advanced Accounting. 3 Credits. (3 Lec) On Demand
PREREQUISITE: ACTG 328. For business majors: formal admission to the College of Business. The theory and practice of financial accounting and reporting pertaining to business combinations and consolidated financial statements, accounting for partnerships and related business forms, foreign currency transactions and financial statement translations, and other advanced accounting topics.

ACTG 441. Financial Statement Analysis. 3 Credits. (3 Rct) F,S
PREREQUISITE: ACTG 327. For business majors: formal admission to the College of Business. Cross-listed with BFEN 441. Analysis with emphasis on how managers’ investing and financing decisions have financial statement implications. Coverage includes: revenue-recognition methods, cash flow analysis, ratios, inventory analysis, capitalizing vs. expensing, depreciation, leasing vs. buying, and overall financial health and earnings quality of the firm.

ACTG 490R. Undergraduate Research. 1-6 Credits. (1 Ind; 12 cr max) F,S,Su
PREREQUISITE: Senior standing and consent of instructor. For business majors: formal admission to the College of Business. Directed undergraduate research/creative activity which may culminate in a research paper, journal article, or undergraduate thesis. Course will address responsible conduct of research. May be repeated.

ACTG 491. Special Topics. 1-4 Credits. (1-4 Lec; 12 cr max) On Demand
PREREQUISITE: Course prerequisites as determined for each offering. Courses not required in any curriculum for which there is a particular one time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

ACTG 492. Independent Study. 1-3 Credits. (1-3 Ind; 6 cr max) On Demand
PREREQUISITE: Formal admission to the College of Business, consent of instructor, and approval of Associate Dean. Directed undergraduate research/creative activity which may culminate in a research paper, journal article, or undergraduate thesis. Not to be used as a substitute for a required course. May be repeated.

ACTG 494. Seminar. 1 Credit. (1 Sem; 4 cr max) On Demand
PREREQUISITE: Junior standing and as determined for each offering. Topics offered at the upper division level that are not covered in regular courses. Students participate in preparing and presenting discussion material.

ACTG 498. Internship. 2-12 Credits. (2-12 Ind; 12 cr max) On Demand
PREREQUISITE: Formal admission to the College of Business and consent of instructor. An individualized assignment arranged with an agency, business or other organization to provide guided experience in the field.

ACTG 514. Fraud Examination. 3 Credits. (3 Lec)
On demand PREREQUISITE: ACTG 411 and admission to MPAC Program or consent of instructor. An overview of fraud examination, including the extent and nature of fraud, motivations of perpetrators, fraud symptoms, legal issues, as well as methods of detection, investigation, and prevention of various asset misappropriation schemes and fraudulent financial statements.

ACTG 515. Professional Services MGM. 3 Credits. (3 Lec)
On demand PREREQUISITE: Admission to the MPAC program or consent of instructor. This course is designed to expose students to the internal operations and client management efforts of professional service organizations and providers, with a particular focus on accounting firms. Topics include managing service relationships, service firm structure and the service-profit chain.

ACTG 521. Advanced Auditing. 3 Credits. (3 Lec) S
PREREQUISITE: ACTG 411 and admission to MPAC Program. An in-depth analysis of contemporary auditing and assurance theory, statistical sampling, internal control, and audit evidence.

ACTG 524. International Accounting. 3 Credits. (3 Lec) On Demand
PREREQUISITE: ACTG 328 and admission to MPAC Program. Introduction to international accounting with special emphasis on four major topics: 1) accounting systems as expressions of cultural, political, and ideological forces, 2) comparative international accounting patterns, 3) efforts to harmonize international accounting standards worldwide, and 4) accounting issues faced by multinational corporations.

ACTG 525. Accounting Theory and Complex Issues in Accounting. 3 Credits. (3 Lec) F
PREREQUISITE: ACTG 328 and admission to MPAC Program. A study of complex financial accounting issues and the underlying theoretical rationale. Key topics include derivative financial instruments, hedge accounting, elements of the other comprehensive income, sale-leaseback transactions, consignment accounting, and troubled debt restructuring.

ACTG 527. Estate and Gift Taxation. 3 Credits. (3 Lec) On Demand
PREREQUISITE: ACTG 401 and admission to MPAC Program or consent of instructor. Study of the federal tax law and incidental property and probate law as it relates to the taxation of gifts and estates. Emphasis is placed upon planning techniques for minimizing estate and gift taxes and providing liquidity for their payment.

ACTG 528. Legal Issues for Accountants. 3 Credits. (3 Lec) S
PREREQUISITE: ACTG 401 and admission to MPAC Program or consent of instructor. Study of the federal tax law and incidental property and probate law as it relates to the taxation of gifts and estates. Emphasis is placed upon planning techniques for minimizing estate and gift taxes and providing liquidity for their payment.

ACTG 530. Tax Research and Planning. 3 Credits. (3 Lec) F
PREREQUISITE: ACTG 401 and admission to MPAC Program or consent of instructor. Tax problem solving through study and application of tax research, planning methods, and techniques, as well as, development of tax practitioner communication skills.

ACTG 531. Tax Practicum. 3 Credits. (3 Lec) S
PREREQUISITE: ACTG 401 and concurrent enrollment in ACTG 526 or consent of instructor. How the broad principles of taxation affect individuals, corporations, partnerships, S-corporations, estates, and trusts. Students apply their knowledge by assisting low income individuals with their tax returns as part of the Volunteer Income Tax Assistance Program.

ACTG 532. Government and Nonprofit Accounting II. 3 Credits. (3 Lec) On Demand
PREREQUISITE: ACTG 415 and admission to MPAC Program or consent of instructor. An in-depth study of the uniquely different characteristics of accounting and financial reporting for the governmental and not-for-profit sectors of the U.S. economy.

ACTG 536. Advanced Accounting. 3 Credits. (3 Lec) F
PREREQUISITE: ACTG 328 and admission to MPAC Program or consent of instructor. The theory and practice of financial accounting and reporting pertaining to business combinations and consolidated financial statements, accounting for partnerships and related business forms, foreign currency transactions and financial statement translations, and other advanced accounting topics.
ACTG 575. Professional Paper and Project. 1-4 Credits. (1-4 Ind; 4 cr max) On Demand
PREREQUISITE: Graduate standing. A research or professional paper or project dealing with a topic in the field. The topic must have been mutually agreed upon by the student and his or her major advisor and graduate committee.

ACTG 589. Graduate Consultation. 1-3 Credits. (1-3 Ind; 3 cr max) F, S, Su PREREQUISITE: Graduate standing and approval of the Dean of Graduate Studies. This course may be used only by students who have completed all of their course work (and Thesis if on a Thesis Plan) but who need additional faculty or staff time or help.

ACTG 591. Special Topics. 1-4 Credits. (1-4 Lec; 4 cr max) On Demand
PREREQUISITE: Graduate standing and courses as determined for each offering. Courses not required in any curriculum for which there is a particular one time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

ACTG 592. Independent Study. 1-3 Credits. (1-3 Ind; 6 cr max) On Demand
PREREQUISITE: Graduate standing, consent of instructor, approval of College of Business Associate Dean and The Graduate School Dean. Directed research and study on an individual basis.

ACTG 594. Seminar. 1 Credit. (1 Sem; 4 cr max)
On demand PREREQUISITE: Graduate standing. Topics offered at the graduate level that are not covered in regular graduate courses. Students participate in preparing and presenting discussion material.

ACTG 598. Internship. 1-3 Credits. (1-3 Ind; 12 cr max) On Demand
PREREQUISITE: Graduate standing and consent of instructor. An individualized assignment arranged with an agency, business or other organization to provide guided experience in the field.

ACTV - Activities: Varsity

ACTV 105. Life Skills for Student Athletes. 2 Credits. (2 Lec) F, S
This course is designed to introduce student athletes to psychological and educational theories and models associated with learning, self-management, personal and career development, and stress, coping and health. Through this course, student athletes will identify and address issues that pertain to learning and development among college students and issues that are unique to you as a student athlete.

ACTV 189. Varsity Athletics. 1 Credit. (1 Lec; 5 cr max) F, S
The participation in an intercollegiate sport which requires a minimum of two to three hours of meeting/participation per week per athletic season.

ACTV 305. Leadership Skills for Student Athletes. 2 Credits. (2 Lec) S
PREREQUISITE: ACTV 105 and junior standing. Intended for student athletes and will focus on understanding and applying principles of leadership to performance. This course will enhance the student’s ability to understand fundamental principles of leadership and apply those principles to their academic, athletic, and professional career. Specific attention will be paid to understanding individual strengths of student personality and translating those strengths into leadership positions.

AGBE - Agricultural Business and Econ

AGBE 210IS. Economics of Ag Business. 3 Credits. (3 Lec) S
PREREQUISITE: ECNS 101IS. This course provides an introduction to marketing, trade, risk, strategic, resource, and financial management of farms/ranches and agribusiness firms in the domestic and global economy. Basic economic principles will be applied to farm/ranch and agribusiness management, marketing, and international agricultural trade issues.

AGBE 290R. Undergraduate Research. 1-8 Credits. (1 Ind; 8 cr max) F, S, Su
PREREQUISITE: ECNS 101IS and consent of instructor. Intended for lower division undergraduate research/undergraduate scholars program. The student will work closely with the supervising faculty. Course will address responsible conduct of research.

AGBE 291. Special Topics. 1-4 Credits. (1-4 Lec; 12 cr max) On Demand
Maximun 12 cr. PREREQUISITE: None required but some may be determined necessary by each offering department. Courses not required in any curriculum for which there is a particular one time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

AGBE 292. Independent Seminar. 1-3 Credits. (1-3 Ind; 3 cr max) On Demand
Maximun 6 cr. PREREQUISITE: Consent of instructor and approval of department head. Directed research and study on an individual basis.

AGBE 315. Ag in a Global Context. 3 Credits. (2 Lec) S to be offered alternate years.
PREREQUISITE: ECNS 204 or BIOB 110 or ANSC 262 and consent of instructor. The primary goal of this course is to provide students with an integrated view of the science, technology, production practices, product handling, product marketing system, and end uses for agricultural products produced in Montana.

AGBE 321. Economics of Ag Marketing. 3 Credits. (3 Lec) F
PREREQUISITE: ECNS 204 or ECNS 251. Issues in marketing agricultural products and the economic principles that assist in analysis of these issues. Factors affecting market prices, and topics associated with methods of marketing are considered. Emphasis on Montana products.

AGBE 337. Agricultural Law. 3 Credits. (3 Lec) F, S
PREREQUISITE: Junior standing. Application of general principles of law to ownership and operation of farming business and its relationship with other agribusiness firms, government agencies and people.

AGBE 341. Farm and Ranch Management. 3 Credits. (3 Lec) S
PREREQUISITE: ECNS 204 or ECNS 251 and ECNS 309. Basic tools of economic decision making useful to farm and ranch managers are examined.

AGBE 345. Ag Finance and Credit Analysis. 3 Credits. (3 Lec) F
PREREQUISITE: ECNS 204 or ECNS 251. Alternatives available to farmers for acquiring and maintaining control over resources used in agriculture production. Emphasis is on the management of cash, credit, debt, taxes, and interest in relation to agricultural price levels and general economic conditions. Cross-listed with ECNS 345.

AGBE 353. Co-operative Business Principles and Practice. 3 Credits. (3 Lec) F
PREREQUISITE: ECNS 101IS or AGBE 210IS, and junior level standing. The course will acquaint students with cooperatives and the cooperative way of doing business. Students will learn the role of cooperatives in marketing, bargaining, purchasing, and service. Cooperative business decision making will be emphasized throughout the course.

AGBE 394. Seminar. 1-2 Credits. (1-2 Ind; 3 cr max) F, S
PREREQUISITE: Junior standing. Current agricultural problems and writings of people in the profession. Topics vary each semester; check with the department before registering.

AGBE 421. Advanced Ag Marketing. 3 Credits. (3 Lec) S
PREREQUISITE: AGBE 321 or consent of instructor. Economic analysis of current issues in agricultural marketing including market structure, risk, and efficiency; commodity promotion; futures and options markets; price forecasting; and retained ownership options.

AGBE 445. Agribusiness Management. 3 Credits. (3 Lec) S
PREREQUISITE: ECNS 301, STAT 216, and either AGBE 345 or BFBN 352. Senior capstone course. Students are expected to use tools and concepts developed in earlier course work to address typical problems faced by agribusiness and agricultural producers. Case studies modified from actual situations are used extensively.

AGBE 451RS. Economics of Ag Policy. 3 Credits. (3 Lec) F
PREREQUISITE: ECNS 301. Senior capstone course. Consideration of the economic problems of American agriculture and of alternative solutions. Rigorous analysis of the causes and consequences of government programs (both past and present) on consumers, producers, and taxpayers.

AGBE 467. Quantitative Method in Ag Econ. 3 Credits. (3 Lec) F
PREREQUISITE: ECNS 301, M 221 and approval of instructor. Static and dynamic optimization models in economics. Nonlinear and dynamic programming models are introduced. Emphasis on formulating economic and management problems in terms of quantitative models.

AGBE 490R. Undergraduate Research. 1-8 Credits. (1 Ind; 8 cr max) F, S, Su
PREREQUISITE: ECNS 204, junior standing, and approval of instructor. Intended for upper division undergraduate research/undergraduate scholars program. The student will work closely with the supervising faculty. Course will address responsible conduct of research.

AGBE 491. Special Topics. 1-4 Credits. (1-4 Ind; 12 cr max) On Demand
PREREQUISITE: Course prerequisites are dependent on the offering. Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

AGBE 492. Independent Study. 1-3 Credits. (1-3 Ind; 6 cr max) On Demand
PREREQUISITE: Junior standing, consent of instructor, and approval of department head. Directed research and study on an individual basis.

AGBE 589. Graduate Consultation. 3 Credits. (3 Ind) F, S, Su
PREREQUISITE: Master’s standing and approval of the Dean of Graduate Studies. This course may be used only by students who have completed all of their coursework (and thesis, if on a thesis plan) but who need additional faculty or staff time or help.
AGBE 590. Master's Thesis. 1-10 Credits. (1-10 Ind; max unlimited) F,S,Su
PREREQUISITE: Master's standing. May be repeated.

AGBE 591. Special Topics. 1-4 Credits. (1-4 Lec; 12 cr max) On Demand.
Maximum 12 cr. PREREQUISITE: Upper division courses, and others as determined for each offering. Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

AGBE 592. Independent Study. 1-3 Credits. (1-3 Ind; 6 cr max) On Demand.
Maximum 6 cr. PREREQUISITE: Graduate standing, consent of instructor, approval of department head and Dean of the Graduate School. Directed research and study on an individual basis.

AGED - Agricultural Education

AGED 105. Microcomputers in Agricultural. 3 Credits. (1 Lec, 2 Lab) S
Utilizing and selecting microcomputer software for the broad field of agriculture.

AGED 140US. Leadership Dev For Agriculture. 3 Credits. (2 Lec, 1 Lab) F,S,Su
PREREQUISITE: FCS 101S. Establishment of a philosophy of agricultural leadership at the secondary, middle school, and elementary level. Instructional content developed through situational leadership and management, principles of people management, goal setting, and belief systems. Collaborative learning and field experience utilized.

AGED 235. Ag Ed in Pub Schools. 3 Credits. (3 Lec) S
PREREQUISITE: AGED 140US and FCS 101S. Establish a philosophy of educational management and supervision, as well as the social science research methodologies, that will serve as course content. Students will conduct and apply techniques, methodologies and procedures that can be used in numerous social science research contexts. In addition, these students will become more familiar with the industry and have a better understanding of current agricultural issues and methods.

AGED 475. Professional Paper. 1-4 Credits. (1-4 Ind; 4 cr max) On Demand
IND A research or professional paper or project dealing with a topic in the field. The topic must have been mutually agreed upon by the student and his or her major advisor and graduate committee.

AGED 482. Non-Formal Teaching Methods in Agriculture. 3 Credits. (2 Lec, 1 Lab) F
PREREQUISITE: Junior standing. Designed for students in Agricultural Relations and other majors who will be designing, implementing and evaluating learning in non-formal environments and/or other careers. Graduate students may also take this course to aid in developing their teaching skills. The course covers theories, principles and practices associated with effective non-formal teaching and learning for adult education as well as youth educational settings such as 4-H meetings, conferences, and conventions. The lab provides hands-on experience in planning, teaching, and evaluating lessons/seminars in the non-formal educational setting.

AGED 485. Laboratory Management and Teaching in Agricultural Education. 3 Credits. (2 Lec, 1 Lab) F
PREREQUISITES: TE 207 and either AGED 315 or AGED 333. COREQUISITE: EDU 475. Teaching Methods in Agriculture & Technology Education. The purpose of this course is to provide students an opportunity to develop the pedagogical knowledge, skills, and attributes required for organizing and delivering laboratory instruction in agricultural systems. An emphasis is placed on planning, implementing, and evaluating effective laboratory management and teaching strategies.

AGED 490R. Undergraduate Research. 1-6 Credits. (1 Ind; 12 cr max) F
PREREQUISITE: TE 207 and either AGED 315 or AGED 333. COREQUISITE: EDU 475. Teaching Methods in Agriculture & Technology Education. The purpose of this course is to provide students an opportunity to develop the pedagogical knowledge, skills, and attributes required for organizing and delivering laboratory instruction in agricultural systems. An emphasis is placed on planning, implementing, and evaluating effective laboratory management and teaching strategies.

AGED 491. Special Topics. 1-4 Credits. (1-4 Lec; 12 cr max) On Demand
PREREQUISITE: Course prerequisites as determined for each offering. Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

AGED 492. Independent Study. 1-3 Credits. (1-3 Ind; 6 cr max) On Demand
PREREQUISITE: Junior standing, consent of instructor and approval of department head. Directed research and study on an individual basis.

AGED 494. Seminar. 3 Credits. (3 Sem; 6 cr max) S
PREREQUISITE: Consent of instructor. Focuses on planning and implementing agricultural activities for youth. The emphasis is on planning an event, developing awareness and utilization of resources (people and things), developing a log and records regarding the event, and evaluating the effectiveness of an implementation plan and the actual event.

AGED 507. Research Methods. 3 Credits. (3 Lec) F
PREREQUISITE: Graduate standing. A study of the literature on specific facets of program planning and evaluation applicable to agricultural and extension education. Application of program planning and evaluation concepts through individual and class projects.
AGED 562. International Extension Systems. 3 Credits. (3 Lec) S
PREREQUISITE: Graduate standing and permission of instructor. This course focuses on a broad range of extension education topic areas which impact agriculture and rural community development. The primary purpose is to further students' understanding about extension systems influence on agricultural and rural development in the world. An analysis of case studies in International Extension will be a focus of this graduate course.

AGED 575. Prof Paper & Project. 1-4 Credits. (1 Ind; 6 cr max) On Demand
PREREQUISITE: Graduate standing. A research or professional paper or project dealing with a topic in the field. The topic must have been mutually agreed upon by the student, the major advisor, and graduate committee.

AGED 585. Laboratory Management and Teaching in Agricultural Education. 3 Credits. (2 Lec, 1 Lab) F
PREREQUISITES: TE 207 and either AGED 315 or AGED 333. COREQUISITE: EDU 497, Teaching Methods in Agriculture & Technology Education. The purpose of this course is to provide students an opportunity to develop the pedagogical knowledge, skills, and attributes required for organizing and delivering laboratory instruction in agricultural systems. An emphasis is placed on planning, implementing, and evaluating effective laboratory management and teaching strategies.

AGED 588. Professional Development. 2 Credits. (2 Lec) On Demand
PREREQUISITE: Graduate Standing. This course may be used only by students who have completed all of their course work (and thesis if on a thesis plan) but who need additional faculty or staff time or help.

AGED 588Z. Professional Development. 2 Credits. (2 Lec) On Demand
Courses offered on a one-time basis to fulfill professional development needs of in service educators. A specific focus is given to each course which is appropriately subtitled.

AGED 589. Graduate Consultation. 3 Credits. (3 Ind) F,S,Su
IND PREREQUISITES: Master's standing and approval of the Dean of Graduate Studies. This course may be used only by students who have completed all of their coursework (and thesis, if on a thesis plan), but who need additional faculty or staff time or help.

AGED 590. Master's Thesis. 1-10 Credits. (1 Ind; 10 cr max) S,F
SU PREREQUISITE: Master's Standing.

AGED 591. Special Topics. 1-4 Credits. (1-4 Lec; 4 cr max) On Demand
PREREQUISITE: Upper division courses and others as determined for each offering. Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

AGED 592. Independent Study. 1-6 Credits. (1 Ind; 6 cr max) S,F
SU PREREQUISITE: Graduate standing, consent of instructor, approval of department head and Dean of Graduate Studies. Direct research and study on an individual basis.

AGED 594. Graduate Seminar. 1 Credit. (1 Sem; 4 cr max) S
PREREQUISITE: Graduate standing. Course prerequisites as determined for each offering. This course will focus on the guidelines, procedures, and processes necessary to complete your Master's degree, either on-campus or online. Topics offered at the graduate level which are not covered in regular courses. Students participate in preparing and present discussion material.

AGED 598. Internship. 2-12 Credits. (2 Ind; 12 cr max) S,F
SU PREREQUISITE: Graduate standing, consent of instructor, approval of department head and Dean of Graduate Studies. An individualized assignment arranged with an agency, business or other organization to provide guided experience in the field.

AGSC - Agricultural Science
AGSC 101. Introduction to Agricultural and Environmental Resources. 1 Credit. (1 Lec) F
PREREQUISITE: Freshman or New Transfer Students. This course is optional but all freshmen in the College of Agriculture are strongly encouraged to enroll. Students taking this course will be introduced to all of the areas of the very broad field of agriculture, including all department programs and areas of specialty, career opportunities, professionalism, history, and ethics.

AGSC 242. Crop Identification. 1 Credit. (1 Lab) F
Meets first third of semester. Recognition and identification of seed, vegetative parts, and floral structure of the major species of cereals, forage legumes, and grasses.
AGSC 455. Molecular Plant-Microbe & Insect Interactions. 3 Credits. (3 Lec) S Alternate years.
PREREQUISITE: BIOB 160. This course is to teach students the molecular mechanisms by which plants and pathogens/insects interact during the progress of pathogenesis or resistance, the understandings of how plants recognize relatively conserved microbial patterns to active defense.

AGSC 465R. Health, Agriculture, Poverty. 4 Credits. (1 Lab) F S PREREQUISITE: Junior standing in student’s major. Students will explore causes and solutions to rural, economic poverty holistically by discovering the interconnections of health, agriculture, and governance. Students will gain skills appropriate to their own academic major to provide leadership in alleviating poverty worldwide. Students will conduct service-learning, community-based research with guided mentoring using the holistic process.

AGSC 481. Ag Ambassador Seminar. 1-6 Credits. (1-6 Sem; 6 cr max) F,S Class meetings, a retreat, a variety of recruiting opportunities, and College of Agriculture and MSU events will make up the largest portion of this course. Students will have to participate in a selection process in order to become an Agriculture Ambassador and participate in this course.

AGSC 490R. Undergraduate Research. 1-6 Credits. (1 Ind; 12 cr max) F,S PREREQUISITE: Junior or Senior standing and approval of instructor. Directed undergraduate research/creative activity which may culminate in a research paper, journal article, or undergraduate thesis. USP scholarships or project support grants are available in many cases. Course will address responsible conduct of research. May be repeated.

AGSC 491. Plant Nutrition and Soil Fertility Management. 3 Credits. (3 Lec) F PREREQUISITE: Approval of instructor, ENSC 245IN and CHMY 121IN or CHMY 141. Applied management of soil fertility to meet plant nutrition needs in agronomic and horticultural systems. Diagnosis of plant nutrient deficiency and toxicity, management of fertilizer and organic sources of plant nutrients, and assessment of environmental effects of soil fertility management.

AGSC 492. Independent Study. 1-3 Credits. (1-3 Ind; 6 cr max) On Demand PREREQUISITE: Junior standing, consent of instructor and approval of department head. Directed research and study on an individual basis.

AGTE - Agricultural Technology

AGTE 355. Power Systems Operational Control. 3 Credits. (2 Lec, 1 Lab) F A study of internal combustion engine systems and the electronic control of these systems. Emphasis on power service, fuel, electrical, ignition, and emission systems used on modern engines. Lab activities include testing, adjusting, and servicing the various systems.

AH - Allied Health

AH 140. Pharmacology. 2 Credits. (2 Lec) F General principles of drug action on multiple body systems, pharmacology of the major drug classifications, and drug side effects as well as basic concepts of mathematics used in the calculation, preparation, and administration of various medications.

AHMA - Allied Health: Medical Assist

AHMA 201. MA Clinical Procedures I. 4 Credits. (4 Lec) F Performance of CLIA waived laboratory tests. Topics include specimen collection, phlebotomy, specimen processing, record keeping, universal precautions, infection control, and quality control.

AHMA 203. MA Clinical Procedures II. 4 Credits. (4 Lec) S Patient assessment, physical examination and patient treatments including: vital signs, patient education, medical emergencies and assisting the physician in medical specialty examinations and minor surgery. Students will learn the theoretical, technical, and practical aspects of infection control, medical and surgical asepsis and EKG.

AHMA 280. Med Assisting Exam Prep. 1 Credit. (1 Sem) F,S Preparation for the AMT (American Medical Technologists) registration exam and/or AAMA (American Association of Medical Assistants) certification exam.

AHMA 298. Medical Assisting Externship. 4 Credits. (4 Ind) S Prerequisites: AHMA 203 and AHMA 220. Practical experience in clinical medical environments under supervision.

AHMS - Allied Health: Medical Support

AHMS 100. Math Applications Health. 3 Credits. (3 Lec) S Prepares health science students for the mathematics required in their profession. Topics investigated include: measurement systems, whole number review, decimals, fractions, ratios, proportions, percentages, conversions.

AHMS 108. Health Data Content and Structure. 3 Credits. (3 Lec) S PREREQUISITE: AHMS 160, AHMS 162. This course provides orientation to the health information department and its organizational interrelationship in healthcare facilities and the interchange of healthcare information. This course examines the collection, review and security of health.

AHMS 144. Medical Terminology. 3 Credits. (3 Lec) F Offered by Gallatin College. Basic elements, rules of building and analyzing medical words, and medical terms associated with the body as a whole. In addition to medical terms, common abbreviations applicable to each body system will be interpreted.

AHMS 156. Medical Billing Fundamentals. 3 Credits. (4 Lec) S PREREQUISITE: AHMS 160, AHMS 162. The most common commercial, managed care and federal health insurance plans in the US will be covered. Billing processes and procedures as well as legal, regulatory, and ethical issues in health insurance will also be covered.

AHMS 158. Legal and Regulatory Aspects of Healthcare. 2 Credits. (2 Lec) S This course covers legal relationships of physicians and patients, contractual agreements, professional liability, malpractice, medical practice acts, informed consent, and bioethical issues. Emphasis is placed on legal terms, professional attitudes, and the principles and basic concepts of ethics and laws involved in providing medical services. This course also identifies patient behaviors and stressors related to illness, cultural influences, death, and dying.

AHMS 160. Beginning Procedural Coding. 4 Credits. (4 Lec) F PREREQUISITE: AHMS 144. This course covers basic and intermediate levels of theory and application of CPT and HCPCS principles and guidelines for coding procedures. Students perform procedural coding using health records, case studies, and scenarios. The course uses applicable coding books and an overview of electronic encoder programs.

AHMS 162. Beginning Diagnostic Coding. 4 Credits. (4 Lec) F PREREQUISITE: AHMS 144. This course covers basic and intermediate levels of theory and application of ICD principles and guidelines for coding procedures. Students perform diagnostic coding using health records, case studies, and scenarios. The course uses applicable coding books and an overview of electronic encoder programs.

AHMS 220. Medical Office Procedures. 3 Credits. (3 Lec) S Electronic patient information system to include appointment scheduling, gathering patient data, posting charges/payments/adjustments, submitting claims, claims management, understanding the various third-party payers (Medicaid, Medicare, Blue Cross, Work Comp, etc.) medical coding (ICD10, CPT, ICD, DRG), manual bookkeeping procedures, and medical records management.

AHMS 250. Advanced Medical Coding. 4 Credits. (3 Lec) S PREREQUISITE: AHMS 160. AHMS 162. Through realistic patient cases the student will be able to assign service and diagnostic codes to a variety of complex medical visits, diagnostic testing, and interpretation, treatments, surgeries, and anesthesia as well as properly audit these cases.

AHMS 298. Professional Practice Experience - Coding. 1 Credit. (1 Lec) S PREREQUISITE: AHMS 160, AHMS 162, AHMS 144, AH 140, BIOH 112. Corequisite: BIOH 113, AHMS 250, AHMS 156, AHMS 108, AHMS 158. This course provides students with authentic coding practices in a hospital, physician’s office, clinic or other healthcare setting with directed projects common to a clinical coding specialist on the job.

AMST - American Studies

AMST 101D. Introduction to American Studies. 3 Credits. (2 Lec, 1 Lab) F Introduction to the field of American Studies and to major issues in American history, literature, and the arts.

AMST 202RA. The Arts in America. 3 Credits. (2 Lec) F,S PREREQUISITE: WRIT 101 W. Uses the methodologies of American Studies to question the history, theory, and criticism of various American art forms and movements. Disciplines covered include: film, photography, television, sculpture, painting, architecture, and music.
AMST 291. Special Topics. 3 Credits. (3 Lec) On Demand
PREREQUISITE: None required but some may be determined necessary by each offering department. Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

AMST 401. Seminar in American Studies. 4 Credits. (4 Sem) S to be offered every year.
PREREQUISITE: AMST 201. Capstone course in American Studies. Students will research and design solutions to contemporary problems in American Society.

AMST 401R. Seminar in American Studies. 4 Credits. (4 Sem) S to be offered every year.
PREREQUISITE: AMST 201. Capstone course in American Studies. Students will research and design solutions to contemporary problems in American Society.

AMST 491. Special Topic for Spring 2016: American Religion and the United States Supreme Court. 3 Credits. (1 Lec, 2 Sem) S
PREREQUISITE: At least two lower division courses in RLST, HSTA, HSTR, PSCL, or AMST. Spring 2016: American Religion and the United States Supreme Court. This course investigates the symbiotic relationship between American religion and the US Supreme Court. Topics include legal discourse surrounding religious freedom, the legal status of minority religions, and the social impact of landmark Supreme Court decisions.

AMST 501. Methods in American Studies. 3 Credits. (3 Sem) F
Introduction to major trends in American Studies scholarship, with a particular focus on American Studies in an international context. The course will also introduce students to the range of scholarship in the American Studies program.

AMST 502. Research in American Studies. 3 Credits. (3 Sem) F,S
PREREQUISITE: AMST 501. Graduate research and advanced readings in American Studies.

AMST 590. Master's Thesis. 1-10 Credits. (1-10 Ind; max unlimited) F,S,Su
PREREQUISITE: Master's standing.

AMST 591. Special Topics. 3 Credits. (3 Sem) On Demand
PREREQUISITE: Graduate standing or seniors by petition. Course prerequisites as determined for each offering. Advanced study of topics in the discipline, in courses not required in any curriculum, including experimental offerings of visiting professors, trial offerings of new courses, or one-time offerings of current topics.

AMST 592. Independent Study. 1-4 Credits. (1-4 Ind; 8 cr max) On Demand
PREREQUISITE: Graduate standing, consent of instructor, approval of department head and Vice Provost of Graduate Education. Directed research and study on an individual basis.

AMST 594. Seminar. 1 Credit. (1 Sem) F
PREREQUISITE: Graduate standing. Graduate level topics which are not covered in other courses. Students will prepare and present discussion material.

AMST 689. Doctoral Reading and Research. 3-6 Credits. (3-6 Ind; max 15) F,S,Su
PREREQUISITE: Doctoral standing. Presentation and discussion of dissertation research and writing.

AMST 690. Doctoral Thesis. 1-10 Credits. (1-10 Ind; max unlimited) F,S,Su
Max credits unlimited PREREQUISITE: Doctoral standing.

ANSC - Animal Science

ANSC 100. Introduction to Animal Science. 3 Credits. (3 Lec) F,S
Introductory Animal Science includes basic principles of animal genetics, nutrition, live animal evaluation, reproduction, and their application to the production of beef and dairy cattle, sheep, swine, horses, and poultry.

ANSC 205. Intro to Meat Evaluation. 2 Credits. (1 Lab) F
PREREQUISITE: ANSC 100. Techniques for the evaluation of carcasses. Course includes U.S. grading standards, introduction to carcass pricing and objective carcass measurements.

ANSC 215. Calving Management. 2 Credits. (1 Lec, 1 Lab) S
PREREQUISITE: ANSC 100 or consent of instructor. Procedures to correctly identify calving problems and subsequently assist the birthing process and application of techniques to maximize calf survival.

ANSC 222. Livestock in Sustain Systems. 3 Credits. (3 Lec) S
PREREQUISITE: Sophomore standing and ANSC 100 is recommended. The role of livestock in balanced sustainable and organic systems will be explored with a primary focus on incorporating targeted grazing into farming systems. The principles of sustainable animal production and the regulations associated with organic animal production will be presented.

ANSC 232. Livestock Management - Sheep I. 1 Credit. (1 Lab) S
PREREQUISITE: ANSC 100. Management practices associated with farm flock and range sheep enterprises.

ANSC 234. Livestock Management - Beef I. 1 Credit. (1 Lab) S
PREREQUISITE: ANSC 100. Hands-on laboratories to familiarize students with the principles of beef cattle handling and management.

ANSC 265. Anatomy and Physiology of Domestic Animals - Lecture. 3 Credits. (3 Lec) S
PREREQUISITE: BIOL 160, Sophomore standing. COREQUISITE: ANSC 266. The lecture defines and identifies the organization of cell types into tissues and organ systems. The lecture explains the physiology of organ systems in domestic farm animals.

ANSC 266. Anatomy and Physiology of Domestic Animals - Lab. 1 Credit. (1 Lab) S
PREREQUISITE: BIOL 160, Sophomore standing. CO-REQUISITE: ANSC 265. Location, structure and identification of various tissues, organs, and systems of domestic animals through dissection of cadaver animals through dissection of cadaver animals. Lab utilizes ruminants and monogastric species.

ANSC 290R. Undergraduate Research. 1-6 Credits. (1-6 Ind; max unlimited) F,S,Su
Directed undergraduate research which may culminate in a written work or other creative project. Course will address responsible conduct of research. May be repeated.

ANSC 291. Special Topics. 1-4 Credits. (1-4 Lab; 12 cr max) On Demand
PREREQUISITE: None required but some may be determined necessary by each offering department. Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

ANSC 292. Independent Study. 1-3 Credits. (1-3 Ind; 6 cr max) On Demand
PREREQUISITE: Consent of instructor and approval of department head. Directed research and study on an individual basis.

ANSC 305. Advanced Meat Evaluation. 2 Credits. (2 Lab) F
PREREQUISITE: ANSC 205 or consent of instructor. Advanced skills in carcass evaluation, U.S. grading standards, and carcass pricing.

ANSC 308. Livestock Evaluation. 2 Credits. (1 Lab) F
PREREQUISITE: ANSC 100 and ANSC 205, or consent of instructor. Techniques and experience in live animal evaluation. Practical use of production data and other evaluation techniques.

ANSC 316. Meat Science. 4 Credits. (3 Lec, 1 Lab) S
PREREQUISITE: ANSC 100, BIOL 160, and CHMY 121HN or CHMY 141 and CHMY 143. The meat industry within North America and beyond will be discussed. Live animal evaluation, pricing and carcass evaluation will be discussed. The class will include an explanation of muscle structure and function and its effect on tenderness and functionality.

ANSC 320. Animal Nutrition. 4 Credits. (3 Lec, 1 Rec) F
PREREQUISITE: ANSC 100, ANSC 265, ANSC 266, and CHMY 123 or CHMY 211, or consent of instructor. Digestion and metabolism of nutrients, nutrient requirements, feed composition, diet formulation, and practical feeding of various classes of domestic animals.

ANSC 321. Physiology of Animal Reproduction. 4 Credits. (4 Lec) F
PREREQUISITE: ANSC 100, ANSC 265, ANSC 266, and CHMY 123 or CHMY 211. A study of the anatomy and physiology of reproduction of vertebrates with major emphasis on mammalian domestic animal and wildlife species. This class introduces students to emerging concepts and current technologies for altering reproductive efficiency in a variety of animal species, including humans.

ANSC 322. Principles of Animal Breeding and Genetics. 3 Credits. (3 Lec) S
PREREQUISITE: ANSC 100, BIOL 160, and STAT 216Q. Genetic improvement of farm animals through performance testing, methods of selection, and application of mating systems such as crossbreeding.

ANSC 337. Disease of Domestic Livestock. 3 Credits. (3 Lec) S
PREREQUISITE: ANSC 100, ANSC 222, and ANSC 265/266. This course is structured to familiarize students with the common diseases of domestic livestock. Infectious and non-infectious diseases of horses, cattle, sheep and swine will be covered. Particular emphasis will be placed on regional diseases.

ANSC 395. Field Experience: Livestock. 1 Credit. (1 Lab) On Demand
PREREQUISITE: ANSC 100 and junior standing. Exposure of students to livestock operations and related business enterprises in different geographical locations. One three-day field trip. Graded P/F.
ANSC 408. Advanced Livestock Evaluation. 3 Credits. (3 Lec) F,S
PREREQUISITE: ANSC 308 or equivalent. Advanced skills in evaluation of animals and data associated with growth and genetic improvement. Develop decision making and oral communication skills.

ANSC 410. Veterinary Entomology and Parasitology. 3 Credits. (3 Lec) S, even years.
PREREQUISITE: BIOL 470, BIOL 262. This course will provide an overview of the importance of arthropods and their effects on human and animal health. Topics covered will include classification and identification of insects, mites, and ticks, basic biology, behavior and ecology, feeding mechanisms, pathogen transmission, vector competency, production impacts, integrated management and prevention.

ANSC 416R. Meat Processing. 3 Credits. (2 Lec, 1 Lab) F
PREREQUISITE: ANSC 316 or consent of instructor. Students will learn to manufacture processed meat products such as fresh sausage, ham, bacon and cooked sausages. They will also be developing new flavor profiles and new products that will be presented to a panel with proposed marketing plans.

ANSC 418. Topics in Beef Nutrition. 2 Credits. (2 Lec) S alternate years, to be offered even years.
PREREQUISITE: ANSC 320 and Junior standing or consent of instructor. Critical evaluation of current issues and related scientific literature in beef cattle nutrition; application to decision making and problem solving.

ANSC 421. Assisted Reproduction Technologies w/ Lab. 4 Credits. (2 Lec, 2 Lab) F
PREREQUISITE: ANSC 321. Reproductive management programs applying physiological knowledge to increase meat and milk production in cattle. Experience in the techniques of artificial insemination and pregnancy evaluation in cattle.

ANSC 432R. Sheep Management. 3 Credits. (2 Lec, 1 Lab) S
PREREQUISITE: ANSC 232 and ANSC 320 and ANSC 321. COREQUISITE: ANSC 232 Management of the ewe flock, nutrition, reproduction, economics, breeding, and health related to efficient sheep production will be discussed. Production preparation and wool marketing in U.S. and world markets and economics of Montana wool production will be covered.

ANSC 434R. Beef Cattle Management. 4 Credits. (2 Lec, 2 Lab) F
PREREQUISITE: NRSM 101, NRSM 102, and ANSC 320; preferred ANSC 321 and ANSC 322. Integration of the principles of nutrition, genetics, physiology, range ecology, and economics into practical and profitable ranch management and business plans. Utilization of performance and financial records, budgeting, feed resource planning, marketing strategies, breeding plans, computer applications, and case studies.

ANSC 436. Professional Development in Beef Production Systems. 2 Credits. (1 Lec, 1 Lab) F
PREREQUISITE: ANSC 100, ANSC 320, or ANSC 408. This course will allow for hands-on experiences in livestock operations. Students will directly interact with professionals and be exposed to topics such as nutrition, health care, management and marketing in the beef cattle industry.

ANSC 437. Professional Development in Beef Feedlot Systems. 2 Credits. (1 Lec, 1 Lab) S
PREREQUISITE: ANSC 100, ANSC 320 and/or ANSC 408. This course will allow for hands-on experiences in beef cattle operations, specifically the feeding and marketing for finished beef. Students will directly interact with industry professionals and be exposed to topics such as nutrition, health, management and marketing in the beef cattle industry.

ANSC 490R. Undergraduate Research. 1-6 Credits. (1 Ind; 12 cr max) F,S,Su
Directed undergraduate research which may culminate in a research paper, journal article, or undergraduate thesis. May be repeated.

ANSC 491. Special Topics. 1-4 Credits. (1-4 Lec; 12 cr max) On Demand
PREREQUISITE: Course prerequisites as determined for each offering. Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

ANSC 492. Independent Study. 1-3 Credits. (1-3 Ind; 6 cr max) On Demand
PREREQUISITE: Junior standing, consent of instructor and approval of department head. Directes research and study on an individual basis.

ANSC 494. Seminar. 1 Credit. (1 Sem; 4 cr max) On Demand
PREREQUISITE: Junior standing and as determined for each offering. Topics offered at the upper division level which are not covered in regular courses. Students participate in preparing and presenting discussion material.

ANSC 498. Internship. 1-12 Credits. (2-12 Ind; 12 cr max) On Demand
PREREQUISITE: Junior standing, consent of instructor and approval of department head. An individualized assignment arranged with an agency, business, or other organization to provide guided experience in the field.

ANTY - Anthropology

ANTY 101D. Anthropology and the Human Experience. 3 Credits. (3 Lec) F,S
PREREQUISITE: Junior focus on human behavior and human cultural systems from the local to global levels. The nature and sources of diversity associated with the human experience are explored and reinforced using examples from archaeology, biological anthropology, cultural anthropology, and linguistics.

ANTY 212CS. Bones, Ashes, and Ancestors. 3 Credits. (3 Lec) S
PREREQUISITE: ANSC 308 or equivalent. Odd years Exploration of human biological evolution from an anthropological perspective, emphasizing scientific understanding through examination of important fossil discoveries and of the behavior and anatomy of living non-human primates, especially apes. Aimed particularly at students not majoring in anthropology.

ANTY 223IS. Anthropology, Pop Culture, and Everyday Life. 3 Credits. (3 Lec) F,S,Su
First 6 weeks. Introduction to basic principles and approaches of socio-cultural anthropology. Covers diverse thoughts, everyday practices and popular culture in the world. Aimed particularly at students not majoring in Anthropology.

ANTY 225IS. Culture, Language, and Society. 3 Credits. (3 Lec) F,S
PREREQUISITE: Consent of instructor and approval of department head. Undergraduate experiences for non-majors fulfilling their core research requirement. Course content is determined by the upper level anthropology course to which this class is linked and by student’s interests. Upper level majors serve as research mentors. At least fifty percent of the course grade is based on library and field or laboratory research.

ANTY 252IS. Mysteries of the Past. 3 Credits. (3 Lec) F,S
ANSC 498. Internship. 1-12 Credits. (2-12 Ind; 12 cr max) On Demand
PREREQUISITE: Junior standing, consent of instructor and approval of department head. An individualized assignment arranged with an agency, business, or other organization to provide guided experience in the field.

ANTY 290R. Undergraduate Research. 1-6 Credits. (1-6 Ind; max unlimited) On Demand
PREREQUISITE: ANSC 101 or ANSC 225. Undergraduate experiences for non-majors fulfilling their core research requirement. Course content is determined by the level of the upper level anthropology course to which this class is linked and by student’s interests. Upper level majors serve as research mentors. At least fifty percent of the course grade is based on library and field or laboratory research.

ANTY 291. Special Topics. 1-4 Credits. (1-4 Lec; 12 cr max) On Demand
PREREQUISITE: None required but some may be determined necessary by each offering. Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

ANTY 292. Independent Study. 1-3 Credits. (1-3 Ind; 3 cr max) On Demand
PREREQUISITE: Consent of instructor and approval of department head. Directes research and study on an individual basis.

ANTY 313. Biological Anthropology. 3 Credits. (3 Lec) S
PREREQUISITE: ANSC 408. Alternate years to be offered odd years PREREQUISITE: Junior standing. ANTY 215. Human evolution and biology from an anthropological perspective: the fossil record, nonhuman primates, osteology, biological variation, and basic techniques of physical anthropology.

ANTY 315. Forensic Anthropology. 3 Credits. (3 Lec) F
PREREQUISITE: ANSC 408. Alternate years to be offered odd years PREREQUISITE: Junior standing and consent of instructor. Detailed study of human cranial and post-cranial skeletal anatomy. Analysis of skeletal materials for estimating sex, age at death, living stature, biological ancestry, cause of death, and other factors of forensic interest. Methods in the recovery of skeletal remains.
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
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<tbody>
<tr>
<td>ANTY 327.</td>
<td>Medical Anthropology</td>
<td>3 Credits</td>
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<tr>
<td>ANTY 332.</td>
<td>Native North America</td>
<td>3 Credits</td>
<td>(3 Lec)</td>
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<tr>
<td>ANTY 336.</td>
<td>Myth, Ritual and Religion</td>
<td>3 Credits</td>
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<td>ANTY 337.</td>
<td>Sex, Gender, Sexuality Japan</td>
<td>3 Credits</td>
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<tr>
<td>ANTY 338.</td>
<td>Contemporary Pacific Societies</td>
<td>3 Credits</td>
<td>(3 Lec)</td>
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<tr>
<td>ANTY 343.</td>
<td>Popular Culture - Japan</td>
<td>3 Credits</td>
<td>(3 Lec)</td>
<td>S</td>
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<tr>
<td>ANTY 350.</td>
<td>Old World Prehistory</td>
<td>3 Credits</td>
<td>(3 Lec)</td>
<td>S alternate years</td>
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<tr>
<td>ANTY 351.</td>
<td>Archaeology of North America</td>
<td>3 Credits</td>
<td>(3 Lec)</td>
<td>F</td>
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<tr>
<td>ANTY 355.</td>
<td>Peoples and Prehistory</td>
<td>3 Credits</td>
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<tr>
<td>ANTY 356.</td>
<td>Archaeology of Southwest Asia</td>
<td>3 Credits</td>
<td>(3 Lec)</td>
<td>F</td>
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<tr>
<td>ANTY 357.</td>
<td>Foragers of Sub-Saharan Africa</td>
<td>3 Credits</td>
<td>(3 Lec)</td>
<td>On Demand</td>
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<tr>
<td>ANTY 416.</td>
<td>Anthropology of Gender</td>
<td>3 Credits</td>
<td>(3 Lec)</td>
<td>S alternate years, odd years</td>
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<tr>
<td>ANTY 450.</td>
<td>Archaeological Theory</td>
<td>3 Credits</td>
<td>(3 Lec)</td>
<td>S alternate years</td>
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<tr>
<td>ANTY 453.</td>
<td>Zooarchaeology</td>
<td>3 Credits</td>
<td>(3 Lec)</td>
<td>On Demand</td>
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<tr>
<td>ANTY 454.</td>
<td>Lithic Technology</td>
<td>3 Credits</td>
<td>(3 Lec)</td>
<td>S</td>
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<tr>
<td>ANTY 467.</td>
<td>Archaeology Field School</td>
<td>1-9 Credits</td>
<td>(1-9 Lec; 9 cr max)</td>
<td>Su</td>
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<td>ANTY 472.</td>
<td>Descriptive Linguistics</td>
<td>3 Credits</td>
<td>(3 Lec)</td>
<td>F alternate years</td>
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<tr>
<td>ANTY 473.</td>
<td>Language &amp; Culture</td>
<td>3 Credits</td>
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<td>F alternate years</td>
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<tr>
<td>ANTY 490R.</td>
<td>Undergraduate Research and Instruction</td>
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<tr>
<td>ANTY 491.</td>
<td>Special Topics</td>
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<td>ANTY 492.</td>
<td>Independent Study</td>
<td>1-3 Credits</td>
<td>(1-3 Ind; 6 cr max)</td>
<td>On Demand</td>
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<td>ANTY 494.</td>
<td>Seminar</td>
<td>1-12 Credits</td>
<td>(1-12 Sem; 12 cr max)</td>
<td>On Demand</td>
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<tr>
<td>ANTY 495.</td>
<td>Field Experience</td>
<td>1-9 Credits</td>
<td>(1-9 Lec; 9 cr max)</td>
<td>Su</td>
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</tbody>
</table>
ARCH 211A. Introduction to Design. 3 Credits. (2 Lec) F,S,Su
PREREQUISITE: For majors and non-majors. Introduction to the design and creative process through global architecture and allied professions. Exploration of the history of design. Emphasis on 20th and 21st century architecture. Individual projects where students apply and explore creative process are required.
ARCH 151RA. Design Fundamentals I. 4 Credits. (2 Lec, 2 Lab) F,Su
A study of the creative design process with emphasis on two-dimensional design, basic three-dimensional design concepts and introduction to the essential tools for graphic communication. Development of students' self-critical skills.
ARCH 152. Design Fundamentals II. 4 Credits. (3 Lec) S,Su
A study of the design process and methods employed by design disciplines as an introduction to architectural principles, architectural graphic skills, and further understanding of the creative process. Development of student's ability to make critical and analytical judgments.
ARCH 1221. World Architecture: Modern to Contemporary. 3 Credits. (3 Lec) F,S
This course will examine the historical development of architecture from the 19th century to the present. Within an historical context, the course will focus on the impact of cultural and philosophical trends, technological changes and innovations, and the globalization of the digital revolution on our built environment. Students will be introduced to seminal theoretical approaches founded by architects and thinkers of the 20th and early 21st centuries.
ARCH 223. Architecture: Modern to Contemporary. 3 Credits. (3 Lec) S,Su
A study of the creative design process through global architecture and allied professions. Exploration of the history of design. Emphasis on 20th and 21st century architecture. Individual projects where students apply and explore creative process are required.
ARCH 211A. Introduction to Design. 3 Credits. (2 Lec) F,S,Su
PREREQUISITE: For majors and non-majors. Introduction to the design and creative process through global architecture and allied professions. Exploration of the history of design. Emphasis on 20th and 21st century architecture. Individual projects where students apply and explore creative process are required.
ARCH 151RA. Design Fundamentals I. 4 Credits. (2 Lec, 2 Lab) F,Su
A study of the creative design process with emphasis on two-dimensional design, basic three-dimensional design concepts and introduction to the essential tools for graphic communication. Development of students' self-critical skills.
ARCH 152. Design Fundamentals II. 4 Credits. (3 Lec) S,Su
A study of the design process and methods employed by design disciplines as an introduction to architectural principles, architectural graphic skills, and further understanding of the creative process. Development of student's ability to make critical and analytical judgments.
ARCH 221. World Architecture: Modern to Contemporary. 3 Credits. (3 Lec) F,S
This course will examine the historical development of architecture from the 19th century to the present. Within an historical context, the course will focus on the impact of cultural and philosophic trends, technological changes and innovations and the globalization of the digital revolution on our built environment. Students will be introduced to seminal theoretical approaches founded by architects and thinkers of the 20th and early 21st centuries.
ARCH 223. Architecture: Modern to Contemporary. 3 Credits. (3 Lec) S,Su
A study of the creative design process through global architecture and allied professions. Exploration of the history of design. Emphasis on 20th and 21st century architecture. Individual projects where students apply and explore creative process are required.
ARCH 211A. Introduction to Design. 3 Credits. (2 Lec) F,S,Su
PREREQUISITE: For majors and non-majors. Introduction to the design and creative process through global architecture and allied professions. Exploration of the history of design. Emphasis on 20th and 21st century architecture. Individual projects where students apply and explore creative process are required.
ARCH 151RA. Design Fundamentals I. 4 Credits. (2 Lec, 2 Lab) F,Su
A study of the creative design process with emphasis on two-dimensional design, basic three-dimensional design concepts and introduction to the essential tools for graphic communication. Development of students' self-critical skills.
ARCH 152. Design Fundamentals II. 4 Credits. (3 Lec) S,Su
A study of the design process and methods employed by design disciplines as an introduction to architectural principles, architectural graphic skills, and further understanding of the creative process. Development of student's ability to make critical and analytical judgments.
ARCH 221. World Architecture: Modern to Contemporary. 3 Credits. (3 Lec) F,S
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ARCH 223. Architecture: Modern to Contemporary. 3 Credits. (3 Lec) S,Su
A study of the creative design process through global architecture and allied professions. Exploration of the history of design. Emphasis on 20th and 21st century architecture. Individual projects where students apply and explore creative process are required.
ARCH 211A. Introduction to Design. 3 Credits. (2 Lec) F,S,Su
PREREQUISITE: For majors and non-majors. Introduction to the design and creative process through global architecture and allied professions. Exploration of the history of design. Emphasis on 20th and 21st century architecture. Individual projects where students apply and explore creative process are required.
ARCH 151RA. Design Fundamentals I. 4 Credits. (2 Lec, 2 Lab) F,Su
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ARCH 152. Design Fundamentals II. 4 Credits. (3 Lec) S,Su
A study of the design process and methods employed by design disciplines as an introduction to architectural principles, architectural graphic skills, and further understanding of the creative process. Development of student's ability to make critical and analytical judgments.
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ARCH 211A. Introduction to Design. 3 Credits. (2 Lec) F,S,Su
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ARCH 151RA. Design Fundamentals I. 4 Credits. (2 Lec, 2 Lab) F,Su
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ARCH 152. Design Fundamentals II. 4 Credits. (3 Lec) S,Su
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ARCH 223. Architecture: Modern to Contemporary. 3 Credits. (3 Lec) S,Su
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ARCH 211A. Introduction to Design. 3 Credits. (2 Lec) F,S,Su
PREREQUISITE: For majors and non-majors. Introduction to the design and creative process through global architecture and allied professions. Exploration of the history of design. Emphasis on 20th and 21st century architecture. Individual projects where students apply and explore creative process are required.
ARCH 151RA. Design Fundamentals I. 4 Credits. (2 Lec, 2 Lab) F,Su
A study of the creative design process with emphasis on two-dimensional design, basic three-dimensional design concepts and introduction to the essential tools for graphic communication. Development of students' self-critical skills.
ARCH 152. Design Fundamentals II. 4 Credits. (3 Lec) S,Su
A study of the design process and methods employed by design disciplines as an introduction to architectural principles, architectural graphic skills, and further understanding of the creative process. Development of student's ability to make critical and analytical judgments.
ARCH 221. World Architecture: Modern to Contemporary. 3 Credits. (3 Lec) F,S
This course will examine the historical development of architecture from the 19th century to the present. Within an historical context, the course will focus on the impact of cultural and philosophic trends, technological changes and innovations and the globalization of the digital revolution on our built environment. Students will be introduced to seminal theoretical approaches founded by architects and thinkers of the 20th and early 21st centuries.
ARCH 223. Architecture: Modern to Contemporary. 3 Credits. (3 Lec) S,Su
A study of the creative design process through global architecture and allied professions. Exploration of the history of design. Emphasis on 20th and 21st century architecture. Individual projects where students apply and explore creative process are required.
ARCH 101. Studio. 3 Credits.
PREREQUISITE: ARCH 322 and ARCH 323. A continuation of the holistic design synthesis encountered in ARCH 457 with emphasis on development of student's emerging design values and theoretical perspective. Field trip possible. Notebook computer required.

ARCH 242. Contemporary Architectural History and Theory. 3 Credits. (3 Lec)
On Demand
PREREQUISITE: ARCH 322 and ARCH 323. Critique and discussion of architectural projects built and ideologies proposed in writings, drawings, and models during the 20th and 21st centuries as they relate to the social, cultural, technical and economic context.

ARCH 245. West Architectural History. 3 Credits. (3 Sem; 6 cr max) On Demand
PREREQUISITE: ARCH 322 and ARCH 323. A study of events and influences that led to the development of western architectural styles, ideology, and forms of individual expression.

ARCH 246. History of Identity of Contemporary Places. 3 Credits. (3 Lec; 6 cr max) On Demand
PREREQUISITE: ARCH 322 and ARCH 323. A course in applied architectural history and theory. Lectures, discussions, and student projects investigate characteristics which convey a sense of place based on historical development, architectural styles, and urban design.

ARCH 427. Non-Western Architectural History. 3 Credits. (3 Sem; 6 cr max) On Demand
PREREQUISITE: ARCH 322 and ARCH 323. A study of events and influences that led to the development of non-western architectural styles, ideology, and forms of individual expression.

ARCH 428. Foreign Study History. 3 Credits. (2 Lec, 1 Ind) F
Su PREREQUISITE: ARCH 322 and ARCH 323. COREQUISITE: ARCH 414.
An on-site study in a foreign country of the social, cultural, and historic influences on architectural design. This course is only offered in conjunction with the foreign study program within the School of Architecture. Course shall include research on-site visits documented in an appropriate media form.

ARCH 431. Sustainability in Architecture. 3 Credits. (3 Lec) F
Su PREREQUISITE: ARCH 332 and ARCH 356. Architectural and site strategies for reducing the energy footprint of structures and spaces with an emphasis on the profession’s ethical responsibility and techniques that maximize the potential of active and passive design strategies to sustain our natural resources.

ARCH 444. Computational Design for Structures. 3 Credits. (2 Lec, 1 Lab) On Demand
PREREQUISITE: ARCH 243 and ARCH 263. Introduction to spreadsheets and computational software; spreadsheet developments for typical structural computations used in architecture; introduction to structural design/analysis software; and development of a library of computational software tools for the application of structural architectural design. Notebook computer required.

ARCH 450. Community Design Center. 5 Credits. (1 Lec, 4 Lab) F
Su PREREQUISITE: ARCH 355. The CDC assists public and non-profit groups by providing planning, programming, and conceptual design ideas. Emphasis and scope of projects are determined by the community needs. Projects are intended to complement and promote the professional practice of architecture in the State of Montana.

ARCH 451. Design for Community. 3 Credits. (3 Ind; 6 cr max) On Demand
PREREQUISITE: ARCH 355. Students will be engaged in architecturally-related activities with government and non-profit agencies. This will enable students to be involved in a service learning academic experience.

ARCH 452. Research Methods in Arch. 3 Credits. (3 Lec) S
PREREQUISITE: ARCH 356. Students are introduced to systematic architectural inquiry, its purpose in architectural design, the different approaches to conducting architectural research, and the major components of architectural research.

ARCH 457. Architectural Design V. 5 Credits. (1 Lec, 4 Lab) S
Su PREREQUISITE: ARCH 356. Senior capstone course. Architectural design integrating building, landscape, and urban context using multi-story projects of medium scale and complexity with particular focus on mixed-use. Integrated topics include programming structural and mechanical integration, ecologically-sound design, building envelope systems and building codes.

ARCH 458. Arch Design VI. 5 Credits. (1 Lec, 4 Lab; 12 cr max) On Demand
PREREQUISITE: ARCH 355. A continuation of the holistic design synthesis encountered in ARCH 457 with emphasis on development of student’s emerging design values and theoretical perspective. Field trip possible. Notebook computer required.

ARCH 465. Advanced Computer Application I. 3 Credits. (1 Lec, 4 Lab) F
Su PREREQUISITE: ARCH 355. COREQUISITE: ARCH 428. Students are introduced to systematic architectural design. This course is only offered in conjunction with the foreign study program within the School of Architecture. Course shall include research on-site visits documented in an appropriate media form.

ARCH 471. Directed Research/Creative Act. 1-6 Credits. (1-6 Ind; max unlimited)
F,S,Su
COREQUISITE: ARCH 472. Directed research/creative activity which may culminate in a research paper, journal article, or design project. May be repeated.

ARCH 472. Directed Research/ Creative Activity Instruction. 1-2 Credits. (1-2 Rct; 4 cr max)
F,S,Su
COREQUISITE: ARCH 471. Classroom instruction associated with directed research/creative activity projects.

ARCH 490R. Undergraduate Research. 1-6 Credits. (1 Ind; 12 cr max)
F,S,Su
COREQUISITE: ARCH 489. Directed undergraduate research/creative activity which may culminate in a research paper, journal article, or undergraduate thesis. Course will address responsible conduct of research. May be repeated.
ARCH 491. Special Topics. 1-4 Credits. (1-4 Lec; 12 cr max) On Demand
PREREQUISITE: Course prerequisites as determined for each offering. Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

ARCH 492. Independent Study. 1-3 Credits. (1-3 Ind; 6 cr max) F,S,Su
PREREQUISITE: Junior standing, consent of instructor, and approval of department head. Directed research and study on an individual basis.

ARCH 494. Seminar. 1-3 Credits. (1-3 Sem; 4 cr max) F,S,Su
PREREQUISITE: Junior standing and as determined for each offering. Topics offered at the upper division level which are not covered in regular courses. Students participate in preparing and presenting discussion material.

ARCH 498. Internship. 6 Credits. (12 Ind) F,S,Su
PREREQUISITE: ARCH 340, ARCH 355 and all other architectural courses through the third year. Students arrange for employment in an architectural office for a continuous period of 12 weeks. Students will participate in a structured work/ study professional practice experience and are required to present the content of this experience upon their return to campus.

ARCH 510. Leadership in Prof Practice. 3 Credits. (3 Rct) S
This course broadens your perspective an understanding of the architect’s value as it relates to different types of economics. It presents the leading edge of traditional practice, alternative opportunities, and civic engagement that utilize the architect’s skill set.

ARCH 519. Synthesis of Arch Practice. 3 Credits. (3 Rct) S
PREREQUISITE: MSEM 501, ARCH 510. This capstone will synthesize the learning acquired in previous courses to culminate in development of a transformative business plan for the student’s office. The focus: Research in design milieu; Development of thesis; Evaluative strategies for measuring success; Total cost accountability.

ARCH 521. Arch Theory. 3 Credits. (3 Sem; 9 cr max) On Demand
PREREQUISITE: Graduate standing or seniors by petition. Specific architectural, urban, planning and preservation theories, their application and context within contemporary practice will be investigated through the study of essays, drawings, models and built projects. May be repeated.

ARCH 522. Historical Issues in Arch. 3 Credits. (3 Sem; max unlimited) On Demand
PREREQUISITE: ARCH 322, ARCH 323. Graduate standing or seniors by petition. Close examination of historic periods and individuals. Emphasis upon in-depth studies of particular personalities and the social, cultural, artistic and scientific developments that influenced the progress of architecture, urban design and city planning. May be repeated.

ARCH 523. Issues in City Planning. 3 Credits. (3 Rct) On Demand
PREREQUISITE: Graduate standing or seniors by petition. Problems and issues, processes and regulations in planning, urban design, and historic preservation. Field trip possible.

ARCH 524. Design Competition. 3 Credits. (3 Lab; max unlimited) On Demand
PREREQUISITE: ARCH 355 or consent of instructor. Admission to graduate program or seniors by petition. Students will work under the direction of a faculty member in the research, design, development and presentation of a project in response to a design competition.

ARCH 525. Special Design Topic. 3 Credits. (3 Lab; 12 cr max) On Demand
PREREQUISITE: ARCH 355 and consent of instructor. Admission to graduate program or seniors by petition. Students will work under the direction of a faculty member in the research, design, development and presentation of a design, research, or historic preservation project. May be repeated as topics vary.

ARCH 526. Advanced Architectural Theory. 3 Credits. (3 Lec; S)
This course focuses on the critique and discussion of current architectural projects built and ideology proposed in writings, drawings and models including historic traditions and the simultaneous global, social, and technical context, in order to examine current architectural issues. To be taken concurrently with ARCH 558 by new Graduate students.

ARCH 527. Architecture: Meaning & Place. 3 Credits. (3 Sem; 9 cr max)
On demand Close examination of the psychological, existential and traditional meaning and consequential sense of place in our natural and built environment.

ARCH 528. Advanced Studies in Interior Design. 3 Credits. (3 Sem)
On demand SEM Exploration of topics related to interior design including theory and application of the principles of interior design.

ARCH 533. Adv Environmental Controls. 3 Credits. (6 Stu)
PREREQUISITE: ARCH 331 and ARCH 332. Admission to the graduate program or seniors by petition. Advanced environmental control systems explored through experimental exercises, calculations, physical modeling and computer simulations with the goal of designing a high-performance buildings with an emphasis on lighting and HVAC systems. Notebook computer required.

ARCH 535. Adv Bldg Sys Integration. 3 Credits. (1 Lec, 2 Lab) F
PREREQUISITE: Graduate standing and admission to Master of Architecture degree program COREQUISITE: ARCH 558 Classroom instruction leading to a demonstrated understanding and integration of environmental, structural, building envelope, building service, building materials and assembly systems in a comprehensive studio design project. To be taken concurrently with ARCH 558 by new graduate students.

ARCH 543. Advanced Applied Design and Construction. 3 Credits. (3 Lab; max unlimited) On Demand
PREREQUISITE: ARCH 241, consent of instructor, and graduate standing or seniors by petition. Small scale projects industrial products, furniture, buildings, etc., will be designed and built by students as an exploration of the opportunities and limitations of materials, technology, economics, and construction methods.

ARCH 545. Advanced Structures. 3 Credits. (2 Lec, 1 Lab) On Demand
PREREQUISITE: ARCH 244 or ARCH 344 and graduate standing or seniors by petition. Advanced structural topics, historical and contemporary structural precedents, load path, performance design, structural LLEC 2systm planning, connection design; structural restoration; complete 2D and 3D design/analysis/structural projects.

ARCH 551. Advanced Arch Studio. 6 Credits. (4 Lab, 2 Stu) S,Su
PREREQUISITE: ARCH 558. Design projects which explore specific critical positions with regard to contemporary architectural issues. Research and analysis of theoretical positions are emphasized along with the development of contemporary methods and techniques for analysis. Field trip required.

ARCH 552. Arch Research Methods. 3 Credits. (3 Sem) F,S,Su
PREREQUISITE: Graduate standing or seniors by petition. An examination of the types of inquiry used to conduct architectural research. Students will engage in initial studies of traditional and non-traditional research methods in architecture and its related fields followed by an individual research project.

ARCH 553. Architectural Application - Theoretical Application. 3 Credits. (1 Lec) On Demand
PREREQUISITE: Graduate standing. Graduate research and analysis of the formal manifestations of the specific theoretical positions advocated and illustrated through the design work of significant architectural practitioners. Notebook computer required.

ARCH 554. Urban Design Studio. 6 Credits. (4 Lab, 2 Stu) On Demand
PREREQUISITE: Graduate standing. Urban design projects that develop an understanding of public planning goals and constraints, urban infrastructure, formal urban fabric, historic preservation, and socio-cultural issues. Notebook computer required. Field trip required.

ARCH 555. Urban Design Research/Theory. 3 Credits. (3 Lec) On Demand
PREREQUISITE: Graduate standing. Methods, models, and techniques for analyzing the city as an artifact of social, cultural, historical, economic and physical significance. Notebook computer required. Field trip required.

ARCH 556. Construction Theory. 3 Credits. (3 Sem; max unlimited) On Demand
PREREQUISITE: Graduate standing. Graduate research and analysis of contemporary and historic design theory. Notebook computer required. Field trip required.

ARCH 557. Architectural Design Studio. 6 Credits. (0 Lec, 4 Lab, 2 Stu) On Demand
PREREQUISITE: Graduate standing. Advanced architectural design projects integrating site analysis, programming, building systems, and contemporary design theory. Emphasis placed on the synthesis of conceptual processes, analysis, preliminary design investigation, and design development. Field Trip required.

ARCH 558. Comprehensive Design Studio. 6 Credits. (4 Lab, 2 Stu) F
PREREQUISITE: Graduate Standing. COREQUISITE: ARCH 535. Comprehensive architectural studio which integrated design thinking and investigative skills with site design, accessibility and life safety, sustainability and environmental, and structural systems in the design and presentation of a programatically complex building.

ARCH 560. Masters Studio Project. 1-6 Credits. (1-6 Studio; 6 cr max) F
PREREQUISITE: ARCH 551 and ARCH 575 Architectural design project that builds upon prior research investigations with an emphasis placed on analysis, synthesis, evaluation and development of a design solution from conceptual design through schematic/design development.
ARCH 564. Adv Arch Graphics. 3 Credits. (3 Lab; max unlimited) F
Su PREREQUISITE: ARCH 262, admission to graduate program or seniors by
petition. Advanced architectural presentation strategies for exploring visual perception and
design development through graphic exploration. May be taken more than once as
topics vary.

ARCH 565. Advanced Computer Applications II. 3 Credits. (3 Lab) On Demand
PREREQUISITE: ARCH 263 or ARCH 464. Computer-aided design and theory for
architecture. Lectures and projects may include topics of three-dimensional modeling,
animation, delineation or digital fabrication.

ARCH 566. Photography for Architects. 3 Credits. (3 Sem)
On demand Theory and application of the principles of photography as a means to
view and interpret the built and natural environment from the perspective of an allied
art.

ARCH 575. Professional Paper. 1-4 Credits. (1-4 Ind; 4 cr max) F,S,Su
PREREQUISITE: Graduate Standing Research or professional paper/project dealing with
a topic in the field. Topic must be mutually agreed upon by the student and
their major advisor and graduate committee. This course is required for students in
Architecture non-thesis (plan B) master’s degree program.

ARNR 589. Graduate Consultation. 1-3 Credits. (1-3 Ind; 3 cr max) F,S,Su
PREREQUISITE: Master’s standing and approval of the Dean of Graduate Studies.
This course may be used only by students who have completed all of their course work
but who need additional faculty or staff time or help.

ARCH 590. Master’s Thesis. 1-10 Credits. (1-10 Ind; max unlimited) F,S,Su
PREREQUISITE: Master’s standing.

ARCH 591. Special Topics. 1-4 Credits. (1-4 Lec; 12 cr max) On Demand
PREREQUISITE: Graduate standing or seniors by petition. Course prerequisites as
determined for each offering. Courses for which there is a particular one time need, or
given on a trial basis to determine acceptability and demand before requesting a regular
course number.

ARCH 592. Independent Study. 1-4 Credits. (1-4 Ind; 8 cr max) On Demand
PREREQUISITE: Admission to graduate program. Directed graduate research and
study of architectural, urban design or historic preservation issues on an individual
basis.

ARCH 594. Seminar. 1 Credit. (1 Sem; 4 cr max) On Demand
PREREQUISITE: Graduate standing. Course prerequisites as determined for each offering. Topics offered at the graduate level which are not
covered in regular courses. Students participate in preparing and presenting discussion material.

ARNR - Animal & Range Natural Res

ARNR 507. Research Methods. 1 Credit. (1 Sem; 5 cr max) F,S
PREREQUISITE: Graduate standing. Application of scientific method and research
procedures, including design of experiments and use of appropriate statistical
procedures.

ARNR 508. Rangeland Ecological Theory and Application. 3 Credits. (3 Lec) F
alternate years, to be offered odd years.
PREREQUISITE: Graduate standing. In this course students will explore the scientific
literature and ecological basis for rangeland management practices and will develop
an ecological awareness to support critical evaluation of and solution building for
ecological problems on arid and semi-arid landscapes.

ARNR 520. Nutrient Metabolism. 3 Credits. (3 Lec) F alternate years, to be offered odd years.
PREREQUISITE: ANSC 320, and either CHMY 123 or BCH 380 or consent of
Instructor. Energy and protein utilization, emphasis on how energy and protein
requirements are determined.

ARNR 521. Adv Ruminant Nutrition. 3 Credits. (2 Lec, 1 Lab) F alternate years, to
be offered even years.
PREREQUISITE: ANSC 320 or consent of instructor. Physiological and
microbiology aspects of ruminant digestion and their influence on the metabolism of
extraluminal tissues.

ARNR 523. Adv Physiology of Reproduction. 3 Credits. (3 Lec) S alternate years, to
be offered odd years.
PREREQUISITE: BIOB 412, BCH 380, ANSC 321 or consent of instructor. Study of
the basic concepts of reproductive process of mammals with special emphasis on
the application of recent techniques in solving reproductive problems associated with
fertility and infertility.

ARNR 524. Adv Animal Breeding. 3 Credits. (3 Lec) S alternate years, to be offered
even years.
PREREQUISITE: ANSC 322. Quantitative and molecular genetics applied to
the improvement of animals. Study of relationships among relatives, methods of
estimating genetic parameters, application of crossbreeding systems and selection
techniques, and the application of molecular biology to understand the basis of
economically important traits in livestock.

ARNR 525. Muscle Growth & Biology. 3 Credits. (3 Lec) S alternate years, to be
offered even years.
PREREQUISITE: BCH 380 AND BIOB 160. Growth and development of muscle,
muscle structure and how growth is controlled by hormones and DNA will be studied.
The impact of growth manipulation on the final product, meat, will also be evaluated.

ARNR 529. Yellowstone Wildlife Habitat Ecology. 2 Credits. (2 Lec) Su
PREREQUISITE: WILD 426 OR WILD 428 or equivalent. This course will describe
the native communities of the internationally prominent northern Yellowstone winter
range for wild ungulates. The ecology of many organisms, both plant and animal will
be studied. Plant identification skills will be incorporated with an emphasis on the
recognition of the Yellowstone northern range’s flora and its importance as wildlife
habitat. Ecosystem interrelationships will form the basis for understanding the ecology
of the range and interpreting the consequences of management alternatives.

ARNR 541. Range Ecophysiology. 3 Credits. (3 Lec) S alternate years, to be offered
even years.
PREREQUISITE: NRSM 240 or BIOE 370 or BIOE 433. Lectures and selected
readings on the response of range plants and animals to daily and seasonal changes in
their environment, including physiology, animal behavior, and plant population
biology.

ARNR 543. Riparian Process & Function. 3 Credits. (3 Lec) S alternate years, to be
offered odd years.
PREREQUISITE: NRSM 455, BIOE 370 and ERTH 432. This course involves an in
depth investigation of the geomorphological physical and biological parameters unique to
riparian areas of the Northern Rocky Mountains and Great Plains. Emphasis will be
placed on how these parameters interact to create the biotic communities associated
with riparian areas.

ARNR 544. Advanced Grazing Management and Ecology. 3 Credits. (3 Lec) S
alternate years, to be offered odd years.
PREREQUISITE: NRSM 240 or NRSM 350 or NRSM 351 or BIOE 370. Review of
management principles for livestock grazing rangelands and their ecological
relationships. Study design and scientific results will be examined to critically review
information.

ARNR 555. Rangeland Wildlife Ecology & Management. 3 Credits. (3 Lec) F
PREREQUISITE: Graduate student standing. Course explores the history, ecology,
and management of wildlife populations occurring on rangelands. Emphasis will be
placed on habitat and population management with primary consideration of
management issues facing wildlife populations in the West.

ARNR 575. Prof Paper & Project. 1-4 Credits. (1-4 Ind; 6 cr max) F,S,Su
PREREQUISITE: Graduate standing. A research or professional paper or project
dealing with a topic in the field. The topic must have been mutually agreed upon by the
student and his or her major adviser and graduate committee.

ARNR 589. Graduate Consultation. 3 Credits. (3 Ind; max unlimited) F,S,Su
PREREQUISITE: Master’s standing and approval of the Dean of Graduate Studies.
This course may be used only by students who have completed all of their course work
(and thesis, if on a thesis plan) but who need additional faculty or staff time or help.

ARNR 590. Master’s Thesis. 1-10 Credits. (1-10 Ind; max unlimited) F,S,Su
PREREQUISITE: Master’s standing.

ARNR 591. Special Topics. 1-4 Credits. (1-4 Lec; 12 cr max) On Demand
PREREQUISITE: Upper division courses and others as determined for each offering.
Courses not required in any curriculum for which there is a particular one time need,
or given on a trial basis to determine acceptability and demand before requesting a
regular course number.

ARNR 592. Independent Study. 1-3 Credits. (1-3 Ind; 6 cr max) On Demand
PREREQUISITE: Graduate standing, consent of instructor, approval of department
head and Dean of Graduate Studies. Directed research and study on an individual
basis.

ARNR 594. Seminar. 1 Credit. (1 Sem; 4 cr max) On Demand
PREREQUISITE: Graduate standing or seniors by petition. Course prerequisites as
determined for each offering. Topics offered at the graduate level which are not
covered in regular courses. Students participate in preparing and presenting discussion material.
ARTH 410. Medieval Art. 3 Credits. (3 Lec) F alternate years to be offered odd years PREREQUISITE: ARTH 200. Early Christian, Byzantine, Romanesque, and Gothic periods.

ARTH 421. Late Gothic Painting. 3 Credits. (3 Lec) F alternate years to be offered odd years PREREQUISITE: ARTH 201. This course will deal with the development of Gothic painting in Italy and its subsequent influence on the Northern tradition of painting in the Netherlands and Germany. Major masters include Giotto, Jan van Eyck, Bosch, Grunewald, Durer, and Bruegel.

ARTH 422. Early Renaissance to 15th Century Art. 3 Credits. (3 Lec) F alternate years to be offered even years PREREQUISITE: ARTH 201. A study of painting, sculpture and architecture in Italy in the 15th century. Major artists include Donatello, Masaccio, Piero della Francesca and Botticelli, Michelangelo, and Giorgione.

ARTH 424. High Renaissance and Mannerism. 3 Credits. (3 Lec) S alternate years to be offered even years PREREQUISITE: ARTH 201. This course is a study of the high renaissance in Rome, Florence and Venice, and the reactions to this in the style of mannerism. Major artists include Leonardo, Michelangelo, Raphael, Pontormo and Titian.

ARTH 426. Baroque Art in Italy and Southern Europe, 1600-1700. 3 Credits. (3 Lec) F alternate years to be offered even years PREREQUISITE: ARTH 201. This course offers students a more in-depth study of art in the Baroque period in Europe (1600-1700) by focusing on cultural developments in the Republic of the Netherlands and its colonies.

ARTH 430. 19th Century Art. 3 Credits. (3 Lec) F alternate years to be offered odd years PREREQUISITE: ARTH 201. This course examines the major artists of the 19th century in Europe and America and the development of the styles of Neoclassicism, Romanticism, Realism, and Impressionism.

ARTH 432. Art in the Age of Revolution. 3 Credits. (3 Lec) S alternate years to be offered even years ARTH 201. This course offers students an in-depth understanding of painting and sculpture in France and Britain in the 18th century. Through focused lectures, readings and discussions and writing assignments students will learn about the 18th century cultural, philosophical and scientific developments in their original contexts as well as their bearing on the present day.

ARTH 435. Art in the United States. 3 Credits. (3 Lec) F alternate even years PREREQUISITES: ARTH 200 or ARTH 201. This course will deal with the art and architecture of the United States from the Early Republic (1800-1865) to the Art Nouveau period (1893-1914).

ARTH 440. 20th Century Art. 3 Credits. (3 Lec) S alternate years to be offered even years PREREQUISITE: ARTH 201. From Post-Impressionism to War WWII. Major artists include Cezanne, Picasso, Matisse, Mondrian, and the German Expressionists.

ARTH 440. 20th Century Art. 3 Credits. (3 Lec) S alternate years to be offered even years PREREQUISITE: ARTH 201. From Post-Impressionism to War WWII. Major artists include Cezanne, Picasso, Matisse, Mondrian, and the German Expressionists.

ARTH 441. Art Now. 3 Credits. (Lec 3) F Alternate Even Years PREREQUISITES: ARTH 200 or ARTH 201. Art Now is designed as a discussion-based course surveying the most recent trends in contemporary art, focusing in particular on developments that have occurred within the art world of the last fifteen years.

ARTH 451. Contemporary Art. 3 Credits. (3 Lec) F alternate years to be offered odd years PREREQUISITE: ARTH 440. This course will focus on issues in contemporary painting, sculpture, and related radical art forms. Students are responsible for discussions of assigned readings and presentations of research projects.

ARTH 460. Contemporary Art & Ecology. 3 Credits. (3 Lec) S PREREQUISITES: ARTH 200 or ARTH 201. This discussion course will examine the themes and movements in ecological art since 1945. Its primary focus will be on the historiography of land art, and the relationship between nature and technology.

ARTH 461. Art and Social Activism. 3 Credits. (3 Sem) S PREREQUISITES: ARTH 200 or ARTH 201. This seminar will sketch a history of alternative art practices and spaces since the 1960’s. It will address the redefinition of public art--from monumental sculpture to interactive and often collaborative work with specific communities.
ARTh 462. Islamic Art and Architecture. 3 Credits. (3 Lec) On Demand
PREREQUISITE: ARTH 200 This course is a survey of Islamic art and architecture from Spain to India, and from the era of Muhammad to the Mughal empire of the 18th century CE. Students will explore the changing role of figurative art. The goal of this course is to understand Islamic art and architecture as the visual expression of the civilization creating it.

ARTH 491. Special Topics. 1-4 Credits. (1-4 Lec; 12 cr max) On Demand
PREREQUISITE: Course prerequisites as determined for each offering. Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

ARTH 492. Independent Study. 1-3 Credits. (1-3 Ind; 6 cr max) On Demand
PREREQUISITE: Junior standing, consent of instructor, and approval of the director. Directed research and study on an individual basis.

ARTH 494. Seminar. 1 Credit. (1 Sem; 4 cr max) On Demand
Topics offered at the upper division level which are not covered in regular courses. Students participate in preparing and presenting discussion material.

ARTH 495. Field Study. 2-5 Credits. (2-2.5 Lab; 6 cr max) S
PREREQUISITE: ARTH 106, ARTZ 108 or ARTH 201, or consent of instructor. Course will allow students to study at an off-campus location such as a foreign country under the direction of an art faculty member. Includes preparatory meetings, several hours per day of discussion on site, and writing or creative project which simulates direct experience and research.

ARTH 498. Internship. 2-12 Credits. (2-12 Ind; 12 cr max) On Demand
PREREQUISITE: Junior standing, consent of instructor, and approval of the director. An individualized assignment arranged with an agency, business, or other organization to provide guided experience in the field.

ARTH 499R. Senior Thesis: Art History. 1-5 Credits. (1 Ind; 12 cr max) F,S,Su Senior capstone course. Directed undergraduate research/creative activity which may culminate in a research paper, undergraduate thesis paper, or undergraduate thesis exhibition. Graphic design students must take this course in the spring. Course will address responsible conduct of research.

ARTH 501. Pedagogy and Professionalism. 2 Credits. (2 Sem) F
Art historians are continually challenged to impart visual and critical thinking skills to a public audience, whether in the context of a university classroom or a scholarly conference. This graduate seminar is designed to provide graduate students with skills necessary for becoming effective instructors and professionals in academic or museum environments.

ARTH 506. Methods and Critical Theory. 3 Credits. (3 Sem) F
The discipline of Art History has had a remarkably complex development, from the formalist concerns of the late nineteenth century to the theoretical arguments of the late twentieth century. This graduate seminar will explore various art historical methods currently in use and diverse critical theories developed over the last few decades.

ARTH 512. Etruscan Art. 3 Credits. (3 Lec) S
The course focuses on the art and architecture produced by an important Italic civilization, the Etruscans, as well as their Iron Age ancestors, Villanovan civilization. The approach is contextual, with an examination of the social, economic, religious factors surrounding their artistic developments.

ARTH 532. Portrait and Identity Form. 3 Credits. (3 Sem) S
Alternate years to be offered odd years 3 cr. SEM 3 This graduate course will explore how portrait images have promoted a range of identities for sitters from the Renaissance through the Modern Era. It will consider them as strategies for communicating political and social values to various viewing constituencies.

ARTH 535. The Origins of the Modern Art Museum. 3 Credits. (3 Sem) S
Alternate years to be offered every even years 3 cr. SEM 3 PREREQUISITE-Graduate Standing This graduate seminar in the origins of the modern art museum will explore how the first public institutions grappled with determining what constitutes “great art”, what conditions were most favorable to its display, and what kinds of information should be relayed to the “public”.

ARTH 555. Critical Terms in Art History. 3 Credits. (3 Sem) F
Alternate years This is a seminar designed for candidates for the master’s degree in art history to expose them to a gamut of issues and approaches to research in the history of art, with particular emphasis on recent concepts and theories pertaining to modern and contemporary art.

ARTH 575. Professional Paper and Project. 1-4 Credits. (1-4 Ind; 6 cr max) F,S,Su
PREREQUISITE: Graduate standing. A research or professional paper or project dealing with a topic in the field. The topic must have been mutually agreed upon by the student and his or her major advisor and graduate committee.

ARTH 588. Professional Development. 1-5 Credits. (1-3 Lec; 3 cr max) On Demand
PREREQUISITE: Graduate standing, teaching experience and/or current employment in a school organization, consent of instructor and Dean of Graduate Studies. Courses offered on a one-time basis to fulfill professional development needs of in service educators. A specific focus is given to each course which is appropriately subtitled.

ARTH 590. Master’s Thesis. 1-10 Credits. (1-10 Ind; 15 cr max) F,S,Su
PREREQUISITE: Master’s standing.

ARTH 591. Special Topics. 1-4 Credits. (1-4 Lec; 12 cr max) On Demand
PREREQUISITE: Upper division courses and others as determined for each offering. Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

ARTH 592. Independent Study. 1-3 Credits. (1-3 Ind; 6 cr max) On Demand
PREREQUISITE: Graduate standing, consent of instructor, and Dean of Graduate Studies. Directed research and study on an individual basis.

ARTH - Art: Visual Arts

ARTH 105RA. Visual Language - Drawing. 3 Credits. (6 Stu) F,S
The development of basic drawing skills and concepts through an emphasis on observation and visual problem-solving. Representation and expression are explored through black and white drawing media. Critiques develop student’s ability to formulate and verbalize knowledgeable responses to visual production.

ARTH 109RA. Visual Language: Comprehensive Foundation. 4 Credits. (1 Lec, 3 Std) F
PREREQUISITE: Consent of instructor. The development of basic two-dimensional and three-dimensional technical and aesthetic concepts through an emphasis on design elements and principles. Visual problem-solving in 2D pictorial construction, 3D form and space, and color theory. Critiques develop student’s ability to formulate and verbalize knowledgeable responses to visual production. Required weekly lecture on various aspects of visual arts practice. Art Department.

ARTH 110RA. Visual Language: Ideation and Creativity. 4 Credits. (1 Lec, 3 Std) S
Development and understanding of processes for ideation and creative thinking to generate questions and solutions. Develop basic abilities to interpret, recognize, construct, appreciate and negotiate information presented in the form of visible actions, images, objects and symbols, natural or human-made.

ARTH 131. Ceramics for Non Majors. 3 Credits. (1 Lec. 2 Studio)
Ceramics for non majors will offer an overview of the history, development, and aesthetics of ceramic vessels and sculpture, the technical aspects of clay, glazes, and the firing of ceramic objects. The course will focus on problem solving and the development of ideas.

ARTH 211RA. Drawing I. 6 Credits. (2 Lec, 4 Sru) F,S,Su
PREREQUISITE: ARTZ 106, ARTH 105. Introduction to the basic vocabulary of drawing, observation, problem solving, and personal expression. Critiques develop student’s ability to formulate and verbalize informed analysis of the completed projects.

ARTH 221. Painting I. 4 Credits. (2 Lec, 2 Lab) F,S
PREREQUISITE: ARTZ 106, ARTH 105. Introduction to oil and/or acrylic painting. Exploration of basic aesthetic and technical concepts in painting. Primarily representational subject matter. Understanding and developing individual stylistic tendencies. Individual and group critiques.

ARTH 231RA. Ceramic I. 4 Credits. (2 Lec, 2 Lab) F,S

ARTH 251. Sculpture I. 4 Credits. (2 Lec, 2 Lab) F,S
PREREQUISITE: ARTH 108. Introduction to three-dimensional form through projects involving platter, woodworking, welding, and non-traditional materials. Introduction to tools, materials, processes, and safety procedures with a conceptual approach to problem solving.

ARTH 261. Metals I. 4 Credits. (2 Lec, 2 Lab) F,S
PREREQUISITE: ARTH 108. A beginning course in basic metalsmithing techniques and three-dimensional design skills. Design concepts, small metal fabrication methods and practical demonstrations.

ARTH 271. Printmaking I. 4 Credits. (2 Lec, 2 Lab) F,S
PREREQUISITE: ARTH 106. A beginning course in which multiple original prints are made from a variety of blocks and plates. Emphasis on relief and intaglio history and processes including woodcut, lino cut, engraving, etching, and aquatint.

ARTZ - Art: Visual Arts
ARTZ 282. Photographic Image and its construction. 4 Credits. (1 Lec. 3 Studio)
PREREQUISITES: ARTZ 109RA, ARTZ 110RA This course will introduce students not only on how to make digital photographs and output them, but also to understand how to read photography, the image and its underlying conceptual construction, with particular reference to photography and fine art practices.

ARTZ 290R. Undergraduate Research. 1-6 Credits. (1-6 Ind; 6 cr max) F,S
Directed undergraduate research which may culminate in a written work or other creative project. Course will address responsible conduct of research.

ARTZ 291. Special Topics. 1-4 Credits. (1-4 Lec; 12 cr max) On Demand
PREREQUISITE: None required but some may be determined necessary by each offering department. Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

ARTZ 292. Independent Study. 1-3 Credits. (5-1.5 Lab; 6 cr max) On Demand
PREREQUISITE: Consent of instructor and approval of the director. Directed research and study on an individual basis.

ARTZ 312. Intermediate Drawing. 5 Credits. (3 Std, 2 Rct; 15 cr max) F,S,Su
PREREQUISITE: ARTZ 211. Advanced technical and aesthetic concepts in drawing with emphasis on the development of a personal artistic style. Use of traditional and non-traditional subject matter. Individual and group critiques.

ARTZ 322. Intermediate Painting. 5 Credits. (3 Std, 2 Rct; 15 cr max) F,S

ARTZ 332. Intermediate Ceramics. 5 Credits. (2 Lec, 3 Std; 15 cr max) F,S
PREREQUISITE: ARTZ 231. Advanced problems in ceramics.

ARTZ 352. Intermediate Sculpture. 5 Credits. (3 Std, 2 Rct; 15 cr max) F,S

ARTZ 361. Metals II. 5 Credits. (2 Lec, 3 Std; 15 cr max) F,S
PREREQUISITE: ARTZ 261. Advanced course designed around a set of specific problems and demonstrations for advanced jewelry and metal forming concepts. Emphasis will be placed on technical development and personal imagery.

ARTZ 373. Intermediate Printmaking - Lithography. 5 Credits. (2 Lec, 3 Std; 15 cr max) F,S
PREREQUISITE: ARTZ 271 and ARTZ 211. An intermediate course in which multiple original prints are made from hand-drawn images on lithographic limestone. Etching in black and multicolor using crayon, tusche, transfer, and photo methods.

ARTZ 374. Intermediate Printmaking - Serigraphy. 5 Credits. (2 Lec, 3 Std; 15 cr max) S
PREREQUISITE: ARTZ 271. An intermediate course in which multiple original, multi-colored prints are made using various water-based silk-screen processes. Stencil techniques include paper, screen filler, drawing fluid, and photo methods.

ARTZ 375. Intermediate Printmaking - Intaglio. 5 Credits. (3 Std, 2 Rct; 15 cr max) S
PREREQUISITE: ARTZ 271. Advanced course in which multiple original prints are made using engraved and/or etched copper, zinc, and/or plastic intaglio plates. Methods include spit bite, viscosity, a la poupee, multi plate color, collagraph, and chine colle.

ARTZ 376. Intermediate Printmaking - Relief. 5 Credits. (3 Std, 2 Rct; 15 cr max) F
PREREQUISITE: ARTZ 271. An advanced course in which multiple original prints are made using plank and end grain wood and plastic/rubber relief plates. Methods include reductive and multi-plate color, shaped and found object (collagraph), color overlay, split fountain, roller and brush inking, and various hand and press printing methods.

ARTZ 379. Alternative Print Media. 5 Credits. (5 Lab; 15 cr max) S
PREREQUISITE: ARTZ 271. An advanced course in which students are offered a wide range of printing processes. These may include monotype, photo techniques, experimental lithography, large format printing, multimedia, and digital printmaking. The structure of the course is based on technical demonstrations, studio assignments, and critiques.

ARTZ 400. Careers in Art. 1 Credit. (1 Lec) F
PREREQUISITE: Junior, Senior, or Graduate standing, or consent of instructor. Senior capstone course for Liberal Arts Studio majors. Presentations by professional artists about important career elements such as resume writing, photographing and marketing your work, making presentations to galleries and design firms, starting a business, researching graduate schools, teaching as a career, and applying for grants and fellowships.

ARTZ 411. Guided Research- Drawing. 1-5 Credits. (1-5 Ind; 15 cr max) F,S,Su
PREREQUISITE: ARTZ 312. Course in which student will work on an individual basis with a faculty member in developing imagery and appropriate techniques in a particular area of drawing. Written, signed contract required prior to registering for this course.

ARTZ 421. Guided Research- Painting. 1-5 Credits. (1-5 Ind; 15 cr max) F,S,Su
PREREQUISITE: ARTZ 322. Course in which student will work on an individual basis with a faculty member in developing imagery and appropriate techniques in a particular area of painting. Written, signed contract required prior to registering for this course.

ARTZ 431. Guided Research- Ceramics. 1-5 Credits. (1-5 Ind; 15 cr max) F,S,Su
PREREQUISITE: ARTZ 332. Course in which student will work on an individual basis with a faculty member in developing imagery and appropriate techniques in a particular area of ceramics. Written, signed contract required prior to registering for this course. Department of Art.

ARTZ 432. Kiln Building Intensive. 3-6 Credits. (1 Lec, 2 Lab) Su,On Demand
PREREQUISITES: ARTZ 231, or consent of the instructor. This course is for those interested in pursuing a career in the ceramic arts. The class will offer students the opportunity to learn the design, cost estimates, and construction process for building an essential tool for their work, a kiln.

ARTZ 453. Guided Research- Sculpture. 1-5 Credits. (1-5 Ind; 15 cr max) F,S
PREREQUISITE: ARTZ 352. Course in which student will work on an individual basis with a faculty member in developing imagery and appropriate techniques in a particular area of sculpture. Written, signed contract required prior to registering for this course.

ARTZ 461. Guided Research-Metalsmithing. 1-5 Credits. (1-5 Ind; 15 cr max) F,S,Su
PREREQUISITE: ARTZ 361. Course in which student will work on an individual basis with a faculty member in developing imagery and appropriate techniques in a particular area of metalsmithing. Written, signed contract required prior to registering for this course.

ARTZ 472. Guided Research- Printmaking. 1-5 Credits. (1-5 Ind; 15 cr max) F,S,Su
PREREQUISITE: ARTZ 373 or 374, ARTZ 376, ARTZ 375, ARTZ 379. Course in which student will work on an individual basis with a faculty member in developing imagery and appropriate techniques in a particular area of printmaking. Written, signed contract required prior to registering for this course.

ARTZ 490R. Undergraduate Research. 1-5 Credits. (1 Ind; 12 cr max) On Demand
PREREQUISITE: Course prerequisites as determined for each offering. Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

ARTZ 491. Special Topics. 1-5 Credits. (1-5 Lec; 12 cr max) On Demand
PREREQUISITE: Course prerequisites as determined for each offering. Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

ARTZ 492. Independent Study. 1-3 Credits. (1-3 Ind; 6 cr max) On Demand
PREREQUISITE: Junior standing, consent of instructor, and approval of the director. Directed research and study on an individual basis.

ARTZ 494. Undergraduate Seminar. 3-6 Credits. (3 Seminar) F,S
PREREQUISITES: If studio arts majors, students must be of junior standing, and have successfully passed the BFA portfolio review. If liberal arts/studio option majors, students must be of senior standing. A weekly platform for critical and creative discussion in which students will study selected critical and/or philosophical readings while engaging in the production of studio work independently, in the media and formal framework that is appropriate to their work.

ARTZ 498. Internship. 2-12 Credits. (2-12 Ind; 12 cr max) On Demand
PREREQUISITE: Junior standing, consent of instructor, and approval of the director. An individualized assignment arranged with an agency, business, or other organization to provide guided experience in the field.
ASTR 499R. Senior Thesis: Studio. 1-5 Credits. (1 Ind; 12 cr max) F,S,Su
Senior capstone course. Directed undergraduate research/creative activity which may culminate in a research paper, undergraduate thesis paper, or undergraduate thesis exhibition. Graphic design students must take this course in the spring. Course will address responsible conduct of research.

ASTR 505. Painting. 1-5 Credits. (1-5 Ind) F,S,Su
Maximum 15 cr PREREQUISITE: ARTZ 421, graduate standing. Course in which the student will work on an individual basis with a faculty member in developing imagery and appropriate techniques in a particular area of painting.

ARTZ 515. Ceramics. 1-5 Credits. (1-5 Ind) F,S,Su
Maximum 15 cr PREREQUISITE: ARTZ 431, graduate standing. Course in which the student will work on an individual basis with a faculty member in developing imagery and appropriate techniques in a particular area of ceramics.

ARTZ 524. Metalsmithing. 1-5 Credits. (1-5 Ind) F,S,Su
Maximum 15 cr PREREQUISITE: ARTZ 461, graduate standing. Course in which the student will work on an individual basis with a faculty member in developing imagery and appropriate techniques in a particular area of metalsmithing.

ARTZ 526. Drawing. 1-5 Credits. (1-5 Ind) F,S,Su
Maximum 15 cr PREREQUISITE: ARTZ 411, graduate standing. Course in which the student will work on an individual basis with a faculty member in developing imagery and appropriate techniques in a particular area of drawing.

ARTZ 527. Printmaking. 1-5 Credits. (1-5 Ind) F,S,Su
Maximum 15 cr PREREQUISITE: ARTZ 472, graduate standing. Course in which the student will work on an individual basis with a faculty member in developing imagery and appropriate techniques in a particular area of printmaking.

ARTZ 529. Sculpture. 1-5 Credits. (1-5 Ind) F,S,Su
Maximum 15 cr PREREQUISITE: ARTZ 453, graduate standing. Course in which the student will work on an individual basis with a faculty member in developing imagery and appropriate techniques in a particular area of sculpture.

ARTZ 530. Intermedia. 1-5 Credits. (1-5 Ind) F,S,Su
Maximum 15 cr PREREQUISITE: ARTZ 352, ARTZ 312, ARTZ 322 and graduate standing. Course in which the student will work on an individual basis with a faculty member in developing imagery and appropriate techniques in a particular area of intermedia.

ARTZ 575. Professional Paper and Project. 1-4 Credits. (1-4 Ind; 6 cr max) F,S,Su
PREREQUISITE: Graduate standing. A research or professional paper or project dealing with a topic in the field. The topic must have been mutually agreed upon by the student and his or her major adviser and graduate committee.

ARTZ 588. Professional Development. 1-3 Credits. (1-3 Lec; 3 cr max) On Demand
PREREQUISITE: Graduate standing, teaching experience and/or current employment in a school organization, consent of instructor and Dean of Graduate Studies. Courses offered on a one-time basis to fulfill professional development needs of in service educators. A specific focus is given to each course which is appropriately subdivided.

ARTZ 589. Graduate Consultation. 3 Credits. (3 Ind) F,S,Su
PREREQUISITE: Master’s standing and approval of the Dean of Graduate Studies. This course may be used only by students who have completed all of their course work (and thesis, if on a thesis plan) but who need additional faculty or staff time or help.

ARTZ 590. Master’s Thesis. 1-10 Credits. (1-10 Ind) F,S,Su
Maximum 15 cr PREREQUISITE: Master’s standing.

ARTZ 592. Independent Study. 1-3 Credits. (1-3 Ind; 6 cr max) On Demand
PREREQUISITE: Graduate standing, consent of instructor, and Dean of Graduate Studies. Directed research and study on an individual basis.

ARTZ 594. Seminar. 1 Credit. (1 Sem; 5 cr max) On Demand
PREREQUISITE: Graduate standing or seniors by petition. Course prerequisites as determined for each offering. Topics offered at the graduate level which are not covered in regular courses. Students participate in preparing and presenting discussion material.

ASTR - Physics-Astronomy

ASTR 110IN. Introduction to Astronomy: Mysteries of the Sky. 3 Credits. (3 Lec) F,S,Su
An introduction to contemporary astronomy that explores the nature, methods, and limitations of scientific inquiry within the context of our struggle to understand the structure and evolution of the Universe. Topics include the history of astronomy, motions of the night sky, the solar system, stellar evolution, galaxies, and cosmology.
AVFT 245. Commercial Ground. 3 Credits. (3 Lec) F
Prerequisite: AVFT 143. Commercial Flight Maneuvers, Airplane Aerodynamics, Advanced Performance, Power plants (including fuel injection and turbo-charging), Environmental Control Systems and Retractable Landing Gear Systems will be taught. Also, airports (marking and lighting) will be reviewed. Advanced Weight and Balance, and Part 61, 91, 125, and 135 and NTSB 830 Commercial Pilot Regulations will build on the private pilot regulations learned earlier. High Altitude Physiology, and High Performance and Turbine-Aircraft Flight Operations will be emphasized.

AVFT 250. Commercial Flight 1 Single Eng. 2 Credits. (2 Lab) F,S
Students must enroll in this course while pursuing the Single-engine commercial certificate at an approved flight school. Credits will be awarded upon completion of 57.5 hours of commercial flight training.

AVFT 251. Commercial Flight 2 Single Eng. 2 Credits. (2 Lab) F,S
Students must enroll in this course while pursuing the Single-engine commercial certificate at an approved flight school. Credits will be awarded upon completion of the FAA Commercial Pilot Certificate.

AVFT 252. Commercial Flight 1 Multi Eng. 2 Credits. (2 Lab) F,S,Su
Students must enroll in this course while pursuing the Multi-Engine commercial certificate at an approved flight school. Credits will be awarded upon completion of 75.5 flight hours of Commercial Flight training.

AVFT 253. Commercial Flight 2 Multi Eng. 2 Credits. (2 Lab) F,S
Students must enroll in this course while pursuing the Multi-engine commercial certificate at an approved flight school. Credits will be awarded upon completion of the FAA Commercial Pilot Certificate.

AVFT 260. Aviation Safety, 3 Credits. (3 Lec) F
This course will concentrate primarily on the organizations and processes that govern commercial and general aviation safety in the United States. This course will also provide an overview of modern techniques used in accident investigation. Also covered are descriptions of major factors and the causation of aviation accidents.

AVFT 261. Flight Instructor Theory. 4 Credits. (4 Lec) F,S
Students must enroll in this course while pursuing their Commercial certificate at an approved flight school. Credits will be awarded upon receipt of a copy of the student’s commercial certificate.

AVFT 262. Advanced Aircraft Theory. 3 Credits. (3 Lec) S
Prerequisite: Private Pilot Certificate and Instrument rating, or consent of instructor. Introduction to high performance, multi engine, aerobatic, and tailwheel aircraft; their systems, performance, weight and balance computations, flight procedures, characteristics, and emergencies. Unusual attitude recoveries, IFR and VFR.

AVFT 263. Aviation Regulations and Professional Conduct. 3 Credits. (3 Lec) S
Provides a detailed study of the regulations and procedures common to the aviation industry as well as a survey of the legal environment and the standards of conduct required of professional pilots.

AVFT 282. Certified Flight Instructor. 1 Credit. (1 Lec) S
Students must enroll in this course while pursuing their Certified Flight Instructor certificate. Credit for the course will be awarded upon completion of the FAA Certified Flight Instructor Practical Test.

BCH - Biochemistry

BCH 104RN. The Biochemistry of Health for Non-Science Majors. 4 Credits. (3 Lec, 1 Lab) S
Introduction for non-science majors to the biochemical basis of nutrition, health, DNA, and the human genome. The class and laboratory includes training for in depth searching of Internet and library information resources, evaluating and presenting the information found, and an introduction to DNA fingerprinting.

BCH 194. Seminar/Workshop. 1 Credit. (1 Sem) F
For the new student. Integration into the department and its research and educational program. Scientific communication and chemical literature searching skills.

BCH 290R. Undergraduate Research. 1-6 Credits. (1-6 Ind; 6 cr max) F,S
Directed undergraduate research/creative activity which may culminate in a written work or other creative project. Course will address responsible conduct of research. May be repeated.

BCH 292. Independent Study. 1-3 Credits. (1-3 Ind; 6 cr max) On Demand
PREREQUISITE: Consent of instructor and approval of department head. Directed research and study on an individual basis.

BCH 294. Seminar/Workshop. 1 Credit. (1 Sem; 4 cr max) S
PREREQUISITE: CHMY 194 or BCH 194. Introduction to faculty research through faculty mini seminars. Departmental research facilities. Research groups. Research planning decisions (MSU laboratory, summer internship, student exchange, REU, USP, etc.).

BCH 380. Biochemistry. 5 Credits. (4 Lec, 1 Lab) F,S,Su
PREREQUISITE: BIOB 160 or BIOB 260, and CHMY 211 or CHMY 323 or CHMY 333. Carbohydrate, lipid, protein, and nucleic acid structure and function; enzyme kinetics; energetics; major metabolic pathways for carbohydrates, lipids, and amino acids; photosynthesis; regulation of gene function.

BCH 394. Seminar/Workshop. 1 Credit. (1 Sem) F
PREREQUISITE: CHMY 294 or BCH 294. Research techniques, procedures, and reports. Seminar reporting and presentation skills. Career planning and resume preparation. May be repeated once.

BCH 441. Biochemistry of Macromolecules. 5 Credits. (3 Lec) F
PREREQUISITE: BIOB 160 or BIOB 260 and CHMY 323 or CHMY 333. Biochemical basis of modern molecular biology; structure and function of proteins, nucleic acids, and membranes; replication; transcription; translation; regulation of gene expression; and recombinant DNA.

BCH 442. Metabolic Regulation. 3 Credits. (3 Lec) S
PREREQUISITE: BCH 441 or consent of instructor. In-depth biochemical treatment of metabolism and its regulation in cellular processes.

BCH 444R Biochemistry & Molecular Biology Methods. 3 Credits. (1 Lec, 2 Lab) S
PREREQUISITE: BCH 441 or consent of instructor. This course focuses on molecular biology/biochemistry procedures integral to current research. Methods include PCR; gene cloning; DNA sequencing; and expression, isolation, purification, and characterization of the gene-encoded protein.

BCH 450. X-Ray Crystallography. 3 Credits. (3 Lec) S
PREREQUISITES: M 172 COREQUISITES: CHMY 323 or BCH 380 or BCH 441 or PHSX 224 or instructor’s approval. This course focuses on the theory of small and macromolecular structure determination by x-ray crystallography. Topics include crystallization of small and macromolecules, and molecular structure determination from single crystal X-ray diffraction data, including model building, refinement and validation.

BCH 490R. Undergraduate Research. 1-6 Credits. (1 Ind; 12 cr max) F,S,Su
Directed undergraduate research/creative activity which may culminate in a research paper, journal article, or undergraduate thesis. Course will address responsible conduct of research. May be repeated.

BCH 491. Special Topics. 1-4 Credits. (1-4 Lec; 12 cr max) On Demand
PREREQUISITE: Course prerequisites as determined for each offering. Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

BCH 492. Independent Study. 1-3 Credits. (1-3 Ind; 6 cr max) On Demand
PREREQUISITE: Junior standing, consent of instructor, and approval of department head. Directed research and study on an individual basis.

BCH 494. Seminar/Workshop. 1 Credit. (1 Sem) F,S
PREREQUISITE or COREQUISITE: CHMY 394 or BCH 394. Senior capstone course. Taught in collaboration with departmental Honors Thesis, CHMY 499. The chemistry/biochemistry research undergraduate experience constitutes a synthesis of our (bio)chemistry class room and laboratory education. The projects are orally presented in seminar form, discussed on the basis of acquired knowledge, and analyzed using stringent scientific methods and criteria. A complete personal resume is prepared. May be repeated once.

BCH 499. Senior Thesis/Capstone. 1 Credit. (1 Lec) S
PREREQUISITE: BCH 300 or BCH 394. Senior capstone course. Taught in collaboration with departmental Honors Thesis, CHMY 499. The chemistry/biochemistry research undergraduate experience constitutes a synthesis of our (bio)chemistry class room and laboratory education. The projects are orally presented in seminar form, discussed on the basis of acquired knowledge, and analyzed using stringent scientific methods and criteria. A complete personal resume is prepared. May be repeated once.

BCH 524. Mass Spectrometry. 3 Credits. (3 Lec) F

BCH 526. Adv Protein NMR Spectroscopy. 3 Credits. (3 Lec) F
PREREQUISITE: CHMY 323. This lecture-based course is designed to teach the fundamental principles of nuclear magnetic resonance (NMR) spectroscopy as it applies to the structural elucidations of proteins in solution. Pre-requisites include familiarity with linear algebra and basic trigonometric functions and CHMY 323. Cross-referenced with CHMY 526.
BFIN 291. Special Topics. 1-4 Credits. (1-4 Lec; 12 cr max) On Demand
PREREQUISITE: None required but some may be determined necessary by each offering. Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

BFIN 292. Independent Study. 1-3 Credits. (1-3 Ind; 6 cr max) On Demand
PREREQUISITE: Consent of instructor and approval of Associate Dean. Directed research and study on an individual basis. Not to be used as a substitute for a required course.

BFIN 322. Business Finance. 3 Credits. (3 Lec) F,Su
PREREQUISITE: Junior standing, ACTG 201, ECNS 204IS, and either M 161Q or STAT 216Q. Study of the principles of finance with emphasis on the application and integration of financial concepts in decision making.

BFIN 357. Financial Markets & Institutions. 3 Credits. (3 Lec) F,S
PREREQUISITE: Junior standing, ACTG 201, ECNS 204IS, and either M 161Q or STAT 216Q. Develops a sound understanding of why financial markets and institutions exist, their roles in a capitalist society, and how financial risk is managed most effectively. Focuses on applied analysis of financial institution risk, market operation, and products.

BFIN 409. Intro to Applied Investing. 1 Credit. (1 Rct) On Demand.
PREREQUISITE: Junior standing. For business majors: formal admission to the College of Business. COREQUISITE: BFIN 322 Students gain hands-on experience by managing a real portfolio, thereby learning how to transact in securities, how the securities business operates, and how to apply various techniques and theories of finance.

BFIN 420R. Investments I. 3 Credits. (3 Lec) F
PREREQUISITE: BFIN 322 and BFIN 357; for business majors: formal admission to the College of Business. Course provides the foundation for students to comprehend the objectives, policies, concepts, analyses, techniques, practices, and theories of investments, both within the U.S. financial markets and globally.

BFIN 421. Real Estate and Investment Analysis. 3 Credits. (3 Lec) On Demand
PREREQUISITE: BFIN 322 or permission of instructor. For business majors: formal admission to the College of Business. To prepare students for careers in real estate, construction lending, real estate valuation, acquisition and asset management, and market and investment analysis. Much of the course material is also applicable to personal financial planning.

BFIN 435. Corporate Finance. 3 Credits. (3 Lec) F
PREREQUISITE: BFIN 322 and BFIN 357; for business majors: formal admission to the College of Business. Course provides the foundation for students to comprehend the objectives, policies, concepts, analyses, techniques, practices, and theories of investments, both within the U.S. financial markets and globally.

BFIN 441. Advanced Analysis of Financial Statements. 3 Credits. (3 Rct) F
PREREQUISITE: ACTG 327; for business majors: formal admission to the College of Business; cross-listed with ACTG 441. Analysis with emphasis on how managers’ investing and financing decisions have financial statement implications. Coverage includes: revenue recognition methods, cash flow analysis, ratios, inventory analysis, capitalization vs. expensing, depreciation, leasing vs. buying, and overall financial health and earnings quality of the firm.

BFIN 452. International Finance. 3 Credits. (1 Lec) S
PREREQUISITE: BFIN 322. For business majors: formal admission to the College of Business. Focuses on the risks associated with financial management of a multinational company. Topics include: financial problems of multinational businesses, international financial environments, long-term capital commitments to international ventures, financial techniques for firm operation, and international investing.

BFIN 456. Financial Management for the Entrepreneur. 3 Credits. (3 Lec) F
PREREQUISITE: BFIN 322; for business majors: formal admission to the College of Business. Study of corporate finance issues confronting entrepreneurial firms. Focus is on financial forecasting and assessing financial needs. Students utilize fundamental financial principles to make small-business decisions. Topics include: strategic financing, financing alternatives, financial contracting, venture valuation, real options, and risk-sharing.

BFIN 458. Commercial Bank Management. 3 Credits. (3 Lec) On Demand
PREREQUISITE: BFIN 322. For business majors: formal admission to the College of Business. Management of commercial banks and similar depository institutions, emphasizing the measurement and control of risk in asset and liability management. Course includes issues in contemporary banking.

BFIN 459. Current Topics. 3 Credits. (3 Sem; 6 cr max) On Demand
PREREQUISITE: BFIN 352, BFIN 441, BFIN 420, BFIN 457; and senior standing. For business majors: Formal admission to the College of Business. Investigation of key issues which will determine future practices in finance.
BFIN 460. Derivative Securities and Risk Management. 3 Credits. (3 Lec) S
PREREQUISITE: BFIN 322 and BFIN 357; for business majors: formal admission to the College of Business. Introduction to derivative securities, their markets and their relation to the markets for real and financial assets. Focuses on the trading and valuation of derivative securities (futures, options, etc.), and their role in financial risk management for financial institutions and corporations.

BFIN 466. Investments II. 3 Credits. (3 Lec) On Demand
PREREQUISITE: BFIN 420; for business majors: formal admission to the College of Business. Security and portfolio analyses, using fundamental and technical indicators, with evaluation of financial and economic environments. In-depth study of stocks, bonds, and derivatives. Risk hedging for both individual investors and portfolio managers, using analyses of embedded risk and returns.

BFIN 490R. Undergrad Research. 1-6 Credits. (1 Ind; 12 cr max) On Demand
PREREQUISITE: Senior standing and consent of instructor. For business majors: formal admission to the College of Business. Directed undergraduate research/creative activity which may culminate in a research paper, journal article, or undergraduate thesis. Course will address responsible conduct of research.

BFIN 491. Special Topics. 1-4 Credits. (1-4 Lec; 12 cr max) On Demand
PREREQUISITE: Course prerequisites as determined for each offering. Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

BFIN 492. Independent Study. 1-3 Credits. (1-3 Ind; 6 cr max) On Demand
PREREQUISITE: Junior standing, formal admission to the College of Business, consent of instructor, and approval of Associate Dean. Directed research and study on an individual basis. Not to be used as a substitute for a required course.

BFIN 494. Seminar/Workshop. 1 Credit. (1 Sem; 4 cr max) On Demand
PREREQUISITE: Junior standing and as determined for each offering. Topics offered at the upper-division level which are not covered in regular courses. Students participate in preparing and presenting discussion material.

BFIN 498. Internship. 2-12 Credits. (2-12 Ind; 12 cr max) On Demand
PREREQUISITE: Formal admission to the College of Business, and consent of instructor. An individualized assignment arranged with an agency, business, or other organization to provide guided experience in the field. Directed research and study on an individual basis.

BFIN 591. Special Topics. 1-4 Credits. (1-4 Lec; 12 cr max) On Demand
PREREQUISITE: Upper-division courses and others as determined for each offering. For business majors: formal admission to the College of Business. Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

BFIN 592. Independent Study. 1-3 Credits. (1-3 Ind; 6 cr max) On Demand
Max 6 cr. PREREQUISITE: Graduate standing consent of instructor, approval of Associate Dean and Dean of Graduate Studies. Directed research and study on an individual basis.

BGEN - Business: General

BGEN 194US. Seminar: Business & Entrepreneurship Fundamentals. 3 Credits. (3 Sem) F
University Seminar Core objectives are integrated into an interactive course that focuses on improving critical thinking, writing, and oral presentation skills while developing an entrepreneurial mindset and an understanding of fundamental business concepts in management, marketing, accounting and finance. Intended for first semester freshmen.

BGEN 204. Business & Entrepreneurship Fundamentals. 3 Credits. (3 Lec) F,S
This interactive course focuses on developing an entrepreneurial mindset and understanding fundamental business concepts in management, marketing, accounting, and finance. Intended for transfers into the College of Business & Entrepreneurship, non-business majors, and those who have not taken BGEN 194US.

BGEN 210. Accounting & Finance Basics. 3 Credits. (3 Lec) F
PREREQUISITES: M 105Q (formerly M 145Q), M 121Q, STAT 216Q, or level 4 or 5 math course. Basics of accounting and finance for non-business students. Topics include fundamentals of accounting, financial statement and budget preparation/analysis, financial analysis/control, working capital management, time value of money, capital investment & financing decisions. May not be substituted for a course required for the business major.

BGEN 235. Business Law. 3 Credits. (3 Lec) F
Offered by Gallatin College. The course will emphasize business ethics, contracts, and employment obligations, including sales, agency, and tort law. The course content will help business leaders make informed decisions based on the philosophical, legal, and historical aspects of the regulatory environment.

BGEN 242D. Intro to Intl Business. 3 Credits. (3 Rct) F,S
Introduces topics of globalization: differences in political economies, culture, legal systems, and ethical standards; international trade laws; issues in foreign direct investment trade alliances; global economic, financial, marketing, and human resource challenges; and organizational and strategic issues for international business.

BGEN 245D. Cultural Dimensions of International Business. 3 Credits. (3 Rct) On Demand
The course will help students recognize the importance cultural differences play in conducting international business transactions. They will analyze the nature and impact of some common problems resulting from not understanding how to deal appropriately with cultural differences.

BGEN 302. Career Perspectives. 1 Credit. (1 Lec) F,S,Su
PREREQUISITE: Business major and BMGT 205. This highly interactive course helps students manage their career planning for business-related fields with an emphasis on pro-active career exploration and planning. Topics include self-assessment, researching career information, understanding the job search process, interviewing skills, and professionalism.

BGEN 303. Professional Coaching Clinic. 1 Credit. (1 Sem) F,S
PREREQUISITES: Business major, BMGT 205 and consent of instructor. The mission of this course is to create in business students a passion for achieving professional excellence in career pursuits. Students work one-on-one with a coach to identify their strengths, weaknesses, competencies, interests, and personal and professional aspirations. May be taken instead of BGEN 302.

BGEN 361. Principles of Business Law. 3 Credits. (3 Lec) F,S,Su
PREREQUISITE: Junior standing. Survey of the U.S. legal system, business ethics, and the following areas of law: civil procedure, torts, contracts, UCC Article 2, intellectual property, employment, agency, and organizational forms. Emphasis on written and oral communication skills, critical thinking, and collaborative learning.

BGEN 468. Contemporary Issues in Business Ethics. 3 Credits. (3 Lec) On Demand
PREREQUISITE: Senior standing or permission of the instructor. For business majors: formal admission to the College of Business. The relationship between business and society in the social, ethical and natural environment. A focus on issues of business responsibility and ethics with emphasis on practical business problems of leadership and accountability.

BGEN 472. Legal and Social Framework of Business Regulation. 3 Credits. (3 Lec) On Demand
PREREQUISITE: BGEN 361 or consent of instructor. For business majors: formal admission to the College of Business. Study of legal and social basis for government regulation of business. Topics include environmental regulation, employment and labor law, securities regulation, antitrust, and international trade. Students research and make class presentation on regulatory issues.

BGEN 499. Senior Thesis/Capstone: Strategy Seminar. 4 Credits. (1 Lec, 3 Sem) F,S,Su
PREREQUISITE: Senior standing, formal admission to the College of Business, and completion of BMGT 335, BMIS 311, BMGT 322, BMKT 325, BFIN 322, and BGEN 361. This course is taken the last semester prior to graduation. Explores how firms achieve competitive advantage in the context of single and multi-business firms using the tools of strategic analysis.

BIOL - Biology-General

BIOL 1001N. Organism Function. 3 Credits. (3 Lec) F,S
This course examines biological origins and diversity of life on Earth, emphasizing biodiversity of principal biomes, origins of biodiversity, and exploring form, function, and adaptation of relevant biological systems, including photosynthesis, nutrition and immunity. The course also explores relevant ecological relationships among organisms with an emphasis on animals and plants.

BIOL 105CS. Introduction to Biotechnology. 3 Credits. (3 Lec) F
Introduction to an ever-growing industry. Course is designed to demonstrate the significance of biotechnology in today's world. Lecture series presented by research professors, social scientists, and industrial experts.
BIOB 110CS. Introduction to Plant Biology. 3 Credits. (3 Lec) S
Provides an understanding of basic plant science principles and the related environmental components that impact society. Current questions in plant biology, agriculture, and ecology are used to develop problem-solving skills and integrative thinking.

BIOB 140R. Honors Molecular Biology. 4 Credits. (3 Lec, 3 Lab) S
PREREQUISITE: Restricted entry through the Honors Program. An introduction to molecular biology research with an emphasis on how gene expression is regulated in cells and organisms. Hands-on learning of basic techniques in cell and molecular biology will culminate in an independent research project.

BIOB 160. Principles of Living Systems. 4 Credits. (3 Lec, 1 Lab) F.S
PREREQUISITE: CHMY 121IN or CHMY 141 or consent of instructor. Introduction to cellular organization and function. Topics covered include synthesis and function of macromolecules, cell organelles and structure, energy transformations in living systems, respiration, photosynthesis, the cell cycle, classical genetics, molecular genetics, and biotechnology.

BIOB 170IN. Principles of Biological Diversity. 4 Credits. (3 Lec, 1 Lab) F.S
This course examines the biology, ecology, and evolutionary relationships among living organisms. All forms of life will be considered, from single celled prokaryotes to multicellular eukaryotic plants and animals.

BIOB 205. Methods in Biotechnology. 4 Credits. (4 Lab) F.S
PREREQUISITE: BIOB 105. This course will challenge students in the biotech major to learn a series of essential molecular techniques focusing on research and faculty interaction. The techniques learned will be highly applicable to the biotech industry, giving students a post-graduation competitive edge.

BIOB 260. Cellular and Molecular Biology. 4 Credits. (3 Lec, 1 Lab) F.S
PREREQUISITE: CHMY 141 or CHMY 151, and STAT 216Q or M 171Q or M 181Q, with a grade of “C-” or better. COREQUISITE: CHMY 145 or 153. Introduction to biological macromolecules, cell structures and function, and gene structure and expression. The laboratory portion will include both wet labs and computer-based modules.

BIOB 280. Miracle molds, magic mushrooms: Fungi in our world. 3 Credits. (3 Lec) S
PREREQUISITE: BIOB 100, 110, 170 or BIOM 103 A presentation of the fungi and their roles in nature and in shaping past and present civilizations. The historical and practical significance of fungi as decayers, as pathogens, as food, and as sources of mind-altering chemicals will be emphasized.

BIOB 290R. Undergraduate Research. 1-6 Credits. (1-6 Ind; max unlimited) On Demand
PREREQUISITE: Sophomore standing. Directed undergraduate research. Course will address responsible conduct of research.

BIOB 291. Special Topics. 1-4 Credits. (1-4 Lec; 12 cr max) On Demand
PREREQUISITE: None required but some may be determined necessary by each offering department. Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before being offered as a regular course number.

BIOB 318. Biometry. 3 Credits. (3 Lec) F
PREREQUISITE: C- or better in any 100 level or above Math course. Analysis and interpretation of biological data. Topics include: analysis of frequency data, measures of center and spread, probability distributions, statistical inference for single means, and proportions, two sample means and proportions, linear regression, and correlation. Use of computer software is emphasized in solving problems.

BIOB 375. General Genetics. 3 Credits. (3 Lec) F,S,Su
PREREQUISITE: BIOB 160, BIOB 170IN, BIOB 260, or BIOM 360. Introduction to classical and molecular genetics of eukaryotes, with emphasis on transmission genetics, the structure and regulation of genes, and mechanisms of genetic change.

BIOB 377. Practical Genetics. 3 Credits. (3 Lec) S
PREREQUISITE: BIOB 160 or BIOB 260 or consent of instructor. Examination of the modes of inheritance, gene expression and genetic manipulation of eukaryotic organisms, particularly those of flowering plants and mammals. Population genetics, genetic diversity and quantitative genetics are also discussed.

BIOB 410. Immunology. 3 Credits. (3 Lec) F
COREQUISITE: CHMY 211 or CHMY 321. Fundamentals of cellular and molecular immunology including consideration of structure, genetics and function of immunoglobulin. T-cell receptors and major histocompatibility antigens; regulation of the immune response; transplantation and immunological diseases.

BIOB 412. Hybridomas. 2 Credits. (1 Lec, 1 Lab) F
PREREQUISITE: BIOM 360 or consent of instructor. This course will provide students with a thorough theoretical and practical appreciation and understanding of the uses and methods involved in the production of monoclonal antibodies.

BIOB 413. Flow Cytometry. 1 Credit. (1 Lec) F
PREREQUISITE: BIOM 360, BIOM 375, or consent of instructor. Theory and practice of flow cytometry with an emphasis on the analysis of mammalian cells.

BIOB 414. Advanced Microscopy. 1 Credit. (5 Lab) F
PREREQUISITE: BIOM 360, BIOM 375, or consent of instructor. Introduction to instrument design, operation and applications, and to modern techniques in preparing specimens for microscopic analyses, including computer-assisted microscopic imaging technology and microinjection.

BIOB 415. Adv Immunology Methods. 1 Credit. (5 Lab) F
PREREQUISITE: BIOM 360, BIOM 375, or consent of instructor. This course provides hands-on experience on assays commonly used in immunology for the detection of an immune response.

BIOB 420. Evolution. 3 Credits. (3 Lec) S
PREREQUISITE: BIOB 375, BIOM 377, or BIOH 320. For seniors in biology. Evolutionary theory is presented and takes two principle directions, the study of evolutionary history, and the study of natural selection.

BIOB 424. Ethical Practice of Science. 3 Credits. (3 Sem) S
PREREQUISITE: PHI 312, PHI 321, or at least one three-hundred level series of any science course. Examines the evolution of the scientific process with specific focus on the ethical responsibilities of scientists and to examine policies and procedures developed by the scientific community to ensure integrity in the research process.

BIOB 425. Adv Cell & Molecular Biology. 3 Credits. (2 Lec, 1 Ret) S
PREREQUISITE: BIOB 260, BIOM 320, and BCH 380. In-depth study of cell structure and function.

BIOB 428. Molecular Evolution. 3 Credits. (3 Lec) F
PREREQUISITE: please check in with instructor. The educational objectives of this course are to provide advanced, upper division undergraduates and graduate students with a basic introduction to molecular evolution. The study of molecular evolution encompasses the origin and evolution of life on earth at the molecular level.

BIOB 430. Plant Biotechnology. 3 Credits. (2 Lec, 1 Lab) S
alternate, even years PREREQUISITE: BCH 380 or BIOM 375 or BIOM 377. Humans have historically altered plants to meet food and fiber needs. Our ability to transfer genes from organism to organism is accelerating this process. The principles of plant genetic engineering will be discussed along with hands-on laboratory.

BIOB 438. Developmental Mechanisms. 3 Credits. (2 Lec, 1 Lab) On Demand
PREREQUISITE: BIOB 425. This course will focus on the molecular and cellular mechanisms which drive developmental processes.

BIOB 476R. Gene Construction. 4 Credits. (1 Lec, 3 Lab) F
PREREQUISITE: BIOB 425 and BCH 380. The goals are to provide upper level students with the opportunity of designing and building their own genes. The goal of the course is to use this design experience to learn basic techniques in cell and molecular biology.

BIOB 477. Genome Science and Gene Expression. 5 Credits. (2 Lec, 3 Lab) S
PREREQUISITE: BCH 380 Covers the theory of eukaryotic and prokaryotic gene expression and methods for measuring gene transcription in cells. This course is heavily focused on laboratory skills and will train students in modern practice of genomics and functional gene expression using DNA cloning, automated DNA sequencing, and comprehensive sequence analysis.

BIOB 480. Conservation Genetics. 3 Credits. (3 Lec) F
PREREQUISITE: BIOB 375, BIOB 420, and STAT 216Q completed (non concurrent registration). Introduces the theory and practice of conservation genetics, focusing primarily on animals. Case studies will be used liberally, and emphasis will be placed on interpreting genetic data. Readings will include primary literature. Cross-listed with BIOE 548.

BIOB 484. Population Genetics. 3 Credits. (3 Lec) F alternate years, to be offered even years.
PREREQUISITE: BIOB 375. Introduction to theory and empirical data on genetics of populations. Topics covered include modeling natural and artificial selection, nonrandom mating, gene flow and effective population size as factors influencing the maintenance of genetic variation in populations. The approach emphasizes the development of simple mathematical models to illustrate fundamental conceptual issues in the field.

BIOB 490R. Undergraduate Research. 1-4 Credits. (1-6 Ind; 12 cr max) F,S,Su
PREREQUISITE: Junior or Senior standing and approval of instructor and approval of department head. Undergraduate research which may culminate in a research paper, journal article, or undergraduate thesis. Course will address responsible conduct of research.
BIOE 491. Special Topics. 1-4 Credits. (1-4 Lect; 12 cr max) On Demand
Max 12 credits, maximum of 6 as electives in Organismal Biology Option.
PREREQUISITE: Course prerequisites as determined for each offering. Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand.

BIOE 492. Independent Study. 1-3 Credits. (1-3 Ind; 6 cr max) F,S,Sa
PREREQUISITE: Junior standing, consent of instructor and approval of department head. Directed research and study on an individual basis.

BIOE 494. Seminar/Workshop. 1 Credit. (1 Sem; 4 cr max) F
PREREQUISITE: Junior standing and as determined for each offering. Topics offered at the upper division level which are not covered in regular courses. Students attend and write critiques of seminar presentations by professional biologists.

BIOE 497. Educational Methods: Biology. 2 Credits. (2 Lab; 4 cr max) F,S,Sa
PREREQUISITE: Junior or senior standing, consent of instructor and department head. Provides deeper contact with a subject for those considering an academic profession. This provides experience in a teaching laboratory under detailed academic supervision in recognition that teaching enhances learning. Includes the preparation, organization, presentation of materials, and student evaluation.

BIOE 498. Internship/Cooperative Edu. 1-6 Credits. (1-6 Ind; 6 cr max) F,S,Sa
PREREQUISITE: Junior standing, consent of instructor and approval of department head. An individualized assignment arranged with an agency, business, or other organization to provide guided experience in the field.

BIOE 499. Senior Thesis/Capstone. 2 Credits. (2 Sem) F,S,Sa
PREREQUISITE: Senior standing in the Cell Biology & Neuroscience Department or in the Plant Sciences & Plant Pathology Department. Senior capstone course. Students are expected both to present and to discuss advanced topics from the current biomedical literature. These topics will expand upon material presented in regular courses in the biomedical science curriculum. Students will write at least one major paper.

BIOE 524. Ethical Practice of Science. 3 Credits. (3 Sem) F
This course exposes students to the ethical issues and federal requirements they will likely encounter throughout their careers and helps develop skills for resolving ethical issues encountered in scientific research.

BIOE 525. Adv. Cell & Molecular Biology. 3 Credits. (2 Lec 1 Rec) S
PREREQUISITES: BIOE 260 and BCH 380 or BCH 441, and BIOE 375 or BIOH 320 In-depth study of cell signaling, structure and function.

BIOE - Biology-Ecological

BIOE 103CS. Environmental Science and Society. 3 Credits. (3 Lec) F,S
The relationship between people and the environment using the earth as an ecosystem to show the effects of people’s activities on natural ecosystems. Environmental issues such as wilderness, wolf reintroduction, global warming, fire ecology, whirling disease, and grizzlies are covered.

BIOE 290R. Undergraduate Research. 1-3 Credits. (1-3 Ind; max unlimited) On Demand
PREREQUISITE: Consent of instructor and approval of department head. Directed research and study on an individual basis.

BIOE 291. Special Topics. 1-4 Credits. (1-4 Lect; 12 cr max) On Demand
Max 12 credits PREREQUISITE: Course prerequisites as determined for each offering. Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand.

BIOE 292. Independent Study. 1-3 Credits. (1-3 Ind; 6 cr max) On Demand
PREREQUISITE: Consent of instructor and approval of department head. Directed research and study on an individual basis.

BIOE 370. General Ecology (equiv to 270). 3 Credits. (3 Lec) F,S
PREREQUISITE: BIOE 170IN; M 121Q or M 161Q or M 171Q. Recommended: STAT 216Q or BIOE 318. Relation of organisms to their environment. The composition, structure, function and distribution of populations, communities, and ecosystems. Emphasis on population ecology, including demography, population dynamics and evolutionary ecology.

BIOE 375. Ecological Responses to Climate Change. 3 Credits. (3 Lec) S
PREREQUISITE: BIOE 160, and BIOE 170IN, and BIOE 370 or NRSM 240. Students explore how ecosystems are responding to climate changes at a range of spatial and temporal scales. Case studies include changes in vegetation and soils, plant and animal phenology, and disease outbreaks.

BIOE 405. Behavioral and Evolutionary Ecology. 3 Credits. (3 Lec) S
PREREQUISITE: BIOE 370. Abundance and distribution of organisms in relation to their evolution, behavior, population biology and interactions with other organisms.

BIOE 408. Rocky Mountain Vegetation. 2 Credits. (1 Lec, 1 Lab) F
PREREQUISITE: Junior or senior status in biological sciences and consent of instructor. Field identification of major Rocky Mountain ecosystem types; the composition, structure and function of climax and alternate communities; their environments, geography and history; and discussion of management alternatives. Includes introduction to field methods, statistical evaluations, remote sensing, and library use.

BIOE 416. Alpine Ecology. 3 Credits. (1 Lec, 2 Lab) S
PREREQUISITE: Junior standing, BIOE 170IN. The ecology characteristics of alpine tundra. A three-day field trip will confirm and reinforce material presented in class and is a course requirement.

BIOE 420. Field Ornithology. 3 Credits. (3 Lab) Sa
PREREQUISITE: Junior standing, and either BIOE 100IN or BIOE 170IN. Field identification, habitat affinities and life histories of birds of the northern Rockies. Includes early morning field trips.

BIOE 421. Yellowstone Wildlife Ecology. 3 Credits. (2 Lec, 1 Lab) Sa
PREREQUISITE: Junior standing, and either BIOE 100IN or BIOE 170IN. Basic ecology of the major animal species of the Yellowstone area and the ecological controversies surrounding their management.

BIOE 422. Insect Ecology. 3 Credits. (3 Lec) F,S,Sa

BIOE 424. Ecology of Fungi. 3 Credits. (2 Lec, 1 Lab) F alternate years, to be offered odd years.
PREREQUISITE: BIOE 170IN, BIOE 256, a comparable course in introductory biology, or consent of instructor. COREQUISITE: None, but an upper division biology course is recommended. This course emphasizes the important and varied roles of the higher fleshy fungi in natural and managed systems, focusing on forest habitats. Fungi are the ecological backbone of many terrestrial systems, yet their ecological roles as saprophytes, symbionts, and mycorrhizal mutualists are often minimized. Both traditional techniques and more recent molecular methods will be presented at the individual, population, community, landscape, and biome levels, along with topics on fungal conservation and global change. This course consists of twice weekly sessions of two hours each for lecture, discussions, and demonstrations. One or two afternoon or morning field trips to nearby forests are required to initiate a final project.

BIOE 427R. Research in Freshwater Ecology. 3 Credits. (1 Lec, 2 Lab) F
PREREQUISITE: Prior or concurrent registration in BIOE 428. Optional laboratory for BIOE 428. Introduction to representative freshwater habitats, communities, organisms, and sampling methods through laboratory and field exercises and classroom discussions. Formal written reports are required after completed exercises.

BIOE 427RN. Research in Freshwater Ecology. 3 Credits. (1 Lec, 2 Lab) F
PREREQUISITE: BIOE 370, Prior or concurrent registration in BIOE 428. This course is designed to expose students to the full process of designing and conducting research in freshwater ecosystems. Students will develop a research question, propose a study design, conduct field and laboratory research, and present their research in oral and written form. This course will also include a stream invertebrate collection and identification assignment.

BIOE 428. Freshwater Ecology. 3 Credits. (3 Lec) F
PREREQUISITE: BIOE 370 or consent of instructor. This course examines relationships between freshwater organisms and their environment. Students learn about the ecology of rivers, lakes, reservoirs, and wetlands, with exposure to a wide diversity of organisms and processes. Emphasis is placed on linking basic concepts and real-world applications.

BIOE 439. Stream Ecology. 3 Credits. (2 Lec, 1 Lab) F
PREREQUISITE: BIOE 170, CHMY 121 or CHMY 141, and PHSX 205. Examination of the structure and function of stream ecosystems emphasizing connections among stream organisms, the aquatic chemical and physical environment, and the surrounding terrestrial landscape.

BIOE 440R. Conservation Biology. 3 Credits. (3 Lec) F
PREREQUISITE: BIOE 370, STAT 216Q and STAT 217. Examines issues relevant to conservation of wild populations, focusing primarily on animals. Emphasis is on approaches that use demography, population biology and genetics to address conservation questions. Readings are from the primary literature, rather than a textbook, including case studies. Cross-listed with BIOE 521.
BIOE 445. Macrosystems ecology: Linking plants, animals, and ecosystems across scales. 3 Credits. (3 Lec) S
PREREQUISITE: BIOE 370 Advanced ecology designed to help students "put the pieces together" and understand how plants, animals, and ecosystems interact. These interactions are examined across biomes of the world to better understand general principles and to derive effective local management strategies.

BIOE 455. Plant Ecology. 3 Credits. (3 Lec) S
PREREQUISITE: BIOB 170IN and BIOE 370 or NRSM 240. Principles of plant ecology, covering plant-environment relations, plant life histories, plant species interactions, plant community concepts, succession, and the role of plants in ecosystem processes.

BIOE 490R. Undergraduate Research. 1-6 Credits. (1-6 Lec; 12 cr max) F,S
Directed undergraduate research which may culminate in a research paper, journal article, or undergraduate thesis. Course will address responsible conduct of research. Maximum of 6 credits as electives in Organismal Biology Option.

BIOE 491. Special Topics. 1-4 Credits. (1-4 Lec; 12 cr max) On Demand
Max 12 credits PREREQUISITE: Course prerequisites as determined for each offering. Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand.

BIOE 492. Independent Study. 1-3 Credits. (1-3 Ind; 3 cr max) On Demand
PREREQUISITE: Junior standing, consent of instructor and approval of department head. Maximum of 6 as electives in Organismal Biology Option. Directed research and study on an individual basis.

BIOE 494. Seminar/Workshop. 1 Credit. (1 Sem; 4 cr max) F,S
PREREQUISITE: Junior standing and as determined for each offering. Topics offered at the upper division level which are not covered in regular courses. Students attend and discuss seminar presentations by professional biologists.

BIOE 498. Internship. 1-4 Credits. (1-4 Internship) On Demand
PREREQUISITE: Approval of intern program by instructor and the department head. An individualized assignment arranged with agency, business, or other organization to provide guided experience.

BIOE 499. Senior Thesis/Capstone. 2 Credits. (2 Sem) F
PREREQUISITE: Senior standing in Ecology Department, and prior or concurrent registration in BIOB 420. Senior capstone course. Discussion of topics that integrate evolutionary theory with ecology, genetics, medicine, behavior, or other subjects that are part of the biology curriculum.

BIOE 513. Terrestrial Ecology of Plains and Prairies. 1 Credit. (1 Rct) Su
PREREQUISITE: Either BIOE 408 or BIOL 516, graduate standing, secondary teacher certification, two years teaching experience, and computer access. Corequisite: Suggested: ESCI 513. Students will develop plant keys for classroom use, quantitatively analyze two grassland communities, and develop classroom activities on the origin, maintenance, and consequences of biological diversity within local communities by examining studies of natural patterns, explorations of mathematical processes.

BIOE 514. Ecological Modeling. 3 Credits. (3 Lec) F
Alternate even years PREREQUISITE: BIOE 370. Interactions and feedbacks between vegetation, disturbance, and climate will be explored using biogeography and biochemical models. Theory and computational techniques in ecological modeling.

BIOE 515. Landscape Ecol & Mgmt. 4 Credits. (2 Lec, 2 Lab) F
Alternate years, to be offered odd years. PREREQUISITE: Graduate standing or consent of instructor. Principles on landscape pattern, change, and function. Application of theory to conservation including population viability, reserve design, multiple use landscapes. Lab introduces GIS, GPS, and simulation models. For graduate students and motivated undergraduates.

BIOE 517. Advances in Ecological Modeling. 3 Credits. (3 Lec) S
PREREQUISITE: BIOE 370. Advances in numerical modelling of disturbance, demography, and ecosystem biology will be introduced with lectures and applied computational examples.

BIOE 519. Riparian Zones/Wetlands. 2 Credits. (2 Rct) Su
PREREQUISITE: Either BIOL 516 or BIOE 408, secondary teacher certification, two years teaching experience, and computer access. Corequisite: Suggested: ESCI 512, ESCI 515. Students will develop plant keys for classroom use, quantitatively analyze two riparian and two wetland areas, and develop classroom activities about ecology of those areas. Distance learning class offered by internet connection. This course is designed for secondary school teachers enrolled in the MSSE program and cannot be used in graduate programs in Biological Sciences.

BIOE 520. Animal Biodiversity in GYE. 2 Credits. (1 Lec, 1 Lab) Su
PREREQUISITE: BIOE 370, F&W 301, BIOE 405, or equivalent and (a) 2 years science technology experience or (b) enrolled in MSSE. Exploration of biodiversity's meaning, importance & determinants; key ecological features of the Greater Yellowstone Ecosystem and patterns of change in those features: & possible strategies for maintaining biodiversity in the Greater Yellowstone Ecosystem.

BIOE 521. Conservation Biology. 3 Credits. (3 Lec) F

BIOE 522. Birds of Prey. 2 Credits. (1 Lec, 1 Lab) Su
PREREQUISITE: BIOE 370, WILD 301, BIOE 405, or equivalent and 2 years science technology experience or enrolled in MSSE. Exploration of the ecology and habitat of avian raptors in the Greater Yellowstone Ecosystem (GYE). Application of the scientific method to the study of raptors. Field identification of raptors, investigation of species life histories, and inquiry methods of species-specific habitat needs. Student will develop methods and skills for classroom based research on wildlife. This course is designed for secondary school teachers enrolled in the MSSE program and cannot be used in graduate programs in Biological Sciences.

BIOE 523. Wildlife Ecology. 2 Credits. (2 Lec) Su
PREREQUISITE: BIOE 370, WILD 301, BIOE 405, or equivalent and 2 years science technology experience or enrolled in MSSE. Introduction to wildlife species and the range of habitats present in the Northern Rocky Mountain ecosystems. Emphasis on large carnivores and ungulates within montane terrestrial systems. Application of the scientific method to study interactions between predators, prey, and human impacts. This course is designed for middle and high school teachers and cannot be used in graduate programs in Biological Sciences.

BIOE 524. Frontiers in Landscape Ecology. 3 Credits. (2 Lec, 1 Lab) F
Alternate Even Years, PREREQUISITE: BIOE 370 or the equivalent. Students and instructor will write a scientific paper for publication that synthesizes an important question in landscape ecology. Students will select the topic, review and synthesize current knowledge on the topic, and write a scientific manuscript.

BIOE 532. Physiological Plant Ecol. 3 Credits. (3 Lec) F
Alternate Even Years, PREREQUISITE: BIOE 370. The goal of this course is to expose students to the fundamental theories of plant physiological ecology, ranging from biochemistry at the leaf scale to energy balance at the ecosystem scale. The lab is designed to expose students to the key instruments in this discipline.

BIOE 534. Vegetation Ecology. 3 Credits. (3 Lec) F
offered in alternate spring semesters in odd numbered years PREREQUISITE: BIOE 370. Considers the composition, structure, function, distribution in time and space, ecology and classification of communities. Emphasizes universal methods, current studies and Rocky Mountain systems. Complementary field experience is available in BIOE 408.

BIOE 540. Analysis of Ecological Communities. 3 Credits. (1 Lec, 2 Lab) S
Alternate even years. Multivariate statistical analysis of data from terrestrial or aquatic, plant or animal communities. Classification, ordination, and predictive modeling of species and communities, emphasizing a hands-on approach and practical problem solving in community ecology.

BIOE 542. Community Ecology. 3 Credits. (3 Lec) S
Alternate Odd Years, PREREQUISITE: At least one upper division or graduate course in each of the following: ecology and statistics, or consent of instructor. Focuses on the origin, maintenance, and consequences of biological diversity within local communities by examining studies of natural patterns, explorations of mathematical models and direct experimentation. The complexities of species interactions are explored in multi species assemblages.

BIOE 548. Conservation Genetics. 3 Credits. (3 Lec) F
PREREQUISITE: BIOL 375, STAT 216Q and STAT 217Q. Introduction to the application of genetics for the conservation of plant and animal populations. Emphasis will be placed on case studies from the primary literature and analyzing genetic data using mathematical models developed in class. Cross-listed with BIOB 480.

BIOE 594. Foundations of Ecology & Mgmt. 1 Credit. (1 Rct) F
This course explores the origin, organization, and application of core principles in ecology. Students gain an appreciation for the scope of ecology, how theory and application are linked, and how big ideas in ecology have matured (or not) over time.
BIOE 555. Communication in Ecol Sciences. 1 Credit. (1 Sem) S
PREREQUISITES: Graduate standing - consent of instructor. This course will require students to gain experience presenting scientific information in a variety of communication methods.

BIOE 575. Professional Paper and Project. 1-4 Credits. (1 Ind; 4 cr max) F,S,Su Graduate standing and committee approval and consent of instructor. A research or professional paper or project dealing with a topic in the field. The topic must be mutually agreed upon by the student and his or her major advisor and graduate committee.

BIOE 590. Master's Thesis. 1-10 Credits. (1-10 Ind; max unlimited) F,S,Su PREREQUISITE: Master’s standing.

BIOE 591. Special Topics. 1-4 Credits. (1-4 Ind; 12 cr max) On Demand PREREQUISITE: Upper division courses and others as determined for each offering. Courses not required in any curriculum for which there is a particular one time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

BIOE 592. Independent Study. 1-3 Credits. (1 Ind; 6 cr max) On Demand PREREQUISITE: Graduate standing, consent of instructor, approval of department head and Dean of Graduate Studies. Directed research and study on an individual basis.

BIOE 594. Seminar. 1 Credit. (1 Sem; 4 cr max) On Demand PREREQUISITE: Graduate standing or seniors by petition and course prerequisites as determined for each offering. Topics offered at the graduate level which are not covered in regular courses. Students participate in preparing and presenting discussion material.

BIOE 598. Internship. 2-12 Credits. (2-12 Ind; 12 cr max) On Demand PREREQUISITE: Graduate standing, consent of instructor and approval of department head. An individualized assignment arranged with an agency, business or other organization to provide guided experience in the field.

BIOE 690. Doctoral Thesis. 1-10 Credits. (1-10 Ind; max unlimited) F,S,Su PREREQUISITE: Doctoral standing.

BIOH - Biology-Human

BIOH 112. Human Form & Function I. 3 Credits. (3 Lec, 1 Lab) F Offered by Gallatin College. Human anatomy, physiology, and pathology; including etiology, prognosis, medical treatment, signs and symptoms of diseases of respiratory, endocrine, excretory, and reproductive systems. Proper diet and nutrition guidelines are also addressed. This course will focus on the key elements of anatomy and physiology necessary for students in allied health professions, specifically those who will work the areas of community health, health enhancement education, health promotion, and kinesiology. The aim of this course is for students to demonstrate working knowledge of the muscular, skeletal, nervous, cardiovascular, and respiratory systems, and to demonstrate an understanding of the endocrine and digestive systems and body metabolism.

BIOH 113. Human Form and Function II. 3 Credits. (3 Lec) S Offered by Gallatin College. Human anatomy, physiology, and pathology; including etiology, prognosis, medical treatment, signs and symptoms of diseases of muscular, skeletal, nervous, cardiovascular, and lymphatic systems.

BIOH 185. Integrated Physiology I. 4 Credits. (3 Lec, 1 Lab) F COREQUISITE: CHMY 141 or CHMY 151. How the human body works. For students planning to be health professionals. Includes basic cellular mechanisms, physiological control and communications. Major topics include muscle, nerve, respiratory, renal and cardiovascular systems. Cadaver laboratory will cover related human anatomy.

BIOH 201. Human Anatomy and Physiology I. 5 Credits. (3 Lec, 2 Lab) F,S,Su PREREQUISITE: CHMY 121IN, CHMY 141, or CHMY 151, with a grade of "C-" or better; priority given to majors requiring this course. General principles of cell and tissue biology that apply to all living systems. Structure and function of skeletal, muscular, nervous, and endocrine systems. Homeostasis, control, and integration of the human body will be emphasized. Laboratory will cover related systems. This course is not repeatable without prior consent of instructor.

BIOH 211. Human Anatomy and Physiology II. 4 Credits. (3 Lec, 1 Lab) S,F PREREQUISITE: BIOH 201, BIOH 260, or BIOM 360, with grades of "C-" or better in each course; priority given to majors requiring this course. Structure and function of digestive, cardiovascular, respiratory, reproductive, and urinary systems of humans. Principles of integration, metabolism, energy flow, and homeostasis will be emphasized. This course is not repeatable without prior consent of instructor.

BIOH 287. Intermediate Human Phys I. 3 Credits. (3 Lec) F,S PREREQUISITE: CHMY 121 or CHMY 141 or CHMY 151 with grades of "C-" or better in either course. General principles of cell and tissue biology; function of skeletal, muscular, nervous, and endocrine systems. Homeostasis, control, and integration of the human body will be emphasized.

BIOH 288. Intermediate Human Phys II. 3 Credits. (3 Lec) F,S PREREQUISITE: or BIOH 201 or BIOH 260 or BIOL 297 or BIOM 360 with grades of "C-" or better in each course. Function of the human digestive, cardiovascular, respiratory, reproductive, and urinary systems. Principles of integration, metabolism, energy flow and homeostasis will be emphasized.

BIOH 301. Special Topics. 3 Credits. (1 Lec, 1 Rec) S Spring 2016 Topic: Global Health. Survey the historical and emerging trends in health issues around the world. Develop a fluency in what health issues are occurring in the various regions around the globe. Establish a basic knowledge of the culture, environment, politics and geography of key global regions.

BIOH 309. Human Neuroanatomy. 4 Credits. (3 Lec, 1 Lab) S PREREQUISITE: BIOH 185 or BIOH 201 and Junior standing or consent from instructor. Covering the organization and function of the human nervous system. The course will emphasize theories of its normal functioning and its responses to environmental change, as in learning and structural modification. Homeostasis will be emphasized.

BIOH 313. Neurophysiology. 3 Credits. (3 Lec) F PREREQUISITE: BIOL 260. Physiology of integrative mechanisms in nervous systems. Topics range from the mechanisms of synaptic transmission and action potential generation to the neural basis of learning and memory.

BIOH 320. Biomedical Genetics. 3 Credits. (3 Lec) S PREREQUISITE: BIOL 260. Introduction to fundamental principles of eukaryotic molecular genetics. Emphasis on the genetics of the major model organisms of biomedical research and how they are exploited to understand human biology and disease.

BIOH 323. Human Developmental Biology. 4 Credits. (4 Lec) S PREREQUISITE: BIOL 260 and BIOL 320. Developmental Biology: Introduction to the cell signaling pathways and morphogenetic processes that establish the basic vertebrate body plan. Includes hands-on study of chicken and frog embryos.

BIOH 395. Human Pathophysiology. 3 Credits. (3 Lec) S PREREQUISITE: BCH 380 or consent of instructor. Students will research two diseases of their own choosing and give a class presentation of their findings. The presentation normally includes diagnosis, pathophysiology, and treatment.

BIOH 405. Hematology. 3 Credits. (3 Lec) F PREREQUISITE: BIOH 410 or BCH 380 are recommended. A study of the function, biochemistry, cell biology, and pathology of blood and its constituents.

BIOH 406. Hematology Laboratory. 1 Credit. (1 Lab) F COREQUISITE: BIOH 405. Methods of examining white blood cells, red blood cells, and platelets. Also included is the examination of abnormal blood cells, hemostasis, and fluorescent antibody cell sorting analysis.

BIOH 411. Adv Human Anatomy. 4 Credits. (2 Lec, 2 Lab) S PREREQUISITE: Senior standing, completion of at least two upper division courses in the biological sciences and consent of instructor. Covers back, extremities and joint anatomy, emphasizing topography and three dimensional relations. Instruction will be based on student dissections of human cadavers, with lectures covering structure and function, as well as pathology typically encountered in the dissection laboratory. Class can fulfill 4 upper division honor credits, if prerequisites are satisfied.

BIOH 422. Genes and Cancer. 3 Credits. (3 Lec) F PREREQUISITE: BIOH 320 This course will focus on the molecular and cellular mechanism of human cancer. The role of oncogenes and tumor suppressor genes in normal and cancerous cells will be examined, with an emphasis on how mutations in certain genes results in altered cell-cell signaling and cell proliferation. The role of genetic mutation in breast, colorectal and lymphoma cancers will be discussed, along with new technologies to detect and treat these cancers.

BIOH 425. Sensory Neurophysiology. 3 Credits. (3 Lec) S PREREQUISITE: BIOH 313. Neurophysiology of sensory cells and systems. Topics range from the mechanisms underlying sensory reception to the processing of sensory information at higher stages. The major focus will be on human sensory systems. Pathologies that effect sensory perception will be considered.

BIOH 428R. Molecular Neurological Disease. 3 Credits. (1 Lec, 2 Rec) F PREREQUISITE: BIOH 313 CoreQUISITE: BCH 380 or BCH 441. This course will give an in-depth view of the molecular aspects to neuroscience. Student projects will then use that knowledge to research the current state of molecular understanding of a chosen neurological disease.
 BIOH 435. Cognitive Neuroscience. 3 Credits. (3 Lec) F
PREREQUISITE: BIOH 313. This course will survey our present knowledge of the neural basis of normal and abnormal cognitive function in humans and non-human primates. Topics will range from perception and action to attention, consciousness and mental illness.

 BIOH 440. Neuroscience of Mental Illness. 3 Credits. (3 Lec) S
PREREQUISITE: BIOH 313. Survey of the major categories of human mental illness and their underlying neural mechanisms and treatments.

 BIOH 444. Modeling Brain Disorders. 3 Credits. (3 Lec) F
PREREQUISITE: BIOH 425 and BIOH 313. In this course, students will delve into the primary research literature in the field of behavioral neuroscience. We will study a variety of model systems and paradigms used to study neurological and psychiatric disorders. In addition, students will learn to effectively communicate about science orally and in writing.

 BIOH 445. Intro Pharmacology. 3 Credits. (3 Lec) F
PREREQUISITE: BIOB 260 and BIOH 185. An introduction to the pharmacodynamics of drug action. Major classes of pharmaceutical drugs will be studied to understand their mechanism of action at the cellular and organ levels. Clinical trials for new drugs will also be considered.

 BIOH 454. Microanatomy (Histology). 4 Credits. (2 Lec, 1 Lab) On Demand
PREREQUISITE: Consent of instructor. Covers an introductory microscopic study of cells, tissues and selected mammalian organs. Emphasizing normal structure and function relating to disease processes in specific organ systems. Class discussion will relate the normal microanatomy to human pathophysiology.

 BIOH 455. Molecular Medicine. 3 Credits. (1 Lec) S
PREREQUISITE: BIOH 320 and BCH 380. Lecture and seminar courses based on recent, original papers. Moves from human disease to molecular explanations. Intended for upper level students with a strong background in biology.

 BIOH 464. Clinical Hematology and Body Fluids. 2 Credits. (1 Lec, 1 Lab) Su
PREREQUISITE: Acceptance in professional training program. Topics include a review of normal hematology; red blood cell, white blood cell, and platelet disorders; body fluid overview; and an introduction to hematology instrumentation.

 BIOH 465R. Gene Expression Lab: From Genes to Proteins to Cells. 3 Credits. (3 Lab) S
PREREQUISITE: BIOH 425 and BCH 380. This course will give students the opportunity to design a unique research project, then learn and use the appropriate methods to pursue their research question. The course will expose students to the research process used in most basic science labs.

 BIOH 466. Clin Microbiology I. 3 Credits. (2 Lec, 1 Lab) Su
PREREQUISITE: Acceptance in professional training program. Topics include a review of medical microbiology, virology, mycology, parasitology, and clinical laboratory testing procedures.

 BIOH 467. Clinical Chemistry I. 3 Credits. (2 Lec, 1 Lab) Su
PREREQUISITE: Acceptance in professional training program. Topics include an introduction to theories and principles with emphasis on all body systems, and the role of instrumentation in the clinical chemistry laboratory.

 BIOH 468. Clinical Immunohematology I. 3 Credits. (2 Lec, 1 Lab) Su
PREREQUISITE: Acceptance in professional training program. Basic techniques in blood banking. Topics to be included are: ABO/Rh typing, antibody identification, transfusion therapy and reactions, donor collection and component preparation.

 BIOH 469. Essentials of Clinical Lab Practice. 1 Credit. (1 Lab) Su
PREREQUISITE: Acceptance in professional training program. Provides an orientation to the program, safety information, phlebotomy training, and an overview of management practices. Also includes instruction in hemostasis, molecular diagnostics and urinalysis.

 BIOH 470. Summer Clinical Laboratory. 12-13 Credits. Su
PREREQUISITE: To take this course, students must be accepted into a professional training program. This is a clinical laboratory science course, which will be conducted at affiliate training programs during the summer of a student's senior year. It includes student lecture and laboratory instruction in clinical immunohematology, clinical chemistry, phlebotomy, clinical hemostasis, clinical microscopy and urinalysis, clinical body fluids, transfusion techniques, and clinical microbiology.

 BIOH 471. Professional Training I. 12-13 Credits. (12-13 Lec; 13 cr max) F
PREREQUISITE: To take this course, students must be accepted into a professional training program. BIOH 470. Students will review basic and advanced information in immunohematology, clinical chemistry, clinical hematology, clinical microbiology, clinical immunology, medical mycology, and phlebotomy techniques. Students will perform patient laboratory testing under the guidance of trained professionals.

 BIOH 472. Professional Training II. 12-13 Credits. (12-13 Lec; 13 cr max) S
PREREQUISITE: To take this course, students must be accepted into a professional training program. BIOH 471. Students will learn financial and quality management information of the clinical laboratory and study advanced immunohematology, clinical chemistry, clinical microbiology, and clinical hematology. During this course, students will perform actual patient laboratory testing under the guidance of trained professionals.

 BIOH 473. Laboratory Practice II. 1 Credit. (1 Lab) F
PREREQUISITE: Students must be accepted to the MMLS training program. Essential skills for performing phlebotomy, laboratory specimen collection, handling and preparing samples for laboratory analysis and interpersonal communication skills will be emphasized.

 BIOH 474. Clinical Hematology II. 2 Credits. (2 Lab) F
PREREQUISITE: Students must be accepted to the MMLS training program. Blood cell identification, manual and automated procedures for the assessment of hematologic disease will be emphasized. Students will begin to learn to assess, interpret and correlate hematologic data with disease.

 BIOH 475. Clinical Hemostasis. 1 Credit. (1 Lab) F
PREREQUISITE: Students must be accepted to the MMLS training program. Laboratory skills using manual and automated procedures will be emphasized. Students will assess, interpret and correlate data as it relates to normal and abnormal hemostasis and anticoagulant therapy.

 BIOH 476. Clinical Microbiology II. 3 Credits. (3 Lab) F
PREREQUISITE: Students must be accepted to the MMLS training program. The ability to differentiate pathogens from commensals and perform identification procedures and antimicrobial susceptibility testing are emphasized along with an introduction to specialized and automated testing.

 BIOH 477. Clinical Chemistry and Urinalysis II. 3 Credits. (3 Lab) F
PREREQUISITE: Students must be accepted to the MMLS training program. Manual and automated procedures for determining chemical analytes in blood and body fluids and the associated disease conditions will be emphasized along with an introduction to specialized testing.

 BIOH 478. Clinic Immunohematology II. 2 Credits. (2 Lab) F
PREREQUISITE: Students must be accepted to the MMLS training program. Maintenance of blood components and performing routine and basic problem solving procedures in the blood bank will be emphasized. Correlation of immunohematology theory and disease with testing and transfusion practices and patient care will be covered.

 BIOH 479. Clinical Immunology/Serology. 1 Credit. (1 Lab) F
PREREQUISITE: Students must be accepted to the MMLS training program. Assessment, interpretation and clinical significance of immunology principles and techniques and their correlation to laboratory data and patient disease will be emphasized.

 BIOH 482. Laboratory Practice III. 2 Credits. (2 Lab) S
PREREQUISITE: Students must be accepted to the MMLS training program. A two week rotation in a small hospital laboratory provides an opportunity to experience a different work environment and practice laboratory skills.

 BIOH 484. Clinical Hematology III. 2 Credits. (2 Lab) S
PREREQUISITE: Students must be accepted to the MMLS training program. Competence in performing testing and the ability to assess, interpret, and correlate hematologic data with other patient information to recommended additional testing, diagnosis, and probable treatment option for the patient will be emphasized.

 BIOH 486. Clinical Microbiology III and Molecular Diagnostics. 2 Credits. (2 Lab) S
PREREQUISITE: Students must be accepted to the MMLS training program. Competently identify and provide susceptibility data for microorganisms isolated from human specimens including clinically significant yeasts, molds, parasites, viruses and mycobacterium. Perform molecular diagnostic techniques available.

 BIOH 487. Clinical Chemistry III. 2 Credits. (2 Lab) S
PREREQUISITE: Students must be accepted to the MMLS training program. Achieve entry level knowledge of disease processes, and exhibit professional competencies in clinical chemistry laboratory procedures and the operation of laboratory instrumentation.

 BIOH 488. Clinical Immunohematology. 3 Credits. (3 Lab) S
PREREQUISITE: Students must be accepted to the MMLS training program. Atraint competency and the ability to correlate testing data to theory and initiate advanced techniques where appropriate. Students will demonstrate entry level competency by managing the daily aspects of blood bank operation.
BIOL 489. Laboratory Management. 1 Credit. (1 Lab) S
PREREQUISITE: Students must be accepted to the MMLS training program. General management policies, principles, and procedures necessary for efficient operation of a clinical laboratory will be emphasized along with federal and state regulations which govern the clinical laboratory.

BIOL 491. Special Topics. 1-4 Credits. (1-4 Lec; 12 cr max) On Demand
PREREQUISITE: BIOB 260. Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand.

BIOL 492. Independent Study. 1-3 Credits. (1-3 Ind; 6 cr max) On Demand
PREREQUISITE: Junior standing, consent of instructor and approval of department head. Directed research and study on an individual basis.

BIOL 528. Molecular Basis of Neurological Diseases. 3 Credits. (1 Lec, 1 Ind, 1 Rec) F
This course will give an in-depth view of the molecular aspects to neuroscience. Student projects will then use that knowledge to research the current state of molecular understanding of a chosen neurological disease.

BIOL 542. Survey of Current Cell Signaling. 2 Credits. (2 Sem.; max 12) S
This course will be in a journal club style where peer reviewed articles will be presented and discussed in a critical fashion. The goals are to learn how to synthesize information, develop critical thinking, keep up with the literature, learn about new topics and foster interdisciplinary interactions. Topics will be student driven with the restriction that they fall under the broad umbrella of cell signaling.

BIOL 565. Gene Expression Lab: From Genes to Proteins to Cells. 3 Credits. (3 Lab) S
PREREQUISITES: BIOH 425 and BCH 380. This course is intended to develop a specific research question and to learn the appropriate techniques necessary to address the chosen research question. The primary focus will be experience with a wide breadth of laboratory techniques including tissue culture, heterogeneous expression, microscopy, RNA extraction, RT-PCR, gene expression analysis, protein extraction, protein expression analysis, and data quantification.

BIOL 590. Master's Thesis. 1-10 Credits. (1-10 Ind; max unlimited) F,S,Su
PREREQUISITE: Master's standing.

BIOL 592. Independent Study. 1-3 Credits. (1-3 Ind; 6 cr max) On Demand
PREREQUISITE: Graduate standing, consent of instructor, approval of department head and Dean of Graduate Studies. Directed research and study on an individual basis.

BIOL 594, Seminar. 1 Credit. (1 Sem; 4 cr max) On Demand
PREREQUISITE: Graduate standing or seniors by petition and course prerequisites as determined for each offering. Topics offered at the graduate level which are not covered in regular courses. Students participate in preparing and presenting discussion material.

BIOL 690. Doctoral Thesis. 1-10 Credits. (1-10 Ind; max unlimited) F,S,Su
PREREQUISITE: Doctoral standing.

BIOL - Biology

BIOL 409. Advanced Human Torso Anatomy. 4 Credits. (2 Lec, 2 Lab) S
PREREQUISITE: Junior standing and 2 upper division biology courses and consent of instructor. Covers thorax and abdomen anatomy, emphasizing topography and three dimensional relations. Instruction will be based on student dissections of human cadavers, with lectures covering structure and function, as well as pathology typically encountered in the dissection laboratory.

BIOL 490R. Undergraduate Research. 1-6 Credits. (1 Ind; 12 cr max) F,S,Su
Directed undergraduate research/creative activity which may culminate in a written work or other creative project. Course will address responsible conduct of research. May be repeated.

BIOL 492. Independent Study. 1-3 Credits. (1-3 Ind; 6 cr max) On Demand
PREREQUISITE: Junior standing, consent of instructor and approval of department head. Directed research and study on an individual basis.

BIOL 510. Topics in Neurobiology. 3 Credits. (2 Lec, 5 Lab; 9 cr max) S
PREREQUISITE: Graduate standing and at least one upper division or graduate course in neurobiology. Recent advances in topics in neurobiology with emphasis in different years on either neurocytology, neuroendocrinology/neuroimmunology, or developmental neurobiology.

BIOL 588. Professional Development. 1-3 Credits. (1-3 Lec; 3 cr max) On Demand
PREREQUISITE: Graduate standing, teaching experience and/or current employment in a school organization, consent of instructor and Dean of Graduate Studies. Courses offered on a one time basis to fulfill professional development needs of in service educators. A specific focus is given to each course which is appropriately subtitled. May be repeated.

BIOL 591. Special Topics. 1-4 Credits. (1-4 Lec) On Demand
PREREQUISITE: Upper division courses and others as determined for each offering. Courses not required in any curriculum for which there is a particular one time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

BIOL 592. Independent Study. 1-3 Credits. (1-3 Ind; 6 cr max) On Demand
PREREQUISITE: Graduate standing, consent of instructor, approval of department head and Dean of Graduate Studies. Directed research and study on an individual basis.

BIOL 690. Doctoral Thesis. 1-10 Credits. (1-10 Ind; max unlimited) F,S,Su
PREREQUISITE: Doctoral standing.

BIOM - Biology-Micro

BIOM 101. Careers in Microbiology. 1 Credit. (1 Lec) F
The course introduces students to educational and career opportunities in the fields of medical, molecular, ecological, and environmental microbiology. The course introduces students to the various options in the microbiology degree program. It will emphasize the differences in the options and the employment opportunities in each once a degree has been obtained.

BIOM 103IN. Unseen Universe: Microbes. 3 Credits. (2 Lec, 1 Lab) F,S
Beneficial and harmful effects of microorganisms on individual health, public health, food and water quality; are relevant to an informed citizen of the 21st century. Current news topics and historical perspectives are emphasized. Laboratory exercises investigate microbial activity in our everyday world.

BIOM 107CS. Molecules of Life. 3 Credits. (3 Sem.) L
Introduction to uses of biological molecules for improving health and agriculture. Gene therapy and DNA fingerprinting are discussed in relation to social/moral issues. Intent of course is to help students develop a rational approach to evaluate cost/benefits of biotechnology to society.

BIOM 250. Microbiology for Health Sciences: Infectious Diseases. 3 Credits. (3 Lec) F,S
Introduction to the world of microorganisms and the role of viral, bacterial, fungal and parasitic infectious agents in human health. Emphasis is on public health aspects of transmission, epidemiology, treatment and control of these diseases. Also host-pathogen interactions with regards to pathogenesis and host immune responses are considered.

BIOM 290R. Undergraduate Research. 1-6 Credits. (1 Ind; 12 cr max) F,S,Su
Directed undergraduate research/creative activity which may culminate in a written work in an individual project. Course will address responsible conduct of research. May be repeated.

BIOM 291. Special Topics. 3 Credits. (1 Lab; 12 cr max) On Demand
PREREQUISITE: None required but some may be determined necessary by each offering department. Courses not required in any curriculum for which there is a particular one time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

BIOM 292. Independent Study. 1-4 Credits. (1-4 Ind; 6 cr max) On Demand
PREREQUISITE: Consent of instructor and approval of instructor. Directed research and study on an individual basis.

BIOM 360. General Microbiology. 5 Credits. (3 Lec, 2 Lab) F,S
PREREQUISITE: BIOB 160 or BIOB 260. An introduction to major topics and subdisciplines in microbiology including microbial diversity and classification, microbial anatomy and physiology, microbial genetics, microbial ecology, medical microbiology and immunology, epidemiology and public health, and biotechnology.

BIOM 400. Medical Microbiology. 3 Credits. (3 Lec) S
PREREQUISITE: BIOM 360; Recommended BIOB 410 and BIOM 435. Selected viral, bacterial and protozoan infections of man and domestic animals will be covered with an emphasis on disease process and immune responses.

BIOM 405. Host-Associated Microbiomes. 4 Credits. (3 Lec, 1 Lab) F
PREREQUISITES: BIOB 160 and CHMY 123 or BCH 380 This course will introduce students to the microbial ecosystems that colonize human and animal hosts, detailing their essential roles in host nutrition, health and development. Students will also be exposed to modern molecular techniques used to study these systems.
BIOM 410. Microbial Genetics. 3 Credits. (3 Lec)
PREREQUISITE: BIOM 360, BCH 380. The students will become familiar with concepts in microbial genetics, including DNA replication, RNA, and protein biosynthesis. Other concepts covered in the course include bacteriophage and plasmid biology, gene regulation, mobile genetic elements, and the fundamentals of genetic engineering.

BIOM 415. Microbial Diversity, Ecology, and Evolution. 3 Credits. (3 Lec) S alternate years, to be offered even years.
PREREQUISITE: BIOM 360, BCH 380, or consent of instructor. The diversity of prokaryotic and eukaryotic microorganisms will be explored from both classical phenotypic and contemporary genotypic perspectives. The linkage between microbial diversity, its evolutionary origins, and its ecological value will be emphasized.

BIOM 421. Concepts of Plant Pathology. 3 Credits. (2 Lec, 1 Lab) S PREREQUISITE: BIOL 170IN. An introductory course in the study of plant diseases. Includes plant pathogens, etiology of disease, and various control strategies.

BIOM 423. Mycology. 3 Credits. (2 Lec, 1 Lab) F alternate years, to be offered even years.
PREREQUISITE: BIOL 170IN. This course surveys the immense diversity of fungi, including all major groups with emphasis on structures, life cycles, identification, and ecology. It provides a broad basis of knowledge for the study of fungi in research, medicine, agriculture, biotechnology, and industry. This course is co-convened with BIOL 523.

BIOM 425. Toxicology: Science of Poisons. 3 Credits. (3 Lec) S PREREQUISITE: CHMY 141, CHMY 143, BIOL 160. This course is appropriate for pre-med, health professional, and environmental science majors. Topics include history principles, and mechanisms of toxicology, disposition of toxins, chemical carcinogens, target organ toxicity, clinical and environmental toxicology.

BIOM 427. General Parasitology. 4 Credits. (3 Lec, 1 Lab) F study of the life cycles, biochemistry, molecular parasitology, pathogenesis, identification and treatment of the major parasitic groups, including parasitic protozoa, monogeneans, digeneans, cestodes, nematodes, acanthocephalans, and parasitic arthropods.

BIOM 430. Applied and Environmental Microbiology. 4 Credits. (3 Lec, 1 Lab) S PREREQUISITE: BIOM 360. The course introduces students to complex concepts in water microbiology, food microbiology, sterility and disinfection, the use of microorganisms in manufacturing processes, and in the degradation of contaminants in the environment.

BIOM 431. Medical Bacteriology. 3 Credits. (3 Lec) S PREREQUISITE: BIOM 360. Recommend BIOL 410. This course considers the nature of the agents of bacterial infectious disease; the etiology, signs, symptoms, pathogenesis, diagnosis, therapy, epidemiology, and prevention of specific diseases. The major objective is for students to gain an understanding of bacteria that cause disease in humans.

BIOM 432. Med Bacteriology Lab. 2 Credits. (2 Lab) S PREREQUISITE: BIOM 360. COREQUISITE: BIOM 431. Laboratory methods designed to teach techniques used in cultivating and identifying bacterial pathogens and normal flora from clinical specimens. Procedures used to test the antibiotic susceptibility of pathogenic bacteria.

BIOM 435. Virology. 3 Credits. (3 Lec) F PREREQUISITE: BIOL 160 or BIOL 260 or BIOL 375 or BIOL 320 or BCH 380 or BCH 442 or BCH 444 or BCH 445. Fundamentals of virology with emphasis on animal viruses of medical importance. Molecular aspects of structure, replication, transmission and host response to viral infection will be covered.

BIOM 441. Eukaryotic Pathogens. 4 Credits. (3 Lec, 1 Lab) S PREREQUISITE: BIOM 360; recommend BCH 380. The study of medically important parasite and fungal pathogens. Covers the biology, taxonomy, host/parasite relationships, pathogenesis, diagnosis and treatment of protozoan and helminth parasites; as well as of pathogenic fungi; with laboratory procedures in fungal isolation and identification.

BIOM 450. Microbial Physiology. 3 Credits. (3 Lec) F PREREQUISITE: BCH 380, BIOM 360. An in-depth examination of microbial cell structure and function, bioenergetics, intermediary metabolism and its control, and the orchestration and regulation of cellular functions that enable microbes to adapt to and survive in their environment.

BIOM 452. Soil & Environmental Microbiology. 3 Credits. (3 Lec) S alternate years, to be offered odd years.
PREREQUISITE: CHMY 143, ENSC 245. Microorganisms in soil environments: Focus on soil microbial ecology, emphasizing relevant aspects of: 1) microbial metabolism, physiology and genetics; 2) plant-microbe interactions; and 3) biotransformations of inorganic or organic contaminants.
BIOO 415. Ichthyology. 3 Credits. (2 Lec, 1 Lab) S

BIOO 433. Plant Physiology. 3 Credits. (3 Lec) S
PREREQUISITE: Junior standing, BIOB 170IN and one of the following: CHMY 211, CHMY 321, or CHMY 123. Physiological processes of higher plants, including photosynthesis, water relations, mineral nutrition, and development.

BIOO 435. Plant Systematics. 3 Credits. (1 Lec, 2 Lab) F even years
PREREQUISITE: BIOB 170IN and BIOO 230. Introduction to the local vascular plant flora emphasizing characteristics of the common families and genera. Lab concentrates on plant identification of common angiosperm plant families in Montana; preparation of about 120 reference specimens taken from the local flora.

BIOO 437. Plant Development. 3 Credits. (3 Lec) S alternate even years. PREREQUISITE: BIOB 375. Cellular and molecular mechanisms of the development of multi cellular life forms that consist of walled cells, and primarily plants. Some topics include developmental differences between plants and animals, regulation of gene expression, environmental effects on plant development, and computer modeling of development.

BIOO 458. Plant Cell Physiology. 3 Credits. (3 Lec) F alternate years, to be offered odd years. PREREQUISITE: BIOB 375, BCH 380. The features of plant cells that differentiate them from animal cells are the chief topics covered. These include cell walls, plastids and vacuoles. Other cellular organelles will also be briefly covered, including intra- and inter-cellular communication mechanisms.

BIOO 460. Plant Metabolism. 3 Credits. (3 Lec) S alternate years, to be offered odd years. PREREQUISITE: BIOO 220, BCH 380 In-depth overview of plant metabolism: photosynthesis including C4 and CAM metabolism; intermediary carbon metabolism; lipids; nitrogen and sulfur assimilation and metabolism; amino acid biosynthesis; secondary metabolism (terpenoids, alkaloids, phenylpropanoids, flavonoids); metabolic changes during plant development.

BIOO 465. Insect Identification. 4 Credits. (2 Lec, 2 Lab) S alternate years, to be offered odd years. PREREQUISITE: BIOO 262IN and one of the following: BIOB 100IN, BIOB 160 or BIOB 170IN. The identification of insects and related terrestrial arthropods. Evolutionary patterns reflected in modern insect diversity will be used to illustrate classification methods. Taxonomic methods will be used as an access to information retrieval.

BIOO 470. Ornithology. 3 Credits. (2 Lec, 1 Lab) S

BIOO 475. Mammalogy. 3 Credits. (2 Lec, 1 Lab) F

BMGT - Business: Management

BMGT 205. Prof Business Communication. 3 Credits. (3 Lec) F,S,Su
PREREQUISITE: Completion of University Seminar and Writing University Core Requirement. Recognizing and creating effective approaches and styles for written, oral, and nonverbal communications appropriate to organizational situation, nature of message, and co-communicators. Course addresses professional document and presentation designs, choices of media, and tones for individual and organizational communications.

BMGT 210. Small Business Entrepreneurship. 3 Credits. (Lec 3) S
Offered by Gallatin College. This course will provide an entrepreneurial learning experience that is grounded in collaborations and dynamic problem-solving opportunities. Through student-driven projects, participants will move through the basic building blocks of conceptualizing and starting a business.

BMGT 215. Human Resource Management. 3 Credits. (3 Lec) S
Offered by Gallatin College. This course provides a vast overview of the essential functions in Human Resource Management. Ideal for entrepreneurs and management/ executives or those interested in learning more about the Human Resource profession. This course focuses on subject areas of the Human Resource function within a business for strategic planning, ethical and legal responsibilities, recruitment and staffing plans, employee development, compensation and benefits, safety and health, and employee and labor relations. Once complete, this course will provide collaborative, best-practice techniques for managing Human Resource within real-world environments and situations.

BMGT 235. Management. 3 Credits. (3 Lec) F
This course is an introduction to critical management skills involved in directing the operations of an organization. Emphasis is placed on effectively working with others to achieve entity objectives. Course topics include the basic management functions of planning, organizing, leading, and controlling as well as staffing, appraising performance, motivating employees, handling disciplinary problems, and stress and time management. Students will develop leadership, teamwork, and communication skills.

BMGT 240IS. Business Research Methods. 3 Credits. (3 Rct) F,S
PREREQUISITE: STAT 216Q, and BMIS 211 as pre- or co-requisite. Introduction to the methods of knowledge and knowing regarding business activities and business organizations. Focused on disciplined inquiry using statistics and quantitative analysis; providing the intellectual foundation for further exploration of the business discipline.

BMGT 291. Special Topics. 1-4 Credits. (1 Lec; 12 cr max) On Demand
PREREQUISITE: None required but some may be determined necessary by offering department. Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

BMGT 292. Independent Study. 1-3 Credits. (1 Ind; 6 cr max) On Demand
PREREQUISITE: Consent of instructor and approval of Associate Dean. Directed research and study on an individual basis. Not to be used as a substitute for a required course.

BMGT 322. Operations Management. 3 Credits. (3 Lec) F,S,Su
PREREQUISITE: Junior standing; for business majors: BMIS 211, M 161Q; and STAT 216Q; for non-business majors: M 161Q and consent of instructor. Introduction to the topics and methods of production and operations management. Emphasis is given to critical thinking, business analyses and computer modeling. Application areas include accounting, finance, marketing, and management.

BMGT 329. Human Resource Management. 3 Credits. (3 Lec) F,S,Su
PREREQUISITE: BMGT 335 and BGEN 361; for business majors: formal admission to the College of Business. The functions and tools used in procurement, development, compensation, integration, and maintenance of human resources and their impact on the effective attainment of organizational goals.

BMGT 335. Management and Organization. 3 Credits. (3 Lec) F,S,Su
PREREQUISITE: Junior standing. A survey of contemporary research-based concepts relevant to management and organization including topics such as motivation, leadership, teamwork, organizational design, communication, decision making, entrepreneurship, diversity, and ethics.

BMGT 366. Supervisory Management Skills. 3 Credits. (3 Lec) S
PREREQUISITE: Junior Standing and BMGT 355; for business majors: formal admission to the College of Business. An applied management course that will build the foundational knowledge and skills required by first line supervisors and newly appointed managers. The course deals with issues including personality, communication, creative problem solving and motivation. The course emphasizes analysis that informs value-adding actions in response to typical challenges confronting first-line supervisors.

BMGT 405. Supply Chain Analytics. 3 Credits. (5 Lec) F
PREREQUISITE: BMGT 322 or ENTD 458; For business students: formal admission to the College of Business. Includes important concepts, methodologies, and tools related to supply chain management and business analytics (i.e., descriptive, predictive, and prescriptive analytics) from a managerial perspective.

BMGT 406. Negotiation/Dispute Resolution. 3 Credits. (3 Lec) S
PREREQUISITE: BMGT 335 or consent of instructor; for business majors: formal admission to the College of Business. Introduction to negotiation theories and skills to help students practice and improve this essential area of business and personal competence. Taught primarily through discussion and in-class exercises that allow students to gain experience and confidence as negotiators.
BMGT 410. Sustainable Business Practices. 3 Credits. (3 Lec) S
PREREQUISITES: Junior standing; for business majors: BMGT 335, BMKT 325, and formal admission to the College of Business; for non-business majors: consent of instructor. Explores sustainability from a business perspective looking at the decision-making process both economically and ecologically. Decision-making tools will be introduced for use in assimilating and evaluating information considering ecological sustainability, strategic human resource management, organizational change, corporate social responsibility, leadership and community renewal. A unified approach to corporate sustainability is identified and used by students to evaluate the sustainability of various businesses.

BMGT 420. Leadership and Motivation. 3 Credits. (3 Sem) F
PREREQUISITE: BMGT 335 or consent of instructor; for business majors: formal admission to the College of Business. Theories, issues, and current topics related to the emergence and effectiveness of leaders, with focus on leadership behaviors and processes in business organizations. Emphasis placed on examination of how individual and organizational leadership capacity is developed.

BMGT 433. Managing Quality and Productivity. 3 Credits. (3 Lec) S
PREREQUISITE: BMGT 322; for business majors: formal admission to the College of Business. An in-depth study of the theoretical foundations of quality management along with applications of the quantitative and qualitative tools used in improving organizational quality and productivity. Coverage will include the principles promoted by major quality experts and a review of the requirements for corporate quality certification.

BMGT 448. Entrepreneurship. 3 Credits. (3 Lec) F
PREREQUISITE: For business majors: BMGT 335, BFIN 322, senior standing, and formal admission to the College of Business; for non-business majors: senior standing and consent of instructor. Introduction to entrepreneurship and launching new ventures. Students learn how to develop creativity skills and an entrepreneurial mindset; identify and evaluate start-up opportunities; analyze the demand for new products/services; and finance, promote, manage, and plan for a new venture. Course simulates the activities of start-up entrepreneurs.

BMGT 458. Adv Entrepreneurship Sem. 3 Credits. (3 Sem) S
PREREQUISITE: For business majors: senior standing, BMGT 448, and formal admission to the College of Business; for non-business majors: Senior standing and consent of instructor. Teaches the process and the key steps for preparing a business plan for a new (or existing) business venture. A business plan is an essential tool in planning an entrepreneurial venture and integrates an analysis of potential demand for the product or service.

BMGT 460. Practical Management Perspectives. 3 Credits. (3 Sem) F
PREREQUISITE: By application, and formal admission to the College of Business (all options encouraged to apply) or declaration of a business minor. Students are partnered with faculty to co-teach BGEC 194/US. This personalized learning experience improves communication, mentoring, feedback, and presentation skills while providing new perspectives on the application of leadership and management principles.

BMGT 461. Small Business Management. 3 Credits. (3 Lec) S
PREREQUISITE: For business majors: BMGT 335, BMKT 325, BFIN 322, senior standing and formal admission to the College of Business; for non-business majors: senior standing and consent of instructor. Focus on the process of starting and managing a small business, with an emphasis on businesses owned and operated by one individual or family. Topics covered will include typical funding sources and all phases of small business management from startup to exit.

BMGT 465. Entrepreneurial Experience. 3 Credits. (3 Lec) F,S
PREREQUISITE: For business majors: BMGT 335, BMKT 325, BFIN 322, senior standing and formal admission to the College of Business; for non-business majors: senior standing and consent of instructor. Real-world experience in projects that assist area entrepreneurs. Students will work with these new ventures to solve their management, marketing, finance and other business problems. The content of the problems will depend on the needs of the client businesses.

BMGT 464. International Management. 3 Credits. (3 Lec) F
PREREQUISITE: BGEC 242D, BMGT 335, and senior standing; for business majors: formal admission to the College of Business. Description of the challenges which the global context poses to business managers. Examination of the elements of international environments and illustration of their effects on management practices and how management deals with such forces.

BMGT 465. International Practicum. 1-12 Credits. (1 Ind) On Demand
PREREQUISITE: By application; for business majors: formal admission to the College of Business. Intensive study of culture, customs, politics, history, and business practices of another country. Program culminates with extended visit to location for lectures, and other relevant activities.

BMGT 466. Middle Management Skills. 3 Credits. (3 Lec) F
PREREQUISITE: BMGT 335 and junior standing; for business majors: formal admission to the College of Business. An applied management course that will build the knowledge and skills required by middle managers. The course deals with issues including the use of teams and teamwork, employee empowerment, conflict, negotiation and ethics. The course emphasizes analysis that informs value-adding actions in response to typical challenges confronting middle managers.

BMGT 469. Community Entrepreneurship & Nonprofit Management. 3 Credits. (3 Lec) S
PREREQUISITE: Junior standing. For business majors: formal admission to the College of Business. For non-business majors: consent of instructor. Engages students in entrepreneurial thinking and the application of business strategies to address community and societal issues. Students develop and strengthen their practical understanding of business concepts, leadership skills and management capacities as they relate to effective nonprofit management.

BMIS 211. Intro to Bus Decision Support. 3 Credits. (3 Lec) F,S
PREREQUISITE: M 121Q. Focuses on best business practices with word-processing, presentation, spreadsheet, and database software. Emphasis on producing and evaluating effective and efficient information designs with applications in finance, accounting, marketing, and management.

BMIS 311. Management Information Systems. 3 Credits. (3 Lec) F,S,Su
PREREQUISITE: Junior standing, BMIS 211, and ACTG 201. A survey of the uses of information in organizational management, with emphasis on strategic systems and systems to support managerial decision making. Students apply concepts in practical application projects using currently available software.

BMIS 314. Business Web Site Design. 3 Credits. (3 Lec) F
PREREQUISITE: For business majors: Formal admission to the College of Business. Students acquire skills necessary to create and implement effective business web sites. Best practices in web site design, HTML, CSS, host site selection and introductory programming are covered. Project-based course includes creating web sites for businesses or non-profit organizations.
BMIS 315. Telecommunications Management. 3 Credits. (3 Lec) On Demand
PREREQUISITE: BMIS 311. For business majors: formal admission to the College of Business. Students acquire skills necessary to understand the role that telecommunications play in organizations, how networks facilitate competitive advantage, and how to integrate technology into a corporate culture. Students create business cases for value-adding networks and telecommunications systems.

BMIS 405. Business App Development. 3 Credits. (3 Lec) On Demand
PREREQUISITE: ACTG 321R or BMIS 311. For business majors: formal admission to the College of Business. Business applications for computers. Accounting inventory, planning, and financial analysis are among the topics covered. End-user programming and prototyping will be emphasized.

BMIS 412. Design of E-Commerce Sites. 3 Credits. (3 Lec) On Demand
PREREQUISITE: BMIS 311. For business majors: formal admission to the College of Business. Study of methods and tools a system analyst uses in development of e-commerce web sites including best practices and performance metrics. Design done on networked microcomputers. Final solutions presented orally, in writing, and on the web.

BMIS 413. Contemporary Support Systems. 3 Credits. (3 Lec) On Demand
PREREQUISITE: BMIS 311. For business majors: formal admission to the College of Business. Integrates theory, application and development of information systems to support managerial decision making in semi-structured and unstructured situations. Considers spreadsheet, expert system, and/or web-based software applications to support decision making. Uses cases and project-based assignments.

BMIS 414. Data-driven Business Web Serv. 3 Credits. (3 Lec) On Demand
PREREQUISITE: BMIS 314. For business majors: formal admission to the College of Business. Design and create data-driven, web-based applications commonly found in electronic-commerce applications by combining database design and use with interactive web site creation.

BMIS 415. Mgmt of Information Technology. 3 Credits. (3 Lec) On Demand
PREREQUISITE: BMIS 405, BMIS 412, and BMGT 335. For business majors: formal admission to the College of Business. Course integrates content from the courses in the Management of Information Technology minor. The course will unite the technical knowledge and skills acquired by students with behavioral knowledge and skills necessary to effectively manage business applications of information technology.

BMKT - Business: Marketing

BMKT 112. Applied Sales. 3 Credits. (3 Lec) F
Offered by Gallatin College. This course will provide the foundation for understanding sales. Students will understand the tactics for researching prospects, identifying and qualifying leads, and methods for successful negotiation with customers. Particular attention will be paid to understanding mindset and habits to succeed in sales situations in a small business setting.

BMKT 225. Marketing. 3 Credits. (3 Lec)
Students will learn and understand marketing, the process through which organizations analyze, plan, implement, and control programs to develop and maintain beneficial exchanges with target buyers. This course covers fundamental marketing terminology, concepts and strategies including product development, consumer behavior, research, target markets, pricing, channels of distribution, promotion and marketing plans.

BMKT 240. Advertising. 3 Credits. (3 Lec) S
Offered by Gallatin College. In this course students will examine how advertising contributes to the overall success of marketing a product, service or organization. Professionals in advertising need to understand how communication goals are achieved through understanding the target audience and ensuring appropriate messages are delivered through strategically selected media channels. Students will display an understanding of the strengths and weaknesses of each communication channel and why it is critical to developing an effective advertising plan. Participants will apply readings to be able to critically evaluate the advertising channels and develop a plan based on a hypothetical budget and target audience.

BMKT 241. Sales. 3 Credits. (3 Lec) On Demand
Principles of sales for non-business majors. Focus is on selling in retail and service environments. This course may not substitute for any required business course.

BMKT 291. Special Topics - 1-4 Credits. (1 Lec; 12 cr max) On Demand
Max 12 cr. PREREQUISITE: None required but some may be determined necessary by each offering department. Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

BMKT 292. Independent Study. 1-3 Credits. (1 Lec; 6 cr max) On Demand
Max 6 cr. PREREQUISITE: Consent of instructor and approval of Associate Dean. Directed research and study on an individual basis. Not to be used as a substitute for a required course.

BMKT 325. Principles of Marketing. 3 Credits. (3 Lec) F,S,Su
PREREQUISITE: Junior standing and ECNS 101. Marketing management decision-making in the product, price, promotion, and distribution areas. The behavioral, legal, ethical, competitive, technological, and economic environments as they affect decisions in the domestic and international organization.

BMKT 337. Consumer Behavior. 3 Credits. (3 Lec) F,S
PREREQUISITE: BMKT 325. For business majors: formal admission to the College of Business. Application of behavioral sciences to understanding human behavior in the market place. Emphasis on culture and subculture, social class, reference group, family, attitudes, perception, motivation, personality, and learning theory on consumer and marketing management decisions.

BMKT 342R. Marketing Research. 3 Credits. (3 Lec) F,S
PREREQUISITE: STAT 217Q or BMGT 240IS, and BMKT 325. For business majors: formal admission to the College of Business. The application of scientific research methods to marketing problems. The emphasis is on survey design and data analysis for market segmentation studies.

BMKT 343. Integrated Marketing Communication. 3 Credits. (3 Lec) F,S
PREREQUISITE: Senior standing and BMKT 325. For business majors: formal admission to the College of Business. Explores the use of advertising, sales promotion, Internet, electronic media, and personal selling as methods for promoting goods and services. Taught from the perspective of the marketing manager, with emphasis on the theory, strategy, and tactics of promotion. College of Business.

BMKT 420. Integrated Online Marketing. 3 Credits. (2 Lec) F,S
PREREQUISITES: For business majors: BMKT 325 and formal admission to the College of Business; For non-business majors: Consent of Instructor. Through readings, case studies and hands-on projects, students will come away with an understanding of foundations, research, strategy, execution, measurement, and adaptation as it relates to effective online marketing. Leading thinkers at companies like IDEO, Google, MailChimp, Salesforce.com, and Amazon will address special topics such as email marketing, user experience design, social media, search engine optimization (SEO), building online communities, and mobile marketing.

BMKT 436. Sales and Sales Management. 3 Credits. (3 Lec) F,S,Su
PREREQUISITE: BMKT 325. For business majors: formal admission to the College of Business. Focus on sales and sales management in a business-to-business and business-to-consumer setting. Students will develop personal, technical, and management skills as they learn selling techniques, practice and develop personal selling skills, and use Customer Relationship Management (CRM) software. College of Business.

BMKT 441. International Marketing. 3 Credits. (3 Lec) S
PREREQUISITE: BMKT 325 and RGEN 242D. For business majors: formal admission to the College of Business. International economic, financial, cultural, political, and legal environments; marketing research, market segmentation and positioning issues analyzed primarily from a global perspective. Global strategies and organizational designs described and analyzed as related to foreign market entry, sourcing, product development, pricing, promotion, logistics and distribution, and export-import management.

BMKT 444. Retail Management. 3 Credits. (3 Lec) F,S
PREREQUISITE: Senior standing and BMKT 325. For business majors: formal admission to the College of Business. The application of marketing theory to retail management problems. Topics include structure of the retail industry and nature of competition; merchandise planning, budgeting and control; and pricing and location theory.

BMKT 446. Marketing for Entrepreneurs. 3 Credits. (3 Lec) F,S
PREREQUISITE: BMKT 325. For business majors: formal admission to the College of Business. Examines the unique marketing challenges faced by start-up organizations. New firms are often resource constrained. As a result, penetrating markets dominated by larger competitors with new and innovative products and services requires different marketing tactics. Markets are undefined and establishing primary demand for a new product category may be required.

BMKT 447. Marketing Mix and Design. 3 Credits. (3 Lec) On Demand
PREREQUISITE: Senior standing, BMKT 325 and approval of instructor. For business majors: formal admission to the College of Business. Students teams apply their expertise in marketing to practical business problems encountered by firms in the community and surrounding area. The problems have their basis in any of the marketing mix elements such as identifying market potential, developing a promotional campaign, or development of a new product.
CAA 290R. Undergraduate Research. 1-6 Credits. (1-6 Ind; 12 cr max) On Demand
PREREQUISITE: Senior standing and consent of instructor. For business majors:
Formal admission to the College of Business. Directed undergraduate research which
may culminate in a research paper, journal article, or undergraduate thesis. Course will
address responsible conduct of research. May be repeated.

BMKT 491. Special Topics. 1-4 Credits. (1 Lec; 12 cr max) On Demand
Max 12 cr. PREREQUISITE: Course prerequisites as determined for each offering.
Courses not required in any curriculum for which there is a particular one-time need,
or given on a trial basis to determine acceptability and demand before requesting a
regular course number.

BMKT 492. Independent Study. 1-3 Credits. (1 Ind; 6 cr max) On Demand
Max 6 cr. PREREQUISITE: Junior standing, formal admission to the College of
Business, consent of instructor and approval of Associate Dean. Directed research
and study on an individual basis. Not to be used as a substitute for a required course.

BMKT 494. Seminar. 1 Credit. (1 Sem) On Demand
PREREQUISITE: Junior standing and as determined for each offering. Topics
offered at the upper-division level which are not covered in regular courses. Students
participate in preparing and presenting discussion material.

BMKT 498. Internship. 2-12 Credits. (2 Ind; 12 cr max) On Demand
PREREQUISITE: Formal admission to the College of Business and consent of
instructor. An individualized assignment arranged with an agency, business, or other
organization to provide guided experience in the field.

BMKT 499. Senior Capstone: Marketing Management. 3 Credits. (3 Lec) F,S
PREREQUISITE: Senior standing, BMKT 337, BMKT 342R, BMKT 343, and
BMKT 436. For business majors: formal admission to the College of Business.
BMKT 436 may be taken as a co-requisite. The content of previous marketing
courses is applied using the case method to solve marketing problems. Emphasis is on
marketing strategy and implementation.

BMKT 591. Special Topics. 1-4 Credits. (1 Lec; 12 cr max) On Demand
Max 12 cr. PREREQUISITE: Upper division courses and others as determined for
each offering. Courses not required in any curriculum for which there is a particular
one-time need, or given on a trial basis to determine acceptability and demand before
requesting a regular course number.

BMKT 592. Independent Study. 1-3 Credits. (1 Ind; 6 cr max) On Demand
Max 6 cr. PREREQUISITE: Graduate standing consent of instructor, approval of
Associate Dean and Dean of Graduate Studies. Directed research and study on an
individual basis.

BREN - Bio-Resources Engineering

BREN 570. Independent Study. 1-3 Credits. (1-3 Ind; 8 cr max) On Demand
Maximum 8 cr. PREREQUISITE: Admission to graduate program. Directed graduate
research and study of architectural, urban design or historic preservation issues on an
individual basis.

BREN 580. Special Topics. 1-4 Credits. (1-4 Lec; 12 cr max) On Demand
Maximum 12 cr. PREREQUISITE: Upper division courses and others as determined for
each offering. Courses not required in any curriculum for which there is a particular
one-time need, or given on a trial basis to determine acceptability and demand before
requesting a regular course number.

BSI - Big Sky Institute

BSI 591. Special Topics. 1-4 Credits. (1-4 Lec; 12 cr max) On Demand
Max 12 cr. PREREQUISITE: Graduate status or seniors by petition. Explores
interactions between the natural (i.e., nonhuman) and human processes that drive
mountain ecosystems. Weekly lectures present current research on relevant topics.
Required of all graduate students enrolling for multidisciplinary study in the Big Sky
Institute.

CAA - College of Arts & Arch

CAA 290R. Collaborative Rsch/Creative. 1-4 Credits. (1 Ind; 8 cr max) F,S
Max 8 cr. PREREQUISITE: Freshman or sophomore standing and consent of
instructor. Intended for lower division undergraduate research and creative projects
undertaken in an interdisciplinary team format. The student will work closely with
students and faculty colleagues seeking creative project solutions while exploring
innovative methods of collaborative problem solving. Course will address responsible
conduct of research. May be repeated. Department Undeclared.

CAA 291. Special Topics. 1-4 Credits. (1-4 Sem; 12 cr max) On Demand
PREREQUISITE: None required but some may be determined necessary by each
offering department. Courses not required in any curriculum for which there is a
particular one-time need, or given on a trial basis to determine acceptability and
demand before requesting a regular course number. Undeclared.

CAA 310. The Art of Mental Healing: Collaboration in Scholarship and
Creativity. 3 Credits. (3 Sem) F
Alternate Odd Years PREREQUISITE: Sophomore standing and WRIT 101W.
Working collaboratively, students in this course will foster developing solutions for
menthal healing and for educating the community through scholarship and creativity.

CAA 490R. Collaborative Rsch/Creative. 1-4 Credits. (1 Ind; 8 cr max) F,S
SU Max 8 cr. PREREQUISITE: Junior or higher standing and approval of instructor.
Intended for upper division undergraduate research and creative projects undertaken in
an interdisciplinary team format. The student will work closely with students and
faculty colleagues seeking creative project solutions while exploring innovative methods
of collaborative problem solving. Course will address responsible conduct of research.
May be repeated. Department Undeclared.

CAA 491. Special Topics-Farm to Market: An Interdisciplinary Design Lab. 3
Credits. (3 Lab) F
PREREQUISITE: Junior standing. This cross-disciplinary design course incorporates
theory and application from marketing, psychology, graphic design, nutrition and food
science. The goal is to expose students to the elements of ideation, design thinking
and user experience — working through all the stages of conceptual development. Student
teams are paired with “Specialty Crops” farmers in Montana to develop new income
opportunities from their existing assets (crops, land, equipment). Students will create, name,
brand, package and develop marketing strategies for products that support local farms and
the state’s overall economic development.

CAPP - Computer Applications

CAPP 120. Introduction to Computers. 3 Credits. (3 Lec) F,S
Offered by Gallatin College. Computer hardware and software concepts as they apply
to all computers. Exposure to software packages such as Windows, word processors,
spreadsheets, and Internet applications. Laboratory projects reflect practical usage in
resolving real world problems/situations.

CAPP 156. Microsoft Excel. 3 Credits. (3 Lec) F
Su Offered by Gallatin College. Introduces business applications using spreadsheets.
Emphasis placed on the essential functions of spreadsheet operation, as well as an
introduction to some advanced spreadsheet features such as lookup functions and
list management. Covers expert level skills for the Microsoft Certified Application
Specialist (MCAS) certification in Microsoft Excel.

CHIN - Chinese

CHIN 101. Elementary Chinese I. 4 Credits. (4 Rct)
Elementary course designed to help students acquire basic language skills in Mandarin:
reading, writing, listening, speaking. Introduction to Chinese writing systems.
Emphasis on establishing correct pronunciation and grasp of grammar. Cultural
perspectives such as greetings, simple dialogues re introduced.

CHIN 102D. Elementary Chinese II. 4 Credits. (4 Rct)
PREREQUISITE: CHIN 101 or equivalent, or placement interview with instructor.
Continuation of CHIN 101. Builds upon the foundation established in 101. Greater
emphasis is placed upon oral and written expression. Reading and discussions are
designed to increase comprehension of more linguistically complex texts and more
conceptually complex cultural issues.

CHIN 130D. Historical and Literary Journey into Modern China. 3 Credits. (3
Lec) On Demand
The focus of this course will be on twentieth-century Chinese short stories and novellas
in English translation. We will look at modern Chinese literature in its historical
setting as well as from the point of view of literary critical theory.

CHIN 201D. Intermediate Chinese I. 4 Credits. (4 Rct)
PREREQUISITE: CHIN 102D. The second year college-level Chinese course that
emphasizes four language skills: listening, speaking, reading and writing. The overall
goal is to help students develop their Chinese communication skills, and provide
students a broader perspective on Chinese culture.

CHIN 202D. Intermediate Chinese II. 4 Credits. (4 Rct)
PREREQUISITE: CHIN 201D. Continuation of CHIN 201. Throughout the entire
course, the more up-to-date language ingredients and authentic linguistic materials
are introduced with a view towards reflecting cultural life in the dynamic and rapidly
changing contemporary China.
CHIN 211D. Chinese Culture & Civilization. 3 Credits. (3 Lec) S
COREQUISITE: WRIT 101 or equivalent. Chinese cultural, social and political history. Confucianism, Buddhism, and such elements of high culture as the arts of poetry and prose, while providing a sense of dynamic chronology. Class is offered in English.

CHIN 320H. History of Chinese Cinema. 3 Credits. (3 Lec) F
PREREQUISITE: Junior standing or permission of instructor. This course reviews the history of Chinese cinema. Provides students opportunities to interrogate cinematic representations of China, to participate in critical thinking discussions and dialogues, and to understand the methods that Chinese filmmakers use to explore those questions. In English.

CHIN 492. Independent Study. 1-3 Credits. (1-3 Ind; 6 cr max) PREREQUISITE: Junior standing and consent of instructor. Directed research and study on an individual basis.

CHMY - Chemistry

CHMY 102CS. Applying Chemistry to Society. 3 Credits. (3 Lec) S
An introduction to contemporary chemistry in the contextual framework of current issues including the effect of human impact on the air, water, and earth. This course will examine the scientific basis for current scientific and societal issues such as depletion of the ozone layer, water pollution, acid rain, genetic engineering and nuclear fusion among other issues. Topics will be addressed from a scientific viewpoint to develop knowledge and understanding of the chemical concepts that underlie these contemporary issues. The goal is to inform non-science majors of chemical and scientific issues in order to help them to become well-informed, inquiring citizens.

CHMY 121IN. Introduction of General Chemistry. 4 Credits. (3 Lec, 1 Lab) F,S,Su
PREREQUISITE: C- or above in M 096 or M 097 or placement in a Math Level 3 (ACT 23 or SAT 540). Introductory general chemistry. Measurement systems, atomic structure, chemical periodicity, bonding, chemical reactions, acid-base chemistry, electrochemistry, nuclear chemistry.

CHMY 123. Introduction of Organic Chemistry and Biochemistry. 4 Credits. (3 Lec, 1 Lab) F,S,Su
PREREQUISITE: C- or above in CHMY 121IN or CHMY 143. An introduction into functional group organic chemistry and important biochemical structures, concepts, and processes. The laboratory is closely integrated with lecture coverage.

CHMY 141. College Chemistry I, 4 Credits. (3 Lec, 1 Lab) F,S,Su
PREREQUISITE: C- or above in M 121Q or placement in a Math Level 4 (ACT 25 or SAT 580). The first of a two-semester course sequence about the general principles of modern chemistry with emphasis on atomic structure, chemical bonding, the periodic table, equilibria, chemical reactivity, and kinetics.

CHMY 143. College Chemistry II. 4 Credits. (3 Lec, 1 Lab) F,S,Su
PREREQUISITE: C- or above in CHMY 141. The second semester of the two-semester general chemistry sequence.

CHMY 151. Honors College Chemistry I. 4 Credits. (3 Lec, 1 Lab) F
PREREQUISITE: Placement in a level 5 Math (Math ACT score of 27 or SAT of 620). Recommended that students registering for this course either have taken calculus or are concurrently enrolled. Also recommended that students registering in this course have taken high school chemistry and/or physics, preferably AP Chemistry and/or Physics. Topic coverage parallels CHMY 141, with emphasis on critical and analytical thought and with a greater reliance on math skills. For departmental honors program and the University honors program.

CHMY 153. Honors College Chemistry II. 4 Credits. (5 Lec, 1 Lab) S
PREREQUISITE: A grade better than a C in CHMY 141 or CHMY 151. Topic coverage parallels CHMY 143, with emphasis on critical and analytical thought and with a greater reliance on math skills. For departmental honors program.

CHMY 194. Seminar/Workshop. 1 Credit. (1 Sem) F
PREREQUISITE: Placement in a level 5 Math (Math ACT score of 27 or SAT of 620). Recommended that students registering for this course either have taken calculus or are concurrently enrolled. Also recommended that students registering in this course have taken high school chemistry and/or physics, preferably AP Chemistry and/or Physics. Topic coverage parallels CHMY 141, with emphasis on critical and analytical thought and with a greater reliance on math skills. For departmental honors program.

CHMY 211. Elements of Organic Chemistry. 5 Credits. (4 Lec, 1 Lab) F,S
PREREQUISITE: C- or above in CHMY 121IN, CHMY 143, or CHMY 153. A one-semester introduction to organic chemistry. The unique character of carbon: bonding, structure, nomenclature, and common reactions of hydrocarbons and functional organic compounds.

CHMY 290R. Undergraduate Research. 1-6 Credits. (1-6 Ind; max unlimited) F,S
Directed undergraduate research/creative activity which may culminate in a written work or other creative project. Course will address responsible conduct of research. May be repeated.

CHMY 291. Special Topics/Expmnl Crse. 1-4 Credits. (1-4 Sem; 12 cr max) On Demand
Max 12 cr. PREREQUISITE: None required, but some may be determined necessary by each offering department. Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

CHMY 292. Independent Study. 1-3 Credits. (1-3 Ind; 6 cr max) On Demand
Max 6 cr. PREREQUISITE: Consent of instructor and approval of department head. Directed research and study on an individual basis.

CHMY 294. Seminar/Workshop. 1 Credit. (1 Sem) F
PREREQUISITE: CHMY 194 or BCH 194. Introduction to faculty research through faculty mini seminars. Departmental research facilities. Research groups. Research planning decisions (MSU laboratory, summer internship, student exchange, REU, USP, etc.).

CHMY 311. Fundamental Analytical Chem. 4 Credits. (3 Lec, 1 Lab) S
PREREQUISITE: CHMY 143 or CHMY 153. Introduction to wet analytical chemistry with an emphasis on the systematic treatment of equilibria, acid-base chemistry, redox equilibria and titrations, complexometric equilibria and titrations, Beer’s law, fundamental lab skills and chromatography.

CHMY 321. Organic Chemistry I. 4 Credits. (3 Lec, 1 Lab) F,SSu
PREREQUISITE: CHMY 143 or CHMY 153. The first of a two-semester professional sequence in organic chemistry. In-depth coverage of stereochemistry, synthetic organic chemistry, physical organic chemistry, spectroscopy, and nomenclature. Students should register for both semesters.

CHMY 323. Organic Chemistry II. 4 Credits. (3 Lec, 1 Lab) S,Su
PREREQUISITE: CHMY 321. The second semester of the two-semester professional sequence in organic chemistry.

CHMY 331. Honors Organic Chemistry I. 4 Credits. (3 Lec, 1 Lab) F
PREREQUISITE: CHMY 151 and CHMY 153 or consent of instructor. CHMY 331 is the first of a two-semester honors sequence in organic chemistry. Topic coverage parallels CHMY 321, but at an accelerated pace with in-depth coverage of physical organic chemistry, stereochemistry, synthetic organic chemistry, spectroscopy, and nomenclature.

CHMY 333. Honors Organic Chemistry II. 4 Credits. (3 Lec, 1 Lab) S
PREREQUISITE: A grade of better than a C in CHMY 331. CHMY 333 is the second semester of the two-semester honors sequence in organic chemistry. Topic coverage parallels CHMY 323, with more in-depth coverage of mechanisms and more emphasis on retrosynthetic analysis and on solving multi step synthesis problems.

CHMY 350. Astrobiology. 3 Credits. (3 Lec) F
PREREQUISITE: BIOL 170, CHMY 121, and ASTR 110 (or equivalent) and junior standing. This course examines the science of astrobiology focused on the origin, evolution, and distribution of life in the universe. Topics that will be discussed include planetary evolution, origin of life, habitability, evolution, intelligence, and the search for life beyond Earth.

CHMY 351. Astrobiology Recitation. 1 Credit. (1 Rct) F
PREREQUISITE: BIOL 170, CHMY 121, and ASTR 110 (or equivalent) and junior standing. COREQUISITE: CHMY 350. These interactive sessions will complement the study of astrobiology as students become both better consumers of and practitioners of science communications. We’ll discuss trends, challenges and opportunities in science communications; analyze and critique current communications campaigns; and strategize how to best convey the diverse aspects of astrobiology through strategies such as science writing; working with the media; social media and websites; and more. Students will create and present their own communications pieces, and will be encouraged to disseminate their work to the public. This recitation recommended, but not required.

CHMY 361. Elements of Physical Chemistry. 4 Credits. (4 Lec) F
PREREQUISITE: M 161Q or M 172Q and PHSX 207, and CHMY 211 or CHMY 323 or CHMY 333. A physical chemistry course directed toward the life sciences, health professions, and agricultural sciences.

CHMY 362. Elements of Physical Chemistry Lab. 1 Credit. (1 Lab) F
PREREQUISITE: CHMY 311. CHMY 361 can be a prerequisite or corequisite. The laboratory to accompany CHMY 361.

CHMY 371. Physical Chemistry-Quantum Chemistry and Spectroscopy I. 3 Credits. (3 Lec) F
PREREQUISITE: CHMY 143 or CHMY 153 and M 172Q and PHSX 222. COREQUISITE: M 273. The first semester of a two-course sequence for science and engineering majors on quantum chemistry, statistical thermodynamics, spectroscopy, classical thermodynamics and kinetics.
CHMY 372. Physical Chemistry Laboratory I. 1 Credit. (1 Lab) F
PREREQUISITE: CHMY 311. COREQUISITE: CHMY 371 or CHMY 373
(Prerequisite or Corequisite). Laboratory to accompany CHMY 371 or 373. Fundamental experiments in thermodynamics and kinetics.

CHMY 373. Physical Chemistry - Kinetics and Thermodynamics. 3 Credits. (3 Lec) S
The second semester of a two-course physical chemistry sequence for science/engineering majors. Students should take both semesters of the sequence.

CHMY 374. Physical Chemistry Lab II. 2 Credits. (2 Lab) S
PREREQUISITE: CHMY 372. COREQUISITE: CHMY 373. The advanced laboratory to accompany CHMY 373. In-depth experiments and data analysis. Required of all chemistry majors who take CHMY 373.

CHMY 394. Seminar/Workshop. 1 Credit. (1 Sem) F
PREREQUISITE: CHMY 294 or BCH 294. Research techniques, procedures, and reports. Seminar reporting and presentation skills. Career planning and resume preparation. May be repeated once.

CHMY 401. Advanced Inorganic Chemistry. 3 Credits. (3 Lec) S
COREQUISITE: CHMY 361 or CHMY 373. A systematic presentation of atomic structure and chemical bonding with emphasis on properties, structure, and the reactions of representative members of the various families of the periodic table.

CHMY 417. Synthetic Chemistry. 3 Credits. (3 Lec) F alternate years, to be offered odd years.
PREREQUISITE: CHMY 323. Organic and inorganic reaction chemistry for advanced students. Modern reagents and transformations are treated in detail, along with relevant theoretical and mechanistic considerations.

CHMY 421. Advanced Instrument Analysis. 3 Credits. (2 Lec, 1 Lab) F, alternate years
PREREQUISITE: CHMY 311 and CHMY 361 or CHMY 371. An advanced analytical chemistry course which covers modern instrumental methods based on spectrochemical and electrochemical principles.

CHMY 490R. Undergraduate Research. 1-6 Credits. (1 Ind; 12 cr max) F,S,Su
Max 12 cr. Directed undergraduate research/creative activity which may culminate in a research paper, thesis article, or undergraduate thesis. Course will address responsible conduct of research. May be repeated.

CHMY 491. Special Topics/Experimental Course. 1-4 Credits. (1-4 Lec; 12 cr max) On Demand
Max 12 cr. PREREQUISITE: Course prerequisites as determined for each offering. Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

CHMY 492. Independent Study. 1-3 Credits. (1-3 Ind; 6 cr max) On Demand
Max 6 cr. PREREQUISITE: Junior standing, consent of instructor, and approval of department head. Directed research and study on an individual basis.

CHMY 494. Seminar/Workshop. 1 Credit. (1 Sem) S
PREREQUISITE or COREQUISITE: CHMY 394 or BCH 394. Senior capstone course. Taught in collaboration with departmental Honors Thesis. CHMY 399. The chemistry/biochemistry research undergraduate experience constitutes a synthesis of our (bio)chemistry class room and laboratory education. The projects are orally presented in seminar form, discussed on the basis of acquired knowledge, and analyzed using stringent scientific methods and criteria. A complete personal resume is prepared. May be repeated once.

CHMY 499. Senior Thesis/Capstone. 1 Credit. (1 Lec) S
PREREQUISITE: CHMY 490 or BCH 490 (minimum of 3 cr.) Thesis format and style will be illustrated, discussed, and monitored. Draft portions of manuscripts are to be completed on a regular schedule. Required of all candidates for departmental honors.

CHMY 505. Critical Concepts in Chemistry. 3 Credits. (2 Lec, 1 Lab) Su
PREREQUISITE: CHMY 121 or equivalent. Course explores new learning strategies that encourage discovery-based learning. Class will explore ways to use computer technology to engage students in discovery-based learning.

CHMY 506. Integrating Computers into Laboratory Instruction. 2 Credits. (1 Lec, 1 Lab) Su
PREREQUISITE: Secondary teacher certification and 2 years teaching experience. One year introductory chemistry course (CHMY 142 and 143) and coursework or experience equivalent to one semester physical chemistry (CHMY 361). A baccalaureate degree and experience teaching science at the secondary level are required. The course will examine and discuss fundamental and critical concepts in chemistry. A practical laboratory component will enable students to develop laboratory and/or demonstration projects for each concept. Individual student-generated presentations are a key course component.

CHMY 515. Structure and Bonding in Inorganic Chemistry. 3 Credits. (3 Lec) F
PREREQUISITE: CHMY 401. Spectroscopy, structure, and bonding of coordination and organometallic compounds.

CHMY 516. Mechanisms and Dynamics in Inorganic Chemistry. 3 Credits. (3 Lec) S
PREREQUISITE: CHMY 401. Mechanisms and dynamics of the reactions of coordination and organometallic compounds.

CHMY 523. Organic Reaction Mechanisms. 3 Credits. (3 Lec) F
PREREQUISITE: CHMY 323, COREQUISITE: CHMY 533. A problem solving course concentrating on analyzing organic reactions and transformations via electron-pushing mechanisms. Problems chosen will be from the current chemical literature. Designed for incoming graduate students and upper-class undergraduates who want to learn or brush up on their electron-pushing skills.

CHMY 524. Mass Spectrometry. 3 Credits. (3 Lec) F alternate years, to be offered odd years.

CHMY 525. Chemical Reactions. 3 Credits. (3 Lec) S alternate years, to be offered even years.
PREREQUISITE: CHMY 373. Treatment of complex chemical equilibria, kinetics, and mass transport in the solution and gas phases with respect to their effects on methods of chemical analysis.

CHMY 526. Adv Protein NMR Spectroscopy. 3 Credits. (3 Lec) F alternate years, to be offered even years.
PREREQUISITE: CHMY 371. This lecture-based course is designed to teach the fundamental principles of nuclear magnetic resonance (NMR) spectroscopy as it applies to the structural elucidation of proteins in solution. Pre-requisites include familiarity with linear algebra and basic trigonometric functions and CHMY 323. Cross-referenced with BCHM 526.

CHMY 527. Analytic Optical Spectroscopy. 3 Credits. (3 Lec) F alternate years, to be offered even years.
PREREQUISITE: CHMY 371. Use of optical spectroscopic methods for chemical analysis.

CHMY 533. Physical Organic Chemistry. 3 Credits. (3 Lec) F
PREREQUISITE: CHMY 417. A semi-quantitative description of the mechanisms of organic reactions. Topics include M.O. theory, orbital symmetry, addition and elimination reactions, the kinetics and thermodynamics of organic reactions, solvent effects, etc.

CHMY 535. Reagent Chemistry. 3 Credits. (3 Lec) S
PREREQUISITE: CHMY 371 and CHMY 361 or CHMY 373. A thorough study of synthetic processes, methodologies and reagents.

CHMY 540. Organic Synthesis. 3 Credits. (3 Lec)
PREREQUISITE: CHMY 533 and CHMY 535. A thorough study of strategies for the synthesis of complex natural products.

CHMY 551. Organic Structure Elucidation. 3 Credits. (3 Lec) S alternate years, to be offered even years.
PREREQUISITE: CHMY 417. Spectroscopic structure elucidation of small organic molecules. Techniques to be discussed include 1-D and 2-D NMR spectroscopy, UV, IR, MS, and Raman spectroscopies. Emphasis will be on interpreting spectra to deduce the structure of the compound in question.

CHMY 554. Organometallic Chemistry. 3 Credits. (3 Lec) S alternate years, to be offered even years.
PREREQUISITE: CHMY 321, CHMY 323 and CHMY 553. Application of organometallic chemistry to organic transformations.

CHMY 557. Quantum Mechanics. 3 Credits. (3 Lec) F alternate years, to be offered even years.
PREREQUISITE: CHMY 373 or equivalent. Applications of quantum mechanics to molecules and spin systems.

CHMY 558. Classical & Stat Thermodynamics. 3 Credits. (3 Lec) F alternate years, to be offered odd years.
PREREQUISITE: CHMY 373 or equivalent. Classical & statistical thermodynamics applied to chemical systems.

CHMY 559. Kinetics & Dynamics. 3 Credits. (3 Lec) S alternate years, to be offered even years.
PREREQUISITE: CHMY 373 or equivalent. Chemical kinetics, theories of reaction rates, molecular reaction dynamics, with applications to Chemical reactions in the gas phase, on surfaces, and in solution.
CHMY 560. Symmetry, Orbitals, and Spectroscopy. 3 Credits. (3 Lec) F alternate years, to be offered odd years. PREREQUISITE: CHMY 373. Group theory with applications, semi-empirical and ab initio calculations, vibrational and electronic spectroscopy, and their interrelationship will be covered.

CHMY 564. Adv Quantum Chemistry. 3 Credits. (3 Lec) S alternate years, to be offered odd years. PREREQUISITE: CHMY 557 or equivalent. Time independent and time dependent quantum mechanics with application to chemical bonding and molecular spectroscopy.

CHMY 575. Professional Paper. 1-6 Credits. (1-6 Ind; 6 cr max) F,S Maximum 6 cr. PREREQUISITE: Consent of instructor. A research or professional paper or project dealing with a topic in the field. The topic must have been mutually agreed upon by the student and his or her major advisor and graduate committee.

CHMY 588. Professional Development. 1-3 Credits. (1-3 Lec; 3 cr max) On Demand Max 3 cr. PREREQUISITE: Graduate standing; teaching experience and/or current employment in a school or organization; and consent of instructor and Dean of Graduate Studies. Courses offered on a one-time basis to fulfill professional development needs of in-service educators. A specific focus is given to each course which is appropriately subdivided. May be repeated.

CHMY 589. Graduate Consultation. 1-3 Credits. (3 Ind) F,S,Su PREREQUISITE: Master’s standing and approval of the Dean of Graduate Studies. This course may be used only by students who have completed all of their course work (and thesis, if on a thesis plan) but who need additional faculty or staff time and help.

CHMY 590. Master’s Thesis. 1-10 Credits. (1-10 Ind; max unlimited) F,S,Su INDI Maximum credits unlimited. PREREQUISITE: Master’s standing.

CHMY 591. Special Topics. 1-4 Credits. (1-4 Lec; 12 cr max) On Demand PREREQUISITE: Upper division courses and others as determined for each offering. Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

CHMY 592. Independent Study. 1-3 Credits. (1-3 Ind; 3 cr max) On Demand Max 3 cr. PREREQUISITE: Graduate standing, consent of instructor, approval of department head and Dean of Graduate Studies. Directed research and study on an individual basis.

CHMY 594. Seminar. 1 Credit. (1 Sem; 4 cr max) On Demand Max 4 cr. PREREQUISITE: Graduate standing or seniors by petition. Course prerequisites as determined for each offering. Topics offered at the graduate level which are not covered in regular courses. Students participate in preparing and presenting discussion material.

CHMY 689. Grad Research/Instruction. 1-3 Credits. (1-3 Lec; 3 cr max) F,S,Su PREREQUISITE: Graduate standing. COREQUISITES: CHMY 590 or CHMY 690. Classroom instruction associated with directed graduate research/creative activity projects.

CHMY 690. Doctoral Thesis. 1-10 Credits. (1-10 Ind; max unlimited) F,S,Su PREREQUISITE: Doctoral standing.

CHTH - Community Health

CHTH 205. Drugs and Society. 3 Credits. (3 Lec) F,S Su On Demand Individual and social implications of psychoactive drug use. Basic pharmacological concepts, legal issues, common pharmaceutical preparations, and over-the-counter products are studied.

CHTH 210. Foundations in Community Health. 3 Credits. (3 Lec) F Introduction to community health discipline outlining the history, evolution, and practice of delivering health information to communities. Principles and practices of community health including multicultural considerations, definitions of health, illness and disease, health education and promotion, demographics, epidemiology and the health of diverse populations throughout the lifespan.

CHTH 245. Physical Activity, Nutrition and Health in Aging. 3 Credits. (3 Lec) F,S,Su On-Line Only To understand the intersection between nutrition, physical activity and health in an aged population. Theories of aging, physiological processes, nutritional needs, chronic health conditions and components of physical activity will be explored.

CHTH 290R. Undergraduate Research. 1-6 Credits. (1-6 Ind; max unlimited) F,S,Su Directed undergraduate research which may culminate in a written work or other creative project. Course will address responsible conduct of research. May be repeated.

CHTH 291. Special Topics. 1-4 Credits. (1-4 Lec; 12 cr max) On Demand Max 12 cr. PREREQUISITE: None required but some may be determined necessary by each offering department. Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

CHTH 292. Independent Study. 1-3 Credits. (1-3 Ind; 6 cr max) On Demand Max 6 cr. PREREQUISITE: Consent of instructor and approval of department head. Directed research and study on an individual basis.

CHTH 298. Internship. 2-12 Credits. (2-12 Ind; 12 cr max) On Demand Max 12 cr. PREREQUISITE: Consent of instructor. An individualized assignment arranged with an agency, business, or other organization to provide guided experience in the field.

CHTH 317. Health Behavior Theories. 3 Credits. (3 Lec) F,S,Su PREREQUISITE: PSYX 100IS or SOCI 101HS. The study and application of theoretical models of exercise and health with emphasis on behavior change in the individual and group levels.

CHTH 325. Economic & Public Policies in Aging. 3 Credits. (3 Lec) S To understand the complex financial needs of older adults from retirement to end-of-life. To understand public policies associated with the politics of aging.

CHTH 405. Caregiving & Aging Families. 3 Credits. (3 Lec) S This class will explore the demographic characteristics of aging individuals and families in America. Specific topics will include family relationships in caregiving, stress and burden, caring for those with complicated health care needs and end-of-life care.

CHTH 428. Health Disparities. 3 Credits. (3 Lec) S PREREQUISITE: CHTH 210 and FCS 371. Examines what contributes to health disparities, which are inequalities in death, disease, disability, and well-being. Focuses on the epidemiologic evidence, theories of why health disparities exist, and current strategies for ameliorating health disparities.

CHTH 430. Mental Health & Social Issues in Aging. 3 Credits. (3 Lec) On-Line Only This course will explore the psychosocial and biological approaches to aging and mental health and will seek to understand the impact of society and societal issues with regard to mental health needs in older adults.

CHTH 435. Human Response To Stress. 3 Credits. (3 Lec) F,S,Su On Demand PREREQUISITE: Junior standing. Analysis of human response to stress in relation to a variety of psychosocial factors; techniques for managing stress are also investigated.

CHTH 440. Principles Of Epidemiology. 3 Credits. (2 Lec) F PREREQUISITE: FCS 371 and CHTH 210 or KIN 105. Senior capstone course. The goal of this course is to provide an introduction to epidemiologic concepts (e.g. incidence, prevalence, bias) and methods (e.g. study designs and measures).

CHTH 443. Program Evaluation for Community Health. 3 Credits. (3 Lec) S PREREQUISITES: CHTH 210, CHTH 317, and FCS 371. Research activities involved in studying the effectiveness of community health programs. The course introduces various evaluation methods including: community assessment, formative, process, outcome, and cost evaluation. Related research designs, measurement, and data analysis as well as qualitative and quantitative approaches to evaluation, and logic modeling.

CHTH 445. Program Planning for CH. 3 Credits. (2 Lec) F PREREQUISITE: CHTH 210, CHTH 317, FCS 371 and senior standing in community health major or consent of instructor. Senior capstone course. Health program planning and evaluation with emphasis on applications in Montana communities.

CHTH 490R. Undergraduate Research. 1-6 Credits. (1 Ind; 12 cr max) F,S,Su Directed undergraduate research which may culminate in a research paper, journal article, or undergraduate thesis. Course will address responsible conduct of research. May be repeated.

CHTH 491. Special Topics. 1-4 Credits. (1-4 Lec; 12 cr max) On Demand Max 12 cr. PREREQUISITE: Course prerequisites as determined for each offering. Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

CHTH 492. Independent Study. 1-3 Credits. (1-3 Ind; 6 cr max) PREREQUISITE: Junior standing, consent of instructor and approval of department head. Directed research and study on an individual basis.

CHTH 495. Pract Experiece in Aging. 3 Credits. (3 Lec) Su PREREQUISITE: Completion of 12-credits of coursework in the online gerontology. This class will provide students the opportunity to gain practical experience in working with older adults as well as provide students the opportunity to develop as professionals in the field of aging.
CHTH 498. Internship. 1-12 Credits. (1-12 Ind; 12 cr max) On Demand PREREQUISITE: Consent of internship director in academic area. An individualized professional assignment arranged for specific discipline. Some academic areas will offer specific sections in sequence for their students. All students must receive department permission prior to registration, and register for a senior seminar in their major area.

CHTH 502. Theories and Models in Health. 3 Credits. (3 Lec) F PREREQUISITE: Graduate standing or permission of instructor. Understanding and application of theory and models in the family and community health fields. The course will focus on applications at the individual, family, community, and environmental levels.

CHTH 503. Community-Based Participatory Research. 3 Credits. (3 Lec) S PREREQUISITE: Graduate student standing. Community-based participatory research is an orientation to research with community. Research is situated within a context relevant to both community and academic partners. Suggests an enrichment of the research results because of integration of the knowledge of community and noncommunity partners.

CHTH 575. Professional Paper and Project. 1-3 Credits. (1-3 Ind; 6 cr max) F,S,Su PREREQUISITE: Graduate standing. A research or professional paper or project dealing with a topic in the field. The topic must have been mutually agreed upon by the student and his or her major advisor and graduate committee.

CHTH 588. Professional Development. 1-3 Credits. (1-3 Lec; 3 cr max) On Demand PREREQUISITE: Graduate standing, teaching experience and/or current employment in a school organization, and consent of instructor. Courses offered on a one-time basis to fulfill professional development needs of in-service educators. A specific focus is given to each course which is appropriately subtitled. May be repeated.

CHTH 589. Graduate Consultation. 1-3 Credits. (1-3 Ind; 3 cr max) F,S,Su PREREQUISITE: Graduate standing in health major and approval of committee chair. This course may be used only by students who have completed all of their course work (and thesis if on a thesis plan) but who need additional faculty or staff time or help. May be repeated.

CHTH 590. Master's Thesis. 1-10 Credits. (1-10 Ind; max unlimited) F,S,Su PREREQUISITE: Master's standing. Directed graduate research/creative activity.

CHTH 591. Special Topics. 1-4 Credits. (1-4 Lec; 12 cr max) On Demand Max 12 cr.

CHTH 592. Independent Study. 1-3 Credits. (1-3 Ind; 6 cr max) F,S,Su Max 6 cr. PREREQUISITE: Graduate standing, consent of instructor, and approval of department head. Directed research and study on an individual basis.

CHTH 594. Seminar. 1 Credit. (1 Sem; 4 cr max) On Demand Maximum 4 cr. PREREQUISITE: Graduate standing or seniors by petition. Course prerequisites as determined for each offering. Topics offered at the graduate level which are not covered in regular courses. Students participate in preparing and presenting discussion material.

CHTH 598. Internship. 2-12 Credits. (2-12 Ind; 12 cr max) F,S,Su Maximum 12 cr. PREREQUISITE: Graduate standing and consent of instructor. An individualized assignment arranged with an agency, business or other organization to provide guided experience in the field.

CLS - College of Letters & Science

CLS 101US. Knowledge and Community. 3 Credits. (3 Sem) F,S,Su PREREQUISITE: First year students (less than 30 credits) only. Small seminar-style classes. Introduction to university study and the excitement of intellectual inquiry. Participation in a community of learners. Readings in the humanities, social sciences, and natural sciences. Emphasis on critical thinking, effective communication, and active learning.

CLS 102US. Engaged Knowledge & Community. 4 Credits. (3 Sem, 1 Lab) F,S,Su Small seminar-style classes. Introduction to university study and the excitement of intellectual inquiry with additional engaged community component. Readings in humanities, social sciences, and natural sciences. Emphasis on critical thinking, effective communication, and active learning.

CLS 201US. Knowledge and Community. 3 Credits. (3 Sem) F,S,C,S,LS,Su CLS 201 is similar to CLS 101 but is designed for students beyond their freshman year. CLS 201 is open to students who have completed at least 30 credits; students will not receive credit if they have passed CLS 101 with a grade of C- or better. Small seminar-style classes.

CLS 289R. Undergrad Resrch/Instruction. 1-3 Credits. (1-3 Rct; max unlimited) F,S Classroom instruction associated with directed undergraduate research/creative activity projects. May be repeated.

CLS 290R. Undergraduate Research. 1-6 Credits. (1-6 Ind; max unlimited) F,S Directed undergraduate research/creative activity which may culminate in a written work or other creative project. Course will address responsible conduct of research. May be repeated.

CLS 460. Teaching Internship. 2-3 Credits. (2 Sem; 6 cr max) F,S As co-facilitators of a section of CLS 101US or CLS 201US, students will learn and have the opportunity to practice classroom teaching strategies and mentoring skills.

CLS 489R. Undergrad Resrch/Instruction. 1-3 Credits. (1 Rct; 4 cr max) F,S,Su Max 4 cr. COREQUISITE: CLS 490. Classroom instruction associated with directed undergraduate research/creative activity projects. May be repeated.

CLS 490R. Undergraduate Research. 1-6 Credits. (1 Ind; 12 cr max) F,S,Su Directed undergraduate research/creative activity which may culminate in a research paper, journal article, or undergraduate thesis. Course will address responsible conduct of research. May be repeated.

CLS 492. Independent Study. 1 Credit. (1 Ind; 2 cr max) F,S,Su Maximum 2 cr. COREQUISITE: CLS 460. Directed research and study on an individual basis.

COA - Coaching

COA 205. Introduction to Coaching. 3 Credits. (3 Lec) F,S,S Prerequisite: Introductory coaching course which will cover basic information from the beginning level in the American Coach Effectiveness Program.

COA 256. Coaching Track and Field. 2 Credits. (2 Lec) F PREREQUISITE: COA 205 with a grade of at least a "C" and declared Coaching minor. The technique of all track and field events. Emphasis on teaching progressions in all events. Classroom sessions include development of training schedules, tactics, strategy, philosophy, meet organization, and officiating.

COA 316. Football Coaching Theory. 1 Credit. (1 Lec) F PREREQUISITE: COA 205 with a grade of at least a "C" and declared Coaching minor. Basic fundamentals and techniques used in coaching football.

COA 317. Basketball Coaching Theory. 1 Credit. (1 Lec) F PREREQUISITE: COA 205 with a grade of at least a "C" and declared Coaching minor. This course is set up to provide the student a working knowledge of basketball coaching techniques and philosophies. The course should assist the student in developing his/her own basketball coaching philosophy.

COA 318. Soccer Coaching Theory. 1 Credit. (1 Lec) F PREREQUISITE: COA 205 with a grade of at least a "C" and declared Coaching minor. A working knowledge of soccer coaching tactics and techniques.

COA 319. Volleyball Coaching Theory. 1 Credit. (1 Lec) S PREREQUISITE: COA 205 with a grade of at least a "C" and declared Coaching minor. A working knowledge of volleyball coaching tactics and techniques.

COA 395. Practicum:Coaching Application. 1 Credit. (1 Lec; 3 cr max) F,S,Su,LS PREREQUISITE: COA 205 with a grade of at least a "C" and declared Coaching minor. Assignment of prospective coaches to specific sports. Discussion and feedback on planning and implementation in practical setting.

COA 405. Advanced Concepts in Coaching. 3 Credits. (3 Lec) F,S,Su PREREQUISITE: COA 205 with a grade of at least a "C" and declared Coaching minor or consent of instructor. The class is intended for student in the MSU Coaching minor and/or experienced coaches who wish to examine current issues in coaching such as dealing with athletes with concussions, coaching the female athlete, emphasizing sportsmanship and ethics in sport, or coach/parent relationships in detail.

COA 567. Prof Issues in Coaching. 3 Credits. (3 Lec) On demand PREREQUISITE: COA 205, COA 393 or three years of successful coaching in public schools. In depth examination of at least one sub-topic from the Montana High School Coach Certification curriculum that is, prevention, care and coaching in public schools. In depth examination of at least one sub-topic from the Montana High School Coach Certification curriculum that is, prevention, care and coaching in public schools.

COA 405. Advanced Concepts in Coaching. 3 Credits. (3 Lec) F,S,Su PREREQUISITE: COA 205 with a grade of at least a "C" and declared Coaching minor or consent of instructor. The class is intended for student in the MSU Coaching minor and/or experienced coaches who wish to examine current issues in coaching such as dealing with athletes with concussions, coaching the female athlete, emphasizing sportsmanship and ethics in sport, or coach/parent relationships in detail.

COA 567. Prof Issues in Coaching. 3 Credits. (3 Lec) On demand PREREQUISITE: COA 205, COA 393 or three years of successful coaching in public schools. In depth examination of at least one sub-topic from the Montana High School Coach Certification curriculum that is, prevention, care and rehabilitation of injuries, risk management in sport; sociological and psychological aspects of coaching; coaching the female athlete.

COLS - College Studies

COLS 100. Effective Academic Practices. 3 Credits. (3 Lec) F,S,Su The course is designed to help students maximize their potential in all courses, specifically to: define one's purpose in pursuing a college education; utilize components that students need to be successful learners-motivation, methods of learning, time management, physical and social environment, and performance; develop practical study techniques that can be applied to daily college course work; set short- and long-term academic and career goals; and become acquainted with professors, MSU resources, and how to seek academic assistance. Offered by Gallatin College.
COLS 101US. First Year Seminar. 3 Credits. (3 Sem) F,S
PREREQUISITE: First year students only. This multi-disciplinary course, presented in seminar format, draws from the disciplines of psychology, sociology, history, and philosophy, and encourages students to explore issues critical to their academic goals and objectives. The course emphasizes verbal communication, critical thinking, intellectual development, and academic choices. Fulfills university seminar requirement of the core curriculum. This course may not be repeated. Offered by Gallatin College.

COLS 103. College Learning Strategies. 1 Credit. (1 Lec) F,S
This survey course introduces the effective use of college resources and methods of increasing success in other courses. It acquaints students with study skills and prepares them to integrate traditional study skills with college content areas. Students will develop learning and study strategies to become efficient students. Also, students will become familiar with professors, academic advisors, and college resources.

COLS 191. Special Topics. 1 Credit. (1 Lec) F,S
This survey course introduces students to the effective use of college resources and methods of increasing success in other courses. It acquaints students with study skills and prepares them to integrate traditional study skills with college content areas. Students will develop learning and study strategies to become efficient students. Also, students will become familiar with professors, academic advisors, and college resources.

COLS 260RS. Studying Human Behavior. 3 Credits. (3 Lec) S
PREREQUISITES: WRIT 101W The purpose of this course is to learn methods and principles used to study human behavior, how to ask meaningful questions that address a topic of study, find out what is already known about the possible answers to those questions, learn the process of collecting and analyzing data, and to generate new knowledge about how or why we behave in the ways we do. Gallatin College Developmental Courses.

COLS 292. Independent Study. 3 Credits. (3 Ind.) S
PREREQUISITE: Consent of Instructor.

COM - Communications

COM 000. COM” COURSES ARE NOW” COMX. 0 Credits.
– All “COM” courses are now listed under the “COMX” subject code. COM 110US Public Communication, last offered in Spring 2015, was replaced with COMX 111US, beginning Summer 2015.

COMX - Communication

COMX 102. Interpersonal Skills in the Workplace. 1 Credit. (1 Lec) F,S,Su
Offered by Gallatin College. This course covers the basics of communication in the business environment, including listening, speaking, and reading. It also looks at the importance of nonverbal communication, ethics, and professional courtesy. It discusses the importance of internal skills like teamwork and external skills with customers such as reflective listening. Successful interview skills are discussed in class and demonstrated in final student project.

COMX 111US. Introduction to Public Speaking. 3 Credits. (1 Lec, 2 Rec) F,S,Su
Overview of the theories, concepts, and principles of public speaking, to include audience analysis, evidence, sensory aids, small group communication, ethics and listening. Application of concepts and principles through preparation and delivery of impromptu, informative, persuasive, and group presentations.

COMX 115. Introduction to Interpersonal Communication. 3 Credits. (3 Lec) F,S
Offered by Gallatin College. This course will examine the importance of both personal and small group communication. The emphasis will be on how individuals perceive information and transmit messages (communicate) based on aspects such as the context in which we interact, the perceptions we hold, and our cultural background, gender, nonverbal and verbal behavior. Students will explore the factors that affect both individual and group dynamics in our professional and personal lives.

COMX 222. Professional Communication. 3 Credits.

CRWR - Creative Writing

CRWR 240. Introduction to Creative Writing. 3 Credits. (3 Rec) F,S,Su
PREREQUISITES: WRIT 101 Introduction to the principles and techniques of creative writing, aimed at developing literary craft and the creative process. Includes lectures, readings, and writing exercises in genres that may include fiction, poetry, and creative nonfiction.

CRWR 340. Intermediate Creative Writing Workshop. 3 Credits. (3 Rec) F,S
PREREQUISITES: WRIT 101W and junior standing and consent of instructor. Beginning exploration, through workshops, discussions, and readings, of creative writing techniques in genres that might include fiction, poetry, play writing, autobiographical writing, or creative nonfiction.

CRWR 440. Advanced Creative Writing Workshop. 3 Credits. (3 Lec; 6 cr max) F,S
Max 6 cr. PREREQUISITE: CRWR 340 and consent of instructor. Continuing exploration of creative writing in which experienced writers act as an audience for each other through workshops, discussions, and readings. Emphasis on techniques in a particular genre, such as fiction, poetry, play writing, autobiographical writing, or creative nonfiction.

CS - Computer Science

CS 140CS. Spinning Webs. 3 Credits. (3 Lec) S
The World Wide Web. What it is. How it works. Where it’s headed. Societal implications. Examination of currently popular Web ventures, such as Google, Facebook, YouTube, Twitter, and Drupal. Construction of individual Web portfolios and a hosted website. Prepares students from all majors to participate in Web ventures and to become Web-informed citizens. No previous Web or programming experience required.

CS 145RA. Web Design. 3 Credits. (2 Lec, 1 Lab) F,S
Basic design principles and how these principles apply to website construction. HTML, XHTML, CSS and Cascading Style Sheets. Laboratory projects reflect practical usage of course concepts. Cross-listed with MART 145.

CS 204. Multimedia Dev Methods. 3 Credits. (2 Lec, 1 Lab) F,S
The design and development of multimedia presentations using computerized studio techniques. Methods for combining video, audio, photography, studio techniques, and computer-generated art forms. Computer-assisted studio control and editing. Project-oriented course organization with interdisciplinary project teams.

CSCI - Computer Science/Programming

CSCI 107. Joy and Beauty of Computing. 3 Credits. (3 Lec) F,S
Examines the computing field and how it impacts the human condition. Introduces exciting ideas and influential people. Provides a gentle introduction to computational thinking using the Python programming language.

CSCI 111. Programming with Java I. 4 Credits. (3 Lec, 1 Lab) F,S
COREQUISITE: M 151Q. Introduction to programming: program design, analysis, and implementation in Java, including I/O, assignment, decision, iteration, scalar types, arrays, control structures, methods, classes, and common data types. No previous programming experience required.

CSCI 112. Programming with C I. 3 Credits. (2 Lec, 1 Lab) S

CSCI 132. Basic Data Structures and Algorithms. 4 Credits. (3 Lec, 1 Lab) F,S
PREREQUISITE: CSCI 111 and M 151Q. An examination of advanced Java and basic data structures and their application in problem solving. Data structures include stacks, queues and lists. An introduction to algorithms employing the data structures to solve various problems including searching and sorting, and recursion. Understanding and using Java class libraries. The laboratory uses Java. Introduces Big-O Notation.

CSCI 215CS. Social & Ethical Issues in CS. 3 Credits. (2 Lec, 1 Rec) F,S
PREREQUISITE: W core and US core. Social and ethical issues as they relate to computing, including privacy, risks, computer abuse, commerce, professionalism, free speech, intellectual property, social justice, and current issues. History of computing.

CSCI 232. Data Structures and Algorithms. 4 Credits. (3 Lec, 1 Lab) S
PREREQUISITE: CSCI 132. Advanced data structures and programming techniques and their application. Topics include: trees, balanced trees, graphs, dictionaries, hash tables, heaps. Examines the efficiency and correctness of algorithms. The laboratory uses Java.

CSCI 246. Discrete Structures. 3 Credits. (3 Lec) F,S
PREREQUISITE: M 171Q, COREQUISITE: CSCI 132. This course covers logic, discrete probability, recurrence relations, Boolean algebra, sets, relations, counting, functions, maps, Big-O notation, proof techniques including induction, and proof by contradiction.

CSCI 290R. Undergraduate Research. 1-6 Credits. (1-6 Ind; max unlimited) F,S
Directed undergraduate research which may culminate in a written work or other creative project. Course will address responsible conduct of research. May be repeated.

CSCI 291. Special Topics. 1-4 Credits. (1-4 Ind; 12 cr max) F,S,S,F
PREREQUISITE: To be determined based on actual topic offered. Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.
CSCI 292. Independent Study. 1-3 Credits. (1-3 Ind; 3 cr max) On Demand
Max 3 cr. PREREQUISITE: Consent of instructor and approval of department head. Directed research and study on an individual basis.

CSCI 305. Concepts/Programming Languages. 3 Credits. (3 Lec) S
PREREQUISITE: CSCI 132 and CSCI 246. An examination of several programming paradigms, and languages, as well as their application and underlying execution model. Paradigms examined include imperative, object-oriented, functional, logic and string based. Students will gain exposure to a variety of languages such as C, C++, Scheme, Prolog and Perl.

CSCI 338. Computer Science Theory. 3 Credits. (3 Lec) S
PREREQUISITE: CSCI 246 and M 171Q. Formal languages, theory, automata, Turing Machines, computability, the Church-Turing thesis, computational complexity, and NP-completeness.

CSCI 351. Systems Administration. 3 Credits. (3 Lec) S
PREREQUISITE: CSCI 112 and CSCI 232. The administration and management of Linux computer systems. Includes installation, user/process management, configuration of services and device handling. A thorough knowledge of Unix/Linux command structure is required.

CSCI 361. Computer Architecture. 3 Credits. (3 Lec) F
PREREQUISITE: CSCI 112 and CSCI 232. The structure and function of computer systems: CPU, memory, I/O. Includes digital logic, data type, instruction set design, pipelining, RISC, parallel processing, and assembly language programming.

CSCI 432. Advanced Algorithm Topics. 3 Credits. (3 Lec) F
PREREQUISITE: CSCI 246 and CSCI 232. A rigorous examination of advanced algorithms and data structures. Topics include average case analysis, probabilistic algorithms, advanced graph problems and theory, distributed and parallel programming.

CSCI 440. Database Systems. 3 Credits. (3 Lec) F
PREREQUISITE: CSCI 232. DBMS architecture; major database models; relational algebra fundamentals; SQL query language; index file structures, data modeling and management, entity relationship diagrams.

CSCI 441. Computer Graphics. 3 Credits. (3 Lec) S odd years.

CSCI 442. Comp Vision: Robot Vision. 3 Credits. (3 Lec) S odd years.
PREREQUISITE: CSCI 232, M 221. Image processing techniques are used to quantify and manipulate visual information in diverse applications such as satellite imagery, robotic vision, and animation. Topics include enhancement, representation, restoration, segmentation, and digitization techniques.

CSCI 446. Artificial Intelligence. 3 Credits. (3 Lec) F even years.

CSCI 447. Machine Learning: Soft Computing. 3 Credits. (3 Lec) F odd years
PREREQUISITE: CSCI 232 and CSCI 246. An exploration of biologically inspired machine learning models and algorithms, including evolutionary algorithms, neural networks, swarm intelligence, and fuzzy systems. An emphasis is placed on results from current research in computational intelligence. Students engage in class discussions and team projects.

CSCI 451. Computational Biology. 3 Credits. (3 Lec) F odd years.
PREREQUISITE: CSCI 232 and CSCI 246. This course surveys classic and recent problems from computational biology. Topics covered include algorithms for genomic sequencing and searching, protein structure prediction, and regulatory network discovery.

CSCI 455. Embedded Systems: Robotics. 3 Credits. (3 Lec) S even years.
PREREQUISITE: CSCI 232 and CSCI 361 or EELE 371. The basic tools and techniques of embedded systems using robotics as a platform. Student teams will build an autonomous mobile robot, and learn to program it to perform increasingly sophisticated behaviors. Besides providing an introduction to autonomous mobile robot technologies, the students also learn key concepts of mechanics, electronics, programming techniques, and systems design and integration.

CSCI 460. Operating Systems. 3 Credits. (3 Lec) F

CSCI 466. Networks. 3 Credits. (3 Lec) F
PREREQUISITE: CSCI 232 and CSCI 112. How computer systems are organized into networks and how communication over networks is organized. Communication protocols and their design with an emphasis on current technology and implementation of software.

CSCI 468. Compilers. 4 Credits. (3 Lec, 1 Lab) S

CSCI 476. Computer Security. 3 Credits. (3 Lec) S
PREREQUISITE: CSCI 232. Introductory to computer security. Covers security issues in software design and development from technical, social and legal viewpoints. Topics include cryptography, security models, software security, authentication, authorization, and system security.

CSCI 477. Simulation. 3 Credits. (3 Lec) F
PREREQUISITE: CSCI 112 and a probability or statistics course. Discrete and continuous simulation modeling methodology using a computer simulation language; random number generation, output analysis, validation, and verification; application to a variety of systems and analysis of large data sets. I&M 422.

CSCI 481. Program Assessment. 0 Credits. (0 Ind) F,S
PREREQUISITE: Graduating Senior. Student participation in Computer Science program assessment activities such as taking the Computer Science Major Field Test.

CSCI 482R. Interdisciplinary Project Instruction. 1 Credit. (1 Rct) F
PREREQUISITE: Senior standing. COREQUISITE: ESOF 322 First part of a senior capstone sequence for the interdisciplinary option. Classroom instruction that prepares a student to undertake an interdisciplinary project that relates computing to the student's minor.

CSCI 483R. Interdisciplinary Project. 3 Credits. (3 Ind) S
PREREQUISITE: CSCI 482R. Second part of a senior capstone sequence for the interdisciplinary option. Students undertake an interdisciplinary project and present their results through a written paper, a poster and an oral presentation.

CSCI 490R. Undergraduate Research. 1-6 Credits. (1-3 Ind; 12 cr max) On Demand
Max 12 cr. PREREQUISITE: Consent of instructor. Directed undergraduate research which may culminate in a research paper, journal article, or undergraduate thesis. Course will address responsible conduct of research. May be repeated.

CSCI 491. Special Topics. 1-4 Credits. (1-4 Lec; 12 cr max) On Demand
Max 12 cr. PREREQUISITE: To be determined based on actual topic offered. Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

CSCI 492. Independent Study. 1-4 Credits. (1-3 Ind; 6 cr max) On Demand
Max 6 cr. PREREQUISITE: Junior standing, consent of instructor, and approval of department head. Directed research and study on an individual basis.

CSCI 494. Seminar. 1-4 Credits. (1-4 Sem; 4 cr max) On Demand
Max 4 cr. PREREQUISITE: Junior standing and as determined by each offering. Topics offered at the upper divisional level that are not covered in regular courses. Students participate in preparing and presenting discussion material.

CSCI 495. Field Work/Practicum. 1 Credit. (1 Ind; 2 cr max) F,S
Max 2 cr. PREREQUISITE: Junior standing and CSCI 232. Directed assistance to, and involvement in labs, with lower division CS students. Can only complete once.

CSCI 498. Internship. 1-6 Credits. (1-6 Ind; 6 cr max) On Demand
PREREQUISITE: Junior standing, consent of instructor, and approval of department head. An individualized assignment arranged with an agency, business or other organization to provide guided experience in the field.

CSCI 520. Distributed Systems. 3 Credits. (3 Lec) S even years.
PREREQUISITE: CSCI 432 and CSCI 466. The design and implementation of software systems that utilize multiple host computer networks as a foundation. Concurrency control, homogeneous and heterogeneous systems, interprocess communication, protocols and application design.

CSCI 532. Algorithms. 3 Credits. (3 Lec) S
PREREQUISITE: CSCI 232. Concrete time and space complexity; combinatorial algorithms; greedy algorithms; dynamic programming; probabilistic and randomized algorithms; branch-and-bound algorithms.

CSCI 538. Computability. 3 Credits. (3 Lec) F
PREREQUISITE: CSCI 338. Turing machine computability and decidability; abstract time and space complexity; intractability.
CSCI 540. Advanced Database Systems. 3 Credits. (3 Lec) F even years.
PREREQUISITE: CSCI 440 or consent of instructor. Advanced database models including spatial, temporal, and object-oriented; advanced data indexing techniques, data warehousing and query optimization.

CSCI 541. Computer Graphics. 3 Credits. (3 Lec) S odd years.

CSCI 547. Machine Learning. 3 Credits. (3 Lec) S even years.
PREREQUISITE: CSCI 446. An exposure to advanced topics from the field of artificial intelligence with an emphasis on machine learning. Examining topics include Bayesian learning, evolutionary computation, and cognitive science.

CSCI 548. Reasoning Uncertainty. 3 Credits. (3 Lec) S odd years
PREREQUISITE: CSCI 446 recommended. Background in probability recommended. An exploration of problem solving using structured probabilistic models. Topics in probabilistic representations, inference algorithms, and learning such models from data will be explored.

CSCI 550. Data Mining. 3 Credits. (3 Lec) F even years.
PREREQUISITE: A probability or statistics course. Clustering, classification and pattern recognition; performing automated discovery of knowledge from a data set.

CSCI 551. Adv Computational Biol. 3 Credits. (3 Lec) F odd years.
PREREQUISITE: CSCI 432. This course examines a variety of algorithmic computational biology topics with an emphasis on elucidating new research problems.

CSCI 565. Wireless Networks and Mobile Computing. 3 Credits. (3 Lec) F even years
PREREQUISITE: CSCI 466 or (ECEE 445 and ECEE 447). This course introduces the topics of wireless networks and mobile computing. Students will be exposed to different technologies of mobile computing, both software and hardware, and be able to use them to perform wireless networking analysis.

CSCI 566. Advanced Networking. 3 Credits. (3 Lec) S odd years.
PREREQUISITE: CSCI 466. This graduate-level course covers advanced topics in networking, including IP and wireless networks. After taking this course, the students are expected to know the state-of-the-art in networking algorithms, protocols and architectures, and to understand how networking research is done.

CSCI 590. Master’s Thesis. 1-10 Credits. (1-10 Ind; max unlimited) F,S,Su
PREREQUISITE: Master’s standing.

CSCI 591. Special Topics. 1-4 Credits. (1-4 Lec; 12 cr max) On Demand Max 12 cr. PREREQUISITE: Upper division courses and others as determined for each offering. Courses not required in any curriculum for which there is a particular one time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

CSCI 592. Independent Study. 1-3 Credits. (1-3 Ind; 6 cr max) On Demand Max 6 cr. PREREQUISITE: Graduate standing, consent of instructor and approval of department head. Directed research and study on an individual basis.

CSCI 594. Seminar. 1 Credit. (1 Sem; 4 cr max) On Demand Max 4 cr. PREREQUISITE: Graduate standing or seniors by petition. Course prerequisites as determined for each offering. Topics offered at the graduate level which are not covered in regular courses. Students participate in preparing and presenting discussion material.

CSCI 598. Internship. 1-6 Credits. (1-6 Ind; 6 cr max) On Demand Max 6 cr. PREREQUISITE: Graduate standing, consent of instructor and approval of department head. An individualized assignment arranged with an agency, business or other organization to provide guided experience in the field.

CSCI 599. Graduate Consultation. 1-3 Credits. (1-3 Ind; 3 cr max) On Demand PREREQUISITE: Master’s standing and approval of the Dean of Graduate Studies. This course may be used only by students who have completed all of their course work, and thesis, if on a thesis plan but who need additional faculty or staff time or help.

CSCI 690. Doctoral Thesis. 1-10 Credits. (1-10 Ind; max unlimited) F,S,Su
PREREQUISITE: Doctoral standing.

CSTN - Construction Trades

CSTN 148. Blueprint Codes and Est.. 3 Credits. (2 Lec) F
This course will introduce blueprints and emphasize reading, scaling, analyzing and bidding from plans. Topics covered will include: line weights, styles and types; title block information, dimensions, structural shapes, auxiliary views, section views, detail prints, symbols, scaling, acronyms found in different industries, and other various blueprint information. Students will also be taught how to use plans to bid and price materials, visit the Fall Parade of Homes, and compare what’s on the page to what really gets built. Typically Taken – 1st Semester (Fall).

CSTN 173. Arch Construct and Material. 3 Credits. (3 Lec) F
Upon successful completion of this course, the student will be able to identify the origins of materials and the extraction, properties, processing, and assemblies of the basic materials of construction. Thorough working knowledge of materials can enhance a construction project and enlighten the client, designer, drafts-person or end user. A complete understanding of materials, methods, techniques, sequences, and procedures can unify a design and create timeless, contemporary elements.

CSTN 248. Plans Examining II - IBC - Commercial Codes, Blueprint Reading, and Estimating. 3 Credits. (3 Lec) S
PREREQUISITE: CSTN 148, or consent of instructor, or approval of program director. This course will introduce blueprints and emphasize blueprint reading, scaling, analyzing, and estimating plan components for commercial and multiple-residence projects. Topics covered will include: building use and occupancy, special occupancy requirements, height and area limitations based on construction type, fire resistance and protection requirements, requirements for evacuation, accessibility for persons with disabilities, building systems (lighting, HVAC, plumbing, electrical and elevators), and structural components. Commercial building code criteria in the design process will be emphasized. Students will also be taught how to use plans to bid and price materials.

DANC - Dance

DANC 150. Social Dance. 1 Credit. (1 Lab; 3 cr max) F,S
Traditional and popular styles of ballroom dancing, including jitterbug, polka, waltz, cha-cha, western dance, and foxtrot.

DDSN - Drafting Design

DDSN 101. CAD 1-A. 2 Credits. (2 Lec) F
This course starts with basic software recognition and user interface concepts, introduces basic computer drafting principles and commands, including some intermediate concepts including 3D visualization and drafting and document publishing. Students will learn blocks, fields, CAD tips and shortcuts, and also create their own template and title block. The featured software is AutoCAD Architecture. There is no prerequisite. This course, when followed by DDSN 102 – CAD 1-B, is equivalent to DDSN 118 CAD-1.

DDSN 102. CAD 1-B. 2 Credits. (2 Lec) F
PREREQUISITE: DDSN 101 This course is a follow-up to DDSN 101 CAD 1- A: the two courses together, completed successfully, are equivalent to DDSN 118 CAD 1. In this course, students will focus on using AEC objects to create construction documents of designs created by others.

DDSN 112. Professional Practices. 3 Credits. (3 Lec) S
Students in this course will learn how to create a professional looking and effective résumé, understand their strengths and weaknesses, talents, and aptitudes, know how to properly seek employment in their chosen field, present themselves well in interviews and elevator pitches, know the basics of setting up their own business, understand the basic principles of the business of the Design Drafting field and learn how to continue to improve in all of these areas.

DDSN 113. Technical Drafting. 3 Credits. (3 Lec) F,S
This course is divided into two parts. The first half of the semester is devoted to hand sketching: orthographic, isometric, and perspective. The second half of the semester is hand drafting with an emphasis on learning the components of residential construction. Traditional drafting tools will be used such as T Squares, triangles, scales, eraser shields, and mechanical pencils.

DDSN 114. Introduction to CAD. 3 Credits. (1 Lec; 2 Lab) S
Provides the learner with an understanding of two-dimensional computer-aided drafting. Students explore and create two dimensional drawings with the aid of AutoCAD software (made by Auto desk). Drawings focus on architecture, mechanical and civil engineering applications.
DDSN 118. CAD I. 4 Credits. (4 Lec) F,S
Prerequisite: DRFT 131 or instructor approval. This course starts with basic software recognition and user interface concepts, introduces basic Computer Drafting principles and commands, navigates CADs steep learning curve, and progresses to Intermediate concepts including 3D Visualization and Drafting, AEC Objects, and Document Publishing. Students will learn Blocks, Fields, CAD Tips and Shortcuts, and also Create their own Template and Title Block. Featured software: AutoCAD Architecture. There is no prerequisite. Typically Taken - 1st Semester.

DDSN 124. Descriptive Geometry, 4 Credits. (4 Lec) S
Prerequisite: DRFT 131. Advanced theory and practices in descriptive geometry construction and pattern development are covered in this course in preparation for advanced courses in Design Drafting. Descriptive Geometry teaches 3D visualization and how to solve geometric problems by drawing them in CAD. Typically Taken – 2nd Semester (Spring).

DDSN 166. Revit I. 3 Credits. (3 Lec) S
Prerequisite: CSTN 173, equivalent work experience or equivalent instruction. Students will be introduced to Parametric Design and Building Information Modeling (BIM) that make up the base platform of this software as they work through a variety of drafting projects.

DDSN 186. CAD II. 3 Credits. (3 Lec) S
Prerequisite: DRFT 156. Explores advanced concepts, techniques, and customizability of AutoCAD. Create templates, set up and modify printers, generate shortcuts and subroutines, and increase drafting speed and efficiency. Transition from an AutoCAD user into a competent CAD manager. Typically Taken – 2nd Semester (Spring).

DDSN 244. GIS and Mapping, 3 Credits. (3 Lec) S
Fundamentals of reading, interpreting, analyzing, and designing maps. Topics of emphasis include 1.) the nature of geographic information, 2.) how geographic information systems (GIS) facilitates data analysis, and 3.) how cartographic design principles can be used to create maps that excel at effective visual thinking and communication. Students will create design effective reference and thematic maps for specific users. Typically Taken – 4th Semester (Spring).

DDSN 245. Civil Drafting, 3 Credits. (3 Lec) S
Prerequisite: DDSN 118 or DDSN 101 or Program Director Approval. This course builds upon previous CAD experience and applies those skills to creating drawings specifically for the Civil Engineering industry. Instruction will be given relating to basic engineering principles like: survey data, acquisition, contour/break line creation, azimuth/bearing calculations, coordinate systems, latitude/longitude, and slope/grade calculations. Projects will primarily use AutoCAD Civil 3D software.

DDSN 255. Machine Drafting, 3 Credits. (3 Lec) S
Prerequisite: DDSN 118 (CAD 1) and DDSN 124 (Descriptive Geometry) or Program Director Approval. This course is a study and application of standards used for producing working drawings, including the fundamentals of geometric dimensioning and tolerance. Both detail and assembly drawings will be produced. Typically Taken – 4th Semester (Spring).

DDSN 256. Machine Drafting II, 3 Credits. (3 Lec) S
PREREQUISITE: DDSN 255. This course presents the advanced use of new design and drafting software and capabilities of solid modeling using the SolidWorks software, including the integration of the advanced parametric modeling and drawing tools for SolidWorks.

DDSN 265. Architectural Drafting, 3 Credits. (3 Lec) F
Prerequisites: CSTN 173, DDSN 118, DDSN 124, and DDSN 186. The students in this course will create, from scratch, an entire two story home, and draw the plans in CAD to the level where it is ready to be submitted for permit to the City of Bozeman or other municipality. Plans will include: Site Plan, Four Exterior Elevations, Foundation Plan, Main Floor Plan, Second Floor Plan, Electrical Plans, Sections and Details as required. All drawings must follow current codes including: International Residential Code, International Mechanical Code, Fuel Gas Code, International Energy Conservation Code, Uniform Plumbing Code, and National Electrical Code. Historical US Home Styles and Space Planning Problems will also be explored.

DDSN 266. Revit II, 3 Credits. (3 Lec) S
Prerequisite: DDSN 166. Students will be introduced to Parametric Design and Building Information Modeling (BIM) that make up the base platform of this software as they work through a variety of drafting projects. Typically Taken 4th Semester (Spring).

DDSN 275. Computer Rendering, 3 Credits. (3 Lec) F
Prerequisite: DDSN 118. This course will introduce basic computer rendering concepts and explore the use of current popular software, 2D and 3D concepts will be explored. Featured software: Adobe Photoshop and Google Sketchup. Typically Taken - 1st Semester (Fall).

DDSN 276. Presentation & Animation. 3 Credits. (3 Lec) S
Excites the student through immersion into the topic of 3D computer graphics and animation. Digital environments are explored using the 3D Studio Max software. Interdisciplinary projects are created utilizing digital object construction, lighting, camera, kinetic and artistic techniques.

DDSN 298. Internship, 4 Credits. (4 Ind) F,S,Su
Prerequisite: Program Director approval only. Job experience within your chosen field. Typically Taken – 4th Semester (Spring).

DDSN 299. Capstone, 3 Credits. (3 Lec) S
Prerequisite: DDSN 312, DDSN 265, and DDSN 275. Concurrent enrollment in DDSN 276 is recommended. Organize and refine previously created work into a presentation/job application format. Course includes: in-class presentations, mock interviews, and a public presentation of the portfolio to be judged by local industry professionals. Portfolios will be featured at the Spring Showcase event. Students are expected to setup, take down, and attend that event. A capstone class where students will create a professional portfolio from the knowledge, skill, and experience that they have acquired over the previous two years. Students will learn how to find employment in the hidden job market, conduct informational interviews, and present themselves in a professional setting. They will acquire the tools to successfully find and keep employment presently and into the future. Typically Taken - 4th Semester (Spring).

**DGED - Graduate Education**

DGED 524. Cellular Mechanotransduction. 3 Credits. (3 Lec) F
PREREQUISITES: Undergraduate students: upper division status within the major. Graduate students: good standing within graduate program. NOTE: this course will co-convene undergraduate and graduate versions with additional work and depth required of graduate students. Solid and fluid mechanics and relationships to cell biology. This interdisciplinary course brings together topics from both engineering and molecular biology to understand the mechanisms by which cells respond to loading. Topics selected from: musculoskeletal, circulatory, lymphatic, chondrocyte, leukocyte, and cancer cell mechanotransduction.

DGED 585. Thesis Prep in Absentia. 0 Credits. (0 Ind) F
→ Thesis preparation for students enrolled in absentia.

DGED 591. Special Topics. 1-4 Credits. (1-4 Lec; 12 cr max) On Demand Max 12 cr. PREREQUISITE: Upper division courses and others as determined for each offering. Courses not required in any curriculum for which there is a particular one time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

DGED 613. IGERT: Scientific Proposal Writing. 3 Credits. (3 Lec) F
PREREQUISITE: Acceptance in IGERT Program; DGED 610 and DGED 611. The goal of this course is to provide the doctoral student with strategies, practical skills and experience in seeking funding sources and writing and evaluating scientific proposals. The student should leave this course with a proposal that is ready to submit for funding.

DGED 614. IGERT: Advanced Methods in Geobiology. 3 Credits. (1 Lec, 1 Lab) F,S,Su
PREREQUISITE: Acceptance in IGERT Program. This course is part of the required curriculum for IGERT students. The purpose is to provide students with the opportunity to learn advanced research methods that will allow them to understand complex geomicrobiological communities.

DGED 676. IGERT: Geobiological Systems Science - Internship. 3 Credits. (3 Ind) F,S,Su
PREREQUISITE: Acceptance in IGERT Program, DGED 610 AND DGED 611. This course is part of the required curriculum for IGERT students, and provides an opportunity for IGERT students to participate in a domestic or international internship at an academic, private and or national laboratory.

**EBIO - Biological Engineering**

EBIO 100. Intro to Biological Engr. 2 Credits. (1 Lec, 1 Lab) F
COREQUISITE: M 151Q or above. An introduction to engineering measurements, computations, problem solving, and experimental design. Discussion of the breadth of opportunities in chemical and biological engineering.

EBIO 216. Elem Princ of Bioengineering. 3 Credits. (3 Lec) S
PREREQUISITE: ECHM 201, M 172Q. Fundamentals of energy balances in biological engineering applications.

EBIO 290R. Undergraduate Research. 1-6 Credits. (1-6 Ind; max unlimited) F,S
Directed undergraduate research/creative activity which may culminate in a written work or other creative project. May be repeated.
EBIO 291. Special Topics. 1-4 Credits. (1-4 Lec; 12 cr max) On Demand
PREREQUISITE: None required but some may be determined necessary by each offering department. Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

EBIO 292. Independent Study. 1-3 Credits. (1-3 Ind; 6 cr max) On Demand
Maximum 6 cr. PREREQUISITE: Consent of instructor and approval of the Associate Dean. Directed research and study on an individual basis.

EBIO 324. Bioengineering Transport. 3 Credits. (3 Lec) F
PREREQUISITE: EBIO 216, ECHM 321. Fundamentals of the phenomena governing the transport of momentum, energy, and mass in biological systems.

EBIO 407. Biological Engineering Thermodynamics. 3 Credits. (3 Lec) F
PREREQUISITE: M 274 and CHMY 211 and EBIO 216. Principles of thermodynamics, conservation of energy and phase equilibria applied to living systems and biological processes.

EBIO 411R. Biological Engineer Design I. 3 Credits. (2 Lec) F

EBIO 412R. Biological Engineer Design II. 3 Credits. (2 Lec) F
PREREQUISITE: EBIO 411R. Senior capstone course. Design and simulation of chemical engineering equipment, processes and plants.

EBIO 438. Bioprocess Engin. 3 Credits. (3 Lec) S
PREREQUISITE: ECHM 201. Biotechnology process engineering - microbial process fundamentals, enzyme catalysis, bioreactor design and analysis, separation of biomaterials.

EBIO 439. Downstream Processing. 3 Credits. (3 Lec) S

EBIO 442. Bioengineering Lab I. 3 Credits. (1 Lec, 2 Lab) F
PREREQUISITE: EBIO 324, EBIO 438, EGEN 350. Students will develop an experimental objective and experimental design to meet a particular objective. Independently investigate the relevant theory for a proposed experiment, analyze data for statistical significance, draw conclusions from the experimental data. They will then effectively communicate the technical information through written reports.

EBIO 443. Bioengineering Lab II. 3 Credits. (1 Lec, 2 Lab) S
PREREQUISITE: EBIO 442. Students will develop an experimental objective and experimental design to meet a particular objective. Independently investigate the relevant theory for a proposed experiment, analyze data for statistical significance, draw conclusions from the experimental data. They will then effectively communicate the technical information through written reports.

EBIO 461. Principles of Biomedical Engineering. 3 Credits. (3 Lec) S
PREREQUISITE: ECHM 321 or consent of instructor. An overview of biomedical engineering including the application of engineering principles to the design of products and processes in the health industries. Topics include ethics, biomechanics, biomaterials, biowmstrumentation, biosensors, pharmacokinetics, and tissue engineering.

EBIO 490R. Undergraduate Research. 1-8 Credits. (1-8 Ind; 12 cr max) F,S,Su
PREREQUISITE: Senior Standing. Directed undergraduate research/creative activity which may culminate in research paper, journal article, or undergraduate thesis. Course will address responsible conduct of research. May be repeated.

EBIO 491. Special Topics. 1-3 Credits. (1-3 Lec; 12 cr max) On Demand
PREREQUISITE: Course prerequisites as determined for each offering. Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

EBIO 492. Independent Study. 1-3 Credits. (1-3 Ind; 6 cr max) On Demand
PREREQUISITE: Junior standing, consent of instructor and approval of department head. Directed research and study on an individual basis.

EBIO 498. Internship. 1-12 Credits. (1-12 Ind; 12 cr max) On Demand
PREREQUISITE: Junior standing, consent of instructor and approval of associate dean. An individualized assignment arranged with an agency, business or other organization to provide guided experience in the field.

EBIO 566. Fundamentals of Biofilm Engr. 3 Credits. (3 Lec) F
PREREQUISITE: M 274. Development of quantitative descriptions of processes of microbial growth, diffusion and convective solute transport, and cell attachment and detachment. Integration of these processes in mathematical models of biofilm accumulation and activity. Application of these approaches to the analysis of biofilms in diverse industrial and natural environments.

EBIO 575. Research or Prof Paper Project. 1-4 Credits. (1-4 Ind; 6 cr max) On Demand
Max 6 cr. PREREQUISITE: Graduate standing. A research or professional dealing with a topic in the field. The topic must have been mutually agreed upon by the student and his or her major advisor and graduate committee. Directed research and study on an individual basis.

EBIO 590. Master’s Thesis. 1-10 Credits. (1-10 Ind) F,S,Su
PREREQUISITE: Master’s standing.

EBIO 591. Special Topics. 1-4 Credits. (1-4 Lec; 12 cr max) On Demand
Max 12 cr. PREREQUISITE: Upper division courses and others as determined for each offering. Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

EBIO 592. Independent Study. 1-4 Credits. (1-4 Ind; 8 cr max) On Demand
Max 6 cr. PREREQUISITE: Graduate standing, consent of instructor, approval of department head and Dean of Graduate Studies. Directed research and study on an individual basis.

EBIO 594. Seminar. 1 Credit. (1 Sem)
PREREQUISITE: Graduate standing or seniors by petition. Course prerequisites as determined for each offering. Topics offered at the graduate level which are not covered in regular courses. Students participate in preparing and presenting discussion material.

EBIO 598. Internship. 2 Credits. (2 Int) F,S
SU Max 6 cr. PREREQUISITE: Graduate standing, consent of advisor and approval of department head. An individualized assignment arranged with an agency, business, or other organization to provide guided experience in the field.

EBIO 690. Doctoral Thesis. 1-10 Credits. (1-10 Ind; 10 cr max)
PREREQUISITE: Doctoral standing.

ECHM - Chemical Engineering

ECHM 100. Intro to Chemical Engr. 2 Credits. (1 Lec, 1 Lab) F
PREREQUISITE: M 151Q or above. An introduction to engineering measurements, computations, problem solving, and experimental design. Discussion of the breadth of opportunities in chemical and biological engineering.

ECHM 201. Elementary Principles of Chemical and Biological Engineering. 3 Credits. (3 Lec) F,S

ECHM 205CS. Energy and Sustainability. 3 Credits. (3 Lec) F
Students from all academic backgrounds explore an array of renewable and non-renewable energy sources and energy conversion systems. Contemporary and contentious energy related issues are presented, and course participants will formulate strategies to address them.

ECHM 215. Elementary Principles of Chemical and Biological Engineering I. 3 Credits. (3 Lec) F

ECHM 216. Elementary Principles of Chemical and Biological Engineering II. 3 Credits. (3 Lec) S
3 cr. LEC 3 PREREQUISITE: ECHM 215, M 172Q. Energy balances and combined energy-material balances. Discussion of contemporary issues in engineering and the impact of engineering solutions in a global, economic, environmental and societal context.

ECHM 290R. Undergraduate Research. 1-6 Credits. (1-6 Ind; max unlimited) F,S
Directed undergraduate research/creative activity which may culminate in a written work or other creative project. May be repeated.

ECHM 291. Special Topics. 1-4 Credits. (1-4 Lec; 12 cr max) On Demand
PREREQUISITE: None required but some may be determined necessary by each offering department. Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

ECHM 312. Chemical Engineering Fluid Mechanics Operations. 3 Credits. (3 Lec) S PREREQUISITE: ECHM 201 and M 172Q, COREQUISITE: M 274Q. Theory and equipment for fundamental chemical and biological engineering operations involving fluid mechanics. Equipment design and computations of operational rates.


ECHM 322. Chemical Engineering Mass Transfer Operations. 3 Credits. (3 Lec) S PREREQUISITE: ECHM 307, ECHM 322. Theory and equipment for fundamental chemical engineering operations involving mass transfer. Equipment design and computations of operational rates.

ECHM 328. Chemical Engineering Reactor Design. 3 Credits. (3 Lec) S 3 cr. LEC 3 PREREQUISITE: ECHM 201, M 274. Application of the chemical kinetics of homogenous and heterogeneous reactions to the design of chemical processing equipment.

ECHM 405. Sustainable Energy. 3 Credits. (3 Lec) F PREREQUISITE: ECHM 307 or EMEC 323, or consent of instructor. Review of energy sources, their extraction, conversion and end-use, focusing on modern technology and materials. Investigate the design, construction and operation of combustion-based energy conversion systems including boilers, engines and gas turbines, in addition to non-combustion-based energy conversion systems including solar-thermal, photovoltaics, wind turbines, fuel cells and batteries.

ECHM 407. Chem Engin Thermodynamics II. 2 Credits. (2 Lec) F PREREQUISITE: ECHM 307 or EMEC 320, or consent of instructor. Review of energy sources, their extraction, conversion and end-use, focusing on modern technology and materials. Investigate the design, construction and operation of combustion-based energy conversion systems including boilers, engines and gas turbines, in addition to non-combustion-based energy conversion systems including solar-thermal, photovoltaics, wind turbines, fuel cells and batteries.

ECHM 411R. Chemical Engineering Design I. 3 Credits. (2 Lec) F PREREQUISITE: ECHM 321, ECHM 322, ECHM 323, ECHM 328, COREQUISITE: EGEN 310R. Senior capstone course. Design and simulation of chemical engineering equipment processes and plants.

ECHM 412R. Chemical Engineering Design II. 3 Credits. (2 Lec) S PREREQUISITE: ECHM 411R. Senior capstone course. Design and economic analysis of chemical engineering equipment, processes and plants.

ECHM 424. Transport Analysis. 3 Credits. (3 Lec) F PREREQUISITE: ECHM 323, M 273Q, M 274. Deterministic modeling techniques are applied to processes for the transport of momentum, energy and mass. Analytical and numerical solution techniques for the differential equations commonly encountered in the transport processes.

ECHM 428. Reaction Engineering and Reaction Modeling. 3 Credits. (3 Lec) S PREREQUISITE: ECHM 323 and ECHM 328. Advanced engineering aspects of chemical reactor design. Analysis of coupled mass and energy transport processes and chemical reaction in application to realistic design and scale-up of various types of chemical reactors. Optimization problems in reactor design and operation.


ECHM 443. Chem Engin Laboratory II. 3 Credits. (1 Lec, 2 Lab) S PREREQUISITE: ECHM 442. Experimental studies of unit operations and transport phenomena. Design of chemical processes and equipment from experimental studies.

ECHM 451. Chemical Engineering Process Dynamics and Control. 3 Credits. (3 Lec) S PREREQUISITE: ECHM 328, ECHM 323, M 274. Transient response analysis of controllers and instruments. Design of chemical process control systems.

ECHM 452. Advanced Engineering Materials. 3 Credits. (3 Lec) On Demand PREREQUISITE: EMEC 250 or EMAT 251, M 274. Micro and macro properties of electronic materials and material processing.

ECHM 490R. Undergraduate Research. 1-8 Credits. (1-8 Ind; 12 cr max) F,S,Su PREREQUISITE: Senior Standing. Directed undergraduate research/creative activity which may culminate in research paper, journal article, or undergraduate thesis. Course will address responsible conduct of research. May be repeated.

ECHM 491. Special Topics. 1-3 Credits. (1-3 Lec; 12 cr max) On Demand PREREQUISITE: Course prerequisites as determined for each offering. Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

ECHM 492. Independent Study. 1-3 Credits. (1-3 Ind; 6 cr max) On Demand PREREQUISITE: Junior standing, consent of instructor and approval of department head. Directed research and study on an individual basis.

ECHM 498. Internship. 1-12 Credits. (1-12 Lec; 12 cr max) On Demand PREREQUISITE: Junior standing, consent of instructor and approval of associate dean. An individualized assignment arranged with an agency, business or other organization to provide guided experience in the field.

ECHM 503. Thermodynamics. 3 Credits. (3 Lec) F PREREQUISITE: ECHM 307. Chemical engineering application to phase equilibria and chemical reaction equilibria. Liquid - liquid, vapor - liquid, and multiple reaction system.

ECHM 510. Reaction Engineering/Modeling. 3 Credits. (3 Lec) S alternate years, to be offered odd years. PREREQUISITE: ECHM 328. Theory and practice of industrial reactions, kinetics, synthesis, modeling of fixed and fluidized beds, process design problems.

ECHM 533. Transport Phenomena. 3 Credits. (3 Lec) S PREREQUISITE: ECHM 424. Comprehensive treatment of mass, momentum, and energy transport. Cross listed with ME 533.

ECHM 534. Mass Transfer. 3 Credits. (3 Lec) On Demand PREREQUISITE: ECHM 424. Mass transfer theory, transport in liquids, porous solids, interfacial effects, related mathematical techniques and application.


ECHM 575. Research or Prof Paper/Project. 1-4 Credits. (1-4 Ind; 6 cr max) On Demand PREREQUISITE: Graduate standing. A research or professional dealing with a topic in the field. The topic must have been mutually agreed upon by the student and his or her major advisor and graduate committee. Directed research and study on an individual basis.

ECHM 590. Master's Thesis. 1-10 Credits. (1-10 Ind; 10 cr max) F,S,Su PREREQUISITE: Master's standing.

ECHM 591. Special Topics. 1-3 Credits. (1-3 Lec; 12 cr max) On Demand Maximum 12 cr. PREREQUISITE: Upper division courses and others as determined for each offering. Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

ECHM 592. Independent Study. 1-3 Credits. (1-3 Ind; 6 cr max) On Demand Maximum 6 cr. PREREQUISITE: Graduate standing. A research or professional dealing with a topic in the field. The topic must have been mutually agreed upon by the student and his or her major advisor and graduate committee. Directed research and study on an individual basis.

ECHM 594. Seminar. 1 Credit. (1 Sem; 4 cr max) F Maximum 4 cr. PREREQUISITE: Graduate standing or seniors by petition. Course prerequisites as determined for each offering. Topics offered at the graduate level which are not covered in regular courses. Students participate in preparing and presenting discussion material.

ECHM 598. CBHE Grad Internship. 1-3 Credits. (1-3 Ind; 6 cr max) F,S,Su Maximum 6 cr. PREREQUISITE: Graduate standing, consent of advisor and approval of department head. An individualized assignment arranged with an agency, business, or other organization to provide guided experience in the field.

ECHM 690. Doctoral Thesis. 1-10 Credits. (1-10 Ind; 10 cr max) F,S,Su PREREQUISITE: Doctoral standing.
ECIV - Civil Engineering

ECIV 101, Intro To Civil Engineering. 1 Credit. (1 Lec) F
PREREQUISITE: Must be taken within your freshman year. This course is optional for students entering civil engineering but is encouraged for freshmen wanting to learn about the breadth of the discipline. Students choosing to take the course will be introduced to civil engineering, including department programs and areas of specialty, civil engineering career options, professionalism, history, and ethics.

ECIV 202, Applied Analysis. 1 Credit. (1 Lab) F,S
PREREQUISITE: M 165Q or M 171Q or M 181Q. Computer applications in civil engineering using M-based software and a programming language.

ECIV 220C, Civil Engineering and Construction - from the Ancient to the Modern. 3 Credits. (3 Lec) Su On Demand
Through the lenses of civil engineering and construction, follow the advancement of civilizations. Assess and evaluate decisions that we must make as a society with respect to protecting the health of the public and the environment with our finite resources.

ECIV 290R, Undergraduate Research. 1-6 Credits. (1-6 Ind; max unlimited) F,S
Directed undergraduate research which may culminate in a written work or other creative project. Course will address responsible conduct of research. May be repeated.

ECIV 291, Special Topics. 1-4 Credits. (1-4 Lec; 12 cr max) On Demand
PREREQUISITE: None required but some may be determined necessary by each offering department. Courses not required in any curriculum in which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

ECIV 307, Construction Estimating and Bidding. 3 Credits. (2 Lec, 1 Lab) F,S
PREREQUISITE: ECIV 202 or ETCC 204, and ECIV 308. Preparation of cost estimates and bids for construction projects. Introduction of computer estimating software and procedures.

ECIV 308, Construction Practice. 3 Credits. (2 Lec, 1 Lab) F,S
PREREQUISITE: BMGT 205 and EGEN 116 or DDNS 101. Contract documents, insurance, bonding, specifications, drawings, labor and labor law, estimating, bidding and scheduling, business organizations, leadership, and ethics. Significant technical and business writing required.

ECIV 309, Building Information Modeling in Construction. 3 Credits. (2 Lec, 1 Lab) F
PREREQUISITE: EGEN 115, DDNS 101 or EGEN 116, ARCH 241 or consent of instructor. CO-REQUISITE: ECIV 308. Introduction to the use of Building Information Modeling (BIM) in the Construction Industry. Instruction in BIM basics using contemporary software, with hands-on exercises in typical construction applications.

ECIV 312, Structures I. 3 Credits. (3 Lec) F,S

ECIV 315, Structures II. 3 Credits. (2 Lec, 1 Lab) F,S

ECIV 320, Geotechnical Engineering. 3 Credits. (2 Lec, 1 Lab) F,S

ECIV 331, Engineering Hydrology. 2 Credits. (2 Lec) F,S
PREREQUISITE: EGEN 350 or STAT 332. Descriptive and quantitative hydrology with applications in water resources engineering.

ECIV 332, Engineering Hydraulics. 2 Credits. (1 Lec, 1 Lab) F,S
PREREQUISITE: EGEN 335. Pipe flow, open channel flow, and hydraulic machines with applications in water resources engineering.

ECIV 350, Transportation Engineering. 3 Credits. (2 Lec, 1 Lab) F
PREREQUISITE: Junior standing. Introduction to vehicle operating characteristics, geometric and pavement design, traffic flow theory, signal design and analysis, capacity analysis and planning. Laboratory work will introduce various in-practice software packages.

ECIV 401, Civil Eng Practice and Ethics. 1 Credit. (1 Rec) F,S
PREREQUISITE: Concurrent registration with ECIV 489R required. Professional ethics, social responsibility, public policy, and leadership.

ECIV 404, Heavy Const Equip and Methods. 3 Credits. (2 Lec, 1 Lab) F,S
PREREQUISITE: STAT 216Q, EGEN 325, and ETCC 382 or ECIV 320. Course content covers construction equipment operating characteristics, economics, and production rate estimation. Heavy construction machines associated with tunneling, aggregate production, and mass earthwork operations.

ECIV 405, Construction Project Planning and Scheduling. 3 Credits. (2 Lec, 1 Lab) F,S
PREREQUISITE: ECIV 307. Project planning and scheduling procedures involving both network (CPM) and non-network techniques. Introduction to computer scheduling software.

ECIV 414, Steel Design. 3 Credits. (2 Lec, 1 Lab) F, offered alternate years
PREREQUISITE: ECIV 315. Design of structural steel members and systems.

ECIV 415, Design of Masonry Structures. 3 Credits. (2 Lec, 1 Lab) F, offered alternate years
PREREQUISITE: ECIV 315. Introduction to masonry design. Integrated with building design, including load calculations, design of foundations, structural elements and connections. Emphasis on low-rise buildings.

ECIV 416, Design of Wood and Timber Structures. 3 Credits. (2 Lec, 1 Lab) F, offered alternate years
PREREQUISITE: ECIV 315. Students will be exposed to the basic behavior of wood and timber structures. They will also be exposed to the current building codes and methodology for the design of wood and timber structures.

ECIV 420, Earth and Foundation Engr. 3 Credits. (3 Lec) S
PREREQUISITE: ECIV 320. Application of soil mechanics principles to the engineering of shallow and deep foundations, analysis of lateral earth pressures and design of retaining walls, and the stability of natural and engineered slopes.

ECIV 425, Geotechnical Structures. 3 Credits. (3 Lec) F

ECIV 431, Open Channel Hydraulics. 3 Credits. (3 Lec) F
PREREQUISITE: ECIV 332 or consent of the instructor. Principles of open channel flow; hydraulic design of open channel structures.

ECIV 435, Closed-Conduit Hydraulics. 3 Credits. (3 Lec) S
PREREQUISITE: ECIV 332. Advanced topics in hydraulic engineering, with emphasis on analysis and design of pipe transmission lines, pumps, and pipe distribution networks.

ECIV 450, Public Transit System Design. 3 Credits. (2 Lec, 1 Lab) F
PREREQUISITE: ECIV 350, and EGEN 350 or STAT 332. Design, implementation and management of public transit systems including paratransit, bus and light rail; including an overview of funding sources, legislation, public relations and other issues with coverage or route optimization strategies and demand estimation techniques. CE 450 is co-convened with CE 450. Students enrolled in CE 450 will not be able to take CE 550 and have it count toward degree requirements.

ECIV 541, Highway Pavements. 3 Credits. (2 Lec, 1 Lab) S, offered alternate years
PREREQUISITE: ECIV 320, ECIV 350. Design of highway pavements including drainage and base/subbase/subgrade preparation. Laboratory in bituminous materials.

ECIV 542, Traffic Engineering and ITS. 3 Credits. (2 Lec, 1 Lab) F, offered alternate years
PREREQUISITE: ECIV 350, EGEN 350 or STAT 332. Application of driver, vehicle, and roadway characteristics to principles of traffic control, operations, and safety. Traditional and advanced technology solutions will be explored.

ECIV 544, Transportation Planning. 3 Credits. (2 Lec, 1 Lab) S, offered alternate years
PREREQUISITE: ECIV 350 and EGEN 350 or STAT 332. Transportation planning process and travel demand forecasting including trip generation, trip distribution, mode split and traffic assignment. Laboratory work will introduce TransCAD software.

ECIV 547, Environmental Engineering. 3 Credits. (3 Lec) F
PREREQUISITE: STAT 216Q or EGEN 325 or ETCC 382. Analysis and design of water distribution networks.
ECIV 455. Survey Data Collection & Analysis for Transportation Engineering. 3 Credits. (2 Lec, 1 Lab) S
PREREQUISITES: EGEN 350 or EIDN 354 or consent of instructor. Welcome to ECIV 455/555! This course introduces students to the principles and practice of survey and data analysis for transportation engineering and elevate students’ ability to design and apply scalable approaches to analyze transportation-related data. The course includes two components: survey data collection and analysis. The survey portion is concerned with various aspects of travel/traffi c surveys—from designing and implementing survey instruments, to reducing response and sampling errors, and to evaluating survey results to ensure data quality within budget. The analysis portion focuses on methods and techniques for anticipating where and when transportation-related events (e.g., traffic crashes, congestion, and non-motorized travel).

ECIV 456. Highway Geometric Design. 3 Credits. (3 Lec) F
PREREQUISITE: SRVY 230, ECIV 350. Advanced geometric design of highway systems including two-lane and interstate roadways and intersection design and traffic control.

ECIV 461. Cold Regions Infrastructure Engineering. 3 Credits. (3 Lec) S
PREREQUISITES: ECIV 320 or ETCC 302, EGEN 331 or EGEN 335. COREQUISITE: ECIV 308. This course explores the challenges of cold regions infrastructure engineering. Design, construction and performance issues specific to cold climates are identifi ed, and methods to overcome them are developed and demonstrated.

ECIV 484. Reinforced Concrete Design. 3 Credits. (3 Lec) F alternate years, to be offered even years.
PREREQUISITE: ECIV 315. Design of reinforced concrete members and systems.

ECIV 489R. Civil Engineering Design I. 2 Credits. (1 Rec, 1 Lab) F
PREREQUISITE: EGEN 310R, and a student must be within two semesters of graduation. COREQUISITE: EGEN 325 and ECIV 308. Concurrent registration with ECIV 401 is required. Senior capstone course. Discussion of the design process from conceptual/preliminary design to final design, plans, and specifications. Develop proposal for engineering services, including scope of work, data acquisition, and organization of design team.

ECIV 490R. Undergraduate Research. 1-4 Credits. (1 Ind; 12 cr max) F,S,Su
Directed undergraduate research/creative activity which may culminate in a research paper, journal article, or undergraduate thesis. Course will address responsible conduct of research. May be repeated.

ECIV 491. Special Topics. 1-4 Credits. (1 Lec; 12 cr max) On Demand
PREREQUISITE: ECIV 320 or ETCC 302, EGEN 331 or EGEN 335. COREQUISITE: ECIV 308. This course explores the challenges of cold regions infrastructure engineering. Design/construction/performance problems specific to cold climates are identifi ed, and the manner of their solution is discussed.

ECIV 492. Independent Study. 1-3 Credits. (1-3 Ind; 4 cr max) On Demand
PREREQUISITE: Junior standing, consent of instructor, and approval of Department Head. Directed research and study on an individual basis.

ECIV 498. Internship. 2 Credits. (2 Ind; 12 cr max) On Demand
PREREQUISITE: Junior standing, consent of instructor and approval of Department Head. An individualized assignment arranged with an agency, business, or other organization to provide guided experience in the field. Students may not take this course the semester they graduate.

ECIV 499R. Capstone: Civil Eng Design II. 2 Credits. (1 Rec, 1 Lab) F

ECIV 504. Construction Productivity. 3 Credits. (3 Lec) Su
PREREQUISITE: One year of experience or one internship (ECIV 498 or ETCC 498). COREQUISITE: ETCC 499 or equivalent. PMSEM-CEM option requirement. ONLINE ONLY. Management concepts will include human factors and cost.

ECIV 505. Quality Assurance/Risk Management. 3 Credits. (3 Lec) Su
PREREQUISITE: Either EGEN 350, EIDN 354 or STAT 352 and ECIV 308 or equivalent plus one year of industrial experience or one internship (ECIV 498 or ETCC 498). PMSEM-CEM option requirement. ONLINE ONLY. Analysis of quality assurance and control concepts to include utilization of statistical analysis. Application of risk analysis principles to the construction process to minimize liability and project costs.

ECIV 506. Ad Construction Management. 3 Credits. (3 Lec) F
S; Lec 3 PREREQUISITE: One year of industrial experience or one internship (ECIV 498 or ETCC 498). COREQUISITE: ETCC 499 or equivalent. PMSEM-CEM option requirement. ONLINE ONLY. Broad issues of construction sustainability (LEED, Lean Construction, Environmental requirements, etc.) and how the construction industry needs to manage this process.

ECIV 507. Law of the Construction Industry. 3 Credits. (3 Lec) F
Lec 3 PREREQUISITE: BGEN 361. PMSEM-CEM option requirement. ONLINE ONLY. This class exposes engineers to the effect of law, rules and regulations on their work both from a practical perspective, for example, what engineers should know about basic concepts of contract law, to more abstract concepts like whether, and in what manner, government should mandate green construction practices. It is about understanding how the construction industry works within a framework of rules and regulations, critically considering whether the rules help or hinder the construction process and most importantly, how you as future leaders in the engineering profession are going to make the process better.

ECIV 511. Building Structural Systems. 2 Credits. (2 Lec) F alternate years, to be offered even years.
Lec 2 PREREQUISITE: ECIV 484 or ECIV 414 or ECIV 415 or ECIV 416. COREQUISITE: ECIV 512. Analysis of multistory structural systems. Emphasis on lateral force resisting systems in buildings.

ECIV 512. Structural Dynamics. 2 Credits. (2 Lec) F alternate years, to be offered even years.
Lec 2. PREREQUISITE: ECIV 312. Response of structures to dynamic loads, including seismic loads.

ECIV 513. Behavior Concrete Structures. 3 Credits. (3 Lec) S alternate years, to be offered odd years.
Lec 2. PREREQUISITE: EGEN 415 This course will present the theoretical background behind common solid mechanics fi nite elements used by structural engineers. Elasticity, energy methods, dynamics, buckling, nonlinear materials and large rotation topics will be addressed. These topics will allow students to utilize advanced fi nite element software in an informed manner.

ECIV 514. Behavior of Steel Structures. 3 Credits. (3 Lec) S alternate years, to be offered odd years.

ECIV 515. Adv Structural Analysis. 2 Credits. (2 Lec) S alternate years, to be offered odd years.
Lec 2. PREREQUISITE: EGEN 415 This course will present the theoretical background behind common solid mechanics fi nite elements used by structural engineers. Elasticity, energy methods, dynamics, buckling, nonlinear materials and large rotation topics will be addressed. These topics will allow students to utilize advanced fi nite element software in an informed manner.

ECIV 519. Bridge and Prestressed Concrete Design. 3 Credits. (3 Lec) F alternate years, to be offered odd years.

ECIV 521. Applied Geotechnical Engin. 3 Credits. (2 Lec, 1 Lab) F alternate years, to be offered even years.
Lec 2. PREREQUISITE: EGEN 415 This course will present the theoretical background behind common solid mechanics fi nite elements used by structural engineers. Elasticity, energy methods, dynamics, buckling, nonlinear materials and large rotation topics will be addressed. These topics will allow students to utilize advanced fi nite element software in an informed manner.

ECIV 524. Advanced Soil Mechanics. 3 Credits. (3 Lec) F alternate years, to be offered odd years.
Lec 3 PREREQUISITE: ECIV 320. Principles of advanced geotechnical laboratory testing and field investigative techniques. Application of laboratory and field test results to the geotechnical design of soil-supported structures.

ECIV 529. Groundwater Contamination. 3 Credits. (3 Lec) S
Lec 3 PREREQUISITE: EGEN 434. Subsurface mass transport and microbial processes and their effect on fate and transport of organic and inorganic contaminants. Bioremediation and other contemporary remediation technologies will be emphasized.

ECIV 530. Ad Hydraulic Investigations. 3 Credits. (3 Lec) S
Lec 3 PREREQUISITE: ECIV 431. Advanced topics in open channel flow.

ECIV 554. Transportation Safety. 3 Credits. (3 Lec) S alternate years, to be offered odd years.
PREREQUISITE: ECIV 350 or consent of instructor. This course addresses safety of the highway system as related to design, construction, and operations. The course provides an overview of the various elements of the highway system namely, road users, vehicles, roadways, and environment as related to safety. Apart from the introduction, the course is structured in three distinct components that represent the sequential stages in highway life: i.e. design, construction, and operations.
ECIV 555. Survey Data Collection & Analysis for Transportation Engineering. 3 Credits. (2 Lec; 1 Lab) S
PREREQUISITES: EGEN 350 or EIDN 354 or consent of instructor. Welcome to ECIV 455/555! This course introduces students to the principles and practice of survey and data analysis for transportation engineering and elevate students’ ability to design and apply scalable approaches to analyze transportation-related data. The course includes two components: survey data collection and analysis. The survey portion is concerned with various aspects of travel/traffic surveys—from designing and implementing survey instruments, to reducing response and sampling errors, and to evaluating survey results to ensure data quality within budget. The analysis portion focuses on methods and techniques for anticipating where and when transportation-related events (e.g., traffic crashes, congestion, and non-motorized travels).

ECIV 556. Traffic Flow Fundamentals. 3 Credits. (3 Lec) S alternate years to be offered even years PREREQUISITE: ECIV 350 or consent of instructor. This course covers traffic stream parameters, their relationships, and important analytical techniques in traffic engineering such as capacity analysis, queueing analysis, shockwave analysis, and traffic simulation. Topics covered are essential in understanding the behavior of vehicular traffic as a complex system.

ECIV 575. Research or Prof Paper/Project. 1-4 Credits. (1 Ind; 6 cr max) F,S,Su PREREQUISITE: Graduate research or professional project dealing with a topic in the field. The topic must have been mutually agreed upon by the student and his or her major adviser and graduate committee.

ECIV 589. Graduate Consultation. 1-3 Credits. (3 Ind; 3 cr max) F,S,Su PREREQUISITE: Master’s standing and approval of the Dean of Graduate Studies. This course may be used only by students who have completed all of their course work (and thesis, if on a thesis plan) but who need additional faculty or staff time or help.

ECIV 590. Master’s Thesis. 1-10 Credits. (1 Ind; max unlimited) F,S,Su PREREQUISITE: Master’s standing.

ECIV 591. Special Topics. 1-4 Credits. (1 Lec; 12 cr max) On Demand PREREQUISITE: Upper division courses and others as determined for each offering. Courses not required in any curriculum for which there is a particular one time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

ECIV 592. Independent Study. 1-9 Credits. (1-9 Ind; 6 cr max) On Demand PREREQUISITE: Graduate standing, consent of instructor, approval of Department Head and Dean of Graduate Studies. Directed research and study on an individual basis.

ECIV 594. Seminar. 1 Credit. (1 Sem; 4 cr max) F,S; Sem 1 Maximum 4 cr. PREREQUISITE: Graduate standing or seniors by petition. Course prerequisites as determined for each offering. Topics offered at the graduate level which are not covered in regular courses. Students participate in preparing and presenting discussion material. May be repeated.

ECIV 598. Internship. 2 Credits. (2 Ind; 12 cr max) On Demand Graduate standing, consent of instructor and approval of Department Head. An individual assignment arranged with an agency, business or other organizations to provide guided experience in the field.

ECIV 690. Doctoral Thesis. 1-10 Credits. (1 Ind; max unlimited) F,S,Su PREREQUISITE: Doctoral standing.

ECNS - Economics

ECNS 100IS. Personal Economics. 3 Credits. (3 Lec) F
PREREQUISITE: Gallatin College degree-seeking student. This course will demonstrate the basic tools of personal finance and economics. The financial lessons will be put into economic perspective by evaluating them at the micro and macro levels helping students understand the fabric of the overall economy. This course does not fulfill the requirement of ECNS 101IS - Economic Ways of Thinking.

ECNS 101IS. Economic Way of Thinking. 3 Credits. (3 Lec) F,S
Introduces important tools and methods of economics, including the core reasoning that underlies decision-making, analytical thinking and problem solving, demand and supply analysis, and indicators of economic performance. Emphasis is on application of the tools of economics to current issues of social and personal importance. LEVEL III MATH SUGGESTED.

ECNS 105. Study Econ Way of Thinking. 1 Credit. (1 Lec) F,S
COREQUISITE: ECNS 101. Optional directed study in a small group setting for ECNS 101 students. Students meet weekly in small groups to review ECNS 101 concepts, gain additional practice with economic problems, and complete in-class problem sets.
ECNS 313. Money and Banking. 3 Credits. (3 Lec) F
PREREQUISITE: ECNS 202 or ECNS 231. Principles and problems of money, banking, and credit. Monetary and banking history, monetary theory and policy; structure and operation of our financial system.

ECNS 314. International Economics. 3 Credits. (3 Lec) F
PREREQUISITE: ECNS 204 or ECNS 251. A survey of international economic theory and policy. Major concepts explored are comparative advantage, impacts of tariffs, exchange rates, and international payments.

ECNS 317. Economic Development. 3 Credits. (3 Lec) S
PREREQUISITE: ECNS 204 or ECNS 251. The plight of the world's low income countries, and the many national and international programs devoted to its alleviation. Primary emphasis directed to economic factors, but attention given to political and social characteristics vital to economic development.

ECNS 320. Public Finance. 3 Credits. (3 Lec) S
PREREQUISITE: ECNS 204 or ECNS 251. Analysis of public expenditure programs, government behavior, and public decision making. Topics such as health care and welfare programs, and principles of taxation will be covered.

ECNS 332. Econ of Natural Resources. 3 Credits. (3 Lec) F
PREREQUISITE: ECNS 204 or ECNS 251. Economic principles regarding the allocation and use of natural resources and the impact of institutional factors within which these decisions are implemented. Emphasis on property rights, economic rent, and impact of regulations on resources such as forests, fisheries, land, and water.

ECNS 345. Econ Org, Fin, & Credit. 3 Credits. (3 Lec) F
PREREQUISITE: ECNS 204 or ECNS 251. Alternatives available to business owners for acquiring and maintaining control over resources used in production. Emphasis is on the management of cash, credit, debt, taxes, and interest in relation to price levels and general economic conditions. Primary focus is the agriculture industry. Cross-listed with AGEC 345.

ECNS 372. Economic History of US. 3 Credits. (3 Lec) On Demand
PREREQUISITE: ECNS 101 or ECNS 251. Interpretation of American economic growth in the context of economic theory. Examines specific issues in U.S. history while focusing on the question of how the U.S. has been able to sustain increases in per capita income.

ECNS 394. Seminar. 1 Credit. (1 Sem; max unlimited) F,S
PREREQUISITE: ECNS 204 or ECNS 251 or consent of instructor. Current economic problems and current writings of people in the profession. Topics vary each semester; students should check with the department before registering.

ECNS 401. Microeconomic Theory. 3 Credits. (3 Lec) F
PREREQUISITE: ECNS 301 or consent of instructor. Current economic problems and current writings of people in the profession. Topics vary each semester; students should check with the department before registering.

ECNS 403R. Intro to Econometrics. 3 Credits. (3 Lec) F
PREREQUISITE: ECNS 301 and STAT 216Q and M 161Q or M 171Q. Senior capstone course. Statistical analysis and interpretation of quantitative data in economics. Focus on estimating economic relationships and conducting hypothesis testing in economics. Utilizes cutting-edge statistical software packages and real data to apply economic methods to problems in business, economics, and public policy.

ECNS 406. Industrial Organization. 3 Credits. (3 Lec) F
PREREQUISITE: ECNS 301 or consent of instructor. Current economic problems and current writings of people in the profession. Topics vary each semester; students should check with the department before registering.

ECNS 409R. Undergraduate Research. 1-8 Credits. (1-8 Ind; 8 cr max) F,S,Su
PREREQUISITE: ECNS 204, junior standing, and approval of instructor. Intended for upper division undergraduate research/undergraduate scholar program. The student will work closely with the supervising faculty. Course will address responsible conduct of research.

ECNS 491. Special Topics. 1-4 Credits. (1-4 Lec; 12 cr max) On Demand
PREREQUISITE: Determined by each offering. Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand prior to requesting a regular course number.

ECNS 492. Independent Study. 1-3 Credits. (1-3 Ind; 6 cr max) On Demand
PREREQUISITE: Junior standing, consent of instructor, and approval of department head. Directed research and study on an individual basis.

ECNS 494. Seminar. 1 Credit. (1 Sem; 4 cr max) On Demand
PREREQUISITE: Junior standing and as determined for each offering. Topics offered at the upper division level which are not covered in regular courses. Students participate in preparing and presenting discussion material.

ECNS 501. Microeconomic Theory. 3 Credits. (3 Lec) S
PREREQUISITE: ECNS 401. Econometric models of optimization as they apply to consumer and firm decision making. Topics covered include comparative statics, theory of the firm and consumer, and consumer and producer surplus.

ECNS 502. Macroeconomic Theory. 3 Credits. (3 Lec) S

ECNS 561. Econometrics I. 3 Credits. (3 Lec) F
PREREQUISITE: ECNS 301, STAT 216, M 221. The use of regression analysis in the estimation of economic relationships, with emphasis on development of the least squares technique, the properties of estimators, and hypothesis testing in the context of the regression model.

ECNS 562. Econometrics II. 3 Credits. (3 Lec) S
PREREQUISITE: ECNS 561. Course consists of theoretical and applied econometrics of static and dynamic structural models, primarily using time-series data. Single equations and system of equations are evaluated. Estimation properties specific to statistical problems, dynamic adjustments to economic behavior, and model forecasting are emphasized.

ECNS 569. Research Methodology. 1 Credit. (1 Lec) F
PREREQUISITE: Graduate standing. ECNS 301, ECNS 303. The research process as a means of acquiring knowledge which is reliable and relevant to problems.

ECNS 575. Professional Paper and Project. 1-4 Credits. (1-4 Ind; 6 cr max) F,S,Su
Max 6 cr. PREREQUISITE: Graduate standing. A research or professional paper or project dealing with a topic in the field. The topic must have been mutually agreed upon by the student and his or her major advisor and graduate committee.

ECNS 589. Graduate Consultation. 3 Credits. (3 Ind) F,S,Su
PREREQUISITE: Master's standing and approval of the Dean of Graduate Studies. This course may be used only by students who have completed all of their course work (and thesis, if on a thesis plan) but who need additional faculty or staff time or help.

ECNS 590. Master's Thesis. 1-10 Credits. (1-10 Ind; max unlimited) F,S,Su
PREREQUISITE: Master's standing. May be repeated.

ECNS 591. Special Topics. 1-4 Credits. (1-4 Ind; 12 cr max) On Demand
PREREQUISITE: Upper division courses and others as determined for each offering. Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand prior to requesting a regular course number.

ECNS 592. Independent Study. 1-3 Credits. (1-3 Ind; 6 cr max) On Demand
PREREQUISITE: Graduate standing, consent of instructor, and approval of department head and Dean of Graduate Studies. Directed research and study on an individual basis.

ECNS 594. Seminar. 1 Credit. (1 Sem; 4 cr max) On Demand
PREREQUISITE: Graduate standing or seniors by petition. Course prerequisites as required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand prior to requesting a regular course number.

ECNS 491. Special Topics. 1-4 Credits. (1-4 Lec; 12 cr max) On Demand
PREREQUISITE: Determined by each offering. Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand prior to requesting a regular course number.

ECNS 492. Independent Study. 1-3 Credits. (1-3 Ind; 6 cr max) On Demand
PREREQUISITE: Junior standing, consent of instructor, and approval of department head. Directed research and study on an individual basis.

ECNS 494. Seminar. 1 Credit. (1 Sem; 4 cr max) On Demand
PREREQUISITE: Junior standing and as determined for each offering. Topics offered at the upper division level which are not covered in regular courses. Students participate in preparing and presenting discussion material.

EDCI - Education Curriculum & Instr

EDCI 501. Educational Statistics I. 3 Credits. (3 Lec) F,S
PREREQUISITE: STAT 216, graduate standing or consent of instructor. The application of statistical processes to the analysis of educational data. Educational problems that require hypothesis testing, regression, estimation and the T-distribution, analysis of frequencies, and ANOVA in their solution will be included.

EDCI 504. Assessment and Evaluation in Education. 3 Credits. (3 Lec) F
PREREQUISITE: Graduate standing. Evaluation as an ongoing process in education. This course will engage students in a discussion regarding the construction, selection and use of criterion-referenced, norm-referenced, and alternative assessment methods. In addition, students will be involved in special projects which allow them to explore evaluation at the classroom and program levels.
EDCI 505. Foundations of Action Research in Teaching and Learning. 3 Credits. (3 Lec) On Demand
PREREQUISITE: Graduate standing. This course presents an overview of classroom-based research for practicing teachers. Students will explore the role of action research in teacher professional development, and review multiple models and methods for action research. Participants will gain experience in data collection and analysis, and will prepare an action research proposal.

EDCI 506. Applied Educational Research. 3 Credits. (3 Lec) F,S,Su
PREREQUISITE: Graduate standing. Students are introduced to systemic scientific inquiry, its purpose in an educational environment, the different approaches to conducting educational research, and the major components of an educational research study. Providing a foundation for further study of research methodologies, students will identify and evaluate existing literature on a topic and conduct an educational research study. Course will address responsible conduct of research.

EDCI 509. Implementing Action Research in Teaching and Learning. 3 Credits. (3 Lec) On Demand
PREREQUISITE: EDCI 505 or another foundational course in action research. In this course, students will implement the research design created in EDCI 505 or in a similar course. This will include developing and refining techniques for gathering classroom data, using multiple strategies for data analysis, and communicating the research results in a professional report and in presentation to more than one audience (e.g., other educators, community members).

EDCI 510. Issues and Trends in Social Studies Instruction. 3 Credits. (3 Lec) S
PREREQUISITE: Graduate standing. Treats current issues & trends in social studies teaching and learning, with special focus on the social and political forces driving change in social studies education and the responses from the research and practice communities.

EDCI 512. Writing and Its Improvement. 3 Credits. (3 Lec) On Demand
PREREQUISITE: Graduate standing. Advanced study in language arts pedagogy. Special attention is given to the writing process.

EDCI 514. Mentoring New Teachers. 3 Credits. (3 Lec) F
PREREQUISITE: Graduate Standing. This course examines research relevant to the process of mentoring new teachers and supporting their professional development. Course content explores skills necessary for successful mentoring, the professional development needs of new teachers, and development of tools for monitoring and evaluation.

EDCI 518. Master Teaching Strategies for Science Educators. 3 Credits. (3 Lec) On Demand
PREREQUISITE: Graduate standing. A professional development class for practicing science educators to learn master teaching strategies to engage grade 6 - 12 students learning science. Intended as a "gateway" online class for teachers interested in exploring an online course in consideration of the MSSE degree. Course an elective for the MSSE degree.

EDCI 520. Visual Arts and Learning. 3 Credits. (3 Lec) On Demand
PREREQUISITE: Graduate standing. Explores the importance of art in the lives of children and adolescents while finding ways to include art experiences in an integrated curriculum. Emphasizes philosophical and cultural groundings for teaching art, studio experiences and research potentials.

EDCI 522. Info Resources & Services. 3 Credits. (3 Lec) S
PREREQUISITE: Graduate standing. A course in the use of information resources in research, reference, integration, and online learning. Topics include the use and evaluation of traditional and electronic information resources, design and selection of information resources for classrooms and libraries. Restricted to Library Media program students.

EDCI 525. Improvement of Instruction in Science. 3 Credits. (3 Lec) S
PREREQUISITE: EDU 495 OR EDU 497. This course focuses on theoretical and practical concerns in science education. Research, conceptual frameworks and policy issues will be introduced, as well as teaching and learning activities for elementary and secondary science classrooms.

EDCI 530. Improvement of Math Instruction. 3 Credits. (3 Lec) F
PREREQUISITE: Graduate Standing. This course will focus on developing mathematical knowledge for teaching through the study of mathematics education literature, designing and testing mathematics lessons, diagnosing student errors, and using those errors as a bridge to better understanding.

EDCI 531. Contemporary Issues in Education. 3 Credits. (3 Lec) Su
This course is designed to establish the necessary social, technical, and research, foundations for cohort groups in the Master’s degree program. This course will examine critical issues in education including advanced pedagogy, Indian Education for All, and school law.

EDCI 532. General School Curriculum. 3 Credits. (3 Lec) On Demand
PREREQUISITE: Graduate standing. A survey of developments in curriculum theory and the role of curriculum reform in school improvement initiatives. Also treated is the relationship between curriculum reform and implementation.

EDCI 533. Middle Years School. 3 Credits. (3 Lec) On Demand
PREREQUISITE: EDU 495, graduate standing. History, philosophy and organization of Junior High and Middle schools, emphasizing curriculum and instruction based on the characteristics and needs of 10 to 13 year olds.

EDCI 534. Literacy Assessment and Instruction. 3 Credits. (3 Lec) On Demand
PREREQUISITE: EDU 330, EDU 431, teaching experience. Current theory and techniques in assessment of reading. Emphasis on instructional strategies and assessment tools developing the literacy of all students. A practicum is included.

EDCI 536. Construction of Curriculum. 3 Credits. (3 Lec) On Demand
PREREQUISITE: Graduate standing. The development and evaluation of curriculum based on psychological and social foundations of curriculum, curriculum theory, developmental models, design issues, purposes, implementation plans and techniques for assessing the impact of curriculum change.

EDCI 537. Contemporary Issues in Science Education. 2 Credits. (2 Lec) On Demand
PREREQUISITE: Graduate standing. This seminar style course focuses on current problems and controversial issues in science education. Emphasis is placed on those issues which relate directly to science teaching, learning and curriculum. Students investigate a variety of issues especially as they relate to their own teaching practices and student learning in their classroom.

EDCI 540. American Indian Studies for Ed. 3 Credits. (3 Lec) On Demand
This course serves to equip teachers with the skills, knowledge, and dispositions to meet Indian Education for All requirements for the state of Montana, and fulfills similar expectations in surrounding states. Instruction pertains to the history, traditions, customs, values, beliefs, and contemporary affairs of American Indians, particularly tribal groups in the Northern Plains Region.

EDCI 541. History & Philosophy of Education. 2 Credits. (2 Lec) On Demand
PREREQUISITE: Graduate standing. In its classical obligation, philosophy meant “a love of learning.” This course traces the growth of cultural and intellectual awareness in human civilizations and examines how we humans learned to create tools for the mind. Teachers learn to see the nature of formal cultural systems in the way they developed, and to recognize the central concepts that are the key to learning any subject.

EDCI 542. Creative Processes in Education. 3 Credits. (3 Lec) On Demand
PREREQUISITE: EDU 495, graduate standing. Reviews historical and current issues in art education, aesthetic education and related areas which inform how we know our world and construct meaningful ways to pursue creative endeavors. Emphasizes documentation and research while acknowledging growth as teachers and artists.

EDCI 544. Philosophical Issues in Education. 3 Credits. (3 Lec) On Demand
PREREQUISITE: Graduate standing. An examination of contemporary educational issues using the perspectives of traditional and contemporary philosophical documents.

EDCI 545. Organization of Information in School Library Media Centers. 3 Credits. (3 Lec) F
PREREQUISITE: EDU 370 or equivalent and graduate standing. In this course students learn application of descriptive and subjective cataloging content and procedures including: Dewey Decimal Classification, Library of Congress headings, AACR II rules, and examine technology issues for automation and management of library holdings. Restricted to BATE Library Media program students.

EDCI 546. School Library Media Specialist. 3 Credits. (3 Lec) Su
PREREQUISITE: EDU 370 or equivalent and graduate standing. This course will examine the management and leadership role of the school library media specialist and how the library media center fits into the educational setting. Restricted to BATE Library Media program students.

EDCI 547. Info Inquiry & Ed Change. 3 Credits. (3 Lec) F
PREREQUISITE: EDU 370 or equivalent and graduate standing. This course presents prospective school library media specialists with content and strategies for working with teachers to incorporate information literacy and media literacy into a changing curriculum and explore information inquiry models. Also included are topics affecting change in libraries and education such as: filtering, censorship, digital ethics, new technologies and other topics as relevant to inquiry and integration. Restricted to BATE Library Media program students.

EDCI 548. Management of Information & Resources. 3 Credits. (3 Lec) Su
PREREQUISITE: EDU 370 or equivalent and graduate standing. Students learn the management, development, use, and evaluation of materials for building library collections in K-12 library media centers. Restricted to Library Media program students.
EDCI 549. Applications of Literature for Children and Young Adults. 3 Credits. (3 Lec) Sp PREREQUISITE: EDU 370 or equivalent and Graduate standing. This course presents an overview of materials for educational, informational, and literary use by children and young adults (YA) with an emphasis on critical selection and analysis of knowledge of age-level developmental stages, and motivational techniques in libraries. Restricted to BATE Library Media program students.

EDCI 551. Education Technology: Teaching, Learning, and Leadership. 3 Credits. (3 Lec) F PREREQUISITE: Graduate standing. Strategies to harness the power of technology to enhance teaching and learning while promoting 21st century skills, productivity, assessment and communication.

EDCI 552. Human Development and the Psychology of Learning. 3 Credits. (3 Lec) On Demand A course on the psychology of learning, including social, developmental, cultural, and cognitive aspects. We examine constructivist and social constructivist theories of education, and study the role language, symbols, concepts, and cultural systems play in the life of the mind. We study models and strategies for creating effective learning communities and for building school curriculum around the deep semantic structures and foundational perspectives of the disciplines. Also includes an Early Field Experience.

EDCI 553. Diversity, Special Needs, and Classroom Discipline. 3 Credits. (3 Lec) On Demand This is a course on the social dimensions of human learning. We examine how teachers work to build a coherent and supportive community of learners responsive to the unique needs and characteristics of all students. Topics include diversity, learning styles, special needs, disabilities, classroom management, positive discipline, working with families, and meeting the requirements of local, state and national requirements while effectively serving the needs of all students.

EDCI 554. Curriculum Design, Pedagogy, & Assessment. 3 Credits. (3 Lec) On Demand This is a course on the pedagogical dimensions of schooling. We cover practical strategies for the design and implementation of curriculum, the design and effective uses of evaluation, alignment of curriculum and assessments with standards, and strategies for meeting the needs of all learners by means of appropriate accommodations, adjustments, and interventions. This course integrates the topics of curriculum design, pedagogy, and assessment.

EDCI 555. Technology, Instructional Design, and Learner Success. 3 Credits. (3 Lec) S Instructional Media; Using Electronic Resources; Software for curriculum and Lesson design; using assessment as an instructional tool; techniques for engaging learners in diverse instructional media; Classroom record keeping systems.

EDCI 556. The Legal, Social, and Practical Basis of Schooling. 3 Credits. (3 Lec) S This is a course on the history of American educational traditions, institutions, practices, policies, and legal rulings as configured within the framework of democratic institutions. This course informs the judgment of teachers by helping them understand schools as integral with the social, political, ideological, economic, and cultural contexts of the societies they serve. Includes practical information on governance structures, unions, school law, ethics, and the culture of the school as a professional workplace.

EDCI 557. Brain Science, Educational Research, and Teaching. 3 Credits. (3 Lec) Su This course examines key theories and concepts on the psychology of learning, from behaviorism through gestalt psychology to current variations of constructivism and cognitive science. Topics include brain imaging, cognitive science, a taxonomy of knowledge types, the power of narrative in learning, and a practical study in establishing curricular coherence through the use of foundational perspectives of the subject matter.

EDCI 558. Internship: Methods of Teaching. 3 Credits. (3 Lec) F This course provides a research and classroom based study of general teaching methods and covers topics such as culturally responsive teaching, differentiated instruction, and student-driven learning. Topics also include strategies to promote student understanding, meeting the needs of ESL students, lesson delivery, motivational techniques for instruction and assessment, and effective work with families and colleagues.

EDCI 559. Internship: Equity, Special Needs, and Diversity. 3 Credits. (3 Lec) F This course focuses on the practical implementation of professional knowledge, skills, and dispositions in the social dimensions of teaching, knowing how to manage a classroom and development an effective learning community. It provides a research and classroom based study of equity; special education laws, theory and practice; diversity, directing theory into practice; and meeting national, state and local standards.

EDCI 564. The Comprehensive Portfolio. 3 Credits. (3 Lec) S This course guides the process of creating the capstone Comprehensive Portfolio in which students summarize all of their learning from the NPTT program and demonstrate how that learning has manifested in the success of the K-12 learners they teach. We study the use of portfolios as a mechanism for authentic assessment of professional practice by various professional organizations. Students engage in self-critique, peer evaluations, and the professional evaluation of your portfolio by faculty and other professional evaluators, and model the habits of self-study, reflection, and critique expected of teachers as life-long learners.

EDCI 571. In-Service Education. 1-4 Credits. (1-4 Lec; 4 cr max) On Demand PREREQUISITE: Graduate standing and employment by sponsoring school organization. An approved supervised group study of an educational problem within a local school supervised by an MSU faculty member which culminates in a special report to be filed with the local district and the

EDCI 575. Professional Paper and Project. 1-4 Credits. (1-4 Ind; 6 cr max) F,S,Su PREREQUISITE: Graduate standing, EDCI 506. A research or professional paper or project dealing with a topic in the field. The topic must have been mutually agreed upon by the student and his or her major advisor and graduate committee.

EDCI 577. Internship: OPI Teacher Certification. 1 Credit. (1 Ind) F,S,Su PREREQUISITE: Consent of instructor and approval of department head. An internship course restricted to OPI teacher certification students.

EDCI 578. Internship-BPE Teacher Certification-Library Media. 1-2 Credits. (1-2 Ind; 7 max) F,S,Su PREREQUISITE: must be in the Dept. of Education OPI Internship program. An internship course restricted to OPI teacher certification students enrolled in the Library Media Certificate program.

EDCI 588. Professional Development. 1-3 Credits. (1-3 Lab; 3 cr max) On Demand Courses offered on a one-time basis to fulfill professional development needs of in service educators. A specific focus is given to each course which is appropriately subtitled.

EDCI 589. Graduate Consultation. 1-3 Credits. (1-3 Ind) F,S,Su PREREQUISITE: Master’s standing and approval of the department head. This course may be used only by students who have completed all of their coursework (and thesis if on a thesis plan) but who need additional faculty or staff time or help.

EDCI 590. Master’s Thesis. 1-10 Credits. (1-10 Ind; max unlimited) F,S,Su PREREQUISITE: Master’s standing, Restricted Entry: Requires contract with major advisor. May be repeated.

EDCI 591. Special Topics. 1-4 Credits. (1-4 Ind; 12 cr max) On Demand PREREQUISITE: Upper division courses and others as determined for each offering. Courses not required in any curriculum for which there is a particular one time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

EDCI 592. Independent Study. 1-3 Credits. (1-3 Ind; 6 cr max) On Demand PREREQUISITE: Graduate standing, consent of instructor, and approval of department head. Directed research and study on an individual basis.

EDCI 598. Internship. 1-12 Credits. (1-12 Ind; 12 cr max) F,S,Su PREREQUISITE: Graduate standing, consent of instructor and approval of department head. An individualized assignment arranged with a school, agency, business or other organization to provide guided experience in the field.

EDCI 604. Advanced Educational Psychology. 3 Credits. (3 Lec) Sp PREREQUISITES: Graduate standing or permission of the instructor. An examination of theory and research related to the diverse learning and motivation needs of K-12 students. Practical implications for effective teaching will be identified throughout the course.

EDCI 690. Doctoral Thesis. 1-12 Credits. (1-10 Ind; max unlimited) F,S,Su PREREQUISITE: Doctoral standing. Restricted Entry: Requires contract with major advisor. Course will address responsible conduct of research.

EDEC - Early Childhood Education

EDEC 160. Early Childhood Development. 3 Credits. (3 Lec) F,S Development of children birth-8 years old. Cognitive, language, physical, social, and emotional domains are examined in addition to contexts of development that influence children’s well-being, such as family, school, and community. Theory, research, and application for professionals are emphasized.
EDEC 253. Health and Movement in Early Childhood. 3 Credits. (2 Lec, 1 Lab) S
PREREQUISITE: EDEC 271. Developmentally appropriate movement and health-related activities in early childhood education. Designing physical activity and nutrition programs in early childhood settings, implementing appropriate teaching practices, understanding movement concepts, and helping guide children in becoming physically active and healthy for a lifetime.

EDEC 271. Paraprofessional Experience in Early Childhood. 2 Credits. (1 Lec, 1 Lab) F,S,Su
PREREQUISITE: EDEC 160. Work directly with young children, learn and use strategies of positive and supportive interactions with teachers, families, and children. Form foundational understanding of the complex roles of early childhood professionals.

EDEC 288. Signing for Early Childhood Educators. 3 Credits. (3 Lec) F
Provides foundational expressive and receptive skill acquisition in American Sign Language to meet federal demand for inclusionary practices in early childhood education and public school settings for deaf and hard of hearing, cognitive and language disorders, pervasive developmental disorders, etc.

EDEC 292. EC Independent Study. 1-4 Credits. (1-4 Ind; 6 cr max) On Demand
Max 12 cr. PREREQUISITE: None required but some may be determined necessary by each offering department. Courses not required in any curriculum for which there is a particular one-time need or given on a trial basis to determine acceptability and demand before requesting a regular course number.

EDEC 350. Play and Learning in Early Childhood. 3 Credits. (3 Lec) F
PREREQUISITE: EDEC 271 and junior standing. Current issues, research, theory, and practice related to young children’s play, learning, and development in educational contexts. Planning and preparing developmentally appropriate learning environments and developing dispositions that promote teacher-child and family-school relationships, diversity and social justice, ethics and professionalism.

EDEC 362. Development, Education, and Well-Being of Children at Risk. 3 Credits. (3 Lec) Su, On Demand
PREREQUISITE: EDEC 160 and junior standing. The course emphasizes well-being indicators in children from a developmental, educational, and community perspective. Exploration and understanding of deficit models and strength models of well-being are examined within the contexts of tribal communities and other at-risk populations.

EDEC 385. Integrated Curriculum Early Childhood Education. 4 Credits. (3 Lec, 1 Lab) S

EDEC 430. Social and Emotional Development in the Young Child. 3 Credits. (3 Lec) S
PREREQUISITE: EDEC 385. Social and emotional development in children birth to age eight in relation to young children’s familial, social, and cultural contexts. This course also addresses effective strategies for promoting development and learning. Some observation of young children is required.

EDEC 450. Literacy in the EC Classroom. 3 Credits. (3 Lec) F
PREREQUISITE: EDEC 350. Development of language and literacy from birth to age 8 utilizing an integrated approach to family, school, and community literacy. Theoretical and foundational perspectives of language development, literacy environments, and emergent literacy skills among young children.

EDEC 453. P-3 Steam. 3 Credits. (3 Lec) F
PREREQUISITES: EDEC 385 and Admittance to the Teacher Education program. COREQUISITES: EDU 395 Practicum II This course focuses on the integration of science, technology, engineering, art, and mathematics in early childhood (preschool – grade 3) classrooms using an inquiry and project-based approach to support young children’s learning. Emphasis to content methods and curriculum standards in the STEAM disciplines to promote P – 3 student creativity, problem solving, and critical thinking.

EDEC 490R. Undergraduate Research ECE. 1-6 Credits. (1-6 Ind; 12 cr max) F,S,Su
Research methods in Early Childhood Education, including survey, ethnography, case studies, and action research. Directed undergraduate research/creative activity which may culminate in a research paper, journal article, or undergraduate thesis. Course will address responsible conduct of research. May be repeated.

EDEC 492. EC Independent Study. 1-3 Credits. (1-3 Ind; 6 cr max) On Demand
Max 6 cr. PREREQUISITE: Junior standing, consent of instructor, and approval of department head. Directed research and study on an individual basis.

EDEC 494. EC Seminar/Workshop. 1 Credit. (1 Sem; 4 cr max) On Demand
Max 4 cr. PREREQUISITE: Senior standing. Topics offered at the upper division level that are not covered in regular courses. Students participate in preparing and presenting class materials.

EDEC 496. Early Childhood Advanced Practicum. 3-6 Credits. (3-6 Lab; 6 cr max) S,Su
PREREQUISITE: Senior standing in major and student teaching applicant screening required. Senior capstone course. Supervised experience in programs for young children and collaboration with early childhood professionals in the community. Students will be responsible for lesson planning and teaching, as well as supervision and evaluation of young children in an NAECY-accredited classroom.

EDEC 498. EC Internship. 1-12 Credits. (1-12 Ind; 12 cr max) F,S,Su
PREREQUISITE: Consent of instructor. An individualized assignment with a professional agency to provide a guided field experience. All students must receive department permission prior to registration.

EDL - Elementary Education

EDEL 503. Contemp Iss in Child Literature. 3 Credits. (3 Lec) On Demand
PREREQUISITE: EDU 330 and EDU 301 and EDU 495. Examination and interpretation of the themes of current, award-winning children’s literature and their relevance to today’s children. Inquiry projects will focus on topics of critical literacy. Emphasis will be on classroom application.

EDLD - Education Leadership

EDLD 501. Foundations of Adult Education. 3 Credits. (3 Lec) On Demand
PREREQUISITE: Graduate standing. This course provides a study of the field of profession of adult education as a part of life-long learning. Professionalism in adult education is approached through the study of historical and philosophical foundations, providers and programs, and teaching strategies appropriate for adult education settings.

EDLD 507. Foundations of Educational Leadership. 3 Credits. (3 Lec) Su
PREREQUISITE: Graduate standing, BA/BS in Education. This is the entry course for the K-12 Educational Leadership program. Topics included are leadership theory and practice; instructional leadership; basic organization theory; working with students, staff, parents, and community; creating a vision and a strategic plan for realizing the vision; and the identification and initial development of leadership skills, including a personal and professional code of ethics.

EDLD 508. Supervision of Instruction. 3 Credits. (3 Lec) F
PREREQUISITE: Graduate standing, BA/BS in Education. This course emphasizes the improvement of teaching and learning through facilitating instructional capacity of teachers in schools. The use of the Danielson Framework for Teaching as it pertains to implementation of Common Core State Standards will be highlighted as well as professional development and legal requirements of school and staff accountability.

EDLD 509. Issues and Trends in Higher Education. 3 Credits. (3 Lec) On Demand
PREREQUISITE: Graduate standing. This course is an in-depth and contemporary exploration of critical issues, trends, and forces facing and influencing higher education. The emphasis is on current issues, but we do cover some of the historical roots. The theme throughout the course is addressing the ways in which contemporary institutions respond to the critical issues and challenges as they are set within and often against the dynamic context of social, political, and economic forces.

EDLD 512. Finance and Administration in Higher Education. 3 Credits. (3 Lec) On Demand
PREREQUISITE: EDLD 505 or consent of instructor. The study of financial governance across higher education from macro-systems (national and state governing boards) to micro-systems (university, college, and department). In the course, students assess the impact of various decisions, methods of budgeting, and levels of funding on students.

EDLD 513. Resource and Program Management. 3 Credits. (3 Lec) On Demand
PREREQUISITE: Graduate standing. The course examines the study of program/department management in higher and adult education, for both academic and administrative/support units. Includes issues that deal with leadership, the management of faculty, support personnel, programs, facilities and budgeting.

EDLD 515. Planned Change. 3 Credits. (3 Lec) Su
PREREQUISITE: Graduate standing. A study of the change process as applied to schools. Includes the theory and process of change, research about change, roles and practice, change models and systems, and leadership in school improvement planning and implementation, and evaluation of changed systems.
EDLD 520. Schools & Diverse Communities. 3 Credits. (3 Lec) S
PREREQUISITE: Graduate standing. BA/BS in Education. This course reviews the techniques for connecting the school with all parents in a diverse community. Students will learn various models that promote community involvement in teaching, community use of school facilities, responding to community interests, and using the news media. Developing effective communication with various cultural, ethnic, racial, and special interest groups in the community will be stressed along with issues of social justice.

EDLD 526. Evaluating School Programs. 3 Credits. (3 Lec) F
PREREQUISITE: Graduate Standing and EDLD 534, Data Driven Decision Making. This course will examine evaluation and reporting techniques for school programs. Students will be required to use data to evaluate and report on an existing school program.

EDLD 529. Post Secondary Distance Delivered Education. 3 Credits. (3 Lec) On Demand
PREREQUISITE: Graduate standing. Higher, continuing, and adult education professionals will study the literature, strategies, and practices involved in delivering post secondary education at a distance.

EDLD 531. Theoretical Foundations of Student Services. 3 Credits. (3 Lec) On Demand
PREREQUISITE: Graduate standing. This course will introduce the theories which have been advanced regarding college students and the professional practice of student affairs. The course will examine the similarities and differences among college students and the impact which different environments and policies may have on student psycho-social development, learning attitudes, values, behaviors, and satisfaction with college.

EDLD 532. School Law, 3 Credits. (3 Lec) F
PREREQUISITE: Graduate standing. A general examination of law and court decisions relative to the administration of K-12 schools. Specific attention is given to Montana school law.

EDLD 533. Law and Policy in Higher Education. 3 Credits. (3 Lec) On Demand
PREREQUISITE: Graduate standing. This course analyzes and interprets of landmark legislation affecting American higher education since 1960 and considers the resulting policies that govern the management of universities and colleges. Topics include separation of church and state, access, collective bargaining, intercollegiate athletics, affirmative action, Title IX, and the legal relationships with state and federal governments to include various institutional types.

EDLD 534. Data Driven Decisions. 3 Credits. (3 Lec) S
PREREQUISITE: Graduate standing. This course focuses on instructional leadership actions and behaviors which guide school personnel in sound decision making practices for continuous school improvement. Students will be required to collect, analyze (using statistical methods) and utilize classroom, school and district level data from local contexts as a means of increasing student achievement across all contexts.

EDLD 535. Student Services. 3 Credits. (3 Lec) Su On Demand
PREREQUISITE: Graduate standing. In this course, students are introduced to the philosophy, values, norms, and practice of the student affairs profession. The course outlines the various functional areas and professional competencies that comprise student services, and engages students in critical thinking on current issues in the field through ethical and legal frameworks employed in student affairs practice.

EDLD 538. College Curriculum. 3 Credits. (3 Lec) On Demand
PREREQUISITE: Graduate standing. This course considers the definition, philosophical and historical roots, disciplinary organization, current issues, design, administration, and evaluation of the college curriculum.

EDLD 543. Social Justice in Educ. 3 Credits. (3 Lec) On Demand
PREREQUISITE: Graduate standing. Consideration of social equity issues in education to include disabilities, gender, ethnic, social, and economic issues.

EDLD 555. School Finance. 3 Credits. (3 Lec) Su
PREREQUISITE: Graduate standing. This course prepares school leaders to identify and analyze sources of fiscal and non-fiscal revenue and resources for schools and school districts, to manage financial and material assets, to develop an efficient budget planning process, and to perform a variety of budget management functions. Course emphasis is on Montana school finance.

EDLD 564. The Comprehensive Portfolio. 3 Credits. (3 Lec) Su, On Demand
PREREQUISITE: Consent of Instructor. Students create a professional portfolio to evidence their vision of learning, the culture of teaching and learning, community/school relationships, and the social, cultural, ethical, legal, political, and economic context of schooling.

EDLD 565. K-12 Instructional Leadership. 3 Credits. (3 Lec) S
PREREQUISITE: Graduate standing. This course prepares school leaders for the role of instructional leader at the building level, and the specific leadership behaviors demonstrated to improve student achievement.

EDLD 566. Administration and Supervision of Special Education Programs. 3 Credits. (3 Lec) S
PREREQUISITE: EDLD 532 MT School Law. Administration and Supervision of Special Education Programs is a master’s level course designed to provide school principals and special education supervisors with the knowledge and skills to effectively and ethically plan, organize and manage special education and related services in their schools. This is a required course for K-12 Principal licensure in Montana.

EDLD 571. In-Service Education. 1-4 Credits. (1-4 Lec, 1-4 Lab; 6 cr max) On Demand
PREREQUISITE: Graduate standing and employment by sponsoring school organization. A carefully supervised group study of an educational problem. The study will culminate in a special report, syllabus, blueprint, course of study or guide book or report to be filed with the local administrator and with the.

EDLD 574. Field Exp in Ed Ldrshp. 1-6 Credits. (5-3 Lab; 6 cr max) F,S,Su
PREREQUISITE: 15 Credits of EDLD Course Work. This is a course that offers students the opportunity for guided field experience as a principal or superintendent in K-12 schools.

EDLD 575. Professional Paper & Project. 3 Credits. (1 Ind; 6 cr max) F,S,Su
PREREQUISITE: Graduate standing. A research or professional paper or project dealing with a topic in the field. The topic must have been mutually agreed upon by the student and his or her major adviser and graduate committee.

EDLD 588. Professional Development. 1-3 Credits. (1 Ind; 1 cr max) On Demand
PREREQUISITE: Graduate standing, teaching experience and/or current employment in a school organization, consent of instructor and Dean of Graduate Studies. Courses offered on a one-time basis to fulfill professional development needs of in service educators. A specific focus is given to each course which is appropriately subtitled.

EDLD 589. Graduate Consultation. 1-3 Credits. (3 Ind; 3 cr max) F,S,Su
PREREQUISITE: Master’s standing and approval of the Dean of Graduate Studies. This course may be used only by students who have completed all of their course work (and thesis, if on a thesis plan) but who need additional faculty or staff time or help.

EDLD 590. Master’s Thesis. 1-10 Credits. (1 Ind; max unlimited) F,S,Su
PREREQUISITE: Master’s standing. This course will address responsible conduct of research.

EDLD 591. Special Topics. 1-4 Credits. (1-4 Lec, or 1-4 Sem; 12 cr max) On Demand
COREQUISITE: Student must be enrolled in a graduate program. Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

EDLD 592. Independent Study. 1-3 Credits. (1-3 Ind; 6 cr max) On Demand
PREREQUISITE: Graduate standing, consent of instructor, approval of the Dean of Graduate Studies. Directed research and study on an individual basis.

EDLD 594. Seminar. 1 Credit. (1 Sem; 4 cr max) On Demand
PREREQUISITE: Graduate standing or seniors by petition. Course prerequisites as determined for each offering. Consent of instructor. Topics offered at the graduate level which are not covered in regular courses. Students participate in preparing and presenting discussion material.

EDLD 598. Internship. 2-12 Credits. (2 Ind; 12 cr max) On Demand
PREREQUISITE: Graduate standing, consent of instructor and approval of advisor. Note: Interns must have taken EDLD 507, EDLD 508, EDLD 532. Interns are those students already hired into an administration position who have been approved by the Board of Public Education. The internship course is designed for those required to include practical experience as part of their degree. Course content is informed by bridging theory with practice and the on-the-job expectations and responsibilities.

EDLD 605. Higher Education History and Philosophy. 3 Credits. (3 Lec) F
PREREQUISITE: Graduate standing. This course is an in-depth past-to-present tour of the historical and philosophical development of American higher education set against the dynamic backgrounds of political, social, economic, cultural, and intellectual landscapes.
EDLD 610. Ldrship and Organizational Thry. 3 Credits. (3 Lec) F, On Demand
PREREQUISITE: Master's degree or consent of instructor. The course will provide existing school leaders with theories, concepts, and behaviors of effective leadership that addresses the challenges of schools today. The course encourages a deeper understanding of personal beliefs, style, values, and ethics required of school leaders.

EDLD 616. Organization and Administration of Higher Education. 3 Credits. (3 Lec) F
In this course students will examine the different organizational structures that characterize and govern American higher education. In this introduction to the field of higher education governance, organization and change structures and influences will be examined.

EDLD 620. The School Superintendent. 3 Credits. (3 Lec) On Demand
PREREQUISITE: Master's degree, Principal's licensure, or consent of instructor. This course focuses on the leadership skills necessary for the school superintendent. There is emphasis on superintendent relations with the school board and the school community, and on working with stakeholders to identify school priorities. The development of effective and appropriate communication strategies and interpersonal skills that promote public confidence for schools is stressed.

EDLD 628. College Students. 3 Credits. (3 Lec) F
PREREQUISITE: Graduate standing. This foundations course reviews theory and research on undergraduate college students’ learning, development, culture, demographics, and sub-populations, which inform current educational practice.

EDLD 630. Supervision & Instruct Ldrshp. 3 Credits. (3 Lec) Su, alternate years.
PREREQUISITE: Master's degree or consent of instructor. The course focuses on increasing the knowledge and skills of supervising and leading instruction on a district or school systems basis. Emphasis is given to dimensions of leadership at the district level including supervision of the leadership team, aligning the vision, mission, and strategic plan with student needs, professional growth, and maximizing resources to support teaching and learning.

EDLD 635. College Teaching. 3 Credits. (3 Lec) F
PREREQUISITE: Graduate standing. This course is designed to explore the learning-teacher nexus; special attention is given to effective teaching practices, learning and assessment theories and perspectives, and effective course design. We approach and frame these topics through the scholarship of teaching and learning and with attention to traditional and diverse learners.

EDLD 643. Leading Social Justice. 3 Credits. (3 Lec) Su
PREREQUISITE: Master’s degree or consent of instructor. This course provides a framework for inclusive leadership. Students evaluate the relationship among privilege, power, and educational equity from a variety of perspectives. Critical theory will be stressed in examining the complexities of diversity and its impact on organizational leadership.

EDLD 645. Personnell and Collective Bargaining in MT. 3 Credits. (3 Lec) Su
PREREQUISITE: Principal’s Certification or concurrent enrollment in EDLD 508. This course is designed to prepare educational leaders to apply effective job analysis procedures, to understand performance appraisal for instructional and non-instructional staff, formulate professional growth plans, negotiate union agreements, and apply appropriate policies, criteria, processes for recruitment, selection, induction, and compensation of personnel with an emphasis on equity and diversity.

EDLD 650. MT Finance & Facilities. 3 Credits. (3 Lec) F, alternate years and Su on demand
PREREQUISITE: Master’s degree in Educational Leadership, state licensure as a principal, or concurrent enrollment in EDLD 555. This course is designed to facilitate a more in depth understanding of the efficient and effective use of finances, facilities, and other tangible and intangible resources at the school district level. An emphasis will be placed on Montana school finance structures, equitable distribution of resources and the alignment of resources to strategic plans and district vision. This course fulfills the Montana Chapter 57 licensure requirements for superintendents educated in out of state preparation programs.

EDLD 655. MT Legal & Policy Studies. 3 Credits. (3 Lec) S
PREREQUISITE: Master’s degree in Educational Leadership, state licensure as a principal, or concurrent enrollment in EDLD 532. This course is designed to facilitate a more in-depth understanding of legal issues relative to education in Montana and their policy implications. Students will increase their understanding of how legal decisions impact school. They will explore policy analysis and implementation, and develop an understanding of how laws, policies, and systemic organizational life are intertwined. This course fulfills the Montana Chapter 57 licensure requirements for superintendents educated in out of state preparation programs.

EDLD 657. Ed Policy & Politics. 3 Credits. (2 Lec) F
Alternate years PREREQUISITE: Graduate standing. This course provides existing school leaders with an understanding of the goals of the U.S. and State level political systems, the governmental structures seek to achieve these goals, and the interest groups that influence the goals and their implementation.

EDLD 690. Doctoral Thesis. 1-10 Credits. (1 Ind; max unlimited) F,S,Su
PREREQUISITE: Doctoral standing. Restricted Entry. This course will address responsible conduct of research.

EDSD - Secondary Education

EDSD 591. Special Topics. 1-4 Credits. (1-4 Lec; 12 cr max) On Demand
PREREQUISITE: Upper division courses and others as determined for each offering. Courses not required in any curriculum for which there is a particular one time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

EDSD 592. Independent Study. 1-3 Credits. (1-3 Ind; 6 cr max) On Demand
PREREQUISITE: Good standing, consent of instructor, and approval of department head. Directed research and study on an individual basis.

EDSD 594. Seminar. 1 Credit. (1 Sem; 4 cr max) F,S,Su
Directed undergraduate research/creative activity which may culminate in a research paper, journal article, or undergraduate thesis. Course will address responsible conduct of research.

EDSP - Special Education

EDSP 306. Exceptional Learners. 3 Credits. (3 Lec) F,S,Su
PREREQUISITE: EDEC 160 or EDU 222IS or EDU 223IS, and junior standing. Categories of exceptionality and implications for educators. Historical, societal, familial and educational attributes; legal requirements of Preschool Amendments, IDEA and ADA including IEPs, IFSPs, 504s, FBAs, and BIPs. Identification, intervention, and best practices including multi-tiered systems of support (MTSS) and RTI.

EDSP 307. Exceptional Learners Lab. 1 Credit. (1 Lab) F,S
PREREQUISITE: EDSP 306; may be taken concurrently. Direct experience and engagement with children and adolescents with special needs in infant-preschool settings, public schools, and community-based settings.

EDSP 458. Assessment and Intervention. 4 Credits. (3 Lec) F, S
PREREQUISITE: EDSP 306. Knowledge, application and interpretation of data in formal and informal assessment instruments; formal report writing; psychometrics; CST, IEP, IFSP, 504, BFA parent and professional roles. Linking assessment data with intervention techniques. Direct experience with children and families required.

EDU - Education

EDU 101US. Teaching and Learning. 3 Credits. (3 Sem) F,S
PREREQUISITE: First year students (less than 30 credits) only. This course is an introduction to the profession of public school teaching. Topics treated include the nature of knowledge, the development of public education, the training of teachers, the nature of schools today, education policy, and society’s expectations of schools.

EDU 202. Early Field Experience. 1 Credit. (1 Lab) F,S
Students will explore the profession of teaching by attending an orientation, conducting in-school observations and interviews, recording personal reflections in a portfolio, and participating in two seminar sessions to debrief/discuss their experiences.

EDU 204IA. Arts & Lifelong Learning. 3 Credits. (3 Lec) F,S
This course explores how dance, drama, music and the visual arts offer students expressive ways to learn and inquire about themselves, their social and physical worlds. Students engage in creative arts by exploring content, practicing critical inquiry skills and reviewing aesthetic perspectives.

EDU 211D. Multicultural Education. 3 Credits. (3 Lec) F,S
PREREQUISITE: Sophomore standing. Examination of the school-society relationship in the United States and of the many issues and variables embedded in this relationship, including equal opportunity, human diversity, ideology, politics and social change. Foundational perspectives (historical, political, social, and policy) will be explored.

EDU 222IS. Educ Psych & Child Development. 3 Credits. (3 Lec) F
PREREQUISITE: EDU 101US or consent of instructor. This course will provide a comprehensive understanding of the nature of children's cognitive, linguistic, social, emotional, and motor development. Special emphasis is given to the needs of diverse learners, including children with disabilities. Topics include: nature and characteristics of persons with disabilities, theories of exceptional development, assessment, classification and educational rights. Critical thinking and application of theory to practice will be emphasized.
EDU 223IS. Educ Psych and Adolescent Dev. 3 Credits. (3 Lec) F,S
Human growth and psychological development of middle and high school students, to include physical, cognitive, and psychosocial development within an educational, familial, and social context. An examination of theory and research related to the development, learning and motivation of middle and high school students. Implications for effective classroom teaching will be identified throughout the course.

EDU 263. Methods of Teaching Grammar. 3 Credits. (3 Lec) F,S
This course explores the structure and function of the English language. In particular, study of grammar including the eight parts of speech, types of phrases and clauses, sentence structure and fluency, word usage, and other language conventions will be addressed.

EDU 290R. Undergraduate Research. 1-6 Credits. (1-6 Ind; max unlimited) F,S
Directed undergraduate research which may culminate in a written work or other creative project. Course will address responsible conduct of research.

EDU 291. Special Topics/Exprrmntl Course. 1-4 Credits. (1-4 Lab; 12 cr max) On Demand
Max 12 cr. PREREQUISITE: None required but some may be determined necessary by each offering department. Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requiring a regular course number.

EDU 292. Independent Study. 1-3 Credits. (1 Ind; 3 cr max) PREREQUISITE: Sophomore Standing. Examination of the school-society relationship in the United States and of the many issues and variables embedded in this relationship, including equal opportunity, human diversity, ideology, politics and social change. Foundational perspectives (historical, political, social, and policy) will be explored.

EDU 330. Emergent Literacy. 3 Credits. (3 Lec) F,S,Su alternate years to be offered every even years PREREQUISITE: EDU 351, EDU 382, Junior Standing. Current theory concerning emergent literacy and developmentally appropriate classroom practices. Emphasis is on a balanced approach which includes phonics and other cue systems, use of authentic children’s literature, and use of programmed reading materials.

EDU 331. Lit and Literacy for Children. 3 Credits. (2 Lec, 1 Lab) F,S
PREREQUISITE: EDU 222 or EDU 223 and sophomore standing. A survey of children’s books with an emphasis on their use in K-8 classrooms. Introduces the history and current genres of children’s literature, selection criteria, award-winning books, and strategies for sharing books with students.

EDU 332. Lit and Arts in Context. 9 Credits. (3 Lec, 6 Lab) Su
Study of British and French literature for children is integrated with experiences in the arts. The course includes a three-week trip to England and France where participants will visit historical sites and see performances that bring stories to life.

EDU 342. Managing the Learning Envir. 3 Credits. (3 Lec) F,S
PREREQUISITE: EDU 382 and good standing in the Teacher Education Program. This course examines key factors in establishing a healthy learning environment for K-12 students. The course will explore factors that contribute to student success such as school law and policy and their relationship to the establishment of effective and respectful management, engaging classroom instruction, and meaningful learning for all students.

EDU 370. Integrating Tech into Educ. 2 Credits. (1 Lec, 1 Lab) F,S,Su
COREQUISITE: EDU 222 or EDU 223, sophomore standing. Exploration of technology use in society and effects on teaching and learning. Includes strategies for developing technology-rich curriculum and techniques for enhancing learning through integration of technology and 21st century skills.

EDU 382. Assessmnt, Curric, Instructn. 3 Credits. (3 Lec) F,S
PREREQUISITE: EDU 222IS or EDU 223IS. COREQUISITE: EDU 370. Fundamental concepts of differentiated educational assessment for classroom teachers including the alignment of assessment to curriculum standards and essential understandings, quality of assessment, principles of item construction, evaluation of student responses, interpretation of results, and improvement of techniques.

EDU 395. Practicum. 3 Credits. (3 Lab; 12 cr max) F,S,Su
PREREQUISITE: Completion of M 1330, EDU 382, and good standing in Teacher Education Program. COREQUISITE: Methods course in teaching major. Students will be assigned to school classrooms to observe children, teachers, and teaching strategies and to co-teach lessons in classrooms. Sections will be specific to grade level 5-12, K-8, or K-12. See advisor for appropriate section and information on term offerings.

EDU 397. METHODS. 3 Credits. (2 Lec, 1 Lab; 25 cr max) PREREQUISITE: EDU 382 and good standing in the Teacher Education Program. Experiences which enhance student understanding of how children make art, appreciate historical aspects of art, and construct their place in a social world. Students explore these concerns through studio experiences, readings, written reports, and locating and gathering resources for teaching art. METHODS K-8 CREATIVE ARTS: PREREQUISITE: EDU 382 and good standing in the Teacher Education Program. This course provides active engagement with the elements and skills of the creative arts, principally focusing on visual art and music. Teacher candidates prepare to guide school age learners as they engage in creative processes and explore historical and cultural aspects of the arts. METHODS K-8 HEALTH ENHANCEMENT: PREREQUISITE: EDU 382 and good standing in Teacher Education Program. The theoretical and practical aspects of teaching health enhancement in the elementary schools. METHODS K-8 HEALTH ENHANCEMENT: The class is designed to provide the elementary education student with a conceptual understanding of school-age health enhancement (health and physical education), to include relationships between movement concepts and skill analysis, the ten comprehensive school health areas, and health-related behavior. METHODS K-8 LANGUAGE ARTS: PREREQUISITE: EDU 331 and good standing in Teacher Education Program. This course provides instruction in best practices for teacher candidates, which links current theory and practice of literacy instruction in grades K-8. Through experiential learning, students will explore methods and approaches to teaching English language arts. METHODS K-8 MATH: PREREQUISITE: EDU 382, M 132, M 133G, M 234, and good standing in Teacher Education Program. This course focuses on mathematics and mathematics teaching methods, mathematics diagnosis and correction, and mathematics curriculum standards for the K-8 classroom. METHODS K-8 SCIENCE: PREREQUISITE: EDU 382, completion of 3 required science courses, and good standing in Teacher Education Program. This course focuses upon methods of teaching science inquiry skills, content, and attitudes in the elementary classroom.

EDU 397R. METHODSK-8 Social Studies. 3 Credits. (3 Lec) F,S,Su odd years 3 cr. Lec 3 PREREQUISITE: EDU 382, completion of 3 required social science courses, and good standing in the Teacher Education Program. Identification of goals, objectives, and instructional strategies for elementary social studies.

EDU 401. Intro Lit Leadership Ed. 3 Credits. (3 Lec) F,S
PREREQUISITE: EDU 330 or EDU 397 (K-8 Methods: Language Arts), and good standing in Teacher Education Program, or consent of instructor. PREREQUISITE or COREQUISITE: EDU 395. This course will introduce students to the role and responsibilities of reading specialists in the professional school setting. Topics include collaborating with colleagues, parents, and the community, current practice in literacy professional development, and reading policy.

EDU 408. Professional Issues: K-12. 2 Credits. (2 Lec) F,S
PREREQUISITE: Senior standing, completion of all coursework, and good standing in Teacher Education Program. COREQUISITE: EDU 495. Overview of salient issues to include applied evaluation, classroom management and discipline, cooperative learning, law, contracts, certification, professional organizations, ethics, resume, job seeking, and professionalism.

EDU 409. Professional Issues: K-8. 2 Credits. (2 Lec) F,S
PREREQUISITE: Senior standing, completion of all required EDEL methods courses, and good standing in Teacher Education Program. COREQUISITE: EDU 495. Senior capstone course. Review the role of teachers and elementary school; school law; teacher contracts; certification; professional organizations; ethics; job seeking; job success; cooperative learning; and other critical issues for elementary education majors.

EDU 411. ESL/Teaching Culturally/Linguistically Diverse K-12 Students. 3 Credits. (3 Sem) F,S
PREREQUISITE: EDU 211 and EDU 222IS or EDU 223IS, or consent of instructor; EDU 382 may be taken as a co-requisite. This course provides an overview of linguistically/culturally appropriate instructional strategies for K-12 teachers to implement with English Language Learners in the regular classroom. This course examines current research, controversial issues, and best practices surrounding second language acquisition and language learning.

EDU 422. Ed Computing Mgmt/App. 1-3 Credits. (1-3 Ind; 3 cr max) On Demand PREREQUISITE: EDU 370. A flexible format that allows the student to select hands-on learning modules based on student need and interest in educational technology and 21st century skills.

EDU 431. Teaching Reading 4-8. 4 Credits. (4 Lec) F,S,Su alternate years to be offered odd years PREREQUISITE: EDU 382, EDU 331, and good standing in Teacher Education Program. Current theory and practice addressing literacy instruction in grades 4-8, with special emphasis on middle school. Topics include reading strategies, the writing process, and workshop approaches to literacy.
EDU 432. Lit and Literacy for Yng Adlts. 3 Credits. (3 Lec) F
3 cr. LEC. 3 PREREQUISITE: EDU 331 Survey of materials for young adult readers. Includes literary analysis, pedagogy, electronic resources, and motivational strategies.

EDU 438. Lrscy Asmnt. Diagnos. and Instr. 3 Credits. (2 Lec, 1 Lab) F,S
PREREQUISITE: EDU 330 or EDU 397 (Methods: K-8 Language Arts); and EDU 438, and good standing in Teacher Education Program. Current theory and techniques in literacy assessment and individualization. Emphasis will be on specific instructional strategies that focus on independence in reading and writing. A practicum is included.

EDU 470. Advanced Educ Technology. 3 Credits. (2 Lec, 1 Lab) F
Hands on experiences in the production of advanced instructional media materials. Emphasis on exploitation of techniques using current and cutting edge technologies. Appropriate for media specialists, teachers, trainers and communicators interested in using the new technology tools.

EDU 481. Literacy Across the Curriculum. 2 Credits. (2 Lec) S
PREREQUISITE: EDU 330 or EDU 397 (Methods: K-8 Language Arts); and good standing in the Teacher Education Program. PREREQUISITE or COREQUISITE: EDU 395. Techniques, materials, and theories in teaching effective reading skills in all content fields, grades 5-12.

EDU 490R. Undergraduate Research. 1-6 Credits. (1-6 Ind; 12 cr max) F,S,Su
Max 12 cr. Directed undergraduate research which may culminate in a research paper, journal article, or undergraduate thesis. Course will address responsible conduct of research. May be repeated.

EDU 491. Special Topics. 1-4 Credits. (1-4 Lec; 12 cr max) On Demand
Max 12 cr. PREREQUISITE: Course prerequisites as determined for each offering. Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

EDU 492. Independent Study. 1-3 Credits. (1-3 Ind; 6 cr max) On Demand
Max 6 cr. PREREQUISITE: Junior standing and as determined for each offering. Topics offered at the upper division level which are not covered in regular courses. Students participate in preparing and presenting discussion material.

EDU 493. Study Abroad. 1 Credit. (1 Sem; 4 cr max) On Demand
PREREQUISITE: Junior standing and as determined for each offering. Topics offered at the upper division level which are not covered in regular courses. Students participate in preparing and presenting discussion material.

EDU 494. Seminar: Lab Safety. 1 Credit. (1 Sem; 4 cr max) S
PREREQUISITE: Junior standing. Topics offered at the upper division level which are not covered in regular courses. Students participate in preparing and presenting discussion material.

EDU 495. Student Teaching. 5-16 Credits. (5-16 Ind; 16 cr max) F,S,Su
5-16 cr. IND PREREQUISITE: Senior standing, completion of all required coursework and good standing in Teacher Education Program. COREQUISITE: EDU 408 for Student Teaching Level 5-12. Specific sections determine grade level: either K-8, 5-12, or K-12. Observation and teaching in a classroom setting; preparation and delivery of lesson plans, and teacher work sample. The student teaching experience will occur under the supervision of experienced teachers and MSU field supervisors.

EDU 496. Methods: K-12 Modern Languages. 4 Credits. (3 Lec, 1 Lab) S
PREREQUISITE: EDU 382, 20 or more credits in subject area, and good standing in Teacher Education Program. COREQUISITE: EDU 395 (for teaching majors in this subject). Provides prospective foreign language instructors with a practical and theoretical foundation for planning (including lesson/unit), implementing teaching, and evaluating programs and learning for levels K-12. Content reading skills are also addressed. Includes practicum experience for majors only.

EDU 497. Methods. 3 Credits. (2 Lec, 1 Lab; 20 cr max)
METHODS 5-12 AG & TECH ED: PREREQUISITE: EDU 382, 20 or more credits in subject area and good standing in Teacher Education Program.
COREQUISITE: EDU 395 (for teaching majors in this subject). Problem solving approach to planning (including lesson/unit), teaching and evaluating vocational and technology education at the middle and secondary school levels. Content area reading will be investigated. Includes practicum experience. METHODS 5-12 ART: PREREQUISITE: EDU 382, 20 or more credits in subject area and good standing in Teacher Education Program. COREQUISITE: EDU 395 (for teaching majors in this subject). Emphasizes the teacher-artist as the essential resource for art experiences in the schools. Readings and written assignments, exploring curriculum content and program implementation, media, resources, content reading, lesson/unit planning and evaluation issues in art education. Includes practicum experience.
METHODS 5-12 ENGLISH: PREREQUISITE: EDU 382, 20 or more credits in subject area and good standing in Teacher Education Program. COREQUISITE: EDU 395 (for teaching majors in this subject). Teaching strategies, methods and materials for planning (including lesson/unit); implementing evaluating language arts instruction. Includes components on course design, writing, reading, literature, speaking and media instruction, and professional development. Includes practicum experience.
METHODS 5-12 SOCIAL STUDIES: PREREQUISITE: EDU 382, 20 or more credits in subject area, and good standing in Teacher Education Program. COREQUISITE: EDU 395 (for teaching majors in this subject). Curriculum, materials, procedures and content reading for planning (including lesson/unit); implementing, teaching, and evaluating social studies programs in secondary schools. Includes practicum experience. METHODS 5-12 FAMILY AND CONSUMER SCIENCES: PREREQUISITE: EDU 382, 20 or more credits in subject area, and good standing in Teacher Education Program. COREQUISITE: EDU 395 (for teaching majors in this subject). Teaching strategies, methods, materials, and content reading for planning (including lesson/unit); implementing and evaluating family and consumer science programs. Includes practicum experience. METHODS 9-12 MATHEMATICS: PREREQUISITE: EDU 382, 20 or more credits in subject area, and good standing in Teacher Education Program. COREQUISITE: EDU 395 (for teaching majors in this subject). Effective techniques in presenting materials, and planning class activities (including lesson/unit). Methods of teaching and evaluating algebra, geometry, trigonometry, probability/statistics; application of current mathematics education research and reading in the content area of mathematics. Includes practicum experience. METHODS 5-12 HEALTH ENHANCEMENT: PREREQUISITE: EDU 382, EDU 397 (Methods: K-8 Health Enhancement) 20 or more credits in subject area, and good standing in Teacher Education Program. Developing pedagogical content knowledge by focusing on research based instructional strategies, methods, materials, and content reading for planning, implementing, and evaluating health enhancement lessons, units, and programs in secondary schools. Includes practicum experience. METHODS 5-12 SCIENCE: PREREQUISITE: EDU 382, 20 or more credits in subject area, and good standing in Teacher Education Program. Developing pedagogical content knowledge by focusing on research based instructional strategies, methods, materials, and content reading for planning, implementing, and evaluating science inquiry skills, content, attitudes, and safety in the secondary classroom.

EDU 497R. Methods: 5-8 Mathematics. 3 Credits. (2 Lec, 1 Lab) S
PREREQUISITE: EDU 382, 20 or more credits in subject area, and good standing in Teacher Education Program. Effective techniques in presenting materials, planning class activities, and creating good learning experiences. Methods of teaching and evaluating arithmetic, remedial mathematics, basic geometry, introductory algebra, and reading/writing mathematics.

EDU 498. Internship. 1-5 Credits. (1-5 Ind; 5 cr max) On Demand
Max 5 cr. PREREQUISITE: EDU 382 and consent of instructor. An individualized assignment with a professional agency to provide a guided field experience.

EDU 602. Educational Statistics II. 3 Credits. (3 Lec) S
PREREQUISITE: EDCI 501. The application of statistical processes to the analysis of educational data. Educational problems that apply multivariate ANOVA; multiple comparison techniques, ANCOVA, multiple regression, and factor analysis in their solution are included.

EDU 606. Mixed Methods Research Design in Education. 3 Credits. (3 Lec) S
PREREQUISITES: The prerequisites for this course include: EDCI 507 – Qualitative Research Methods with a grade of C or better and EDCI 501 – Educational Statistics 1 with a grade of C or better. This course provides students an advanced mixed methods research knowledge and concepts, including research designs, strategies for data collection, analysis, and integration of both qualitative and quantitative findings of a research, and its applications in education research.
EDU 607. Quantitative Educational Research. 3 Credits. (3 Lec) F
PREREQUISITES: EDCI 502, EDCI 506, and graduate standing. This course explores the implications of and application of the quantitative research paradigm to systematic inquiry within the field of education. The course includes quantitative designs, design-related data collection and management methodologies, appropriate data analysis and writing strategies, and the role of quantitative research in decision-support. Students will plan and complete a quantitative research project. Course will address responsible conduct of research.

EDU 608. Advanced Quantitative Research. 3 Credits. (3 Lec) F
PREREQUISITES: EDCI 502, EDCI 507, EDI 607. Students will operationalize a research plan proposed in EDCI 507 or EDCI 607. Specifically, they will refine their research proposals to produce a dissertation proposal that is defensible by piloting research procedures, data collection methods, data analysis techniques, and presentation of results in written and oral formats.

EDU 610. Qualitative Educational Research. 3 Credits. (3 Lec) F
PREREQUISITES: Graduate standing and EDCI 506. This course explores the implications and application of the qualitative research paradigm to systematic inquiry within the field of education. Methods used in qualitative research including techniques of data collection, analysis, and reporting will be reviewed. Students will plan and complete a qualitative research project. Course will address responsible conduct of research.

EDU 612. Critical Race Theory. 3 Credits. (3 Lec) F
Critical Race Theory (CRT) is an analytical framework that provides a raced-based epistemological and methodological approach to study racial inequality in education. This seminar focuses on the application of CRT to educational leadership, policy, and practice.

EDU 613. Indigenous Methodologies in Educational Research. 3 Credits. (3 Sem) F
An examination of interdisciplinary methodologies demonstrated in an sociocultural context highlighting ethical practices when researching Indigenous peoples. Students get guidance in framing a culturally attuned methodology for their research and examine critiques of Indigenous methodologies.

EDU 614. Planning Program Assessment. 3 Credits. (3 Lec) F
PREREQUISITES: Graduate standing. This course exposes students to the accepted literature, evaluation models, standards, strategies, and skills to plan and carry out an assessment or program evaluation of post-secondary educational programs or other administration settings. These assessments are aimed at various internal and external clients including accrediting agencies, national funding organizations, and other governing bodies of higher education.

EDU 637. Institutional Research and Assessment. 3 Credits. (3 Lec) F
PREREQUISITE: EDCI 506 or comparable research course and EDLD 516. This course will explore (a) the roles of institutional research and assessment in higher education; (b) appropriate measures of academic and administrative assessment, internal and external data sources, and analytic strategies; and (c) the communication of information to academic and administrative decision makers. EDCI 506 or comparable research methods course is a prerequisite for this course. It is assumed that students have a basic understanding of qualitative and quantitative approaches in research.

EDU 650. Dissertation Seminar. 1-3 Credits. (3 Sem) F
PREREQUISITE: Doctoral standing and instructor approval. This course is designed to help students prepare their dissertation proposals.

EDU 691. Doctoral Seminar. 1 Credit. (3 Sem) F, Su
PREREQUISITE: Doctoral standing and instructor approval. This course introduces and orient new students to the expectations and culture of doctoral study.

EELE - Electrical Engineering

EELE 101. Intro Electrical Fundamentals. 3 Credits. (1 Lec, 1 Lab) F, S
PREREQUISITE: M 151Q or equivalent. Lecture/laboratory introduction to electrical fundamentals including Kirchhoff’s and Ohm’s Laws, using meters and oscilloscopes, time-varying signals in electric circuits, inductors and capacitors, series and parallel circuits, introduction to digital circuits, problem solving including computer applications, technical communications, team work.

EELE 201. Circuits I for Engineering. 4 Credits. (3 Lec, 1 Lab) F, S
PREREQUISITE: EELE 101, M 172Q, COREQUISITE: PHSS 222. Introduction to circuit analysis, Ohm’s and Kirchhoff’s Laws, nodal and mesh methods, network theorems; resistors, capacitors, inductors, dependent sources, ideal op-amps; the complete response of first order circuits; complex frequency and phasors; steady-state AC circuits, coupled inductors and ideal transformers.

EELE 203. Circuits II for Engineering. 4 Credits. (3 Lec, 1 Lab) S
PREREQUISITE: EELE 201, M 274. Natural and forced response of R-L-C circuits, frequency response of R-L-C circuits and Bode plots, frequency response, slew-rate and DC imperfections of real op-amps; Laplace Transform, Fourier series and Fourier Transform techniques in circuit analysis; basic R-L-C and op-amp filters; two port networks.

EELE 217. The Science of Sound. 2 Credits. (2 Lec) S
PREREQUISITE: M 121Q, M 132, or M 105Q, or the equivalent. Introduction to the principles of musical acoustics, sound systems, and audio technology for non-engineering students. This course is particularly geared toward students in the College of Arts and Architecture and in the Music Technology program.

EELE 250. Circuits, Devices and Motors. 4 Credits. (3 Lec, 1 Lab) F, S
An introductory course in the fundamental concepts of classical digital design. Course covers design and implementation of combinational logic circuits, synchronous sequential circuits and information storage circuits. Basic concepts of Hardware Description Languages (HDLs), design and simulation of digital systems using HDLs, and digital system implementation with programmable logic devices are presented.

EELE 290R. Undergraduate Research. 1-6 Credits. (1-6 Ind; max unlimited) F, S
Directed undergraduate research which may culminate in a written work or other creative project. Course will address responsible conduct of research. May be repeated.

EELE 291. Special Topics. 1-4 Credits. (1-4 Lec; 12 cr max) On Demand
PREREQUISITE: None required but some may be determined necessary by each offering department. Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

EELE 292. Independent Study. 1-3 Credits. (1-3 Ind; 6 cr max) On Demand
PREREQUISITE: Consent of instructor and approval of department head. Directed research and study on an individual basis.

EELE 308. Signals and Systems Analysis. 3 Credits. (3 Lec) F
PREREQUISITE: EELE 203, M 273Q. Discrete and continuous time signals and systems. Properties, application, synthesis and analysis for the CT and DT Fourier Series, the Fourier transform, the DTFT, z and Laplace transform. Applications in differential and difference equations, sampling, feedback, and communications. Introduction to the DFT.

EELE 317. Electronics. 4 Credits. (3 Lec, 1 Lab) F
PREREQUISITE: EELE 203. This is an introductory course in electronics. It introduces diodes, bipolar junction transistors, field effect transistors and bipolar and MOS analog and digital circuits.

EELE 321. Intro To Feedback Controls. 3 Credits. (3 Lec) S
PREREQUISITE: EELE 308 or EMEC 303 or consent of instructor. Classical continuous-time, transfer function approach to control systems engineering. Approximations, linearization, and time response. Design and analysis via root-locus, Nyquist, and Bode methods. Proportional, dominant pole, lead, lag, PID, and minor loop compensation. Describing functions. Lab exercises incorporate a variety of hand-on control systems.

EELE 334. Electromagnetic Theory I. 3 Credits. (3 Lec) F
PREREQUISITE: PHSS 222, M 273Q. Basic electric and magnetic fields including transmission lines. The materials covered will include both static and dynamic fields, traveling waves, and transmission line concepts such as impedance, reflection coefficient, and transient response.

EELE 354. Electric Power Applications. 3 Credits. (2 Lec, 1 Lab) F
PREREQUISITE: M 166Q or M 172Q and PHSS 207 or PHSS 222. An applied study of electricity and electrical power circuits, with laboratory experience, for that person not expected to deal with electronics or advanced circuit techniques. Topics covered include electrical circuit laws; power and energy; alternating current circuits; residential, commercial and industrial wiring; wire sizing, three-phase circuits; and application of transformers and electric motors.

EELE 355. Energy Conversion Devices. 4 Credits. (3 Lec, 1 Lab) S
PREREQUISITE: EELE 203. Three-phase power; electromechanical energy conversion devices and motor drives; introduction of power electronic converters for power control and motor drive applications. Laboratory experience includes power measurements; experience with transformers and motor-generator operational characteristics and DC and AC motor drives operation.
ELEL 367. Logic Design. 4 Credits. (3 Lec, 1 Lab) S
PREREQUISITE: ELEL 261 Advanced combinational and sequential logic design. Hardware descriptive language (HDL) programming knowledge. Laboratory experience implementing advanced logic designs using FPGAs.

ELEL 371. Microprocessor HW and SW Systems. 4 Credits. (3 Lec, 1 Lab) F
PREREQUISITE: ELEL 261 and knowledge of a programming language or consent of instructor. Introduction to the structure of microprocessors, arithmetic and logic units, processor control, interrupts, memories, and input/output. Laboratory experience in assembly level programming of microprocessor applications.

ELEL 394. Multidisciplinary Seminars. 1 Credit. (1 Seminar) F,S
PREREQUISITE: Junior standing. Students attend seminars presented by a variety of departments and disciplines to gain an appreciation of multidisciplinary environments leading to a greater understanding of the impact of engineering solutions in a global and societal context.

ELEL 407. Intro To Microfabrication. 3 Credits. (2 Lec, 1 Lab) F
PREREQUISITE: Junior standing and PHSS 222 or PHSS 207. Provide an introduction to clean room safety protocol and micro fabrication. Lectures will introduce micro fabrication methods, models and equipment. Laboratories will perform the steps to produce and characterize a metal-oxide-semiconductor transistor.

ELEL 408. Photovoltaic Systems. 3 Credits. (2 Lec, 1 Lab) S
PREREQUISITE: PHSS 222. Provide a basic understanding of the design, fabrication and operating principles of solar cells and how they are integrated into photovoltaic systems. Laboratories will perform the steps required to produce and characterize silicon solar cells.

ELEL 409. EE Material Science. 3 Credits. (3 Lec) F
PREREQUISITE: ELEL 317. Basic material properties of dielectrics, magnetic materials, conductors, and semiconductors. Practical applications of materials to semiconductor devices.

ELEL 411. Advanced Analog Electronics. 3 Credits. (3 Lec) S
PREREQUISITE: ELEL 317. This course covers differential and multistage amplifiers, frequency response, feedback, analog integrated circuits, filters, and tuned circuits, analog to digital and digital to analog conversion, noise in electronics, current topics.

ELEL 414. Intro to VLSI Design. 3 Credits. (3 Lec) F
PREREQUISITE: ELEL 261, ELEL 317. Introduction to the fundamentals of CMOS VLSI circuit design. This course covers CMOS device characteristics and timing, CMOS fabrication, CAD tools, design rules, simulation and layout, CMOS combinational and sequential logic, SRAM and DRAM memory, and dynamic logic design.

ELEL 417. Acoustics/Audio Engineering. 3 Credits. (3 Lec) F
PREREQUISITE: ELEL 317. This course covers basic principles of acoustics, audio engineering, and audio signal processing. Propagation of sound in enclosures. Engineering analysis of loudspeakers, microphones, and recording devices. Human psychoacoustics.

ELEL 422. Intro to Modern Control. 3 Credits. (3 Lec) F

ELEL 432. Applied Electromagnetics. 3 Credits. (3 Lec) S
PREREQUISITE: ELEL 334 or PHSS 423. Advanced study of electromagnetic wave propagation, including polarization, reflection and refraction at interfaces, and cavities and multilayer structures, to investigate a number of practical devices with applications related to electrical engineering and optics, such as waveguides, fiber optics, and antennas.

ELEL 445. Telecommunication Systems. 4 Credits. (3 Lec, 1 Lab) S
PREREQUISITE: ELEL 308, ELEL 317. Introduction to analog and digital communication systems with lab. Topics include signals in communications; noise characterization; bandwidth considerations; probability of error; analog and digital modulation; frequency domain analysis; matched filter applications. Experiments involve modulation, demodulation, A/Ds, sampling theory, and aliasing.

ELEL 447. Mobile Wireless Communications. 3 Credits. (3 Lec) F
PREREQUISITE: ELEL 445. Characteristics of the radio environment, propagation, cellular concepts, channel allocation, modulation techniques, multiple access techniques, Shannon’s Capacity Theorem, error-correcting codes, data compression, spread spectrum modulation, current wireless communication systems.
EELE 488R. Electric Engineering Design I. 2 Credits. (2 Sem) F
PREREQUISITE: EELE 317 and EGEN 310R. Part I of a two consecutive semester senior capstone design sequence in Electrical Engineering. Students, under the guidance of a faculty supervisor, formulate a solution to a real-world design problem culminating in a critical design review.

EELE 489R. Electrical Eng Design II. 3 Credits. (3 Sem) F
PREREQUISITE: EELE 488R. The second of a two consecutive semester senior capstone design sequence in Electrical Engineering. Students, under the guidance of a faculty supervisor, realize, assess and document the performance of their solution to a real-world design problem.

EELE 490R. Graduate Research. 1-6 Credits. (1 Ind; 6 cr max) F,S,Su Directed undergraduate research which may culminate in a research paper, journal article, or undergraduate thesis. Course will address responsible conduct of research. May be repeated.

EELE 491. Special Topics. 1-4 Credits. (1-4 Lab; 12 cr max) On Demand PREREQUISITE: Course prerequisites as determined for each offering. Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

EELE 492. Independent Study. 1-3 Credits. (1-3 Ind; 6 cr max) On Demand PREREQUISITE: Junior standing, consent of instructor and approval of department head. Directed research and study on an individual basis.

EELE 498. Internship. 1-2 Credits. (1 Ind; 12 cr max) F,S Su PREREQUISITE: Sophomore standing and consent of instructor. On-site, one semester practicum under guidance of employer designated mentor.

EELE 499R. Capstone; Electrical Engr Dsgn. 3 Credits. (2 Lab) F,S PREREQUISITE: ENGR 310R. Senior capstone course. A design project culminates with the actual construction and demonstration of the results. Design teams report progress to the design supervisor periodically. Students are required to write a technical paper, participate in a Design Fair, and generate complete technical documentation for the project.

EELE 503. Advanced Analog Circuit Design. 3 Credits. (3 Lec) F alternate years to be offered odd years PREREQUISITE: EELE 317. Solid-state device models, p-type and n-type semiconductor devices, measurement and simulation of electronic circuits.

EELE 505. MEMS Sensors and Actuators. 3 Credits. (2 Lec, 1 Lab) S alternate years to be offered even years PREREQUISITE: EELE 409. Microfabrication of mechanical and electronic devices. Theory of various mechanical transducers and physical sensors including optical MEMS, RF MEMS, and Bio/Chemical MEMS.

EELE 517. Acoustics/Audio Engineering. 3 Credits. (3 Lec) F alternate years to be offered even years PREREQUISITE: PHYS 222. Introduction to the principles of acoustics, audio engineering, and audio signal processing. Propagation of sound in enclosures. Engineering analysis of loudspeakers, microphones, and recording devices. Human psychoacoustics.

EELE 522. Adaptive Control. 3 Credits. (3 Lec) S alternate years to be offered even years PREREQUISITE: EELE 422. On-line parameter estimation, self tuning regulators, model reference adaptive controls. Robust control.

EELE 525. System Identification. 3 Credits. (3 Lec) F alternate years to be offered odd years PREREQUISITE: EELE 422. System identification with emphasis on off-line techniques. Stability of matrix decompositions used for identification. Recursive least squares, auto regressive techniques, hypothesis testing. Geometrical and statistical interpretations of least squares, maximum likelihood, and Bayesian estimation. Derivative and derivative-free iterative solutions. Modeling and model order selection. Analytical techniques including Lagrange multipliers.

EELE 526. Sequential State Estimation. 3 Credits. (3 Lec) F alternate years to be offered even years PREREQUISITE: EELE 422. Sequential estimation, with emphasis on Kalman filtering and smoothing. Continuous and discrete time.

EELE 528. Advanced Controls and Signals. 3 Credits. (3 Lec; 6 cr max) On Demand Max 6 cr. PREREQUISITE: EELE 422 or equivalent. Reading, discussion and exploration of original source material on advanced control systems and signal processing. Topics selected to complement current interest and existing courses; for example, computational statistical methods, estimation, modeling, compression, advanced analytical techniques, multi-dimensional systems, spectral analysis, and implementation.

EELE 533. Antenna Engineering. 3 Credits. (3 Lec) F alternate years to be offered even years PREREQUISITE: EELE 334 or equivalent. Introduction to the electromagnetic theory and practice of antenna design and analysis. Common antenna structures are studied, including dipoles, arrays, horns, and reflectors. Applications will be explored in wireless communication, remote sensing, and related fields. Numerical electromagnetic simulation techniques are used for antenna modeling.

EELE 538. Adv Top Electromagnet & Optics. 3 Credits. (3 Lec; 6 cr max) -- Advanced topics in applied electromagnetics and optics, chosen to represent current research in this field.

EELE 541. Advanced Communication Theory. 3 Credits. (3 Lec) F alternate years to be offered even years PREREQUISITE: EELE 445. Signal spectrum analysis, random processes, correlation functions, functional transformations of random variables, optimal linear filtering and estimation, statistical analysis of digital and analog modulation systems, orthogonality and related signals: time, bandwidth, and dimensionality.

EELE 543. Advanced Telecom Systems. 3 Credits. (3 Lec) F alternate years to be offered odd years PREREQUISITE: EELE 445. Digital and analog switching systems, packet and circuit telecommunication transmission networking and media switching (fiber optics, cable, microwave and satellite), network configuration, network technologies, equipment selection, system design examples and project.

EELE 547. Ad Hoc Wireless Sensor Network. 3 Credits. (3 Lec) S alternate years to be offered even years PREREQUISITE: EELE 447 and EELE 543. Stationary and mobile sensor network topologies, RF technologies, frequency selection, link layer and media access protocols, energy management techniques, mobility management, standards and applications.

EELE 548. Advanced Communication Systems. 3 Credits. (3 Sem; 6 cr max) S alternate years to be offered odd years Max 6 cr. PREREQUISITE: EELE 543 or equivalent. Reading and discussion of original source material on advanced communications systems on topics including digital communications systems, optical technologies and systems, packet networks, IP networking, wireless systems, ad hoc networks.

EELE 552. Power System Analysis/Control. 3 Credits. (3 Lec) S alternate years to be offered even years PREREQUISITE: EELE 454. Representation of power system elements, fast-decoupled power flow, optimal power flow, voltage control, load-frequency control, operation of active and reactive power flow. Application of FACTS devices in power flow control, electrical faults and contingency calculations, transient stability, dynamic stability.

EELE 555. Alt Energy Dist Gen Systems. 3 Credits. (3 Lec) S alternate years to be offered even years PREREQUISITE: EELE 355. Exploration and analysis of alternative power generation sources and systems such as wind, solar, microturbine, and fuel cells, combined sources and their design, power electronic interfacing, and energy storage systems.

EELE 556. Advanced Power Electronics. 3 Credits. (3 Lec) F alternate years to be offered odd years PREREQUISITE: EELE 451. Mathematical modeling of switching power converters, advanced power converter topologies, design constraints and control methods, design-oriented analysis techniques for applications in electro-mechanical systems, power systems, transportation systems, etc.

EELE 558. Advanced - Electrical Power. 3 Credits. (3 Lec; 6 cr max) On Demand Max 6 cr. PREREQUISITE: EELE 454 or equivalent. Reading, discussion and exploration of advanced electrical power topics including power system operation and control, power dynamics, power markets, protection, electric drives, or power electronics.

EELE 561. Digital System Design. 3 Credits. (3 Lec) S alternate years to be offered even years PREREQUISITE: EELE 468 and EELE 334 and EELE 371. Analysis and design of high speed digital systems including chip-to-chip signal propagation, transmission lines, IC package interconnect, printed circuit board design, state-of-the-art simulation tools, and measurement techniques using Time Domain Reflectometry (TDR) and Vector Network Analyzers. Research of modern topics.

EELE 565. Parallel Processing. 3 Credits. (3 Lec) F alternate years to be offered even years PREREQUISITE: EELE 466. Architecture and applications of parallel processors, major design issues, fault tolerant computing, performance measures of parallel systems, and issues in concurrent programming.

EELE 575. Research/Prof Paper/Project. 3-6 Credits. (3-6 Ind; 6 cr max) S,F,Su Maximum 6 cr. PREREQUISITE: Graduate standing. A research or professional paper dealing with a topic in the field. The topic must have been mutually agreed upon by the student and his or her major advisor and graduate committee. This course is required for students in the Electrical Engineering non-thesis (plan B) master's degree program.
EENV 340. Water Chemistry for Envir Engr. 3 Credits. (Lec 3) F
Le 3 PREREQUISITE: EGEN 335. Fundamentals of aquatic chemistry and principles of water technology for environmental engineers. Based on chemical thermodynamics. Students learn to quantify water quality and control parameters characterizing water quality. Co-convened with EENV 440. Students enrolled in this course will not be able to take EENV 540 and have it count toward degree requirements.

EENV 441. Natural Treatment Systems. 3 Credits. (Lec 3) F
Le 3 PREREQUISITE: EENV 340. Planning, design, and operation of remediation facilities emphasizing natural versus mechanical elements. Specific topics include stabilization ponds, constructed wetlands, land treatment, and on-site domestic systems.

EENV 443. Air Pollution Control. 3 Credits. (Lec 3) F

EENV 447. Hazardous Waste Management. 3 Credits. (Lec 3) S
Le 3 PREREQUISITE: Junior standing and one of the following: CHMY 211 or EGEN 335. Introduction to the technologies, regulations, political and social issues, and environmental impacts of hazardous wastes. Management approaches are developed through fundamental studies and review of case histories.

EENV 490R. Undergraduate Research. 1-6 Credits. (1 Ind) F,S,Su
Directed undergraduate research which may culminate in a research paper, journal article, or undergraduate thesis. Course will address responsible conduct of research. May be repeated.

EENV 491. Special Topics. 1-3 Credits. (1-3 Ind; 12 cr max) On Demand
PREREQUISITE: Course prerequisites as determined for each offering. Courses not required in any curriculum for which there is a particular one-time need or given on a trial basis to determine acceptability and demand before requesting a regular course number.

EENV 492. Independent Study. 1-3 Credits. (1-3 Ind; 4 cr max) On Demand
PREREQUISITE: Junior standing, consent of instructor, and approval of Department Head. Directed research and study on an individual basis.

EENV 534. Environ Eng Investigation. 3 Credits. (Lec 3) F
Alternate years, to be offered odd years. Le 3 PREREQUISITE: EENV 340 and one of the following: ECIV 431, EENV 434, ECIV 435. Laboratory and field investigations for design and analysis of environmental engineering systems.

EENV 540. Water Chemistry for Envir Engr. 3 Credits. (Lec 3) F
Le 3 PREREQUISITE: EENV 340. Fundamentals of aquatic chemistry and principles of water technology for environmental engineers. Based on chemical thermodynamics. Students learn to quantify water quality and control parameters characterizing water quality. Co-convened with EENV 440. Students enrolled in this course will not be able to take EENV 440 and have it count toward degree requirements.

EENV 561. Environ Eng Reactor Theory. 2 Credits. (Lec 2) F

EENV 562. Water Treatment Process/Design. 3 Credits. (Lec 3) S

EENV 563. Wastewater Treat Proc/Design. 3 Credits. (Lec 3) S
EENV 565. Chem Sens/Instr Envir Biotech. 2 Credits. (2 Lec) S alternate years, to be offered every even year.

LEC 2 PREREQUISITE: EENV 340 or consent of instructor. The course provides the knowledge necessary to design, manufacture, and use chemical sensors in the area of environmental biotechnology. Principles of manufacture and examples of application of chemical sensors along with the principles of measurement, signal conditioning, and data acquisition are presented to an extent that is necessary for the operation of sensors. The measurement techniques are preceded with an adequate theoretical introduction. Demonstrations of the sensors are organized in the Microsensors Laboratory located at the Center for Biofilm Engineering.

EENV 575. Research or Prof Paper/Project. 1-4 Credits. (1 Ind; 6 cr max) F,S,Su Max 6 cr. PREREQUISITE: Graduate standing. A research or professional paper or project dealing with a topic in the field. The topic must have been mutually agreed upon by the student and his or her major advisor and graduate committee.

EENV 589. Graduate Consultation. 3 Credits. (3 Lec) On Demand PREREQUISITE: Master's standing and approval of the Dean of Graduate Studies. This course may be used only by students who have completed all of their coursework (and thesis, if on a thesis plan) but who need additional faculty or staff time or help.

EENV 590. Master's Thesis. 1-10 Credits. (1 Ind; max unlimited) On Demand PREREQUISITE: Master's standing. May be repeated.

EENV 591. Special Topics. 1-3 Credits. (1 Lec; 6 cr max) On Demand PREREQUISITE: Upper division courses and other as determined for each offering. Courses not required in any curriculum for which there is a particular one time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

EENV 592. Independent Study. 1-3 Credits. (1 Ind; 6 cr max) On Demand PREREQUISITE: Graduate standing, consent of instructor, approval of Department Head and Dean of Graduate Studies. Directed research and study on an individual basis.

EENV 598. Internship. 2 Credits. (1 Lec, 1 Lab) On Demand PREREQUISITE: Graduate standing, consent of instructor and approval of Department Head. An individual assignment arranged with an agency, business or other organizations to provide guided experience in the field.

EENV 690. Doctoral Thesis. 1-10 Credits. (1-10 Ind; max unlimited) F,S,Su Prerequisite: Doctoral Standing.

EFIN - Financial Engineering

EFIN 101. Introduction to Financial Engineering. 1 Credit. (1 Lec) S
A seminar course surveying the financial engineering profession. Topics include an overview of career opportunities, problem solving processes, and an introduction to the basic financial engineering processes, professionalism, and ethics.

EFIN 301. Engineering & Economic Financial Management I. 3 Credits. (3 Lec) S PREREQUISITE: ECNS 301, EIND 354 COREQUISITE: EFIN 101 Introduction to financial engineering principles and tools used to manage risk, lower costs, and access new markets. Applications of arbitrage pricing are explored with emphasis on derivatives and applications. Numerous numerical financial applications using R and higher-level programming languages.

EFIN 401. Engineering & Economic Financial Management II. 3 Credits. (3 Lec) F PREREQUISITE: EFIN 301 This is the second course in the financial engineering course sequence. Financial engineering develops and manages financial strategies and tools in financial management. Topics include optimization, depreciation, risk management, asset value models, stress testing, credit derivatives, and regulation.

EFIN 499R. Financial Engineering Design Capstone. 3 Credits. (1 Lec, 1 Ind, 1 Rec) S PREREQUISITE: EFIN 401. A comprehensive open-ended team design project emphasizing the engineering and evaluation of financial instruments and decision support models in order to manage risk, create strategic business opportunities, lower costs and access new markets. Teamwork and communication skills emphasized. Dept of Mechanical & Industrial Engineering.

EGEN 102. Intro to Engineer Comp Apps. 2 Credits. (2 Lec) S COREQUISITE: M 171Q. Effective methods for applying the computer to common numerical problems encountered in chemical engineering. Chemical engineering examples will provide a basis for more comprehensive problems encountered in the other professional level courses.

EGEN 105. Intro to General Engineering. 2 Credits. (1 Lec, 1 Lab) F,S Provides students an opportunity to explore the fields of engineering, engineering technology, and computer science. Other topics include engineering design, career opportunities, professionalism, and ethics.

EGEN 115. Engineering Graphics. 1 Credit. (1 Lec) F,S Lec 1 Introductory course developing freehand sketching for engineering design graphics. Skills will be developed for sketching and interpreting dimensioned multi-view drawings, pictorials, sections, and assemblies.

EGEN 125GS. Tech, Innovation, and Society. 3 Credits. (3 Lec) F,Su This course explores the innovative engineering processes that connect the creative elements of science and engineering with solving problems of everyday life. Topics include understanding the role of creativity, public safety and ethics in creating technological solutions. Case studies are investigated, including applying critical thinking to exploring how innovation can help society.

EGEN 200. Designing Our Community. 1 Credit. (1 Sem) F,S This course is designed to explore issues in engineering and college academics for American Indian students in the Designing Our Community Program. The course will provide a learning community among students to ensure success in achieving their professional goals. Spring semester focuses on service learning projects.

EGEN 201. Engineering Mechanics--Statics. 3 Credits. (3 Lec) F,S,Su PREREQUISITE: PHSX 220 or PHSX 240. COREQUISITE: M 273Q or M 283Q. Equilibrium of particles and rigid bodies; static analysis of structures including trusses, beams, frames and machines; coulomb friction; area and mass centroids, moments and products of inertia.

EGEN 202. Engineering Mechanics Dynamics. 3 Credits. (3 Lec) F,S,Su on demand PREREQUISITE: EGEN 201 and M 273Q or M 283Q. Kinematics, kinetics, work-energy, and impulse-momentum for particles and rigid bodies.

EGEN 203. Applied Mechanics. 3 Credits. (3 Lec) F,S PREREQUISITE: PHSX 205 or PHSX 220 or PHSX 240. COREQUISITE: M 166Q or M 172Q. Force systems in equilibrium and applications to structural trusses and frames; section properties; distributed force systems; shear and moment distributions in beams; basic particle dynamics.

EGEN 205. Mechanics of Mtls (equiv 305). 3 Credits. (3 Lec) F,S,Su On Demand PREREQUISITE: EGEN 201 or EGEN 221. Stress and strain, Hooke's Law, thermal strain, torsion, bending of beams, combined stress, limit analysis, energy methods, virtual work, column theory.

EGEN 208. Applied Strength of Materials. 3 Credits. (3 Lec) F,S,Lec 3 PREREQUISITE: EGEN 201 or EGEN 203 or EGEN 221. Equilibrium and deformation of structural elements; concepts of stress and strain and interrelationship; representation and transformation of combined stress states; axial, torsional and flexural stresses and deformation; column buckling.

EGEN 221. Honors Statics. 3 Credits. (2 Lec, 1 Lab) On Demand PREREQUISITE: PHSX 200 or PHSX 240 and good standing in University Honors. COREQUISITE: M 273Q or M 283Q. Honors offering of engineering statics, including topics dealing with equilibrium of particles and rigid bodies; static analysis of structures including trusses, beams, frames and machines; coulomb friction; area and mass centroids, moments and products of inertia.

EGEN 290R. Undergraduate Research. 1-6 Credits. (1-6 Ind; max unlimited) F,S,S,Su Directed undergraduate research which may culminate in a written work or other creative project. Course will address responsible conduct of research. May be repeated.

EGEN 291. Special Topics. 1-4 Credits. (1-4 Ind; 12 cr max) On Demand PREREQUISITE: None required but some may be determined necessary by each offering department. Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

EGEN 292. Independent Study. 1-3 Credits. (1 Ind; 6 cr max) On Demand PREREQUISITE: Consent of instructor and approval of department head. Directed research and study on an individual basis.

EGEN 310R. Multidisciplinary Engineering Design. 3 Credits. (3 Lec) F,S PREREQUISITE: An Engineering curriculum or consent of instructor. Introduces engineering students to topics such as design process, creative design, project management, teamwork, and technical leadership while highlighting the skills needed to work in a multi-disciplinary environment.

EGEN 324. Applied Thermodynamics. 3 Credits. (3 Lec) F,S,S Su PREREQUISITE: PHSX 205 or PHSX 220. COREQUISITE: M 166Q or M 172Q. General treatment of the basic laws of thermodynamics and engineering applications with introduction to heat transfer for curricula not requiring EMEC 320/ EMEC 321 series.
EGEN 325. Engineering Economic Analysis. 3 Credits. (3 Lec) F,S,Su
PREREQUISITES: Junior standing, M 171Q or M 163Q, or instructor approval. Methods for comparing and evaluating capital investment alternatives. Concepts include the time value of money, rates of return, cash flows, incremental analysis, depreciation, influences of taxes, inflation and deflation, depreciation, replacement analysis. Emphasis is placed upon evaluating various engineering alternatives. Some open-ended design problems are included.

EGEN 330. Business Fundamentals for Technical Professionals. 3 Credits. (3 Lec) F,S,Su
PREREQUISITES: Junior Standing; and M 171Q or M165Q. Basic business topics for engineers and other technical professionals. Introduces key topics related to financial statements, accounting practices, project management, and evaluation of capital investment alternatives including present worth, rate of return, and after-tax analysis methods.

EGEN 331. Applied Mechanics of Fluids. 3 Credits. (3 Lec) F,S
Lec 1 PREREQUISITE: EGEN 208 or EGEN 205. Basic principles of fluid mechanics: pressure measurement, forces on submerged areas, fluid flow through conduits, parallel pipe systems, open channel flow, forces caused by fluids in motion, pumps, flow of air in ducts.

EGEN 335. Fluid Mechanics. 3 Credits. (3 Lec) F,S
Su on demand PREREQUISITE: EGEN 202, EGEN 205. Introduction to modern fluid mechanics.

EGEN 350. Applied Engineering Data Analysis. 2 Credits. (2 Lec) F,S,Su
PREREQUISITES: M 166Q or M 172Q. An overview of data variability and applied statistical analysis techniques for a broad range of engineering disciplines. Topics include fundamentals of probability, essential probability distributions, hypothesis testing, experimental design strategies, and regression in the context of engineering applications.

EGEN 415. Advanced Mechanics of Solids. 3 Credits. (3 Lec) F
Lec 1 PREREQUISITE: EGEN 205, Advanced topics in deformational mechanics of materials; application to contemporary engineering problems. Computer applications.

EGEN 435. Fluid Dynamics. 3 Credits. (3 Lec) S
Lec 1 PREREQUISITE: EGEN 335. Equations governing steady and unsteady fluid flow; applications to contemporary engineering problems. Computer applications.

EGEN 488. Fundamentals of Engineer Exam. 0 Credits. (0 Ind) F,S
PREREQUISITE: Must be in final two semesters of program. Student participation in engineering program assessment. Requirement to complete the Fundamentals of Engineering (FE) examination or the Major Field Test in Computer Science (CS majors only). Applications for the exams must be obtained from the students’ departments. Application deadlines: fall semester - May 15th; spring semester - December 15th.

EGEN 490R. Undergraduate Research. 1-4 Credits. (1 Ind; 12 cr max) F,S,S
Directed undergraduate research/creative activity which may culminate in a research paper, journal article, or undergraduate thesis. May be repeated.

EGEN 491. Special Topics. 1-4 Credits. (1-4 Lec; 12 cr max) On Demand PREREQUISITE: Course prerequisites as determined for each offering. Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

EGEN 492. Independent Study. 1-3 Credits. (1 Ind; 4 cr max) On Demand PREREQUISITE: Junior standing, consent of instructor, and approval of Department Head. Directed research and study on an individual basis.

EGEN 498. Internship. 1-3 Credits. (1 Int; 12 cr max) On Demand IND PREREQUISITE: Junior standing, consent of instructor and approval of Department Head. An individualized assignment arranged with an agency, business, or other organization to provide guided experience in the field. Students may not take this course the semester they graduate.

EGEN 498Z. Internship. 1-3 Credits. (1 Ind; 12 cr max) On Demand IND PREREQUISITE: Junior standing, consent of instructor and approval of Department Head. An individualized assignment arranged with an agency, business, or other organization to provide guided experience in the field. Students may not take this course the semester they graduate.

EGEN 505. Advanced Engineering Analysis. 3 Credits. (3 Lec) F
PREREQUISITE: One of the following: EMEC 425, EMEC 326, EGEN 335. Mathematical modeling of engineering systems, physical interpretation of ordinary and partial differential equations and methods of solution.

EGEN 506. Numerical Sol to Engr Problems. 3 Credits. (3 Lec) S
Numerical methods used to solve common engineering research problems. Solutions to nonlinear equations. Optimization methods.

EGEN 541. Thry Magnetic Resonance Img I. 3 Credits. (3 Lec) F,S
PREREQUISITE: Graduate standing, or consent of instructor. Advanced topics in NMR phenomena including relaxation, diffusion, chemical shift, and magnetic susceptibility, as well as experimental aspects including phase cycling, magnetic field gradients, rf coil, tuning and matching and pulse sequence development will be covered.

EGEN 542. Thry Magnetic Resonance Img II. 3 Credits. (3 Lec) F,S
PREREQUISITE: Graduate standing. Consent of Instructor. Advanced topics in nuclear magnetic resonance phenomena focusing on molecular dynamics and pulse sequence development for measuring complex dynamics will be covered.

EIND - Industrial Engineering

EIND 101. Introduction to Industrial & Management Systems Engineering. 1 Credit. (1 Lec) F
PREREQUISITE: Must be taken the first year enrolled in IE program. Overview of the industrial engineering profession. Lectures will concentrate on tools and methods of industrial and management system engineering, and their application in manufacturing and service industries.

EIND 142. Introduction to Systems Engineering. 2 Credits. (1 Lec, 1 Lab) S
Introduces students to the methods used by industrial engineers to improve efficiency and safety of human-based systems. Labs will include hands-on activities and plant tours. Contemporary industrial engineering topics will be introduced, such as designing for the environment and sustainability.

EIND 290R. Undergraduate Research. 1-6 Credits. (1-6 Ind; max unlimited) F,S
Directed undergraduate research which may culminate in a written work or other creative project. Course will address responsible conduct of research. May be repeated.

EIND 291. Special Topics. 1-4 Credits. (1 Lec; 12 cr max) On Demand PREREQUISITE: None required but some may be determined necessary by each offering department. Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

EIND 300. Engineering Management & Ethics. 3 Credits. (3 Lec) F
PREREQUISITE: WRIT 101W, COMX 111US, and Junior standing. Introduction to management, leadership and organizational theory with applications to the engineering profession. Communication skills, social responsibility and ethical decision making for managers and engineers emphasized throughout. Cases and class exercises used to illustrate contemporary problems and environments.

EIND 313. Work Design and Analysis. 3 Credits. (2 Lec, 1 Lab) S
PREREQUISITE: WRIT 101W; EIND 142 for IE majors. Covers analysis and design methods for occupational tasks to improve productivity, workplace health, and safety. Topic areas include fundamental aspects of work standards development, ergonomics, and industrial safety. The labs demonstrate example applications of these topic areas.

EIND 354. Engineering Probability and Statistics I. 3 Credits. (3 Lec) F
PREREQUISITE: M 172, Junior standing, or consent of instructor. Understanding the statistical nature of engineering processes. Emphasis on proper data collection and classification, characteristics of variables and their distributions, joint probability distributions, and establishing hypotheses and statistical significance over engineering design specifications.

EIND 364. Principles of Operations Research I. 3 Credits. (3 Lec) F
PREREQUISITE: M 221. Formulation of models and optimization techniques to facilitate engineering management decisions. Resource allocation, transportation and multiple goals via networks, linear, and integer programming with primal-dual emphasis.

EIND 371. Introduction to Computer Integrated Manufacturing. 3 Credits. (2 Lec, 1 Lab) F
PREREQUISITE: ETME 215 or consent of instructor. Introduces core concepts of computer controlled manufacturing systems and their applications. Topics include fundamentals of automation, programmable logic controllers, numerical control, industrial robotics, material handling and storage, and flexible manufacturing systems. Laboratories require students to apply course concepts in solving simulated industrial problems, and implement hardware-software solutions to meet stated objectives.

EIND 373. Production Inventory Cost Analysis. 3 Credits. (3 Lec) S
PREREQUISITE: M 161, M 165, or M 171. Industrial cost systems, accounting processes, and cost estimation; cost analysis of manufacturing processes, economic decision making and uses of cost information in making product design and product line decisions.
EIND 410. Interaction Design. 2 Credits. (2 Lec) S
PREREQUISITE: EIND 313 or EGEN 310 (or equivalent) for Engineering majors.
This course demonstrates the processes of integrating the psychology of the user into the design process as well as conducting usability testing to evaluate the design success. It emphasizes the need to understand the needs, capabilities, and emotions of the user to produce usable and desirable designs.

EIND 411. Interaction Design Project. 1 Credit. (1 Rct) S
COREQUISITE: EIND 410. Applications of interaction design methods discussed in EIND 410 to an actual product or service concept (prototype), based on student project teams guided by faculty.

EIND 413. Ergonomics & Human Factors Engineering. 3 Credits. (3 Lec) S
PREREQUISITE: EGEN 325 or EGEN 330 or equivalent. Introduction to principles of ergonomic design and the human factors in engineering. Topics include techniques of anthropometrics, biomechanics, bioinstrumentation, physiology, design error, design for special populations (e.g., those with disabilities), mental stress/workload, and risk assessment methods for work applied to common problems faced by engineers. Emphasis on design and analysis of occupational systems and consumer products which best fit job tasks or user requirements to human capabilities.

EIND 422. Introduction to Simulation. 3 Credits. (3 Lec) F
PREREQUISITE: CSCI 111 or equivalent, and EIND 354 or equivalent. Discrete simulation modeling methodology; sampling, output analysis, validation, and verification; application to varied systems design and analysis problems. Cross-listed with CSCI 477.

EIND 425. Technology Entrepreneurship. 3 Credits. (3 Lec) F
PREREQUISITE: EGEN 325 or EGEN 330 or equivalent. Introduction to principles of entrepreneurship and starting a business. Students learn how to formulate, plan, and implement a new venture, emphasizing the unique intellectual property, funding and marketing/selling concerns of technology startups. Includes extensive use of technology examples and case studies.

EIND 434. Project and Engineering Management. 3 Credits. (3 Lec) F, Su
PREREQUISITE: Junior standing. Fundamental principles of planning and executing engineering and research projects, including estimating, budgeting, scheduling, controlling, software applications, and Agile project management approaches. Focus on management practices that drive success in domestic and international projects including team development and communication practiced through a term project.

EIND 442. Facility and Material Handling Systems Design. 3 Credits. (3 Lec) F
PREREQUISITE: IMSE seniors in their last full academic year, EIND 313, EMEC 103, ETME 215, COREQUISITE: EIND 300. Senior capstone course. The first course in the senior capstone sequence. Principles and techniques for planning and designing production facilities and material handling systems. Product and process analysis, requirements, layout and support facilities. Computer-aided analysis and design.

EIND 454. Engr Probability and Stats II. 3 Credits. (3 Lec) On Demand
PREREQUISITE: EIND 354. Identification, characterization, and analysis of variation in engineering data. Includes inferential statistics, goodness of fit, applications of non-parametric statistics, curve fitting, regression, and the design of engineering experiments. A team design project is required.

EIND 455. DOE for Engineers. 3 Credits. (3 Lec) S, odd years
PREREQUISITE: EIND 354 or consent of instructor. Statistical analysis for managerial decision-making as applied to engineering problems. Single and multifactor ANOVA, randomized complete, full-blown and fractional designs with blocking and confounding. Introductions to nested and split-plot designs, multiple regression and response surface designs.

EIND 457. Regres & Multivar Analysis. 3 Credits. (3 Lec) S, even years
PREREQUISITE: EIND 354 or consent of instructor. Advanced topics in applied statistical analysis for engineers. Topics include regression techniques: ANOVA, simple linear regression, multiple linear regression, and variable selection procedures; and multivariate analysis techniques: principal components, factor analysis, canonical correlation analysis, and clustering methods. Statistical analysis for managerial decision-making as applied to engineering problems.

EIND 458. Production & Engineering Mgmt. 3 Credits. (3 Lec) S
COREQUISITE: EIND 464 or consent of instructor. Design and management of efficient production/delivery systems for goods and services, emphasizing qualitative analysis and systems approaches. Topics include forecasting, inventory management, production planning, scheduling, material planning, and lean manufacturing systems.

EIND 464. Prin of Operations Research II. 3 Credits. (3 Lec) S
PREREQUISITE: EIND 354 and EIND 364. Advanced formulation of models, optimization techniques and application to engineering design and operations management decision making. Integer programming algorithms. Stochastic models including advanced queuing and general Markov processes.

EIND 468. Managerial Forecasting & Decision Analysis. 3 Credits. (3 Lec) F
PREREQUISITE: EIND 354. Time series analysis through classical approaches; autoregression, smoothing models, and advanced time series models. Technical applications emphasized. Includes investigations into final and dependent data. Approaches designed for managers to test real applications for making decisions.

EIND 477. Quality Management Systems. 3 Credits. (3 Lec) S
PREREQUISITE: EIND 354 or EGEN 350 or consent of instructor. Introduction to industrial methods used to improve the quality of products and services and their application. Quality management approached from both qualitative and quantitative (statistical) tools. Emphasis on Six Sigma methods through case studies and projects.

EIND 490R. Undergrad Research. 1-6 Credits. (1 Ind: 12 cr max) F,S,Su
PREREQUISITE: Junior standing, consent of instructor, and approval of certifying officer. Directed undergraduate research/creative activity which may culminate in a research paper, journal article, or undergraduate thesis. Course will address responsible conduct of research. May be repeated.

EIND 491. Special Topics. 1-4 Credits. (1-4 cr.)
PREREQUISITE: Course prerequisites as determined for each offering. Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

EIND 492. Independent Study. 1-3 Credits. (1 Ind: 6 cr max) F,S,Su
PREREQUISITE: Junior standing, consent of instructor, and approval of department head or director. Directed research and study on an individual basis.

EIND 499R. Indus Eng Design Capstone. 3 Credits. (1 Lec, 1 Lab, 1 Rct) S
PREREQUISITE: EGEN 310, EGEN 325, EIND 434 and EIND 442.
COREQUISITE: EIND 458. Senior capstone course. Second course in senior capstone sequence. A comprehensive open-ended team design project emphasizing the application of industrial engineering tools and knowledge to create engineered solutions for real business needs or opportunities. Oral and written communication and project management emphasized.

EIND 506. Healthcare Delivery Systems. 3 Credits. (3 Lec) S even years
PREREQUISITES: NRSG 505 or EIND 458 or consent of instructor. This interdisciplinary course targets nursing students pursuing certification as a Clinical Nurse Leader and Industrial Engineering students who intend to work in the healthcare sector. Students will learn strategies for analyzing and improving processes, coordinating interdisciplinary healthcare teams, enhancing healthcare quality management, and reducing health risk through medical error elimination. This course is cross-listed with NRSG 608.

EIND 509. Systems Simulation. 3 Credits. (3 Lec) F odd years
PREREQUISITE: CSCI 111, EIND 354, EIND 422; or consent of instructor. Systems exhibiting randomness are modeled and statistically analyzed using a state-of-the-art simulation language. Graphical model animation, and advanced output analysis are emphasized. Applications include improvement of existing and design of new production and service systems.

EIND 510. Usability Engineering. 3 Credits. (3 Lec) F, odd years
PREREQUISITE: EIND 410 or EGEN 310R or consent of instructor. Usability engineering is an iterative design process that applies human-centered design principles integrated with user participation (usability testing) to produce usable, desirable, and sustainable products, services and systems. This project-based course will use a seminar format with industry guest speakers from various disciplines.

EIND 511. Advanced Human Factors. 3 Credits. (3 Lec) S, even years
PREREQUISITE: Basic knowledge of statistics (t-tests, ANOVA, regression, design of experiments) or consent of instructor. Advanced research methods applied to areas where ergonomics and human factors is playing a key role in increasing effectiveness, efficiency and safety of human-based systems. Example application areas include: (1) transportation systems; (2) health care systems; and (3) occupational work.

EIND 513. Human Factors in the Safety of Complex Systems. 3 Credits. (3 Lec) F, even years
PREREQUISITE: EIND 313 or EIND 413 (or equivalent); or consent of instructor. Advanced topics in human factors engineering applied to the understanding of human error in the failure of safety-critical systems. Emphasis is on understanding the system and human basis of failure in order to design systems with greater resilience. Basic and applied issues of human cognition, emotion, culture, and skill in relation to human error and system safety are explored through seminars, laboratory demonstrations and case studies.
EIND 514. Occupational Biomechanics. 3 Credits. (3 Lec) S, odd years
PREREQUISITE: Basic knowledge of statistics (t-tests, ANOVA, regression, design of experiments); EIND 413 or consent of instructor. Topics relate to occupational biomechanics and bioinstrumentation application, focused on designing for the health and safety at work. Topics include the skeletal system, physiology, fatigue assessment, stress response, psychometrics, biomechanics, work design assessments and implementation of ergonomics programs.

EIND 525. Multi-Attribute Analysis. 3 Credits. (3 Lec) F, even years.
PREREQUISITE: EIND 564. Theory, methods and applications pertinent to decision making with multiple attributes and/or multiple objectives. Special emphasis is given to multi-attribute utility theory, goal programming, and multiple criteria optimization decision-making in modern manufacturing and service systems and in design decision-making to support competitive priorities of an enterprise.

EIND 554. DOE for Engineers. 3 Credits. (3 Lec) S, odd years
PREREQUISITE: EIND 354 or consent of instructor. Statistical analysis for managerial decision-making applied to engineering problems. Single and multi-factor ANOVA, randomized complete and fractional factorial designs with blocking and confounding. Introductions to nested and split-plot designs, multiple regression and response surface designs.

EIND 557. Regression & Multivar Analysis. 3 Credits. (3 Lec) S, even years
PREREQUISITE: EIND 354 or consent of instructor Advanced topics in applied statistics for engineers. Topics include regression techniques: ANOVA, simple linear regression, multiple linear regression, and variable selection procedures; and multivariate analysis techniques: principal components, factor analysis, canonical correlation analysis, and clustering methods. Statistical analysis for managerial decision-making as applied to engineering problems.

EIND 558. Manage Forecast & Dec Analysis. 3 Credits. (3 Lec) F, odd years
PREREQUISITE: EIND 354 or EIND 457. Time series analysis through classical approaches including regression, smoothing models, and advanced time series models. Technical applications emphasized in concepts, tools, and methods. Includes investigations into financial and dependent data. Approaches designed for managers to test real applications for making decisions.

EIND 574. Management Engineering Systems. 3 Credits. (3 Lec) S, odd years
PREREQUISITE: EIND 500 or consent of instructor. Students will explore various facets of designing effective organizational and management systems. Topics will include: classical and open system organization theory, socio-technical systems theory, congruence, technology and innovation management, knowledge management, and continuous improvement in organizations. Students will complete an independent research project in addition to course readings and in-class discussion.

EIND 575. Research or Prof Paper/Project. 1-4 Credits. (1-4 Ind) F,S,Su
PREREQUISITE: Graduate standing. A research or professional paper or project dealing with a topic in the field. The topic must have been mutually agreed upon by the student, major advisor, and graduate committee.

EIND 589. Graduate Consultation. 1-3 Credits. (1-3 Ind) F,S
PREREQUISITE: Master’s standing and approval of the Dean of Graduate Studies. This course may be used only by students who have completed all of their coursework (and thesis if on a thesis plan) but who need additional faculty or staff time or help.

EIND 590. Master’s Thesis. 1-10 Credits. (1-10 Ind) F,S,Su
PREREQUISITE: Master’s standing; consent of instructor.

EIND 591. Special Topics. 1-4 Credits. (1-4 cr.)
PREREQUISITE: Upper division courses and others as determined for each offering. Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

EIND 592. Independent Study. 1-3 Credits. (1-3 Ind) F,S,Su
PREREQUISITE: Graduate standing, consent of instructor, approval of Department Head and Dean of Graduate Studies. Directed research and study on an individual basis.

EIND 598. Internship. 1-12 Credits. (1-3 Ind) On Demand
PREREQUISITE: Graduate standing, consent of instructor and approval of graduate program coordinator. An individualized assignment arranged with an agency, business or other organization to provide guided experience in the field.

EIND 690. Doctoral Thesis. 1-10 Credits. (1-10 Ind) F,S,Su
PREREQUISITE: Doctoral standing; consent of instructor.

EM - Engineering Mechanics

EM 506. Advanced Dynamics. 3 Credits. (3 Lec) On Demand
Lec 3 PREREQUISITE: EGEN 335. Kinematics of particles, rigid bodies, and mechanisms. Lagrange’s equations, constraints, applications, and numerical solutions.

EM 510. Elastic & Inelastic Analysis I. 3 Credits. (3 Lec) S
Lec 3 PREREQUISITE: EM 525 or EGEN 415. Fundamentals of linear elasticity, linear viscoelasticity and plasticity. Correspondence principles for elastic and viscoelastic materials and analogy between elastic and inelastic materials will be presented. Constitutive theories of linear elasticity, linear viscoelasticity, and plasticity. Application to static structural theories for beams, torsion, plane stress, and plane strain will be covered for elastic and inelastic behavior.

EM 518. Theory Plates & Shells. 2 Credits. (2 Lec) S alternate years, to be offered even years.
Lec 2 PREREQUISITE: EGEN 415. Theory of small plate deformations, membrane shell theory, shell bending.

EM 525. Continuum Mechanics. 3 Credits. (3 Lec) F
Lec 3 PREREQUISITE: EGEN 415. Solid and fluid mechanics, laws of vector and tensor transformations, vector and tensor calculus using cartesian tensors, theory of deformation, principles of thermodynamics, constitutive equations for elastic solids and viscous fluids.

EM 560. Finite Element Analysis in Engr. 3 Credits. (2 Lec, 1 Lab) F
Lec 2, Lab 1 PREREQUISITE: EGEN 415 or EGEN 435. General finite element analysis. Application to the classical equations of fluid, solid, and thermal mechanics.

EM 591. Special Topics. 1-4 Credits. (1-4 Lec; 12 cr max) On Demand
Max 12 cr. PREREQUISITE: Upper division courses and others as determined for each offering. Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

EM 592. Independent Study. 1-3 Credits. (1 Ind; 4 cr max) On Demand
Max 4 cr. PREREQUISITE: Graduate standing, consent of instructor, approval of Department Head and Dean of Graduate Studies. Directed research and study on an individual basis.

EMAT - Materials Engineering

EMAT 251. Materials Structures and Prop. 3 Credits. (3 Lec) F,S
PREREQUISITE: CHMY 141 or CHMY 121. COREQUISITE: M 165Q OR M 171Q. Chemistry and internal structure of solids and the relationship of structure to physical and mechanical properties of metals and nonmetallic solids.

EMAT 252. Materials Struct and Prop Lab. 1 Credit. (1 Lab) F
PREREQUISITE: WRIT 101W, CHMY 121IN for MET Majors; CHMY 141 for ME Majors COREQUISITE: EMEC 250; M 172Q for ME majors; M 165Q for MET majors. This course is intended to supplement current materials lecture course offerings. Provides students with hands-on lab experience to identify and quantify physical, electrical, and mechanical properties of engineering materials via experimental measurements. Experimental procedures and reporting are emphasized.

EMAT 350. Engineering Materials. 3 Credits. (3 Lec) S
PREREQUISITE: EMAT 251 or EMAT 252, and EMEC 252. Application of material selection to the engineering design process. Development of microstructure-processing-properties relationships on the mechanical and functional behavior of materials.

EMAT 460. Polymeric Materials. 3 Credits. (3 Lec) F
PREREQUISITE: EMAT 251, ECHM 215. The nature and special characteristics of synthetic high polymers and the technology of their manufacture and processing.

EMAT 461. Principles of Tribology. 3 Credits. (3 Lec) F
PREREQUISITE: EMEC 326 and EMEC 342 or instructor approval. Introduction to elastic and elastoplastic deformation, microstructure, and surface interactions at the micro- and nano-scale. Application of fundamental knowledge to control friction and wear behavior through lubrication, selection of materials and coatings in practical situations.

EMAT 462. Manufacturing of Composites. 3 Credits. (2 Lec, 1 Lab) S
Alternate Even Years PREREQUISITE: EMEC 341, EMEC 320, and EMEC 303; or ETME 310, ETME 203 and EGEN 324. This course will examine the fundamentals of composite manufacturing, focusing on fiber reinforced plastics. Techniques such as open molding, resin transfer molding, pultrusion, and filament winding will be covered.

EMAT 463. Composite Materials. 3 Credits. (3 Lec) F
Alternate Even Years. PREREQUISITE: EMAT 251 or EMEC 250. Structure and properties of composite materials and design procedures for composite structures.
EMAT 464. Biomedical Materials Engineering. 3 Credits. (3 Lec) F
S PREREQUISITES: EGEN 331 or EGEN 335 or ECHM 321, and EMEC 250 or EMAT 251. This course will include materials engineering as related to the selection, fabrication, and design of biomaterials, largely for medical applications. Topics will include soft and hard materials, testing and characterization techniques. Emphasis will be placed on mechanics, design, and testing.

EMAT 511. Catalysis/Applied Surface Chem. 3 Credits. (3 Lec) On Demand
PREREQUISITE: CHBE 328. The fundamental principles of catalysis, surface chemistry, and reactor design at a working research level.

EMAT 550. Failure of Materials. 3 Credits. (3 Lec) S
Alternate Even Years PREREQUISITE: One of the following: EMAT 463, EGEN 415, or EMAT 452. Concepts of brittle and ductile fracture, fatigue, creep-rupture and environmentally assisted fracture. Applications to metals, polymers, ceramics and composite materials.

EMAT 551. Advanced Composite Materials. 3 Credits. (3 Lec) S alternate years, to be offered even years.
PREREQUISITE: EMAT 463. Advanced treatment of composite materials, including constituent properties, interfaces, micromechanics, microscopic behavior, modes and mechanisms of failure.

EMAT 552. Advanced Ceramics. 3 Credits. (3 Lec) F, odd years.
PREREQUISITE: Either EMAT 251 or EMEC 250, and both EMAT 232 and EMAT 350. Advanced treatment of ceramic material including phase transformations, defect chemistry, thermodynamics, synthesis/processing, sintering theory, grain growth, and characterization. Emphasis is placed on functional properties of oxide ceramics for applications in energy conversion.

EMAT 553. Advanced Composite Materials. 3 Credits. (3 Lec) S
Alternate Odd Years PREREQUISITE: EMAT 463. Advanced treatment of composite materials, including constituent properties, interfaces, micromechanics, microscopic behavior, modes and mechanisms of failure.

EMEC - Mechanical Engineering

EMEC 100. Introduction to Mechanical Engineering. 1 Credit. (1 Lec) F
COREQUISITE: M 151Q. The mechanical engineering profession, logical process of problem solving and design, professionalism, ethics.

EMEC 103. CAE I-Engineering Graphics Communications. 2 Credits. (2 Lab) F,S
PREREQUISITE: EME majors only. EMEC 103. COREQUISITE: M 171Q for ME majors; M 151Q for MET majors. Communication through engineering graphics. The course topics include drawing utilizing sketching, 2-D CAD and 3-D solid modeling software, drawing standards, fits, and tolerances.

EMEC 203. CAE II-Mechanical Engineering Computations. 2 Credits. (1 Lec, 1 Lab) F,S
PREREQUISITE: EME majors only, EMEC 103. COREQUISITE: M 172Q. Computer methodology, use of various computer software packages in mechanical engineering applications.

EMEC 250. Mechanical Engineering Materials. 3 Credits. (3 Lec) F,S
PREREQUISITE: WRIT 101W. CHMY 141 for ME majors; CHMY 121IN for MET majors. Properties of engineering materials and ceramics as related to their structures. Material selection for engineering applications.

EMEC 290R. Undergraduate Research. 1-6 Credits. (1-6 Ind) F,S
SU PREREQUISITE: Consent of instructor and approval of department head or director. Directed undergraduate research/creative activity which may culminate in a written work or other creative project. Course will address responsible conduct of research. May be repeated.

EMEC 291. Special Topics. 1-4 Credits. (1-4 cr.) On Demand
PREREQUISITE: None required but some may be determined necessary by each offering department. Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

EMEC 292. Independent Study. 1-3 Credits. (1-3 Ind) F,S,Su
PREREQUISITE: Consent of instructor and approval of department head or director. Directed research and study on an individual basis.

EMEC 303. CAE III--Systems Analysis. 3 Credits. (3 Lec) F,S
PREREQUISITE: EMEC 203, M 273Q, M 274. COREQUISITE: EGEN 205. Course focuses on enhancing the appreciation of mathematics in ME and advancing the knowledge of mathematical methods in engineering analysis. Topics include introduction to mathematical modeling of engineering systems, linear algebra techniques, numerical methods, method of Laplace transformation, Fourier analysis, with classic and modern engineering applications.

EMEC 320. Thermodynamics I. 3 Credits. (3 Lec) F,S
PREREQUISITE: EGEN 201. Basic thermodynamic concepts, first and second laws, open and closed systems, properties of ideal and real substances, work, heat, irreversibility, and availability.

EMEC 321. Thermodynamics II. 3 Credits. (3 Lec) F,S
PREREQUISITE: EMEC 320. Vapor, gas power, and refrigeration cycles; mixtures and combustion.

EMEC 326. Fundamentals of Heat Transfer. 3 Credits. (3 Lec) F,S

EMEC 341. Adv Mechanics of Materials. 3 Credits. (3 Lec) F,S
PREREQUISITE: M 274 and EGEN 205. COREQUISITE: Concurrent enrollment in or prior completion of ETME 217 and EGEN 350. Static yield theories, introduction to fracture mechanics, analysis of fatigue, thick-walled pressure vessels, strain energy, Castigliano’s theorem, application to engineering design analysis problems.

EMEC 342. Mech Component Design. 3 Credits. (3 Lec) F,S
PREREQUISITE: EMEC 341. Requires completion of all 100-200 level courses (except core). Analysis of components used in mechanisms and machines. Topics include bolts, welds, springs, bearings, gears, belts, chains, motors, and hydraulic elements.

EMEC 360. Measurement & Instrumentation. 3 Credits. (3 Lec) F,S
PREREQUISITE: Requires completion of all 100-200 level courses (except Core), for ME majors. COREQUISITE: EGEN 350; EMEC 303 and EMEC 320 for ME majors; EGEN 324 for MET majors. THEORY and application of engineering measurement concepts including: temperature, pressure, displacement and flow sensing; calibration; statistical and uncertainty analysis; sampling; signal conditioning; 1st and 2nd order dynamic response; emphasis of computerized data acquisition and feedback-based actuation and control.

EMEC 361. Measurement & Instrument Lab. 1 Credit. (1 Lab) F,S
COREQUISITE: EMEC 360. Application of engineering measurement concepts including: temperature, pressure, displacement and flow sensing; calibration; statistical and uncertainty analysis; sampling; signal conditioning; 1st and 2nd order dynamic response.

EMEC 368. Introduction to Aerospace. 3 Credits. (3 Lec) F
PREREQUISITE: M 172, PHSS 222. Introductory course on topics relevant to aerospace engineering and science. Required for the Aerospace Minor. Topics include history, atmospheric and space vehicles, propulsion, flight vehicle performance, materials and structures, and stability and control.

EMEC 403. CAE IV--Design Integration. 3 Credits. (1 Lec, 2 Lab) F
on demand; S PREREQUISITE: EMEC 103 or EMEC 303; or instructor’s consent; junior standing. Develop the ability to use solid and parametric modeling to design and document machine parts. Geometric dimensioning and tolerancing, auxiliary views, analysis of models, advanced modeling techniques and customization are covered through hands-on experiences.

EMEC 405. Finite Element Analysis. 4 Credits. (3 Lec, 1 Rct) F,S
COREQUISITE: Concurrent enrollment in or prior completion of EMEC 342. Introduction to the finite element method emphasizing the fundamental principles of FEA. Various finite element formulations for applications to structural analysis, thermal/fluids analysis, and design. Practical computational experience using a commercial finite element computer code.

EMEC 424. Cellular Mechanotransduction. 3 Credits. (3 Lec) F
PREREQUISITE: College of Engineering students—completion of all required mathematics courses in the major; other students—permission of the instructor. Solid and fluid mechanics and relationships to cell biology. This interdisciplinary course brings together topics from both engineering and molecular biology to understand the mechanisms by which cells respond to loading. Topics selected from: musculoskeletal, circulatory, lymphatic, chondrocyte, leukocyte, and cancer cell mechanotransduction.

EMEC 425. Advanced Thermal Systems. 3 Credits. (3 Lec) F
S PREREQUISITE: EMEC 321, EGEN 335. Study of thermodynamics, heat transfer, and fluid mechanics analysis for applications to thermal systems.
EMEC 426. Thermodynamics of Propulsion Systems. 3 Credits. (3 Lec) S
PREREQUISITE: EMEC 425. Advanced Thermal Systems. An introduction to computer-aided thermodynamics calculations with applications to the mechanics and thermodynamics of aerospace propulsion systems. Includes computer-based chemical equilibrium applications and compressible fluid flow applications.

EMEC 430. Introduction to Combustion. 3 Credits. (3 Lec) F
PREREQUISITES: EMEC 321 or ECHM 407 CO REQUISITES: EMEC 326 or ECHM 322. Study of combustion science based on chemistry, thermodynamics, fluid mechanics, and transport phenomena. Stoichiometry, energetics of chemical reactions and flame structures; combustion kinetics; momentum, heat and mass transport in combustion; combustion phenomena and applications.

EMEC 436. Computational Fluid Dynamics. 4 Credits. (3 Lec. 1 Rec) F,S
PREREQUISITE: EMEC 303 and EGEN 335 and M 274. Introduction to computational methods used for the solution of advanced fluid dynamics problems. Emphasis on finite difference methods as applied to various ordinary and partial differential model equations in fluid mechanics, fundamentals of spatial discretization, numerical integration, and numerical linear algebra. A focus on the engineering and scientific computing environment. Other topics may include waves, advanced numerical methods (like spectral, finite element, finite volume), non-uniform grids, turbulence modeling, and methods for complex boundary conditions.

EMEC 444. Mech Behavior of Materials. 3 Credits. (3 Lec) F
Alternate Odd years PREREQUISITE: EMAT 251. Professional elective standing, or consent of instructor. Theory, analysis, and application of mechanical behavior of materials. Constitutive behavior. Topics selected from: plasticity, fracture mechanics, viscoelasticity, high temperature behavior, and material symmetry. Engineering behavior of materials such as metals, polymers, ceramics, composites, and biomaterials. Structure-function relationships such as stress-based growth, toughening mechanisms, fatigue, and damage-tolerant design with modern engineering materials are emphasized.

EMEC 445. Mechanical Vibrations. 3 Credits. (3 Lec) F
PREREQUISITE: EMEC 303. Requires completion of all 100-200 level courses (except Core). Vibration problems of single and multiple degree of freedom systems. Introduction to vibration of continuous bodies. Analysis of free and forced vibration problems. Effects of damping.

EMEC 447. Aircraft Structures. 4 Credits. (3 Lec. 1 Rec) On Demand
PREREQUISITE: EMEC 341 or instructor approval. An introduction to the current practices in the design and analysis of aircraft metallic and composite structures. Overview of aircraft design, analysis, testing, and certification with examples. Static and dynamic load condition analysis.

EMEC 465. Bio-inspired Engineering. 3 Credits. (3 Lec) S
PREREQUISITE: EGEN 335, EMEC 320, EGEN 310 for ME majors; consent of instructor for non-majors. Addresses design in nature and resultant solutions as inspiration for solving engineering design problems. Structural, thermal, and fluid concepts in nature will be applied to engineering. Smart structures, self-healing materials, and robotics will be introduced.

EMEC 467. Micro-Electromechanical Systems. 3 Credits. (2 Lec, 1 Lab) On Demand
PREREQUISITE: Senior standing; EELE 250 and EGEN 205; or consent of instructor. Introduction to sensors and actuators and their working principles. MEMS (microelectromechanical systems) fabrication procedures. MEMS materials and their mechanical properties. Mechanical behavior of microsystems. MEMS packaging and thermal-mechanical stresses in MEMS packages. Reliability issues in MEMS.

EMEC 489R. Mechanical Engineering Design Capstone I. 2 Credits. (1 Lec, 1 Rec) F
PREREQUISITE: EGEN 301R, ME majors only. COREQUISITE: Concurrent enrollment in or prior completion of EMEC 321, EMEC 326, EMEC 342, EMEC 360, EMEC 361, EMEC 445. Senior capstone design experience in Mechanical Engineering. Students, under the guidance of a faculty supervisor, solve real-world design problems.

EMEC 490R. Undergraduate Research. 1-6 Credits. (1-6 Ind) F,S,Su
PREREQUISITE: Junior standing, consent of instructor, and approval of certifying officer. Directed undergraduate research/creative activity which may culminate in a research paper, journal article, or undergraduate thesis. Course will address responsible conduct of research. May be repeated.

EMEC 491. Special Topics. 1-4 Credits. (1-4 cr.)
PREREQUISITE: Course prerequisites as determined for each offering. Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

EMEC 492. Independent Study. 1-3 Credits. (1-3 Ind) F,S,Su
PREREQUISITE: Junior standing, consent of instructor, and approval of department head or director. Directed research and study on an individual basis.

EMEC 495. Student Teaching: ME Consult. 1-3 Credits. (1-3 Ind; 3 cr. max) F,S,Su
PREREQUISITE: Sophomore standing in ME/MET curriculum and consent of supervising faculty. Students enrolled in this class will provide technical support for selected ME/MET courses.

EMEC 498. Internship. 1-3 Credits. (1 Ind) F,S,Su
PREREQUISITE: Junior standing, EMEC 303, EMEC 320, EMEC 341, and consent of internship coordinator. An individualized assignment arranged with an agency, business, or other organization to provide guided experience in the field.

EMEC 499R. Mech Eng Design Capstone II. 3 Credits. (1 Lec, 1 Rec, 1 Lab) F,S
PREREQUISITE: EMEC 489R or consent of instructor. ME majors only. Senior capstone design experience in Mechanical Engineering. Students implement and test the function of design prototypes, under the guidance of a faculty supervisor.

EMEC 524. Cellular Mechanotransduction. 3 Credits. (3 Lec) F
PREREQUISITE: College of Engineering students-completion of all required mathematics courses in the major; other students--permission of the instructor. Solid and fluid mechanics and relationships to cell biology. This interdisciplinary course brings together topics from both engineering and molecular biology to understand the mechanisms by which cells respond to loading. Topics selected from: musculoskeletal, circulatory, lymphatic, chondrocyte, leukocyte, and cancer cell mechanotransduction.

EMEC 525. Conduction Heat Transfer. 3 Credits. (3 Lec) F
PREREQUISITE: EMEC 326. COREQUISITE: EMEC 510. Advanced topics in conduction heat transfer with emphasis on analytical techniques including separation of variables, Duhamel’s theorem, two-phase problems, and numerical techniques.

EMEC 530. Advanced Fluid Mechanics I. 3 Credits. (3 Lec) S alternate years, to be offered odd years.
PREREQUISITE: EGEN 335 or ECHM 322. COREQUISITE: EM 525 or consent of instructor. Review of conservation equations, laminar and turbulent internal flows, potential flows, and Stokes flow.

EMEC 531. Advanced Fluid Mechanics II. 3 Credits. (3 Lec) S alternate years, to be offered even years.
PREREQUISITE: EGEN 335 or ECHM 322. COREQUISITE: EM 525. Laminar boundary layer and free shear flows, internal and external compressible flows.

EMEC 533. Transport Phenomena. 3 Credits. (3 Lec) On Demand
PREREQUISITE: EMEC 531. Comprehensive treatment of mass, momentum, and energy transport. This course is cross-listed with ECHM 533.

EMEC 536. Computational Fluid Mechanics. 3 Credits. (3 Lec) F alternate years, to be offered even years.
PREREQUISITE: EGEN 335 or ECHM 322. COREQUISITE: EM 525. Laminar boundary layer and free shear flows, internal and external compressible flows.

EMEC 545. Advanced Mechanical Vibrations. 3 Credits. (3 Lec) On Demand

EMEC 565. Smart Structures. 3 Credits. (3 Lec) On Demand
PREREQUISITE: EMEC 303 and EMEC 342 and EMEC 445, or equivalent. Analysis and design of intelligent structures for aerospace, mechanical, and civil applications. Topics include piezoelectricity, shape memory effects, magneto rheology, and biomimicking.

EMEC 575. Research or Prof Paper/Project. 1-4 Credits. (1-4 Ind) F,S,Su
PREREQUISITE: Graduate standing. A research or professional paper or project dealing with a topic in the field. The topic must have been mutually agreed upon by the student and his or her major advisor and graduate committee. This course can be used toward fulfilling the requirements for the Master of Science in Mechanical Engineering for non-thesis option students.

EMEC 589. Graduate Consultation. 1-3 Credits. (1-3 Ind) F,S,Su
PREREQUISITE: Master’s standing and approval of the Dean of Graduate Studies. This course may be used only by students who have completed all of their coursework (and thesis, if on a thesis plan) but who need additional faculty or staff time.

EMEC 590. Master’s Thesis. 1-10 Credits. (1-10 Ind; unlimited max) F,S,Su
PREREQUISITE: Master’s standing; consent of instructor. May be repeated.

EMEC 591. Special Topics. 1-4 Credits. (1-4 cr.)
PREREQUISITE: Upper division courses and others as determined for each offering. Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.
EMEC 592. Independent Study. 1-3 Credits. (1-3 Ind) F,S,Su
PREREQUISITE: Graduate standing, consent of instructor, approval of department head or director. Directed research and study on an individual basis.

EMEC 594. Seminar. 1 Credit. (1 Sem) F,S
PREREQUISITE: Graduate standing or seniors by petition. Course prerequisites as determined for each offering. Topics offered at the graduate level which are not covered in regular courses. Students participate in preparing and presenting the discussion material.

EMEC 598. Internship. 1-12 Credits. (1-3 Ind) On Demand
PREREQUISITE: Graduate standing, consent of instructor and approval of graduate program coordinator. An individualized assignment arranged with an agency, business or other organization to provide guided experience in the field.

EMEC 690. Doctoral Thesis. 1-10 Credits. (1 Ind; max unlimited) F,S,Su
Max credits unlimited. PREREQUISITE: Doctoral standing; consent of instructor.

ENGL - English

ENGL 290R. Undergraduate Research. 1-6 Credits. (1-6 Ind; max unlimited) F,S
Directed undergraduate research/creative activity which may culminate in a written work or other creative project. Course will address responsible conduct of research. May be repeated.

ENGL 339. Teaching Writing in Secondary School. 3 Credits. (3 Rct) S
PREREQUISITE: WRIT 101 and LIT 201. Explores theoretical and practical issues related to teaching textual production within secondary English classrooms, including, but not limited to the following: creating assignments, assessing and evaluating student textual production, standardized writing assessments, and multi-modal and digital composing processes.

ENGL 445. Teaching Reading and Literature. 3 Credits. (3 Rct) S
PREREQUISITE: ENGL 339 Explores theoretical and practical issues related to teaching textual consumption within secondary English classrooms, including, but not limited to the following: reading strategy instruction, applying literary theories to the teaching of literature, and linking literacy and literature pedagogies.

ENGL 450. Rhetoric and Composition. 3 Credits. (3 Lec) F or S PREREQUISITE: Junior standing or consent of instructor. Intensive study in composition/rhetorical theory.

ENGL 461R. Issues in English Education. 3 Credits. (3 Rct) F
PREREQUISITE: EDU 497, senior standing. Senior capstone course for senior English teaching majors and minors. Explores current trends and issues within the field of English Education. At least one-third of this course will focus on students’ original research related to English Education.

ENGL 490R. Undergraduate Research. 1-6 Credits. (1 Ind; 12 cr max) F,S,Su
Max 12 cr. Directed undergraduate research/creative activity which may culminate in a research paper, journal article, or undergraduate thesis. Course will address responsible conduct of research. May be repeated.

ENGL 505. Teaching College Composition. 2 Credits. (2 Sem) F
PREREQUISITE: Matriculation in the English M.A. or possession of an M.A. degree and G.T.A. or instructor standing. Writing pedagogy applicable to teaching writing at the college level. Covers major problems and issues in writing instruction (e.g. assignment design, work-shopping writing, evaluating writing). Required for English graduate teaching assistants concurrent with their first semester of teaching.

ENGL 510. Studies in Critical Theory. 3 Credits. (3 Sem; 6 cr max) S
Max 6 cr. PREREQUISITE: Graduate standing and upper division literary theory courses. Topics in critical theory and practice. Explores how historical and contemporary theories of literature have shaped the ways readers, teachers, and critics have thought about such fundamental questions as canon formation, pedagogical practice, and the goals and purposes of literary studies as a field.

ENGL 520. Pedagogy Theory and Practice. 3 Credits. (3 Sem) S
PREREQUISITE: Graduate standing. Topics in English/literacy education. Examines different theoretical and pedagogical approaches to teaching and learning secondary English Language Arts/literacy.

ENGL 530. Writing Theory and Practice. 3 Credits. (3 Sem; 6 cr max) F
Max 6 cr. PREREQUISITE: Graduate standing and upper division writing courses. Topics in rhetoric and composition. Examines a variety of models that have historically governed composition theory and writing practice.

ENGL 550. Focused Research Seminar. 3 Credits. (3 Lec; 6 cr max) F,S
Max 6 cr. PREREQUISITE: Graduate standing. Course prerequisites as determined for each offering. Topics offered at the graduate level not covered in the required courses. Involves directed research resulting in paper, as well as participation in preparing and presenting discussion material. Topics will vary.

ENGL 575. Professional Paper. 1-6 Credits. (1-6 Ind; 6 cr max) F,S,Su
Max 6 cr. PREREQUISITE: Graduate standing. A research or professional paper or project dealing with a topic in the field. The topic must have been mutually agreed upon by the student and his or her major advisor and graduate committee.

ENGL 580. Special Topics. 1-4 Credits. (1-4 Lec; 12 cr max) On Demand
Max 9 cr. PREREQUISITE: Graduate standing or seniors by petition. Course prerequisites as determined for each offering. Advanced study of topics in the discipline, in courses not required in any curriculum, including experimental offerings of visiting professors, trial offerings of new courses, or one-time offerings of current topics.

ENGL 588. Professional Development. 1-3 Credits. (1-3 Lec; 3 cr max) On Demand
Max 3 cr. PREREQUISITE: Graduate standing, teaching experience and/or current employment in a school organization, consent of instructor and Dean of Graduate Studies. Courses offered on a one-time basis to fulfill professional development needs of in-service educators. A specific focus is given to each course, which is appropriately subtitled. May be repeated.

ENGL 590. Master’s Thesis. 1-10 Credits. (1-10 Ind; 10 cr max) F,S,Su
PREREQUISITE: Graduate standing. A thesis dealing with a topic in the field. The topic must have been mutually agreed upon by the student and his or her major advisor and graduate committee.

ENGL 591. Special Topics. 1-4 Credits. (1-4 Lec; 12 cr max) On Demand
PREREQUISITE: Graduate standing or seniors by petition. Course prerequisites as determined for each offering. Advanced study of topics in the discipline, in courses not required in any curriculum, including experimental offerings of visiting professors, trial offerings of new courses, or one-time offerings of current topics.

ENGL 592. Independent Study. 1-4 Credits. (1 Ind; 6 cr max) On Demand
Max 6 cr. PREREQUISITE: Graduate standing, consent of instructor, approval of department chair and Dean of Graduate Studies. Directed research and study on an individual basis.

ENGL 594. Graduate Seminar. 1-4 Credits. (1 Sem; 4 cr max) On Demand
PREREQUISITE: Graduate standing or seniors by petition. Course prerequisites as determined for each offering. Topics offered at the graduate level which are not covered in regular courses. Students participate in preparing and presenting discussion material.

ENGL 598. Internship. 1-12 Credits. (1-12 Lec; 12 cr max) On Demand
PREREQUISITE: Graduate standing, consent of instructor, approval of department chair, and completion of 15 credits of graduate work in English. An individualized assignment arranged with an agency, business, school, or other organization to provide guided experience in the field.

ENGR - Engineering

ENGR 610. Rsch & Mthds in Engineering. 3 Credits. (3 Lec) F
PREREQUISITE: Doctoral standing. Exploration of experimental design, statistical methods, models, and teaching issues. Methods of modern information access will also be covered.

ENGR 685. Mentored Student Teaching. 1 Credit. (1 Ind) F
PREREQUISITE: PhD student standing in the College of Engineering and ENGR 610. Students desiring a mentored teaching experience at the college level will have primary responsibility for a portion of a course and will be mentored and assisted by the instructor of the course. Students will develop assignments, deliver lectures, meet students in the practicum course, and receive intensive mentoring from the faculty.

ENGR 694. Seminar. 1-2 Credits. (1-2 Sem; 4 cr max) S
Required 2 cr. total. PREREQUISITE: Doctoral standing or consent of instructor. Seminar experience. For students enrolled before 8/07, initial enrollment immediately follows completion of ENGR 610. First time students will present and defend their thesis topics (1 credit). The second enrollment will be taken the semester prior to the student’s comprehensive exam where they will prepare and defend a formal research proposal (1 credit). For students enrolling after 8/07, ENGR 600 will be taken once as a two credit class the semester prior to scheduling the comprehensive exam; the course is designed to help the student prepare their proposal.
ENSC - Environmental Science

ENSC 110. Land Rez Environ Sciences. 3 Credits. (3 Lec) F
Introduction to environmental science associated with managed and natural ecosystems. Students will learn how to identify scientific questions from issues, and how to develop scientifically-based objective information for answering environmental and land management questions. The class is a survey of the department’s majors in agroecology, environmental biology, geospatial sciences, land rehabilitation, and soil and water science. Students must be proficient in basic algebra and have an understanding of biological principles.

ENSC 245IN. Soils. 3 Credits. (2 Lec, 1 Lab) F
3 cr. LEC 2 LAB 1 PREREQUISITE: M 097 or equivalent. Soils and their properties as components of landscapes and ecosystems. Application of soils knowledge to problems in environmental sciences and management of agricultural, wildland, and urban landscapes.

ENSC 260. Evolution for Env Scientists. 3 Credits. (3 Lec) S
PREREQUISITE: BIOB 160 Overview of the mechanisms and patterns of evolution, focusing methods in the field the role of evolutionary biology in understanding issues in environmental science.

ENSC 272CS. Water Resources. 3 Credits. (3 Lec) F
3 cr. LEC 3 An introduction to the science, uses, policy and management of fresh water resources, including hydrologic and ecologic processes, and related historic, policy, law and socioeconomic aspects. The course is intended for majors in the sciences, social sciences, and other disciplines.

ENSC 290R. Undergraduate Research. 1-4 Credits. (1 Ind; 12 cr max) F,S,Su
1 - 4 cr. IND May be repeated. Maximum 12 cr. PREREQUISITE: Freshman or sophomore standing and approval of instructor. Course will address responsible conduct of research. Directed undergraduate research/creative activity which may culminate in a research paper, journal article, or other creative project.

ENSC 291. Special Topics. 1-4 Credits. (1 Lec; 12 cr max) On Demand
1 - 4 cr. Maximum 12 cr. PREREQUISITE: None required, but some may be determined necessary by each offering department. Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

ENSC 292. Independent Study. 1-3 Credits. (1 Lec; 6 cr max) On Demand
1-3 cr. IND Maximum 6 cr. PREREQUISITE: Consent of instructor and approval of department head. Directed research and study on an individual basis.

ENSC 298. Internship. 2-4 Credits. (2-4 Lec; 12 cr max) On Demand
2 - 12 cr. IND Maximum 12 cr. PREREQUISITE: Consent of instructor and approval of department head. An individualized assignment arranged with an agency, business, or other organization to provide guided experience within the field.

ENSC 353. Environmental Biogeochemistry. 3 Credits. (3 Lec) F
PREREQUISITE: CHMY 143, ENSC 245. Foundational course will cover mechanisms controlling the behavior of inorganic and organic constituents in soil and water systems. Applications will focus on integrating biological and chemical processes to understand biogeochemical cycling, nutrient bioavailability, and the fate and transport of chemicals.

ENSC 407. Environmental Risk Assessment. 3 Credits. (3 Lec) F

ENSC 410R. Biodiversity Methods. 3 Credits. (2 Lec, 1 Lab) F
PREREQUISITE: NRSM 240 or BIOE 370; BIOB 318 or STAT 216; GPHY 284 and BIOO 230 preferred. Biodiversity survey and monitoring designs, sampling methods, and data evaluation techniques are introduced. Emphasis is on plants but other taxa are addressed for agricultural, rehabilitation and wildland systems. One week of fieldwork required prior to semester; course completion early October.

ENSC 443. Weed Ecology and Management. 3 Credits. (2 Lec, 1 Lab) F
PREREQUISITE: M 121Q, STAT 216Q or BIOB 318. The principles of weed ecology including plant population demographics, biotic and abiotic regulating mechanisms, and plant community temporal and spatial dynamics in managed ecosystems. Weed population model construction, spreadsheet calculations and thorough assessment of pest threshold theory. The study of ecologically-based weed management approaches including cultural, mechanical, biological, and chemical control practices.

ENSC 444. Watershed Hydrology. 3 Credits. (2 Lec, 1 Lab) F
PREREQUISITES: ENSC 245IN; M 151Q or M 160Q or M 165Q or M 166Q or M 171Q or M 181Q or M 182Q; PHSX 205 or PHSX 220 or PHSX 240; or consent of instructor (students who do not have these pre-reqs must see instructor); RECOMMENDED PREREQUISITE: STAT 216Q. This course provides a conceptual and quantitative introduction to the physical fundamentals of environmental and watershed hydrology. Focus is on the hydrological processes that determine how rainfall and snowmelt ultimately become stream flow and evapotranspiration. Topics include the basics of: stream flow analysis, water balances, thermal energy balances, climate and weather, soil physics, ecohydrology, groundwater hydrology, groundwater-surface water interactions, stream flow generation, and water quality. Incoming students are advised to be proficient in algebraic and spreadsheet analyses and to be familiar with the basics of probability analysis and descriptive statistics.

ENSC 445. Watershed Analysis. 3 Credits. (3 Lec) S
PREREQUISITE: ENSC 444 and STAT 216 or BIOB 318 or permission of instructor. Conceptual and quantitative introduction of watershed processes with an emphasis on modeling surface water hydrology and water resources management. Watershed modeling concepts including analysis of time series, spatially variable data, model calibration, and uncertainty analysis will be studied and demonstrated.

ENSC 448. Stream Restoration Ecology. 3 Credits. (2 Lec, 1 Lab) F
PREREQUISITE: BIOB 170, and either NRSM 240 or BIOE 370 or consent of instructor. Students will critically assess the definitions, assumptions, goals, appropriateness, and outcomes implicit in stream restoration projects in relation to ecosystem processes and dynamics in rivers and streams. Based on this information, students will critique an array of real-world stream restoration plans to identify implicit assumptions, goals, biases, and assess implementation strategies in the context of tenets of the conceptual underpinnings of stream ecology as a discipline.

ENSC 454. Landscape Pedology. 3 Credits. (2 Lec, 1 Lab) F
PREREQUISITE: ENSC 245. Processes leading to the formation and spatial distribution of soils on the landscape. Describing, classifying, and mapping soils. We explore classical approaches to evaluating soil development using concepts of soil age and residence time, and variation of soil properties with climate, geomorphic and hydrologic context, plant communities, and parent material. The course includes a substantial hands-on field component. Land use and soil management for agriculture/ landscape considered in the context of larger scale controls on soil development and distribution.

ENSC 458. Teaching Applications in LRES. 1-3 Credits. (1-2 Lab; 3 cr max) F,S
Application of teaching philosophies and methods through classroom, laboratory, and field teaching experiences.

ENSC 460. Soil Remediation. 3 Credits. (3 Lec) S
PREREQUISITE: ENSC 245. Principles of soil remediation in impacted landscapes. Soil reconstruction practices are presented for drastically disturbed lands. Treatment science is presented to repair soil systems contaminated by metals and salt as a result of resource extraction and landscape disturbance by humans. Protection of water resources are examined as related to sediment loss control, acid rock drainage science and treatment, and selective handling of geologic stratum. A field trip to a contaminated landscape will demonstrate on-going soil remediation practices.

ENSC 461. Restoration Ecology. 3 Credits. (3 Lec) F
PREREQUISITE: BIOB 170, and either NRSM 240 or BIOE 370. Review of ecosystem structure and function, and community and population processes in intact systems, along with the effects of major disturbances on natural systems. Restoration amendments will be discussed in terms of their effects on ecosystem structure and function. The course includes case studies, and focuses on plant and soil systems.

ENSC 464. Computational Techniques Environmental Science. 1 Credit. S
1 cr. LAB 1 PREREQUISITE: BIOB 170 Computational skills are increasingly important in the Environmental Sciences. This course will focus on basic computer programming using R. No prior expertise is required and exercises will begin at a basic level.

ENSC 465. Environmental Biophysics. 3 Credits. (2 Lec, 1 Lab) S
PREREQUISITE: BIOB 170 or equivalent and PHSX 205 (can be taken concurrently). The study of physical relationships between organisms, ecosystems, and their environment. Basic principles of Micrometeorology, Biontometry, Ecological Climatology, and Biophysical Ecology as applied to contemporary ecological challenges. Laboratory sessions will focus on computer exercises using ecosystem models and field observations.
ENTO 468. Ecosystem Biogeochem. 3 Credits. (3 Lec) S
PREREQUISITE: ENSC 353. Introduction to the study of biogeochemistry and ecosystem dynamics from an Earth-systems perspective. Discussion will emphasize factors governing the "grand elemental cycles" of carbon, nitrogen, and phosphorous of Earth's major ecosystems and how modern human activities are affecting these cycles.

ENTO 490R. Undergraduate Research. 1-6 Credits. (1 Ind; 12 cr max) F,S
1 - 4 cr. IND May be repeated. Maximum 12 cr. PREREQUISITE: Junior or Senior standing and approval of instructor. Directed undergraduate research/creative activity which may culminate in a research paper, journal article, or undergraduate thesis. USP scholarships or project support grants are available in many cases. Course will address responsible conduct of research. May be repeated.

ENTO 491. Special Topics. 1-4 Credits. (1-4 Lec; 12 cr max) On Demand
1 - 4 cr. Maximum 12 cr. PREREQUISITE: Course prerequisites as determined for each offering. Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

ENTO 492. Independent Study. 1-3 Credits. (1 Ind; 6 cr max) On Demand
1 - 3 cr. IND Maximum 6 cr. PREREQUISITE: Junior standing, consent of instructor, and approval of department head. Directed research and study on an individual basis.

ENTO 498. Internship. 2-4 Credits. (2 Ind; 12 cr max) F,S
S, Su 2 - 4 cr. IND Maximum 12 cr. PREREQUISITE: Junior standing, consent of instructor and approval of department head. An individualized assignment arranged with an agency, business, or other organization to provide guided experience in the field.

ENTO 499R. LRES Capstone. 3 Credits. (3 Lec) F
3 cr. LEC 3 PREREQUISITE: LRES major; Senior standing only. Senior capstone course. Provides disciplinary and interdisciplinary knowledge requiring integration and application of environmental science knowledge to natural resource management issues. Topic of course will change. Students will work both independently and in groups to research and critique the current literature related to science application. Course emphasizes writing and presentation skills, scientific methods, review of primary literature and critique of information from varied sources.

ENTO - Entomology

ENTO 510. Insect Ecology. 3 Credits. (3 Lec) S alternate years
1-3 cr. IND 201-300. PREREQUISITE: ENTO 301-401. Introduction to the study of insect ecology and community dynamics. Emphasis on seasonal adaptations, dispersion, life table analysis, r and k-selection, ecological methods, and insect-plant interactions.

ENTO 520. Insect Physiology. 3 Credits. (3 Lec) F alternate years, to be offered even years.

ENTO 525. Insect Morphology. 2 Credits. (1 Lec, 1 Lab) S alternate years, to be offered odd years.
PREREQUISITE: ENTO 204 and one of the following: BIOL 301, BIOL 412, BIOL 413, BIOL 435, BIOL 465, ENTO 514, or ENTO 525. The course focuses on a systems physiology approach, emphasizing the principles of insect physiology and insect-plant interactions. Material covered will include the digestive, respiratory, excretory, and circulatory processes, neurophysiology and communication, endocrinology, reproductive systems, muscular systems and locomotion, defensive mechanisms, and water balance. The basic course goal is to provide a strong fundamental understanding of insect physiological function as it relates to the environment. Emphasis will be placed on process comprehension.

ENTO 590. Master's Thesis. 1-10 Credits. (1 Ind; max unlimited) F,S
S, Su 1-10 cr. IND Maximum credits unlimited. PREREQUISITE: Master's standing.

ENTO 592. Independent Study. 1-3 Credits. (1 Ind; 6 cr max) On Demand
1 - 3 cr. IND Maximum 4 cr. PREREQUISITE: Graduate standing, consent of instructor, approval of Department Head and Dean of Graduate Studies. Directed research and study on an individual basis.
EQUS 291. Special Topics. 1-4 Credits. (1-4 Lec; 12 cr max) On Demand
PREREQUISITE: None required but some may be determined necessary by each offering department. Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

EQUS 292. Independent Study. 1-3 Credits. (1-3 Ind; 6 cr max) On Demand
PREREQUISITE: Consent of instructor and approval of department head. Directed research and study on an individual basis.

EQUS 327. Equine Lameness. 3 Credits. (3 Lec) F
PREREQUISITE: ANSC 100, ANSC 265/266, and EQUS 347. This course is structured to familiarize students with the many types of lameness in the horse. Students will be instructed on the correlation between anatomy, conformation, locomotion and lameness. Selected diseases of the bones, joints, and soft tissue will be discussed. Significant time will also be spent on lameness diagnosis, treatment, prognosis, as well as shoeing principles for sound and lame horses.

EQUS 346. Equine Reproductive Management. 4 Credits. (3 Lec, 1 Lab) S
PREREQUISITE: ANSC 320 and Junior standing or consent of instructor. Critical evaluation of current issues and related scientific literature in equine nutrition; application to designing effective feeding programs.

EQUS 347. Equine Form to Function. 3 Credits. (2 Lec, 1 Lab) S
PREREQUISITE: ANSC 100, ANSC 265, ANSC 266, EQUS 206, and Junior standing. Development of methods for analyzing a horse's conformation along with a good understanding of anatomy and its relationship to performance.

EQUS 423. Equine Nutrition. 2 Credits. (2 Lec) S alternate years, to be offered odd years.
PREREQUISITE: ANSC 320 and Junior standing or consent of instructor. Critical evaluation of current issues and related scientific literature in equine nutrition; application to designing effective feeding programs.

EQUS 424. Equine Exercise Physiology. 3 Credits. (3 Lec) S
PREREQUISITE: ANSC 265/266, ANSC 320, EQUS 347. This course seeks to provide a detailed understanding of equine exercise physiology. Topics covered: Physiological interactions of various systems during exercise, conditioning, training, and athletic performance; conditioning and training regimes and methods of assessing athletic fitness in horses.

EQUS 430. Horse Management. 4 Credits. (3 Lec, 1 Lab) S
PREREQUISITE: ANSC 265/266, ANSC 320, ANSC 321, ANSC 322, or consent of instructor. Horse management and problems with emphasis on behavior, nutrition, reproduction, and management programs.

EQUS 490R. Undergrad Research. 1-6 Credits. (1 Ind; 12 cr max) F,S
Directed undergraduate research which may culminate in a research paper, journal article, or undergraduate thesis. May be repeated.

EQUS 491. Special Topics. 1-4 Credits. (1-4 Lec; 12 cr max) On Demand
PREREQUISITE: Course prerequisites as determined for each offering. Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

EQUS 492. Independent Study. 1-3 Credits. (1-3 Ind; 6 cr max) On Demand
PREREQUISITE: Junior standing, consent of instructor and approval of department head. Directed research and study on an individual basis.

EQUS 494. Seminar. 1 Credit. (1 Sem; 4 cr max) On Demand
PREREQUISITE: Junior standing and as determined for each offering. Topics offered at the upper division level which are not covered in regular courses. Students participate in preparing and presenting discussion material.

ERTH - Earth Systems

ERTH 101IN. Earth System Sciences. 4 Credits. (3 Lec, 1 Lab) F,S,Su
Examination of basic geologic processes, Earth and planets through geologic time, internal geosystems, and surficial geosystems.

ERTH 102CS. Topics in Earth Sciences. 1 Credit. (1 Lec; 16 cr max) F,S
A series of 16 one-credit immersion courses offered on topics related to Earth processes and impacts on humanity such as natural hazards, resources, and policy issues. Choose any 3 for Core credit in Contemporary Issues in Science.

ERTH 201IN. Honors Earth System Science. 4 Credits. (3 Lec, 1 Lab) F
PREREQUISITE: Enrollment in the MSU Honors Program. This Honors course explores the complex interactions occurring at all scales between the Earth's geosphere, biosphere, hydrosphere, atmosphere, and anthroposphere. The goal of the course is to understand the Earth as a "system" of interconnected sources of energy through deep geologic time and space.

ERTH 212RN. Yellowstone: Scientific Lab. 4 Credits. (3 Lec) F
The Yellowstone region is an unparalleled laboratory for earth scientists. The volcanic, glacial, climatic, and ecological processes that shaped the region will be introduced through lecture, discussions, and projects. Excursions sections and field trips provide additional hands-on experiences.

ERTH 303. Weather and Climate. 3 Credits. (3 Lec) F
PREREQUISITE: ERTH 101IN. The climates of the continents, and their classification, characteristics and interrelationships with other factors of the physical and human environment.

ERTH 307. Principles of Geomorphology. 4 Credits. (3 Lec, 1 Lab) F
PREREQUISITE: ERTH 101IN; familiarity with spreadsheets and word-processing is assumed; Junior standing. Framework, process, system, and time as factors which control the generation of land forms. Laboratories involve field trips and map interpretation, and computer modeling.

ERTH 432R. Surface Water Resources. 3 Credits. (2 Lec, 1 Lab) On Demand
PREREQUISITE: Junior Standing. ERTH 101 and STAT 216 or STAT 332 and PHYS 205 or PHYS 211. Physical analysis of the surface portion of the hydrologic cycle: climate, evapotranspiration, precipitation, runoff, flooding, stream channels, sediment production, sediment transport and drainage basins. The surface-water resource in terms of regional supply and human use and intervention. Laboratory fee required.

ERTH 450R. Snow Dynamics and Accumulation. 4 Credits. (1 Lec, 2 Lab) S
PREREQUISITE: Ability to Ski/Board at intermediate level in back country alpine terrain. Junior or Senior standing; STAT 216, PHYS 205 or PHYS 220, and ERTH 101 or consent of instructor. Senior capstone for the Snow Science Option. The accumulation, redistribution, and metamorphism of snow as related to humans. Avalanche, recreation, agriculture, silviculture, runoff, and the alpine environment. Field studies are conducted on a regular basis under rigorous field conditions.

ERTH 455. Physiography of the U.S.. 3 Credits. (2 Lec, 1 Lab) On Demand
PREREQUISITE: Junior standing, ERTH 307. The physiographic provinces of the United States, their physical characteristics, evolution, and identification.

ERTH 484. Quaternary Environment. 3 Credits. (3 Sem) F even years
PREREQUISITES: ERTH 101IN and Junior standing. This course is an opportunity to learn about the history of the western US over the last 2 million years through a critical analysis of current and historic literature. It will provide an overview of the tools and approaches used to study past environmental change, significant events in the climate history of region, the geologic record of ice-age environments, including glaciation, climate, evolutionary, fluvial lakes, and vegetation, the evolution of the postglacial landscape, and important biotic and human events during the Holocene.

ERTH 490R. Undergraduate Research. 1-6 Credits. (1 Ind; 12 cr max) F,S,Su
Directed undergraduate research which may culminate in a research paper, journal article, or undergraduate thesis Course will address responsible conduct of research. May be repeated.

ERTH 491. Special Topics. 1-4 Credits.

ERTH 494. Seminar. 1 Credit. (1 Sem; 4 cr max) F
PREREQUISITE: Junior standing and as determined for each offering. Topics at the upper division level not covered in regular courses. Students participate in preparing and presenting discussion material.

ERTH 498. Internship. 2-12 Credits. (2-12 Ind; 12 cr max) On Demand
PREREQUISITE: Junior standing, consent of instructor, and approval of department head. An individualized assignment arranged with an agency, business or other organization to provide guided experience in the field.

ERTH 499. Senior Thesis/Capstone. 3 Credits. (3 Rct) F,S
PREREQUISITE: Senior standing; minimum 3.0 cum gpa; faculty recommendation. Senior thesis provides an opportunity to conduct research under the supervision of a faculty member leading to the production of a research paper ("mini-thesis") and an oral presentation to the department or at a professional meeting. Excellent preparation for graduate school and professional work.

ERTH 502. Fluvial Geomorphology. 3 Credits. (3 Lec) On Demand
PREREQUISITE: ERTH 307 or other introduction to fluvial systems or instructor permission. This course provides a foundation for understanding fluvial processes, interpreting fluvial forms, and teaches basic tools for use in watershed and river assessment. Course will cover drainage networks, channel form, and apply these concepts to a river assessment problem.
ETRC 505. Geomicrobiology. 3 Credits. (Sem) S alternate years, to be offered every year.
The course examines geochemical and microbial interactions that control earth surface processes and ultimately major biogeochemical cycles. The course focuses on how integrated approaches using geochemistry, stable isotope geochemistry, and microbial techniques are applied to research problems.

ETRC 512. Mtn & Plns Riparian Proc. 2 Credits. (Lec, 2 Sem) Su, On Demand PREREQUISITE: ERTH 101IN, secondary teaching certification plus two years teaching experience; recommended ERTH 516 and access to the world wide web. Riparian hydrologic and geomorphic processes with examples drawn from the mountains and plains. Ground-water recharge and discharge; Horton overland flow; partial variable runoff areas; riparian best management practices; sapping, types of springs; sediment from slopes. K-12 riparian science education.

ERTH 516. North Rocky Mtn Geology. 2 Credits. (Lab) Su PREREQUISITE: ERTH 101IN, early history and evolution (GEO 211); graduate standing; secondary teaching certification plus two years teaching experience; a computer with modem. Geologic history of Northern Rocky Mountains, and landscapes from Archean to present. Structural, tectonic, and surficial elements. Field examination of geologic evidence for history of the Gallatin Range, Bridger Range, and Yellowstone National Park. Exploration and development of teaching methods and resources for the K-12 classroom.

ERTH 551. Snow Science Seminar. 3 Credits. (Lec, 1 Lab) F alternate even years. PREREQUISITE: Graduate Standing; PHYS 211, STAT 332 or STAT 401. Interest in snow science. A mixed lecture and laboratory style course providing an in-depth examination of recent developments in snow science based upon current literature, newly published or about to be published literature, field methods and modeling regarding snow science. Topics will depend partially upon the interests of the instructor and student in the course.

ERTH 582. Quaternary Paleocology. 3 Credits. (Sem) F alternate even years, to be offered only even years. PREREQUISITE: ERTH 101IN or BIOB 170IN or equivalent. Course examines the history and development of modern biomes and the causes and consequences of long-term ecological change.

ERTH 583. Topics in Paleocology. 3 Credits. (Sem) F alternate even years, to be offered only odd years. PREREQUISITE: ERTH 101IN or BIOB 170IN or equivalent. Course examines important themes in paleocology. Topics change on a yearly basis addressing needs and interests of current students. It is intended for students with an interest in ecology, paleontology and environmental history.

ERTH 584. Quaternary Envir of Western US. 3 Credits. (Sem) F, alternate years, to be offered every even year. PREREQUISITE: ERTH 101 or BIOB 170 or equivalent. This graduate course examines current research and recent developments in Quaternary paleoclimatology in the western U.S. The seminar will be centered around weekly discussions of the primary literature, hands-on experience with international data bases, and class paper and presentation.

ERTH 585. Advances in Geobiology. 1 Credit. (Sem) F, to be offered every even year. Discussion of recent developments in paleontology, paleoecology, biogeochemistry, and biogeochemistry based on current literature and presentation of faculty and student works in progress.

ERTH 588. Professional Development. 1-3 Credits. (1-3 Lec; 3 cr max) On Demand Max 3 cr. PREREQUISITE: Graduate standing, teaching experience and/or current employment in a school organization, consent of instructor and Dean of Graduate Studies. Courses offered on a one-time basis to fulfill professional development needs of in service educators. A specific focus is given to each course which is appropriately subdivided. May be repeated.

ERTH 589. Graduate Consultation. 3 Credits. (3 Ind) F,S,Su PREREQUISITE: Master's standing and approval of the Dean of Graduate Studies. This course may be used only by students who have completed all of their course work (and thesis if a thesis plan) but who need additional faculty or staff time or help.

ERTH 590. Master's Thesis. 1-10 Credits. (1 Ind; max unlimited) F,S,Su PREREQUISITE: Master's standing.

ERTH 591. Special Topics. 1-4 Credits. (1-4 Sem; 12 cr max) PREREQUISITE: Upper division courses and others as determined for each offering. Courses not required in any curriculum for which there is a particular one time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

ERTH 592. Independent Study. 1-3 Credits. (1 Ind; 6 cr max) On Demand PREREQUISITE: Graduate standing, consent of instructor, approval of Department Head and Dean of Graduate Studies. Directed research and study on an individual basis.

ERTH 594. Seminar. 1-4 Credits. (Sem; 4 cr max) F,S,Su PREREQUISITE: Graduate standing or seniors by petition. Course prerequisites as determined for each offering. Topics offered at the graduate level which are not covered in regular courses. Students participate in preparing and presenting discussion material.

ERTH 598. Internship. 2-12 Credits. (2 Ind; 12 cr max) On Demand PREREQUISITE: Graduate standing, consent of instructor and approval of department head. An individualized assignment arranged with an agency, business or other organization to provide guided experience in the field.

ERTH 605. History of Geological Concepts. 3 Credits. (Sem) F to be offered alternate even years. PREREQUISITE: Course limited to graduate students or senior undergraduates with permission. Weekly seminars examine the evolution of geological thinking through an exploration of its history and contributions to science. The course enables students to research the origin and importance of concepts in their area of scientific specialization.

ERTH 609. Dissertation Research. 1-10 Credits. (1-10 Ind; max unlimited) F,S,Su PREREQUISITE: Doctoral candidate standing.

ERTH 609. Doctoral Seminar. 1-3 Credits. (1-3 Sem; 6 cr max) F,S,Su PREREQUISITE: Doctoral candidate standing.

ESOF - Software Engineering

ESOF 322. Software Engineering. 3 Credits. (Lec) F PREREQUISITE: CSCI 232 and WRIT 221. Software lifecycles, Unified Modeling Language, design patterns, software engineering standards, requirements analysis, development issues, efficiency tools, verification and validation, configuration management, testing and maintenance.

ESOF 422. Advanced Software Engineering. 3 Credits. (Sem) S alternate years, to be offered every even year. PREREQUISITE: ESOF 322. Course focuses on the early and late phases of the software lifecycle, extending the knowledge developed in ESOF 322 around UML specifications to formulate precise requirements and develop an understanding of the theoretical foundations of the most common forms of software testing.

ESOF 522. Empirical Software Engr. 3 Credits. (Lec) S odd years PREREQUISITE: ESOF 322 or equivalent and STAT 216Q or equivalent. Empirical software engineering focuses on improving software quality through the use of metrics. The course will provide guidance on designing, analyzing and reporting empirical studies, provide information on techniques and metrics needed to measure desired qualities, and the use of practical approaches to study software evolution.

ETCC - Engr Tech, Civil & Constr

ETCC 204. Appld Analysis for Const Tech. 1 Credit. (Lab) F,S,Su PREREQUISITE: M 165Q or M 171Q or M 181Q. Computer applications in construction technology using contemporary software and solution techniques appropriate to the construction industry.

ETCC 290R. Undergraduate Research. 1-6 Credits. (1-6 Ind; max unlimited) F,S,Su Directed undergraduate research/creative activity which may culminate in a written work or other creative project. Course will address responsible conduct of research. May be repeated.

ETCC 291. Special Topics. 1-4 Credits. (1-4 Lec; 12 cr max) On Demand PREREQUISITE: None required but some may be determined necessary by each offering department. Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

ETCC 292. Independent Study. 1-3 Credits. (1 Ind; 6 cr max) On Demand PREREQUISITE: Consent of instructor and approval of department head. Directed study and research on an individual basis.

ETCC 302. Soils and Foundations. 4 Credits. (Sem) F,S,Su PREREQUISITE: CSCI 232 and WRIT 221. Software lifecycles, Unified Modeling Language, design patterns, software engineering standards, requirements analysis, development issues, efficiency tools, verification and validation, configuration management, testing and maintenance.

ETCC 310. Concrete Technology. 3 Credits. (Sem) F,S,Su PREREQUISITE: M 165Q or M 171Q or M 181Q. Concrete reinforcing requirements and analysis of concrete members.
**ETCC 412. Structural Elements. 3 Credits.** (3 Lec) F,S

**ETCC 490R. Undergraduate Research. 1-4 Credits.** (1 Ind; 12 cr max) F,S,Su
Directed undergraduate research/creative activity which may culminate in a research paper, journal article, or undergraduate thesis. Course will address responsible conduct of research. May be repeated.

**ETCC 491. Special Topics. 1-4 Credits.** (1-4 Lec; 12 cr max) On Demand
PREREQUISITE: Course prerequisites as determined for each offering. Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

**ETCC 492. Independent Study. 1-3 Credits.** (1-3 Ind; 6 cr max) On Demand
PREREQUISITE: Junior standing, consent of instructor, and approval of Department Head. Directed research and study on an individual basis.

**ETCC 498. Internship. 1-2 Credits.** (1-2 Ind; 12 cr max) On Demand
PREREQUISITE: Sophomore standing, consent of instructor, and approval of Department Head. An individualized assignment arranged with an agency, business, or other organization to provide guided experience in the field. Students may not take this course the semester they graduate.

**ETCC 499R. Capstone Const Engin Tech. 3 Credits.** (2 Lec, 1 Lab) F,S,Su
PREREQUISITE: BGEN 361, EGEN 325, and EGEN 310R. COREQUISITE: ECIV 404 and ECIV 405; student must be graduating the semester of enrollment in ETCC 499. A senior capstone course encompassing total project control through introduction of a professional construction management organization to ensure cost effectiveness and early completion of a project. Construction safety. A requirement of the course is to take the Constructor Qualification Examination Level I (CQEI) administered by the American Institute of Constructors (AIC).

**ETME - Engr Tech, Mechanical**

**ETME 100. Introduction to Mechanical Engineering Technology. 1 Credit.** (1 Sem) F
A seminar course surveying the mechanical engineering technology profession. Topics include an overview of career opportunities, problem solving processes, an introduction to the basic engineering design process, professionalism, professional registration, and ethics.

**ETME 202. Mechanical Engineering Technology Computer Applications. 1 Credit.** (1 Lab) F,S
COREQUISITE: M 166. Computer methodology, and use of various computer software packages in mechanical engineering technology applications.

**ETME 203. Mechanical Design Graphics. 3 Credits.** (2 Rec, 1 Lab) F
on demand, S PREREQUISITE: EMEC 103. Course emphasizes the design process as it pertains to manufacturability, and the role of graphics to communicate design intent to production. Using 3-D software, design method, G,D,&T, and data management techniques, students will create drawings that communicate their designs.

**ETME 215. Manufacturing Processes. 3 Credits.** (3 Lec) F,S,Su
On Demand PREREQUISITE: EMAT 251 or EMEC 250. Basic methods of processing materials to change shapes, dimensions, and finishes; special attention to attendant forces, temperature, and property changes.

**ETME 216. Manufacturing Process Laboratory - Mechanical Engineering Technology. 1 Credit.** (1 Lab) F,S
PREREQUISITE: MET majors only; non-majors require instructor approval. COREQUISITE: ETME 215. Hands-on applications of the fundamentals of basic manufacturing processes.

**ETME 217. Manufacturing Process Laboratory - Mechanical Engineering. 1 Credit.** (1 Lab) F,
S PREREQUISITE: EMAT 252. COREQUISITE: ETME 215. Course will supplement lecture materials covered in ETME 215. Provides students with hands-on experience for performing and analyzing a broad spectrum of manufacturing processes including metal casting, injection molding, powder metallurgy, metal forming, metal removal, inspection and measurement and welding.

**ETME 290R. Undergraduate Research. 1-6 Credits.** (1-6 Ind) F,S,Su
PREREQUISITE: Consent of instructor and approval of department head or director. Directed undergraduate research/creative activity which may culminate in a written work or other creative project. Course will address responsible conduct of research. May be repeated.

**ETME 291. Special Topics. 3 Credits.** (1-4 Ind) On Demand
PREREQUISITE: None required but some may be determined necessary by each offering department. Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

**ETME 292. Independent Study. 1-3 Credits.** (1-3 Ind) F,S,Su
PREREQUISITE: Consent of instructor and approval of department head or director. Directed research and study on an individual basis.

**ETME 303. CAE Tools in Mechanical Design. 3 Credits.** (2 Rct, 1 Lab) F
S PREREQUISITE: ETME 203 or equivalent, EGEN 208, EGEN 324. COREQUISITE: ETME 321, EGEN 331. Emphasizes the use of computer aided engineering tools in the design process: understanding proper use and interpretation, gaining experience in how to use them through exercises and projects, modeling for analysis, rapid prototyping, and computer aided manufacturing techniques.

**ETME 310. Machining and Industrial Safety. 3 Credits.** (1 Lec, 2 Lab) F,S
Annually PREREQUISITE: ETME 203 or instructor approval. COREQUISITE: ETME 216. Offered Summers on demand. Introduction to modern machining technology and the key principles of industrial safety, material properties related to machining practices, design, and specifications. Semi-precise and precision layout are covered. An introduction to computer numerically controlled (CNC) technology and operations is included. Specific hands-on experiences included in laboratory.

**ETME 311. Joining Processes. 3 Credits.** (1 Lec, 2 Lab) F,S,Su
PREREQUISITE: EMEC 103 or instructor approval. COREQUISITE: ETME 216. Offered Summers on demand. Introduction to the modern science of joining technology, and detailed examination of metallurgy and materials properties as related to joining processes. Introduction to welding specification and symbols, and modern welding code usage. Weld design, set-up, preparation, application, and tests are emphasized. Specific hands-on experiences in OAW, SMAW, GMAW, GTAW, common separating processes; destructive and non-destructive testing are included in laboratory. This course will also expose students to other fastening joining techniques used in industry. Resistance welding, composites, riveting, and mechanical fastening and their application will be explored.

**ETME 321. Applied Heat Transfer. 3 Credits.** (3 Lec) F
S on demand PREREQUISITE: EGEN 324 or equivalent. COREQUISITE: EGEN 331 or equivalent. Study of the basic mechanisms of heat transfer and its applications. Introduction to equipment that utilize these mechanisms.

**ETME 340. Mechanisms. 4 Credits.** (3 Lec, 1 Lab) S
F; on demand COREQUISITE: EGEN 208, ETME 202. Introduction to mechanisms and machine elements used in the design and synthesis of mechanical devices.

**ETME 341. Machine Design. 4 Credits.** (3 Lec, 1 Lab) F
on demand; S PREREQUISITE: EGEN 208 or equivalent. Application of mechanisms fundamentals, strength of materials, material selection, and tolerances and fit to the design of machines and machine systems. Specific hands-on experiences included in laboratory.

**ETME 360. Measurements and Instrumentation Applications. 3 Credits.** (2 Lec, 1 Lab) F
s; S on demand PREREQUISITE: ELEE 250, or equivalent. COREQUISITE: EGEN 350, EGEN 324. Theory and application of engineering technology measurement concepts including function and operation of transducers; temperature, pressure, displacement and flow sensing; sensor system calibration; statistical and uncertainty analysis; sampling theory fundamentals; signal conditioning; 1st order response; emphasis on applications involving computerized acquisition of data.

**ETME 400. Mechanical Engineering Technology Senior Seminar. 1 Credit.** (1 Sem) F,S
S PREREQUISITE: Senior standing. A seminar course focusing on career path development. Students will meet with current industry professionals to discuss specific careers, as well as meet with freshman students to share undergraduate experiences. Pass/Fail.

**ETME 401. Fundamentals of Engineering Review. 1 Credit.** (1 Lec) F,S
A review of engineering fundamentals presented throughout the mechanical engineering technology curriculum. It serves primarily to prepare students to take the Fundamentals of Engineering Exam, and subsequently prepare them to progress towards becoming registered professional engineers.

**ETME 410. Computerized Numerical Control and Computer-aided Manufacturing Technology. 3 Credits.** (1 Lec, 2 Lab) F,S
PREREQUISITE: ETME 310 or instructor approval. Application and optimization of computer numerical control (CNC) and computer-aided manufacturing (CAM) technology fundamentals as related to turning, milling, and plasma cutting operations. Development of toolpaths and machine code (G&F) from associated CAD models is emphasized. Specific hands-on experiences included in laboratory.
ETME 415. Design for Manufacturing and Tooling. 3 Credits. (2 Lec, 1 Lab) S F; on demand. PREREQUISITE: ETME 215; ETME 216 or ETME 217. COREQUISITE: EGEN 150; ETME 310 for MET majors; or instructor approval. Overview of production systems and lean manufacturing fundamentals and principles. Introduction to design for assembly and design for manufacturing principles. Fundamentals of tool design, including tooling materials, workholding principles, jig design, fixture design, assembly tool design, design of tools for inspection and gauging, and tool fabrication techniques. Practical lab experiences will enhance the course material.

ETME 422. Principles of HVAC I. 3 Credits. (3 Lec) S F; on demand. PREREQUISITE: EMEC 320 or EGEN 324, ETME 321 or EMEC 326, or instructor consent. Refrigeration and heating, ventilating and air-conditioning (HVAC) for comfort and industrial applications. Psychrometrics, physiological factors in cooling, HVAC load calculations; modern vapor compression, absorption, low temperature refrigeration cycles; air distribution and fan-duct analysis, design/selection of HVAC equipment and control systems.

ETME 423. Principles of HVAC II. 3 Credits. (1 Lec, 2 Lab) S PREREQUISITE: ETME 422 or consent of instructor. Heating, ventilating, and air-conditioning (HVAC) system design/selection as they relate to building performance, energy conservation, and sustainability. Integrated building design, building information modeling and building performance/energy modeling as it applies to various building structures is covered.

ETME 424. Thermal Processes Lab. 1 Credit. (1 Lab) S F; on demand. COREQUISITE: ETME 422. Laboratory experiences covering topics in heat transfer, thermodynamics, and HVAC areas in support of ETME 321, EGEN 324, and ETME 422.

ETME 425. Building Systems. 3 Credits. (3 Lec) F PREREQUISITE: PHSX 207 and junior standing. A survey of the systems and equipment for water supply, sanitation, fire protection, electrical service, heating and air conditioning of buildings.

ETME 430. Fluid Power Systems Design. 3 Credits. (2 Lec, 1 Lab) F PREREQUISITE: ELEE 250; EGEN 331 or EGEN 335; ETME 360 or EMEC 360 and EMEC 361; or consent of instructor. An introduction to the fundamentals and application of fluid power in industry today. Coverage includes: flow and pressure relationships, fluid properties, heat, filtration, selection of components, electro-hydraulic and electro-pneumatic systems, controls, design of hydraulic and pneumatic circuits, and troubleshooting.

ETME 460. Advanced Instrumentation. 3 Credits. (2 Lec, 1 Lab) S On Demand. PREREQUISITE: ETME 360 or EMEC 360, EMEC 361; or equivalent, or consent of instructor. An applications-based course in advanced instrumentation and control, focusing on parameter identification; test planning, proper transducer selection, installation, and operation; computerized data acquisition programming and operation; handling and presentation of acquired data. Theory and practice is merged in a project setting.

ETME 462. Industrial Processing. 3 Credits. (2 Lec, 1 Lab) S PREREQUISITE: ETME 360 or EMEC 360, and ELEE 250. The intent of this course is to equip engineering students with the basic understanding of industrial processes, knowledge of the fundamental machines, sensors, and controls used in automated processing, and an understanding of processing system design.

ETME 470. Renewable Energy Applications. 3 Credits. (2 Lec, 1 Lab) F PREREQUISITE: ETME 360 or EMEC 360; EMEC 361; ETME 340 or EMEC 341; ETME 321 or EMEC 326; or consent of instructor. Experience with energy technologies including wind, solar, thermal, solar photovoltaic, fuel cell, biomass, and hydro-electric systems. Lecture covers practical applications, component design, and theory for devices and systems. Social, economic, geo-political, and environmental considerations are discussed. Hands-on lab activities supplemented with site visits.

ETME 489. Capstone: Mechanical Engineering Technology Design I. 2 Credits. (1 Lec, 1 Rec) S PREREQUISITE: ETME 303, EGEN 310, for MET majors only with senior standing. COREQUISITE: ETME 360, ETME 325, ETME 310, ETME 311, ETME 340, ETME 341. Senior capstone design experience in Mechanical Engineering Technology. Students, under the guidance of a faculty supervisor, solve real-world design problems.

ETME 490R. Undergraduate Research. 1-6 Credits. (1-6 Ind) F,S,Su PREREQUISITE: Junior standing, consent of instructor, and approval of certifying officer. Directed undergraduate research/creative activity which may culminate in a research paper, journal article, or undergraduate thesis. Course will address responsible conduct of research. May be repeated.

ETME 491. Special Topics. 1-3 Credits. (1-4 Ind) On Demand PREREQUISITE: Course prerequisites as determined for each offering. Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

ETME 492. Independent Study. 1-3 Credits. (1-3 Ind) F,S,Su PREREQUISITE: Junior standing, consent of instructor, and approval of department head or supervisor. Directed research and study on an individual basis.

ETME 498. Internship. 1-12 Credits. (1-12 Ind) F,S,Su PREREQUISITE: Junior standing, consent of instructor, and approval of department head. An individualized assignment arranged with an agency, business, or other organization to provide guided experience in the field.

ETME 499R. Capstone: Mechanical Engineering Technology Design II. 3 Credits. (1 Lec, 1 Rec, 1 Lab) F,S,Su PREREQUISITE: ETME 489, or consent of instructor. For MET majors only. Senior capstone design experience in Mechanical Engineering Technology. Students implement and test the function of design prototypes, under the guidance of a faculty supervisor.

FCS - Family and Consumer Sciences

FCS 101IS. Indiv. and Faml Dev.: Lifespan. 3 Credits. (3 Lec) F,S,Su On Demand Examination of individual growth, development, and well-being within families across the lifespan from conception to death. Emphasis on classical and contemporary individual development, and family theories, current research, and practical applications for practitioners, teachers, and parents.

FCS 138. Survey of Family Financial and Consumer Issues. 3 Credits. (3 Lec) F,S,Su If you need to make dollar last throughout the semester, this class is for you! The course combines some basic economics with how to’s of becoming financially literate. Covers earning, using credit, spending plans, avoiding fraud, and financial planning.

FCS 218. Design, Fashion, and Textiles. 3 Credits. (3 Lec) F,S,Su Alternate years offered even years. Methods of teaching textiles and apparel; wardrobe management; planning, selection, and purchase, design principles including color, lines, and emphasis; and the care of clothing and types and characteristics of fibers, production and properties of fabrics.

FCS 219. Apparel Construction. 3 Credits. (1 Lec, 2 Lab) F,S,Su Alternate years offered odd years. Students will learn how to construct basic apparel. Emphasis will be placed on pattern reading and state-of-the-art construction techniques. A second emphasis will be on pedagogy techniques related to the construction of apparel and other items.

FCS 239. Contemporary Consumer Issues. 3 Credits. (3 Lec) F,S,Su PREREQUISITE: FCS 138 or consent of instructor. Theories of consumer economics will be introduced and applied to current consumer issues such as housing, food, health care, and energy.

FCS 261. Adult Development and Aging. 3 Credits. (3 Lec) F,S,Su PREREQUISITE: FCS 101IS or EDEC 160 for majors and social science core for non-majors. Focus on the adult stages of the life span and families with adult children; issues include intergenerational relationships; gender differences in individual, family, and career development; and the demographic and economic consequences of an aging population.

FCS 263. Relationships and Fam Systems. 3 Credits. (3 Lec) F,S,Su PREREQUISITE: Sophomore standing. Relationship development across the life cycle from a family systems perspective. Relationship dynamics through major relationship transitions including couple formation, cohabitation, marriage, parenthood, death, divorce, and remarriage will be examined. The diversity of family experiences will be emphasized.

FCS 271. Statistical Measures of Well-Being. 3 Credits. (3 Lec) S PREREQUISITE: Sophomore standing and any quantitative courses. An introduction to quantitative and qualitative measures of well-being. Students will learn how to find, read, analyze, and interpret data related to the well-being of American families.

FCS 290R. Undergraduate Research. 1-6 Credits. (1-6 Ind; max unlimited) F,S,Su Directned undergraduate research which may culminate in a written work or other creative project. Course will address responsible conduct of research. May be repeated.

FCS 291. Special Topics. 1-4 Credits. (1-4 Ind; 1-2 Lab; 12 cr max) On Demand MEX 12 cr. PREREQUISITE: None required but some may be determined necessary by each offering department. Courses not required in any curriculum for which there is a particular one-time need or given on a trial basis to determine acceptability and demand before requesting a regular course number.
FCS 292. Independent Study. 1-3 Credits. (1-3 Ind; 6 cr max) PREREQUISITE: Consent of instructor and approval of department head. Directed research and study on an individual basis.

FCS 334. Contemporary Housing Topics. 3 Credits. (3 Lec) S PREREQUISITE: FCS 338 or permission from instructor. A survey course of housing issues from families and consumers. Among the topics to be covered are: housing design for human needs, affordability and availability issues, safety issues, and demographic influences on housing choices.

FCS 337. Personal and Family Finance I. 3 Credits. (3 Lec) F PREREQUISITE: FCS 338, M core, or permission of instructor. Planned use of financial resources to meet the goals of individuals and families. Concepts include time value of money concepts, credit, budgeting, risk management, taxation and basic investments. First in a series of courses to prepare students for the accredited financial counselors exams.

FCS 338. Personal and Family Finance II. 3 Credits. (3 Lec) S PREREQUISITE: FCS 337. In-depth analysis for individuals and families in risk management, retirement planning, estate planning, and investment and portfolio management.

FCS 339. Family Financial Counseling. 3 Credits. (3 Lec) S PREREQUISITE: FCS 337, FCS 338, or permission from instructor. Counseling practices are introduced and applied to individuals and families who are facing financial difficulties. Case studies and role playing will be incorporated into course materials.

FCS 359. Theories and Skills for the Human Services. 3 Credits. (3 Lec) F,S PREREQUISITE: Junior standing in Health and Human Development major or consent of instructor. An overview of forming the professional helping relationship, the foundation for work in human services. An introduction to various family and counseling theories, modalities, ethics, and cultural competency. Development of interpersonal and professional skills for working with others.

FCS 371. Research Methods in HHD. 3 Credits. (3 Lec) F,S,Su, On Demand PREREQUISITE: Math core completed with a grade of C or better and junior standing in major. Prepares Health and Human Development students to become informed consumers of research. Research principles for both quantitative and qualitative research are covered. Readings and other class materials ensure that students will understand how research in HHD enriches human well-being.

FCS 437. Managing Work and Family. 3 Credits. (3 Lec) S PREREQUISITE: FCS 371. This course focuses on how families acquire and use resources from work and the household to meet family goals and demands. Special attention to managing the dual demands of work and family in relation to the family's time, money, marital, and child-rearing responsibilities.

FCS 450. Curric Dev in FCS Education. 3 Credits. (2 Lec, 1 Lab) S PREREQUISITE: EDU 497. How to plan, develop, teach, supervise, and evaluate programs in family and consumer sciences education. A second focus will be to learn about responsible actions and decision making as leaders in family, community, and work settings through the use of FCCLA.

FCS 454. Professional Issues - Senior Seminar. 4 Credits. (1 Lec, 3 Lab) S,Su PREREQUISITE: FCS 371 and screening procedures as specified by instructor. Senior capstone course. Establishing a professional identity and transitioning to a career in the field of early childhood education and child services and human development and family science. The lab section of this course will entail the scientific application of family and consumer sciences theory and methods. In consultation with course instructor, students will participate in a lab assignment.

FCS 455R. Program Planning and Administration in Family & Consumer Sciences. 3 Credits. (3 Lec) F PREREQUISITE: FCS 371 and senior standing. Knowledge and skills necessary for planning, establishing and administering various human service programs including early childhood, youth, family, older adults, and agency settings. Students will design a program including preparation of a grant application.

FCS 457. Family Life Education. 3 Credits. (3 Rct) F PREREQUISITE: FCS 371 and junior standing in the major. Students will gain an understanding of the general philosophy and broad principles of family life education in conjunction with the ability to plan, implement, and evaluate such educational programs. This course will be taught in accordance with the guidelines from the National Council of Family Relations on becoming a Certified Family Life Educator.

FCS 459. Reaching the Hurt Child. 3 Credits. (3 Lec) F,S PREREQUISITE: FCS 101, PSYX 100, or completion of the social science core; completion of 60 or more credits. Children who are traumatized due to events such as abandonment by birth parents, abuse, neglect, or other issues, experience relational trauma that interferes with normal child development between conception and early adulthood. This course presents both the theoretical-neurobiological discoveries about the effects of traumatic events and the relational disruption on the child’s developmental trajectory, as well as offering approaches to helping these children heal by closing development gaps. This course is designed for students who want to be parents (especially foster and adoptive parents, adoption workers, family services professionals, clergy, teachers, counselors, and adults who have experienced childhood trauma.

FCS 460. Parenting. 3 Credits. (3 Lec) S,F,Su, On Demand PREREQUISITE: FCS 263 and FCS 371. Examines parenting processes and parent-child relationships based on scientific study of child development and family relations. Diverse parenting issues (e.g., parenting through divorce; parental stress and adaptation) will be explored across the lifespan using family systems and ecological frameworks.

FCS 461. Principles Wellbeing in Aging. 3 Credits. (3 Lec) Su PREREQUISITE: Completion of 12-credits of coursework in the online gerontology. This class will explore the theoretical foundations of wellbeing. Students will work to understand and analyze the interconnectedness of the dimensions of wellbeing with older adults, family units and family relationships.

FCS 464A, B, C, and D Family Diversity. 3 Credits. (3 Lec) S,F,S,Ss PREREQUISITE: FCS 263, FCS 371 or equivalent, and senior standing or permission of instructor. Examines gender, race, social class, and diversity in family life as well as the intersections of gender, race, class, and other variables, such as geographic location (rural, urban) and household composition, using family systems, ecological, cultural, and feminist frameworks.

FCS 465R. Family Law & Public Policy. 3 Credits. (3 Lec) F,S,Su PREREQUISITE: FCS 263, FCS 371 or equivalent, and senior standing or permission of instructor. Examines laws and public policies impacting family well-being including marriage, domestic partnership, divorce, child custody, welfare, foster care, ICWA, and adoption. The impact of workplace and health care policies on families is also examined.

FCS 491. Special Topics. 1-4 Credits. (1-4 Lec; 12 cr max) On Demand Max 12 cr. PREREQUISITE: Course prerequisites as determined for each offering. Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

FCS 492. Independent Study. 1-3 Credits. (1-3 Ind; 6 cr max) F,S,S,F,S,Su PREREQUISITE: Junior standing, consent of instructor, and approval of department head. Directed research and study on an individual basis.

FCS 494. Seminar/Workshop. 1 Credit. (1 Sem; 4 cr max) On Demand Max 4 cr. PREREQUISITE: Senior standing. Topics offered at the upper division level that are not covered in regular courses. Students participate in preparing and presenting class materials.

FCS 498. Internship. 1-12 Credits. (1-12 Ind; 12 cr max) F,S,S,F,S,Su PREREQUISITE: Consent of instructor. An individualized assignment with a professional agency to provide a guided field experience. All students must receive department permission prior to registration.

FCS 572. Professional Practicum. 2-6 Credits. (2-6 Lab; 9 cr max) F,S,S,F,S,Su Max 9 cr. PREREQUISITE: EDEC 555, HDO 554, graduate standing and consent of instructor. Practicum experience in the field of human development.

FCS 575, Prof Paper & Project. 1-4 Credits. (1 Ind; 6 cr max) F,S,S,F,S,Su Max 6 cr. PREREQUISITE: Graduate standing. A research or professional paper or project dealing with a topic in the field. The topic must have been mutually agreed upon by the student and his or her major advisor and graduate committee.

FCS 588. Professional Development. 1-3 Credits. (1-3 Lec; 3 cr max) On Demand Max 3 cr. This course may be used only by students who have completed all of their course work (and thesis if on a thesis plan) but who need additional faculty or staff time or help. May be repeated.

FCS 589. Graduate Consultation. 1-3 Credits. (1-3 Ind; 3 cr max) F,F,S,S,F,S,Su Max 3 cr. PREREQUISITE: Master’s standing and approval of committee. This course may be used only by students who have completed all of their course work (and thesis if on a thesis plan) but who need additional faculty or staff time or help.

FCS 590. Master’s Thesis. 1-10 Credits. (1-10 Ind; max unlimited) F,F,S,S,F,S,Su Max credits unlimited. PREREQUISITE: Master’s standing. Directed graduate research/creative activity.
FILM 100IH. Intro to Film & Photography. 3 Credits. (2 Lec) F,S,Su
An exploration of the historical, artistic and critical connections between photography and film and as profoundly influential media shaping the 20th century and as the foundation of “new media” in the 21st century.

FILM 101IH. Understanding Film and Media. 3 Credits. (1 Lec, 2 Lab) F
This course provides students with the tools of film and media analysis as a foundation for future cinema study and practice. Close analysis of films from different countries and time periods will be used to recognize the formal elements of film production, principally style and narrative.

FILM 112. Aesthetics of Film Production. 3 Credits. (1 Lec, 2 Lab) F,S
An understanding of motion pictures, video art and television practice through study of principles of concept and production. Will include assignments to view and critique selected examples and the completion of short exercises.

FILM 201D. Film History I: Origins to the 1960’s. 3 Credits. (1 Lec, 1 Lab, 1 Rec) F
PREREQUISITE: FILM 101IH A survey of major developments in international film history from the 1890s to the 1960s, examining the aesthetic, social, cultural and technological dimensions of cinema. School of Film and Photography.

FILM 202D. Film History II: 1960s to the Present. 3 Credits. (3 Lec) S
PREREQUISITE: FILM 101IH, and FILM 201D. A survey of major developments in international film and media history from the 1960s to the present, examining the aesthetic, economic, cultural and technological dimensions of moving images. School of Film and Photography.

FILM 212. Aesthetics Film Production II. 4 Credits. (4 Lab) F,S
PREREQUISITE: FILM 100, FILM 101, FILM 112, PHOT 113 and Sophomore standing in Film. An intensive intermediate course in the fundamental aspects of film production. Students learn to use professional filmmaking tools and apply these skills to short productions. The course emphasizes the language of visual/aural storytelling and the development of directorial vision.

FILM 251. Scriptwriting. 3 Credits. (1 Lec, 2 Lab) S, On Demand
PREREQUISITE: FILM 100, FILM 101, FILM 112, PHOT 113 and Sophomore standing in FILM. Experience in techniques and concepts of writing for motion picture and video production.

FILM 253. Television Production. 3 Credits. (2 Lab) F, On Demand
PREREQUISITE: Sophomore standing in Film. Introduces students to live television production and multi-camera studio operations, and the technologies used in the production and delivery of live TV. Explores the group production process using hands-on exercises in a working studio environment.

FILM 254. Acting for Film. 3 Credits. (1 Lec, 2 Lab) F,S, On Demand
PREREQUISITE: FILM 100IH, FILM 101, FILM 112, PHOT 113 and Sophomore standing in FILM. An introduction to the basic skills of acting through acting exercises and individual projects, including a unit for acting for the camera.

FILM 259. Multimedia Audio Prod. 3 Credits. (1 Lab) S
3 cr. LAB 1 RCT 2 PREREQUISITE: MUST 220, consent of instructor. The study of theoretical and practical approaches to audio production for multimedia, to include ADR/Dialog replacement, Foley, sound effects, field/location recording, studio recording, music integration and editing, surround sound techniques/encoding, delivery paradigms, and aesthetics of audio for multimedia.

FILM 290R. Undergraduate Research. 1-6 Credits. (1-6 Ind; 12 cr max) F,S
PREREQUISITE: Consent of instructor. Directed undergraduate research which may culminate in a written work or other creative project. Course will address responsible conduct of research. School of Film and Photography.

FILM 295. Practicum. 1-3 Credits. (1-3 Ind; 12 cr max) F,S,Su
PREREQUISITE: Consent of instructor. Max 12 cr. Practical experience associated with production and research project in motion pictures, television/video, photography, and theatre. May include rehearsal or performance activity. Credit will be offered to students doing basic work on faculty members’ productions or on student productions under direct faculty supervision. Credit will be offered to students giving basic technical support to: a) faculty teaching courses, b) faculty engaged in creative activities, or c) advanced students’ productions (while supervised by an SFP faculty member).

FILM 333. Production Management. 3 Credits. (1 Lec) On Demand
PREREQUISITE: FILM 212, FILM 251 and FILM 254. A comprehensive approach to managing the personnel and financial resources of media production. Includes both fiction and nonfiction. Learn script breakdown, budgeting, scheduling, legal requirements, and paperwork. Practice managing the two key elements of professional cinematic art – people and money.

FILM 351. Advanced Script Writing. 3 Credits. (3 Rec) On Demand
PREREQUISITE: FILM 251 or permission of instructor. Advanced training in the techniques of writing for motion picture production. This class requires that students author a 100 page Hollywood script.

FILM 352. Editing, 3 Credits. (1 Lec) On Demand
PREREQUISITE: FILM 212. History and techniques of motion picture and video editing. The course will combine lectures with hands-on exercises in editing.

FILM 354. Lighting. 3 Credits. (2 Lec) On Demand
PREREQUISITE: FILM 212. An introduction to the aesthetics and technical principles of lighting for film and theatre with attention to familiarity with basic instruments and a lighting board. The opportunity for an exercise in lighting design will be provided.

FILM 355. Cinematography. 3 Credits. (1 Lec) On Demand
PREREQUISITE: FILM 212. An examination of the aesthetics and practice of cinematography using 16mm film and digital video cameras.

FILM 356. Production Design. 3 Credits. (2 Lec, 1 Lab) On Demand
PREREQUISITE: FILM 212. Introductory course in production design for theatre, film and video.

FILM 357. Directing. 3 Credits. (1 Lab) On Demand
PREREQUISITE: FILM 212 and FILM 254. An examination of the theory and practice of directing and working with actors. Students complete projects for the stage and for filming during the semester.

FILM 359. Sound Design. 3 Credits. On Demand
PREREQUISITE: FILM 212 or Consent of Instructor. Theoretical and practical approaches to the motion picture soundtrack. Topics and exercises will include field recording, post-production, sound design, and the musical score.

FILM 371. Non-Fiction Film Production. 4 Credits. (4 Sem) F,S
PREREQUISITE: FILM 212, 251, and 254. Exploration of the aesthetics and practice of creating documentary films. The course will utilize production exercises, screenings, and presentations to develop understanding of documentary film and video production. Students will work in teams to produce short documentary film projects.

FILM 372. Fiction Film Production. 4 Credits. (4 Sem) F,S
PREREQUISITE: FILM 212, 251, and 254. Projects pursued under faculty supervision, emphasizing fiction productions using traditional and non-traditional approaches from pre-production through post-production. Details of individual sections and the supervising faculty will be posted by the department prior to pre-registration.

FILM 381. Studies in Film. 3 Credits. (1 Lec; 9 cr max) On Demand
PREREQUISITE: Junior standing in Film. An advanced introduction to the theories which enable an understanding of the national cinemas practiced in light of, outside of, the influence of Hollywood. Focus on particular national cinemas varies by semester, but may include examinations of major European cinemas, Asian cinema, and/or the cinemas of the developing world.

FILM 394. Seminar/Workshop. 2-4 Credits. (2-4 Sem; 12 cr max) F,S,Su
PREREQUISITE: Consent of instructor. Seminar/Workshop devoted to a specific topic in Film Production or Film Studies. Topics vary.
FILM 395. Practicum. 1-3 Credits. (Ind; 12 cr max) F,S,Su
Max 12 cr. PREREQUISITE: Junior Standing in Film and consent of instructor. Practical experience associated with production and research projects in motion pictures, television/video, photography, and theatre. May include rehearsal or performance activity. Credit will be offered to students doing advanced work on faculty members' productions or on student productions under direct faculty supervision.

FILM 449. Film and Documentary Theory. 3 Credits. (1 Lec, 1 Lab) F,S On Demand
PREREQUISITE: Upper-division standing. An intensive survey of major trends in film and media theory, as applied to feature-length fiction, documentary, and experimental cinema. Topics include: feminism, post-colonialism, cultural studies, psychoanalysis, star intertextuality, and cognitive methods.

FILM 459. Sound Design. 3 Credits. (3 Sem) S
PREREQUISITE: FILM 212 or FILM 510 This course emphasizes film sound created for 5.1 and other multi-channel systems.

FILM 481. Advanced Studies in Film. 1-12 Credits. (1-12 Sem; 9 cr max) F,S,Su, On Demand
PREREQUISITE: Any 300 level film studies course or consent of instructor. COREQUISITE: Sophomore level. Studies topics offered at the upper division level that are not covered in regular courses. Students participate in preparing and presenting discussion material. May be repeated.

FILM 490R. Undergraduate Research. 1-6 Credits. (1-6 Ind; 12 cr max) F,S,Su Max 12 cr. PREREQUISITE: Consent of Instructor. Directed undergraduate research which may culminate in a research paper, journal article, or undergraduate thesis. Course will address responsible conduct of research. May be repeated.

FILM 492. Independent Study. 1-3 Credits. (1 Ind; 6 cr max) On Demand 1-3 cr. IND. May be repeated, Maximum 6 cr. total for FILM, PHOT & THTR 492 combined. PREREQUISITE: Consent of instructor and approval of department head. Directed research and study on an individual basis for advanced students.

FILM 493. Study Tour. 3 Credits. (3 Sem) S, On Demand
PREREQUISITE: Junior Standing and Consent of the instructor. This course prepares the students for an intensive encounter with accomplished professionals in the motion picture, video, and television industries.

FILM 494. Seminar/Workshop. 1-4 Credits. (1-4 Sem; 12 cr max) On Demand
PREREQUISITE: Consent of instructor. Advanced topics in film production or film studies. Topics vary. School of Film and Photography.

FILM 498. Career Internship. 2-12 Credits. (2-12 Ind; 12 cr max for FILM, PHOT, THTR 498 combined) F,S
PREREQUISITE: Consent of instructor and approval of department head. Directed research and study on an individual basis for advanced students.

FILM 499. Senior Production. 5 Credits. (5 Sem; 10 cr max) F,S
May be repeated Maximum 10 cr. PREREQUISITE: Complete 2 of FILM 371, 372 or THTR 304. Senior capstone course. Direction or major production role on a short film or stage production.

FILM 504. Film and Documentary Theory. 3 Credits. (3 Lec) F
An advanced introduction to the methods developed for studying the fiction, documentary and experimental film over the past 100 years.

FILM 505. Crit Approch Nat Hst Filmmaking. 3 Credits. (3 Lec) F
A close analysis and interpretation of the social function and cultural value of science and natural history films, with a particular emphasis for broadcast nationally and internationally.

FILM 506. Crit Approach Sci Filmmaking. 3 Credits. (3 Lec) S
An advanced introduction to the critical methodologies necessary for intelligently interrogating the representations of science and technology in print and media.

FILM 510. Fundamentals of Filmmaking. 3 Credits. (1 Lec, 2 Lab)
Basic field production techniques in film, video, sound, and editing. Training in digital video, 16mm cinematography, analogue and hard-disk sound recording, and digital nonlinear editing.

FILM 513. Advanced Cinematography. 3 Credits. (3 Sem) S
PREREQUISITE: MTA 510. This course will train graduate students in advanced film and video cinematography techniques. The course will include advanced lighting, camera movement, narrative uses of the camera.

FILM 515. Science and Natural History Film Prod.. 3 Credits. (3 Sem) S
PREREQUISITE: FILM 510. This course will teach production techniques used by professional science and natural history film makers.

FILM 517. Production Management. 3 Credits. (3 Lec) S
PREREQUISITE: MTA 510, 511, 512. COREQUISITE: MTA 515, 516. This course is about the logistical, financial and managerial methodologies of documentary filmmaking.

FILM 518. Writing for Documentary and Non-Fiction Film. 3 Credits. (3 Lab) S
PREREQUISITE: FILM 510. This course examines models of non-fiction writing and explores elements such as acts, character, emotional arcs, turning points, emotional emphasis and information imperatives.

FILM 519. Post Production Workflow. 3 Credits. (3 Lab) S
PREREQUISITE: FILM 510. This course will examine the unique post-production requirements for contemporary documentary film and video.

FILM 521. Interactive Documentary. 3 Credits. (3 Sem) S
PREREQUISITE: MTA 504, MTA 505, MTA 507, MTA 510, MTA 515, MTA 517, MTA 518, MTA 519 - All. This production course explores the creation of non-linear documentary media.

FILM 523. Second Year Film Prep. 2 Credits. (2 Sem) F
PREREQUISITE: Second year standing. This course will prepare second year SNHF MFA students to create their required second year film.

FILM 524. Research Methods. 3 Credits. F
PREREQUISITE: FILM 510, FILM 504, FILM 505 This course will fill a need among the graduate students in the MFA in Science and Natural History Filmmaking Program for instruction in research methods, including sources and attribution, for both the written thesis and the thesis film.

FILM 525. Second Year Film Prod. 3 Credits. (3 Lab) S
PREREQUISITE: Second year standing. The objective of this course is to provide faculty support and supervision of second year MFA film projects.

FILM 526. Alternative Nonfiction. 3 Credits. (3 Sem) S
Graduate students will study a range of contemporary documentary and experimental documentary filmmakers. Each student will then develop and produce their own original short documentary works utilizing some aspect(s) of the contemporary works studied.

FILM 553. Adv Prob TV and Internet Prod. 1-9 Credits. (1-9 Lab; 9 cr max) F,S,Su
This course are the teaching of advanced techniques in broadcast and Internet production based on the website, podcast, and Montana PBS broadcast series Terra: The Nature of the World.

FILM 560. Post Production Meets Info Design. 3 Credits. (3 Rct) S
This course will teach advanced post-production and information design skills to Graduate MFA students.

FILM 581. Special Professional Proj. 1-4 Credits. (1-3 Lab; 6 cr max) F,S,F,Su
PREREQUISITE: FILM 510. Special Professional Projects provides students with special funded projects the opportunity for professional level supervision and assistance from the faculty and other students. Funding must be in place before the class begins.

FILM 590. Master’s Thesis. 1-15 Credits. (1-15 Ind; 15 cr max) F,S,Su 1-3 cr. IND Maximum credits unlimited PREREQUISITE: Master’s standing.

FILM 591. Special Topics. 1-3 Credits. (1-3 Sem; 12 cr max) On Demand
PREREQUISITE: Consent of instructor. Courses not required in a curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

FILM 592. Independent Study. 1-3 Credits. (1-3 Ind; 3 cr max) On Demand
PREREQUISITE: Graduate standing, consent of instructor, approval of department head and Dean of Graduate Studies. Directed research and study on an individual basis.

FILM 598. Professional Internship. 1-12 Credits. (1-12 Ind; 12 cr max) F,S,Su
PREREQUISITE: FILM 510 and FILM 515. This course allows the student to spend a semester working in a professional environment under the guidance of a mentor.

FRCH - French

FRCH 101. Elementary French I. 3 Credits. (3 Rct)
NOTE: Offered on a rotating basis with German and Spanish in Summer. An elementary level course designed to help students acquire basic proficiency in communicating within culturally significant contexts. An integrated approach to teaching language skills with emphasis on vocabulary acquisition and basic grammatical structures.
FRCH 102D. Elementary French II. 3 Credits. (3 Rct)
PREREQUISITE: FRCH 101 or equivalent, or two years of high school French. Offered on a rotating basis with German and Spanish in Summer. This course builds upon the foundation established in 101. Greater emphasis is placed upon oral and written expression. Reading and discussions are designed to increase comprehension of more linguistically complex texts and more conceptually complex cultural issues.

FRCH 105. Accelerated Elementary French I and II. 3 Credits. (3 Rec) F, S, Su PREREQUISITE: Previous study of French. An accelerated version of FRCH 101 and FRCH 102D in a single semester for students who have some background in French or another Romance language but who are not currently prepared for FRCH 102D or FRCH 201. Designed to help students acquire basic proficiency in communicating within culturally significant contexts. An integrated approach to teaching language skills with emphasis on vocabulary acquisition and basic grammatical structures.

FRCH 201D. Intermediate French I. 3 Credits. (3 Rct)
PREREQUISITE: FRCH 102 or equivalent, or a minimum three years of high school French or placement interview. Intensive, methodical review of grammar and syntax combined with the integrated development of proficiency in the four language skills. Expansion of cultural knowledge and functional vocabulary through intermediate readings and discussions. Increased emphasis on written communication.

FRCH 202D. Intermediate French II. 3 Credits. (3 Rct)
PREREQUISITE: FRCH 201 or equivalent, or placement interview. Fourth semester French language course designed to provide basis for advanced level study of French language, literature, and culture. Application of language skills in discussions and explications of selected readings in literature and culture.

FRCH 301. French Oral and Written Expression. 3 Credits. (3 Rec) On Demand PREREQUISITE: FRCH 202D. Fifth semester French language course designed to provide the basis for advanced level study of French language, as well as Francophone literature, and culture. Application of language skills in discussions and explications of selected readings in literature and culture.

FRCH 305. Histoire Civilisation. 3 Credits. (3 Lec) S alternate years, to be offered even years.
PREREQUISITE: FRCH 202D Survey of French culture from the middle ages to modern era; focus on historical, artistic, literary, and social developments. Taught in French.

FRCH 306H. French: From Reflection to Rev. 3 Credits. (3 Rct) On Demand Reading and discussion of selected major works from the eighteenth century. All reading and discussions are in English. Majors may be required to do some work in French.

FRCH 320D. La France Aujourd'hui. 3 Credits. (3 Lec) S alternate years, to be offered odd years.
PREREQUISITE: FRCH 202D The French personality today in social, cultural, and political settings. Taught in French.

FRCH 323. Adv Grammar and Comp. 3 Credits. (3 Lec) F alternate years, to be offered odd years.
PREREQUISITE: FRCH 202D or consent of instructor. Intensive review of French grammar to increase proficiency in various forms of written expression including business correspondence, problems of translation, and short essays.

FRCH 324. Adv Conv and Phonetics. 3 Credits. (3 Rct) F alternate years, to be offered even years.
PREREQUISITE: FRCH 201 Intensive conversation coupled with a practical study of French phonetics and contrapuntal comparison with English for teaching application. Various levels of the spoken language from slang to formal speech.

FRCH 401. French Text & Cinema. 3 Credits. (3 Rct) S PREREQUISITE: FRCH 202D. Study of several fine French films and the literary works upon which they were based. Emphasis is on the transformation of written text into image. Taught in French.

FRCH 402. French Literature. 3 Credits. (3 Rct) F alternate years, to be offered odd years.

FRCH 450. Seminar: French Literature and Culture. 3 Credits. (3 Rct) F PREREQUISITE: WRIT 101W or consent of instructor. COREQUISITE: FRCH 401 or FRCH 402 Junior/Senior Seminar. The study of Francophone literature and culture. Topic varies with instructor. Taught in French.

FRCH 490R. Undergraduate Research. 3 Credits. (3 Sem; 12 cr max) F PREREQUISITE: FRCH 401 or FRCH 402. Senior capstone course. Advanced research in the study of Francophone literature and culture. Research paper required. Taught in French. Course will address responsible conduct of research.

FRCH 492. Independent Study. 1-3 Credits. (1-3 Ind; 6 cr max) PREREQUISITE: Junior standing and consent of instructor. Directed research and study on an individual basis.

FRCH 497B. Education Methods. 1-2 Credits. (1 Rec; 4 cr max) F,S,Su Max 4 cr. COREQUISITE: FRCH 499. Classroom instruction associated with directed undergraduate research/creative activity projects. May be repeated.

FRCH 499R. Senior Thesis/Capstone. 1-6 Credits. (1 Ind; 12 cr max) F,S,Su Directed undergraduate research/creative activity which may culminate in a research paper, journal article, or undergraduate thesis. May be repeated.

GDSN - Graphic Design

GDSN 223. Design Principles. 4 Credits. (0 Lec, 2 Lab, 2 Snt) F PREREQUISITE: Art 110 and Art 111 and Art 112. Introduction to fundamental design principles, basic layout, tools and techniques, and creative thinking.

GDSN 224. Form and Content. 4 Credits. (2 Lec, 2 Lab) F PREREQUISITE: GDSN 223. Further exploration of design principles with increased emphasis on typographic skills and visual communications.

GDSN 360. Yellowstone Digital. 3 Credits. (3 Lab) Su PREREQUISITE: GDSN 224 or ARTZ 211 or MFA 265 or ARCH 261. A field workshop located along the Yellowstone river using either 35mm or a Digital camera to create fine art digital prints. This course is designed for individuals with a working knowledge of photographic basics and a fundamental familiarity with their own equipment that desire to explore the new media of the fine art digital print.

GDSN 361. Teton Digital. 3 Credits. (3 Lec) Su PREREQUISITE: GDSN 224, ARTZ 211, or MFA 260, or ARCH 261. An intensive field workshop located in the Jackson, Wyoming area and Grand Teton National Park using a Digital camera to create fine art digital prints. This course is designed for individuals with a working knowledge of photographic basics and a fundamental familiarity with their own equipment that desire to explore the new media of the digital print.

GDSN 366. History of Graphic Design. 3 Credits. (3 Lec) F PREREQUISITE: Junior standing in graphic design option or permission of instructor. A historical perspective of work created by graphic designers, over the past 125 years, and more particularly following the creative trends/technological breakthroughs/social achievements in Western art and design that have informed modern American design and designers.

GDSN 367. Identity Systems. 5 Credits. (5 Lab) F,S,Su PREREQUISITE: GDSN 224 and passing portfolio review. Research and production of large and small-scale identity programs, focusing on how identity functions in the context of graphic design practice.

GDSN 368. Art Direction. 5 Credits. (5 Lab) F,S,Su PREREQUISITE: GDSN 224 and passing portfolio review. The examination of art direction as it relates to the look and feel of contemporary advertising and marketing.

GDSN 369. Publication Design. 5 Credits. (5 Lab) F,S,Su PREREQUISITE: GDSN 224 and passing portfolio review. The research, development, organization, design and presentation of complex print communication documents.

GDSN 371. Motion Graphics. 5 Credits. (5 Lab) F,S,Su PREREQUISITE: GDSN 224 and passing portfolio review. Explores design issues unique to contemporary digital media including organization, narrative, motion and sound.

GDSN 372. Interaction Design. 5 Credits. (5 Lab) F,S,Su PREREQUISITE: GDSN 224 and passing portfolio review. Explores web design and planning, specifically: wayfinding, navigation, interactivity and content development.

GDSN 373. Illustration. 5 Credits. (5 Lab) F,S,Su PREREQUISITE: GDSN 224 and passing portfolio review. The investigation of specialized illustration techniques and concepts to create artwork in traditional formats that emphasize realistic modeling, as well as expressive and historical perspectives.

GDSN 374. Digital Visualization. 5 Credits. (5 Lab) F,S,Su PREREQUISITE: GDSN 224 and passing portfolio review. Examining computer based image generation techniques including photography, illustration, 3-D rendering and other digital imaging methods.

GDSN 375. Letterpress. 5 Credits. (5 Lab) F,S,Su PREREQUISITE: GDSN 224 and passing portfolio review or consent of instructor. Utilizing vintage presses and a collection of wood and cast type, to explore uncommon aspects of type and print, including the activities of hand-setting type, preparing proof sheets and specimen sheets, and printing small editions.
GDSN 376. Screenprinting. 5 Credits. (5 Lab) F,S,Su
PREREQUISITE: GDSN 224 and passing portfolio review. Using modern screenprinting technology as a communication medium. Including the preparation of screens, mixing pigments, and printing.

GDSN 377. Design and Society. 5 Credits. (5 Lab) F,S,Su
PREREQUISITE: GDSN 224 and passing portfolio review. The examination of the role of designers with local/national/global communities through a series of practical projects.

GDSN 378. Guerrilla Advertising. 5 Credits. (5 Lab) Su
PREREQUISITE: GDSN 224 or consent of instructor. Photo and marketing majors are highly encouraged. Students stretch the boundaries of traditional advertising solutions by placing their work in unusual contexts for maximum impact. The workshop-like atmosphere involves quick-fire problem solving sessions, working outdoors, guest critiques and socially-driven solutions. Graphic Design, Film & Photography, and Marketing majors are particularly encouraged to apply.

GDSN 465. Professional Studio. 5 Credits. (2 Lec, 3 Lab) F
PREREQUISITE: GDSN 223 and GDSN 224. Comprehensive projects dealing with a variety of visual communication applications. Emphasis on high standards of typography and graphic design, computer techniques, and presentation. Laptop computers are required for all upper level graphic design courses. Completion of junior level.

GDSN 491. Special Topics. 1-5 Credits. (1-5 Lec; 15 cr max) On Demand
PREREQUISITE: Course prerequisites are determined for each offering. Courses not required in any curriculum for which there is a one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

GDSN 492. Independent Study. 1-5 Credits. (1-5 Ind; 15 cr max) F,S
Max 15 cr. PREREQUISITE: Junior standing in Graphic Design. Course in which student will work on an individual basis with a faculty member in developing imagery and appropriate techniques in a particular area of graphic design. Written, signed contract required prior to registering for this class.

GDSN 498. Internship. 2-12 Credits. (2-12 Ind; 12 cr max) On Demand
PREREQUISITE: Junior standing, consent of instructor, and approval of the director. An individualized assignment arranged with an agency, business, or other organization to provide guided experience in the graphic design field.

GDSN 499. Senior Portfolio. 5 Credits. (3 Lab, 2 Stu) S
PREREQUISITE: GDSN 465. Senior capstone course. Directed undergraduate research/creative activity which culminates in a professional portfolio. Graphic design students must take this course in the spring.

GEO - Geology
GEO 103CS. Intro to Envrmntl Geology. 4 Credits. (3 Lec, 1 Lab) S
Application of geologic principles to topical problems in environmental and resource geology. Topics include analysis of environmental issues such as earthquake disaster preparedness, land use, land use, floods and human occupation, ground water withdrawal and contamination issues, volcanic and coastal hazards, and the response of landscapes and people to resource development (minerals/salt/water/energy). Laboratories will be used to analyze and debate data relevant to environmental problems from a geologic perspective.

GEO 105IN. Oceanography. 3 Credits. (3 Lec) F alternate years, to be offered odd years.
Introduction to the formation, distribution, history, and resources of the oceans of the world. Emphasis is on the geologic, physical, chemical and biological processes operating in the ocean system, distribution of life in marine ecosystems, effects of human activity on ocean resources and the interdisciplinary perspective necessary to understand ocean dynamics.

GEO 111IN. Dinosaurs. 3 Credits. (2 Lec) S alternate years, to be offered even years.
This course provides an introduction to dinosaur paleontology. Students will learn how hypotheses about extinct animals are formulated and tested, with comparisons to modern sedimentary environments and living animals. Recitation sections allow discussion of current research and hands-on experience with sedimentary rocks and fossils. Field trips provide additional education opportunities.

GEO 140IN. Planetary Geoscience. 3 Credits. (3 Lec) F
Offered even years. Introduction to the formation, geochemical development, interior and surficial processes, and exobiology of the planets, moons, and other objects of our solar system, as well as known exoplanets. Observations and data relative to planetary interiors, surfaces, and atmospheres, using principles derived from integration of chemical, physical, geologic, biologic, and engineering sciences are addressed.

GEO 208IN. Earth Materials. 3 Credits. (2 Lec, 1 Lab) F
PREREQUISITES: ERTH 101IN Earth Materials provides an overview of the minerals, rocks (igneous, sedimentary, metamorphic), and soils that comprise the solid part of the Earth system. Emphasis will be on hand sample identification, physical and chemical properties, natural occurrences, and interpretations of these materials to decipher geologic history, processes, and utility to humanity.

GEO 211. Earth History and Evolution. 3 Credits. (3 Lec) S
PREREQUISITE: ERTH 101IN. Evolution of the earth and its life from origin to present configuration. Role of plate tectonic processes in the geologic development of the continents and ocean basins. Major evolutionary developments and crises in the history of life.

GEO 290R. Undergraduate Research. 1-6 Credits. (1-6 Ind; max unlimited) F,S,Su
Directed undergraduate research which may culminate in a written work or other creative project. Course will address responsible conduct of research. May be repeated.

GEO 291. Special Topics. 1-4 Credits. (1-4 Lec; 12 cr max) On Demand
PREREQUISITE: None required but some may be determined necessary by each offering department. Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

GEO 302. Mineralogy and Optical Mineral. 4 Credits. (2 Lec, 2 Lab) S
PREREQUISITE: ERTH 101IN, CHMY 143, and GEO 208IN. Identification, properties, occurrence, and associations of the rock-forming minerals; introduction to crystallography (crystal classes, lattice types, and external morphology) and crystal chemistry (bonding and crystal structure types); analytical techniques including mineral optics, x-ray, and SEM analysis. Laboratory fee included.

GEO 309. Sedimentation and Stratigraphy. 4 Credits. (3 Lec, 1 Lab) S
PREREQUISITE: GEO 211, and M 172Q. Physical, chemical, and biological processes and their effects on sediment dispersal, deposition, and diagenesis. Geometry and lateral and vertical relationships between sedimentary rock bodies. Labs emphasize the description and analysis of sedimentary rock bodies.

GEO 310. Invertebrate Paleontology. 3 Credits. (2 Lec, 1 Lab) S alternate years, to be offered even years.
PREREQUISITE: GEO 211. Investigation of invertebrate organisms and their evolution through time as preserved in the sedimentary rock record. Emphasis is on the morphology, paleoecology, evolution, and stratigraphic and environmental significance of important fossil groups. Labs stress fossil recognition.

GEO 312. Dinosaur Paleontology. 3 Credits. (2 Lec, 1 Lab) S alternate years, to be offered odd years.
PREREQUISITE: GEO 211 and BIEO 170IN. Dinosaur Paleontology covers the origin, evolution and extinction of dinosaurs. Topics of special emphasis include phylogeny, the origin of birds, and functional adaptations. Labs examine dinosaur skeletons, their novel adaptations and role in developing evolutionary trees.

GEO 315. Structural Geology. 4 Credits. (3 Lec, 1 Lab) S
PREREQUISITE: GEO 208IN, GEO 211. Geometry, kinematics, and dynamics of natural rock deformation. Laboratory will focus on analytical and graphical techniques of modern structural analysis. Field work required.

GEO 330. Paleontology Lab Techniques. 2 Credits. (1 Lec, 1 Lab) F
Offered odd years. PREREQUISITE: GEO 211. Provides laboratory and research experience in vertebrate paleontology, including: training in fossil preparation, identification of osteological specimens, documentation (photographic and scientific illustration), molding and casting, specimen curation, and other skills necessary for professional presentation of research.

GEO 411. Vertebrate Paleontology. 3 Credits. (2 Lec, 1 Lab) S alternate years, to be offered even years.
PREREQUISITE: GEO 211, and BIEO 170IN. This course traces the history of vertebrates from the earliest chordates to synapsids, dinosaurs, and hominids. Lectures and labs emphasize phylogeny, anatomy, novel adaptations, and major evolutionary events such as the conquest of land, flight, and mass extinctions.

GEO 413. Macroevolution/Fossil Record. 3 Credits. (3 Sem) S alternate years, to be offered odd years.
PREREQUISITE: GEO 310 or GEO 312 or BIEO 375. Macroevolution explores major trends in evolution through geologic time. The course examines such topics as whether communities evolve, cladogenesis, mass extinctions, rates of speciation and extinction, controls of biodiversity, and the role of sex and body size in evolution.

GEO 417. Taphonomy: Fossil Preservation. 3 Credits. (2 Lec, 1 Lab) F alternate years, to be offered even years.
PREREQUISITE: GEO 309 and GEO 211. Scattered dinosaur bones lie entombed in a rock; what do they mean? Taphonomy examines the processes that act on an organism from the time of its death until its discovery and how these processes bias or help in fossil interpretation.
GEO 419. Field Paleontology. 2 Credits. (1 Lec, 1 Lab) Su alternate years, to be offered even years. 
PREREQUISITE: GEO 208. This two-week class provides field experience in vertebrate paleontology, including sedimentology, facies analysis, measuring stratigraphic sections, microsite screening, field identification of vertebrate and invertebrate fossils, excavation of fossil specimens, and taphonomic data collecting.

GEO 420. Hydrogeology. 3 Credits. (2 Lec, 1 Lab) On Demand 
PREREQUISITE: Junior standing, M 161 or M 172; CHMY 143, PHSX 205 or PHSX 220, ERTH 101. The relationship between ground-water and other parts of the hydrologic cycle: ground-water availability, movement, chemistry, exploration, geology, and aquifer tests. The ground-water resource in terms of regional supply and human use and intervention.

GEO 429R. Field Geology. 6 Credits. (6 Lab) Su 
PREREQUISITE: ERTH 307, GEO 211, GEO 309, and GEO 315. Must receive a minimum grade of "C" in these courses. A senior capstone course for the geology, geohydrology and paleontology options. Summer field course with application of field procedures and mapping techniques to a variety of field problems and exercises. Extensive hiking and outdoor physical challenges require that students be physically fit. A fee for supplies, transportation, and other logistical expenses is required.

GEO 433. Global Tectonics. 3 Credits. (3 Lec) F, even years 
PREREQUISITE: GEO 315. History of tectonic theory; modern view of plate tectonic processes; Precambrian tectonics; case studies of Phanerozoic orogenic belts; neotectonics; geophysics.

GEO 439. Geophysics. 3 Credits. (3 Lec) On Demand 
PREREQUISITE: GEO 211, GEO 302, M 171Q, PHSX 207. Seismology, gravity, isostasy, magnetism and paleomagnetism, electrical methods, radioactivity, geothermics, applied geophysics.

GEO 440. Volcanology. 3 Credits. (2 Lec, 1 Lab) F alternate years, to be offered even years. 
PREREQUISITE: GEO 208IN, GEO 302, and GEO 450. Overview of current ideas concerning volcanic eruptions and their resulting deposits, concentrating on examination of processes as elucidated from the study of modern volcanic environments. Required weekend field trip and field trip fee.

GEO 445. Glacial Geology. 3 Credits. (2 Lec, 1 Sem) F 
PREREQUISITE: ERTH 307. In-depth study of the processes of glaciation and the resulting land forms. Includes class and library readings, and field examination of features of mountain glaciations.

GEO 448. Sedimentary Petrology. 3 Credits. (2 Lec, 1 Lab) S 
PREREQUISITE: GEO 302. Detailed analysis and interpretation of the mineralogy, fabric, and genesis of terrigenous clastic and carbonate sedimentary rocks. Use of thin-section microscopy, the scanning electron microscope, and x-ray diffraction techniques are emphasized in the laboratory.

GEO 449. Metamorphic Petrology. 3 Credits. (2 Lec, 1 Lab) F 
Offered odd years. PREREQUISITE: GEO 302. Introduction to the principles of metamorphic petrology; metamorphic facies, reactions, phase equilibria, processes, petrographic analysis, deformation, and interpretation of metamorphism in the context of global tectonics.

GEO 450. Igneous Petrology. 3 Credits. (2 Lec, 1 Lab) S 
PREREQUISITE: GEO 208IN and GEO 302. Introduction to the distribution, mineral associations, and chemical compositions of igneous rocks in the earth's crust and upper mantle. Emphasis is on the use of petrographic features and chemistry to identify igneous rocks and interpret rock-forming processes.

GEO 490R. Undergraduate Research. 1-6 Credits. (1 Ind; 12 cr max) F,S,Su 
Directed undergraduate research which may culminate in a research paper, journal article, or undergraduate thesis. Course will address responsible conduct of research. May be repeated.

GEO 491. Special Topics. 1-4 Credits. (1-4 Lec; 12 cr max) On Demand 
PREREQUISITE: Course prerequisites as determined for each offering. Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand.

GEO 492. Independent Study. 1-3 Credits. (1 Ind; 6 cr max) On Demand 
PREREQUISITE: Junior standing, consent of instructor, and approval of department head. Directed research and study on an individual basis.

GEO 494. Senior Geology Seminar. 1 Credit. (1 Sem) F,S 
Max 4 cr. PREREQUISITE: Junior standing and as determined for each offering. Topics at the upper division level not covered in regular courses. Students participate in preparing and presenting discussion material.

GEO 497. Geology Instruction. 1-2 Credits. (1-2 Lab; 3 cr max) F,S,Su 
PREREQUISITE: Junior or senior standing in geology and consent of instructor and Department Head. Student works as a tutor and undergraduate teaching assistant in a teaching laboratory under close academic supervision. Weekly meeting focuses on geology, teaching, organization of class materials, and student supervision. Weekly lab emphasis on applying active learning concepts in a geologic laboratory context.

GEO 498. Internship. 2-12 Credits. (2 Ind; 12 cr max) On Demand 
PREREQUISITE: Junior standing, consent of instructor, and approval of department head. An individualized assignment arranged with an agency, business or other organization to provide guided experience in the field.

GEO 499. Senior Thesis/Capstone. 3 Credits. (3 Lec) F,S 
PREREQUISITE: Senior standing; minimum 3.0 cum gpa; faculty recommendation. Senior thesis provides an opportunity to conduct research under the supervision of a faculty member leading to the production of a research paper ("mini-thesis") and an oral presentation to the department or at a professional meeting. Excellent preparation for graduate school and professional work.

GEO 508. Depositional Systems. 3 Credits. (3 Sem) S alternate years, to be offered odd years. 
PREREQUISITE: GEO 309. Facies models for terrestrial and marine depositional environments and their application to interpreting the stratigraphic record.

GEO 509. Montana Geology. 2 Credits. (1 Lec) On Demand 
PREREQUISITE: Graduate Standing. This course is designed to be rigorous overview of Montana’s geologic history form the oldest rocks (Archean in the Beartooth Mountains) to the most recent seismic events. As such, it will also serve as a thorough review of many aspects of undergraduate geology, thus helping to prepare new graduate students for their oral comprehensive exams. Readings will be based on the technical literature, such as articles from refereed journals, advanced topical books and special publications of the Geological Society of America, etc.

GEO 515. Structural Geology. 3 Credits. (2 Lec, 1 Lab) On Demand 
PREREQUISITE: GEO 315 or equivalent. Advanced topics in structural geology and structural analysis; topics may vary with each offering; class research project is required. Field trip fee required.

GEO 517. Taphonomy. 3 Credits. (2 Lec) F alternate years, to be offered even years. 
PREREQUISITE: Graduate standing and GEO 448 or GEO 309 and GEO 310 or GEO 411 or their equivalents. Before one can ask questions about a fossil organism's anatomy, paleoecology or evolution, one must clearly understand its geologic context. Taphonomy investigates the death to discovery history of fossils and the biases created by post-mortem processes to the fossil record.

GEO 520. Ancient Ocean Systems. 3 Credits. (3 Sem) S alternate years, to be offered even years. 
PREREQUISITE: Course limited to graduate students or senior undergraduates with permission. Seminar on marine geology with emphasis on ancient deep-marine outcrops.

GEO 521. Dinosaur Paleontology. 2 Credits. (1 Lec, 1 Lab) Su 
PREREQUISITE: Graduate Standing. This course is an introduction to Dinosaur Paleontology and Hell Creek Formation of Eastern Montana. It will provide new graduate students for their oral comprehensive exams. Readings will be based on the technical literature, such as articles from refereed journals, advanced topical books and special publications of the Geological Society of America, etc.

GEO 522. Dino Paleontology II. 2 Credits. Su alternate years, to be offered even years. 
PREREQUISITE: GEO 521 and consent of instructor. This course builds on identification and field techniques acquired from GEO 521 through hands-on participation in on-going paleontology research. Students acquire greater understanding of field data collection and formulation and testing of hypotheses; and advanced knowledge of paleoenvironments and geological processes.

GEO 530. Tectonics of Sedimentary Basin. 3 Credits. (3 Sem) On Demand 
PREREQUISITE: GEO 309 and GEO 315. This course examines the plate tectonic setting and controls on development of modern and ancient sedimentary basins. Includes investigation of sediment provenance, facies patterns, methods of basin analysis, and subsidence history.

GEO 533. Graduate Global Tectonics. 3 Credits. (3 Lec) F, alternate years to be offered even years PREREQUISITE: GEO 315. History of tectonic theory; modern view of plate tectonics processes; Precambrian tectonics; case studies of Phanerozoic orogenic belts; neotectonics; geophysics. Graduate students will be required to write an in-depth research paper on a topic chosen in consultation with the instructor.
GEO 535. Advanced Stratigraphy. 4 Credits. (3 Lec, 1 Lab) S to be offered even years.
PREREQUISITE: Graduate standing. Weekly lecture and lab, including one-week field excursion, examines different approaches in stratigraphy used to reconstruct ancient terrains. Course emphasizes advanced correlation techniques and interpretation methods applied in sedimentary geology.

GEO 540. Volcanology. 3 Credits. (2 Lec, 1 Lab) F alternate years, to be offered even years.
PREREQUISITE: GEO 208IN, GEO 302, and GEO 450. Understand processes by which magma and associated gases rise into the crust and are extruded onto the Earth’s surface and atmosphere, interpret the forms of volcanoes and their magmatic magma, and provide the necessary background to perform research in volcanology.

GEO 542. Comparative Osteology. 3 Credits. (Sem) On Demand
PREREQUISITE: BIOC 310, BIOL 504. Fossil bone histology and comparative osteology including enchainchondral ossification, epiphyseal ontogeny, cortical ossification, bone remodeling, special bone tissues, fossil bone content, bone architecture and biomechanics, bone chemistry and diagenesis, comparative bone morphology, and functional anatomy.

GEO 548. Graduate Sedimentary Petrology. 3 Credits. (2 Lec, 1 Lab) On Demand
PREREQUISITE: GEO 302. Detailed analysis and interpretation of the mineralogy, fabric, and genesis of terrigenous clastic and carbonate sedimentary rocks. Use of thin-section microscopy, the scanning electron microscope, and x-ray diffraction techniques are emphasized in the laboratory.

GEO 549. Graduate Metamorphic Petrology. 3 Credits. (2 Lec, 1 Lab) F alternate years, to be offered odd years.
PREREQUISITE: GEO 302 Principles of metamorphic petrology; metamorphic facies, reactions, phase equilibria, processes, petrographic analysis, deformation, and interpretation of metamorphism in the context of global tectonics.

GEO 550. Graduate Igneous Petrology. 3 Credits. (2 Lec, 1 Lab) S
PREREQUISITE: GEO 208 AND GEO 302. Emphasis on the distribution, mineral associations, and chemical compositions of igneous rocks in the earth’s crust and upper mantle. Emphasis is on the use of petrographic features and chemistry to identify igneous rocks and interpret rock-forming processes.

GEO 560. Geology Yellowstone Volcanic. 2 Credits. (2 Lec, 1 Lab)
3 cr. LEC. 2 LAB 1 PREREQUISITE: MSSE Student The purpose of this course is to provide an understanding of the geology of the Yellowstone Volcanic Center, the largest active explosive continental volcanic center on Earth. The course consists of 3 days of in-class instruction on campus and 2 subsequent days of field trips designed to explore the geology of the Yellowstone Volcanic Center. Topics covered include evidence of caldera formation, differing styles of volcanic eruptions, mineral and microbe interactions at thermal features, consequences of seismic activity, and controls of volcanic activity on landscape components including topography, soils, soil distribution, and water resources.

GEO 575. Professional Paper. 1-6 Credits. (1-6 Ind; 6 cr max) F, S, Su PREREQUISITES: Consent of Instructor A research or professional paper or project dealing with a topic in the field. The topic must have been mutually agreed upon by the student and his or her major advisor and graduate committee. Dept of Earth Sciences.

GEO 581. Quaternary Environments. 3 Credits. (2 Lec) On Demand
PREREQUISITE: ERTH 307. The last two million years of earth history as interpreted from geologic, biologic, and pedologic proxy data. Includes both global and regional analyses of changing climates and their effects on earth surface processes and land forms.

GEO 583. Applied Geological Hydrology. 3 Credits. (2 Lec, 1 Lab) On Demand.
PREREQUISITE: Graduate standing or GEO 420. Application of ground-water principles to ground-water resource, contamination and remediation problems.

GEO 591. Special Topics. 1-4 Credits. (1-4 Sem; 12 cr max) On Demand
PREREQUISITE: Upper division courses and others as determined for each offering. Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

GEO 592. Independent Study. 1-4 Credits. (1-3 Ind; 6 cr max) On Demand
PREREQUISITE: Graduate standing, consent of instructor, approval of Department Head and Dean of Graduate Studies. Directed research and study on an individual basis.

GEO 594. Seminar. 1 Credit. (1 Sem) F, S
PREREQUISITE: Graduate standing or seniors by petition. Course prerequisites as determined for each offering. Topics offered at the graduate level which are not covered in regular courses. Students participate in preparing and presenting discussion material.

GEO 598. Internship. 2-12 Credits. (2 Ind; 12 cr max) On Demand
PREREQUISITE: Graduate standing, consent of instructor and approval of department head. An individualized assignment arranged with an agency, business or other organization to provide guided experience in the field.

GPHY - Geography

GPHY 121D. Human Geography. 3 Credits. (3 Lec) F
Global geographies of population and economic development; patterns of language and religion; global distributions of agriculture, industry, and urban landscapes; use of human geography to analyze selected world problems.

GPHY 141D. Geography of World Regions. 3 Credits. (3 Lec) F, S, Su
Resume of major world regions; their cultures, populations, resources, utilization of land; emphasis on regions outside Anglo-America.

GPHY 262. Spatial Sci Tech & Application. 3 Credits. (2 Lec, 1 Lab)
S
Fundamentals of GPS, GIS and remote sensing, and their application in a wide range of disciplines. Exploration of the increasing use of geospatial technologies in our world and their impact on our lives. Students will gain hands-on experience with GPS receivers, and GPS, GIS and remote sensing software.

GPHY 284. Intro to GIS Science & Cartog. 3 Credits. (2 Lec, 1 Lab) F, S
Concepts of spatial thinking; understanding spatial relationships and interaction in the natural and built environment. Spatial data principles, data models, relational database concepts, contemporary digital cartography, map design and composition, spatial data conversion, introduction to spatial analysis and synthesis.

GPHY 290R. Undergraduate Research. 1-6 Credits. (1-6 Ind; max unlimited) F, S, Su
May be repeated. Directed undergraduate research/creative activity which may culminate in a written work or other creative project. Course will address responsible conduct of research.

GPHY 291. Special Topics. 1-4 Credits. (1-4 Ind; 12 cr max) On Demand
Max 12 cr. PREREQUISITE: None required but some may be determined necessary by each offering department. Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

GPHY 321. Urban Geography. 3 Credits. (3 Lec) S alternate years, to be offered odd years.
PREREQUISITE: GPHY 121D or STAT 216Q. Historical evolution and spatial patterns of urban places in the U.S. and the world; human-environment relationship in urban areas; analyses of urban economy and land use in the city; spatial structure of urban system in national and regional background; some important methods and theories in urban geographical research.

GPHY 322. Economic Geography. 3 Credits. (3 Lec) F alternate years, to be offered odd years.
PREREQUISITE: GPHY 121D and STAT 216Q. Contemporary research questions and methodologies in economic geography; spatial patterns and processes of main economic activities; principles of spatial interaction; application of locational theory in urban and rural settings.

GPHY 325. Cultural Geography. 3 Credits. (3 Lec) F alternate years, to be offered odd years.
PREREQUISITE: GPHY 121D and STAT 216Q. Historical evolution and spatial patterns of cultural activities; principles of spatial interaction; application of locational theory in urban and rural settings.

GPHY 426. Geography of Energy Resources. 3 Credits. (3 Lec) S
PREREQUISITES: GPHY 121 OR GPHY 141 Pre-industrial and contemporary energy systems; global distribution of energy resources; implications of energy resource distribution for contemporary geopolitics and development; metrics of energy consumption.

GPHY 429. Environment and Society. 3 Credits. (3 Lec) F
This course introduces students to the study of relationships between people and the environment from a social science perspective. It explores the social causes and consequences of environmental change and examines the different approaches to decision-making about environmental issues.

GPHY 357. GPS Fund/App in Mapping. 3 Credits. (1 Lec, 2 Lab) F
PREREQUISITE: GPHY 284. Theory and application of the global positioning system Global Positioning System (GPS) to mapping in natural resource and land management sciences. Mapping issues and accuracy assessment are emphasized. Labs and term mapping project include hands-on experience with GPS receivers and work with Pathfinder Office and Arc GIS ArcGIS software. Students must be proficient with the latest version of ArcGIS.
GPHY 358. GPS Mapping Svc Learning. 1 Credit. (1 Rec) F
COREQUISITE: GPHY 357. Participation in one of two established GPHY 357 service-learning projects: E-911 mapping of high density housing developments to aid in emergency response (section 1); AGAI canal mapping to update the Gallatin Valley inventory of water resources (section 2).

GPHY 365. Geographical Planning. 3 Credits. (3 Lec) S
PREREQUISITE: GPHY 121D. Planning history in the U.S.; Main factors, elements, organization, and issues of urban and rural planning in a geographical context; main principles, methods and tools of geographical planning; integration of physical and human variables into the planning process.

GPHY 384. Adv GIS and Spatial Analysis. 3 Credits. (2 Lec, 1 Lab) F,S

GPHY 402. Water and Society. 3 Credits. (3 Lec) F, odd years
PREREQUISITE: Junior, senior, or graduate student standing. This course introduces students to the study of relationships between people and the environment from a social science perspective. It explores the social causes and consequences of environmental change and examines the different approaches to decision-making about environmental issues.

GPHY 411. Biogeography. 3 Credits. (3 Lec) S
Offered odd years. PREREQUISITE: GPHY 121D or BIOC 170IN. Factors affecting the geography of plants and animals in space and time.

GPHY 425. Geographic Thought. 3 Credits. (3 Lec) S
PREREQUISITE: Senior standing in Geography program. A senior capstone course for the geography option. The exploration of the history of geographic thought; the emergence and evolution of modern academic and applied geography. Contemporary trends and issues in geography.

GPHY 426. Remote Sensing. 3 Credits. (2 Lec; 1 Lab) S
PREREQUISITE: Junior standing or consent of instructor. Theory and application of remote sensing, the electromagnetic spectrum, earth-energy interactions, and operation of multispectral sensors. Applications include satellite image analysis for agriculture, environmental assessment, forestry, geology, rangeland, urban, wildlife, and others.

This course is intended for students not in geospatial or GIS majors.

GPHY 429R. Applied Remote Sensing. 3 Credits. (2 Lec; 1 Lab) S
PREREQUISITE: Junior standing or consent of instructor. Applications of remote sensing, including advanced studies of multispectral and hyperspectral sensors and image processing algorithms. Emphasis is on using remote sensing technologies for solving applied land resource issues. This course is intended for students in geospatial and GIS majors. Dept of Land Resources & Environmental Science.

GPHY 431. Historical Geography. 3 Credits. (3 Lec) S alternate years, to be offered odd years.
PREREQUISITE: GPHY 121 Past geographies of North America. Political, cultural, economic, and urban evolution of Northern American regions from the colonial era to 1900.

GPHY 441R. Mountain Geography. 4 Credits. (2 Lec; 2 Lab) F alternate years, to be offered odd years.

GPHY 445. Adv. Regional Geography. 3 Credits. (3 Lec; 6 cr max) On Demand PREREQUISITE: Two of the following: ERTH 101IN, GPHY 141D, or GPHY 121D. A topical and regional analysis of related political subdivisions or other geographical areas. Course may be taken twice if regional emphases differ.

GPHY 446. East Asia in the Global System. 3 Credits. (3 Lec) S alternate years, to be offered even years.
PREREQUISITE: ERTH 101IN, GPHY 141D. Physical environments, history, cultures, demography, economies, politics, international relationships and urban developments of East Asia as a geographical region and inside independent countries; main position and development tendency of East Asia in the world system.

GPHY 457. Adv GPS Mapping for GIS. 3 Credits. (3 Lab) F
PREREQUISITE: GPHY 284 and GPHY 357. Advanced topics and techniques in GPS/GIS mapping, emphasizing high accuracy data collection, data quality and documentation. Advanced datalogging options, carrier phase and dual-frequency data collection, GPS photo link, and mobile GIS are some of the topics explored. Course includes topic research and presentation, and service-learning project work.

GPHY 461. Tourism Planning. 3 Credits. (3 Lec) S alternate years, to be offered even years.
PREREQUISITE: GPHY 284 and GPHY 365. Concepts and components of tourism system; types and geographical patterns of main tourism resources; methods and theories in tourism geography studies; case analyses of tourism planning at site, regional and national scale.

GPHY 484R. Applied GIS & Spatial Analysis. 3 Credits. (2 Lec; 1 Lab) S
PREREQUISITE: GPHY 384 and either STAT 217 or STAT 332. Advanced spatial analysis, synthesis and modeling concepts and methods. Semester projects apply theory and concepts to a project related to student's discipline. Students learn to develop GIS applications to address a variety of issues.

GPHY 490R. Undergraduate Research. 1-6 Credits. (1 Ind; 12 cr max) F,S,Su
Directed undergraduate research which may culminate in a research paper, journal article, or undergraduate thesis. Course will address responsible conduct of research. May be repeated.

GPHY 491. Special Topics. 1-4 Credits. (1-4 Lec; 12 cr max) On Demand PREREQUISITE: Course prerequisites as determined for each offering. Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand.

GPHY 492. Independent Study. 1-3 Credits. (1-3 Ind; 6 cr max) On Demand PREREQUISITE: Junior standing, consent of instructor, and approval of department head. Directed research and study on an individual basis.

GPHY 494. Seminar. 1 Credit. (1 Sem; 4 cr max) On Demand PREREQUISITE: Junior standing and as determined for each offering. Topics at the upper division level not covered in regular courses. Students participate in preparing and presenting discussion material.

GPHY 497. Geography Instruction. 1-2 Credits. (5 Lab; 4 cr max) F,S,Su
PREREQUISITE: Junior or senior standing in geography and consent of instructor and Department Head. Student works as a tutor and undergraduate teaching assistant in a teaching laboratory under close academic supervision. Weekly meeting focuses on geography teaching, organization of class materials, and student supervision. Weekly lab emphasizes applying active learning concepts in a geography laboratory context.

GPHY 498. Internship. 2-12 Credits. (2-12 Ind; 12 cr max) On Demand PREREQUISITE: Junior standing, consent of instructor, and approval of department head. An individualized assignment arranged with an agency, business or other organization to provide guided experience in the field.

GPHY 502. Water and Society. 3 Credits. (3 Lec) F, odd years
PREREQUISITE: Graduate student standing. This course introduces students to the study of relationships between people and the environment from a social science perspective. It explores the social causes and consequences of environmental change and examines the different approaches to decision-making about environmental issues.

GPHY 503. Settlement Geography. 3 Credits. (3 Sem) F alternate years, to be offered even years.
PREREQUISITE: Graduate standing. Settlement history and contemporary land use in the trans-Mississippi west. Evolution of cultural landscapes in the Mountainous West.

GPHY 504. GIS Research Fundamentals. 3 Credits. (2 Lec; 1 Lab) F
PREREQUISITE: Graduate standing, Geographic Information Science Fundamentals in the context of developing a research program. Spatial data principles, data models, conversion and sampling strategies, analysis methods and cartography. Lab exercises uses GIS software. Students specialty area explored through literature review and individual project.

GPHY 505. Bioclimatology. 3 Credits. (3 Sem) On Demand PREREQUISITE: GEO 211 or BIOL 370. The distribution of plants, as controlled by climate, geologic history and geographic location. Changes over time in distribution patterns as related to climate change and other human activities.

GPHY 520. Land Use Planning. 3 Credits. (3 Sem) F alternate years, to be offered odd years.
PREREQUISITE: Graduate standing. History and philosophy of land use planning; application of geographical skills to contemporary land use planning issues. Selected topics include population pressure and land requirement, law, eminent domain, property right, public control over private land use, institution, and economics in land use planning.

GPHY 545. Adv Regional Geography. 3 Credits. (3 Lec) F alternate odd years PREREQUISITE: Two of the following: ERTH 101, GPHY 121, or GPHY 141 A topical and regional analysis of related political subdivisions or other geographical areas. Course may be taken twice if regional emphases differ.
GRMN - German

GRMN 101. Elementary German I. 3 Credits. (3 Rct)
NOTE: Offered on a rotating basis with French and Spanish in Summer. An elementary level course designed to help students acquire basic proficiency in communication within culturally significant contexts. An integrated approach to teaching language skills with emphasis on vocabulary acquisition and basic grammatical structures.

GRMN 102D. Elementary German II. 3 Credits. (3 Rct)
PREREQUISITE: GRMN 101 or equivalent, or two years of high school German. Offered on a rotating basis with French and Spanish in Summer. This course builds upon the foundation established in 101. Greater emphasis is placed upon oral and written expression. Reading and discussions are designed to increase comprehension of more linguistically complex texts and more conceptually complex cultural issues.

GRMN 201D. Intermediate German I. 3 Credits. (3 Rct)
PREREQUISITE: GRMN 102 or equivalent, or a minimum three years of high school German, or placement interview. Intensive methodical review of grammar and syntax combined with the integrated development of proficiency in the four language skills. Expansion of cultural knowledge and functional vocabulary through intermediate-level readings and discussions. Increased emphasis on written communication.

GRMN 202D. Intermediate German II. 3 Credits. (3 Rct)
PREREQUISITE: GRMN 201 or equivalent, or a placement interview. Designed to follow the third semester review of grammar and basic skills. Taught through a series of carefully selected readings in German culture, civilization and literature which will provide the basis for writing essays and reports and developing advanced language skills.

GRMN 301. Oral and Written Expression I. 3 Credits. (3 Rct) F
PREREQUISITE: GRMN 202D. In-depth review of grammar, syntax, and idiomatic expression; vocabulary building practice in conversation. Short readings in German as a basis for conversation and composition. Emphasis on accuracy in grammar and expression.

GRMN 302. Oral and Written Expression II. 3 Credits. (3 Rct)
PREREQUISITE: GRMN 202D or permission of the instructor. In-depth review of grammar, idiomatic expression, and conversation and writing skills. Longer readings in German. Emphasis on attaining proficiency in spoken and written German, some focus on phonetics and German for the professions.

GRMN 303H. Issues of German Cinema. 3 Credits. (3 Rct) S alternate years, to be offered even years.
PREREQUISITE: Junior standing or consent of instructor. Acquaints students with the traditions of German cinema in national, European and global contexts. Theoretical film analysis of silent film, propaganda film, post-war cinema, rubble film, censored films, New German Cinema and other genres. All films, readings, and discussions in English.

GRMN 315. Survey of German Literature. 3 Credits. (3 Lec) F alternate years, to be offered odd years.
PREREQUISITE: GRMN 202D. A survey of representative works of German literature from selected literary periods before 1900.

GRMN 350. German Culture & Civilization. 3 Credits. (3 Lec) S alternate years, to be offered odd years.
PREREQUISITE: GRMN 202D. A survey of some of the great figures and periods of German Art, literature, music, and public life in German-speaking countries which have made significant cultural contributions to world civilization up to 1871.

GRMN 360H. German Myths. 3 Credits. (3 Lec) F alternate years, to be offered even years.
PREREQUISITE: Junior standing or consent of instructor. An examination of the German mythical figures in pursuit of love, knowledge, and blood. These themes are explored through the texts from medieval legends through contemporary popular culture. Authors include Goethe, Heine, and others. Films by Murnau and Herzog. All readings and discussions in English.

GRMN 422H. German Text & Cinema. 3 Credits. (3 Rct) F
PREREQUISITE: Junior standing or permission of instructor. This seminar focuses on the cultural, historical, and linguistic elements crucial to an understanding of the relationship between text and cinema within a national and international tradition. It is designed to provide a context for majors and minors to read longer texts not otherwise taught in the curriculum, including the canonical novels of the late 19th century. Taught in English.

GRMN 440H. German Cultural Studies. 3 Credits. (3 Rct)
PREREQUISITE: None. Students acquire expertise in social, philosophical, and cultural concepts that inform the evolution of German cultural theory from the 18th century to the present. Topics covered include nation-building narratives, Marxism, psychoanalysis, feminism, critical theory, and contemporary cultural studies. (Conducted entirely in English).

GRMN 450R. Sem:German Lit and Culture. 3 Credits. (3 Sem) S
PREREQUISITE: GRMN 330, GRMN 315, or GRMN 320. Senior capstone course. Topics offered at the upper division level which are not covered in regular courses. Students participate in preparing and presenting discussion material. It is recommended to take this course multiple times (as GRMN 490R).

GRMN 490R. Undergraduate Research. 1-6 Credits. (1 Ind; 12 cr max) F,S,Su
Directed undergraduate research which may culminate in a research paper, journal article, or undergraduate thesis. Course will address responsibility conduct of research. May be repeated.

GRMN 491. Special Topics. 1-3 Credits. (1-3 Sem; 12 cr max) On Demand
PREREQUISITE: Course prerequisites as determined for each offering. Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

GRMN 492. Independent Study. 1-3 Credits. (1-3 Ind; 6 cr max)
PREREQUISITE: Junior standing and consent of instructor. Directed research and study on an individual basis.

HADM - Health Administration

HADM 445. Managing Healthcare Organizations. 3 Credits. (3 Lec) S
PREREQUISITE: CHTH 210 or KIN 105 and junior standing. An introduction to health administration. Management of public health organizations, patterns of health organizations, and various administrative factors involved in the practice of health administration. Issues of budgeting, finance, marketing and public relations will be explored.

HDCF - Human Devel Child/Family Life

HDCF 474. Senior Seminar. 4 Credits. (1 Lec, 3 Lab) S,Su
PREREQUISITE: HDCF 371 and screening procedures as specified on the Health and Human Development web site. Senior capstone course. Establishing a professional identity and transitioning to a career in the field of early childhood education and child services and family and consumer sciences. The lab section of this course will entail the scientific application of family and consumer sciences theory and methods. In consultation with course instructor, students will participate in a lab assignment.

HDCF 590. Master’s Thesis. 1-10 Credits. (1-10 Ind; max unlimited) F,S,Su
Max credits unlimited. PREREQUISITE: Master’s standing. Directed graduate research/creative activity.

HDCO - Human Devel Counseling

HDCO 460. Student Leader Training. 2 Credits. (1 Lec; 6 cr max) S
Maximum 6 cr PREREQUISITE: Orientation leader status; restricted entry. Knowledge and skills necessary for interaction, presentation, and facilitation with regard to new student group leading, peer advising, and campus representation.
HDCO 463. Student Assistant Training. 1 Credit. (1 Lec) F
PREREQUISITE: Resident Assistant status; restricted entry. Course includes training in various aspects related to the performance of the Resident Advisor position duties. It includes areas such as self-understanding, interpersonal skills, intervention techniques, and perspectives on college students and the campus environment, which are fundamental to the effective functioning of Resident Assistants.

HDCO 464. Sdtnt Asst Candidate Train. 1 Credit. (1 Lec) S
PREREQUISITE: Resident Assistant candidate status; pass/fail grading; restricted entry. Course includes exposure to college student development theories, advising, and communication skill development areas within a residence hall setting. Emphasis is given to working with individuals and groups in a peer counseling/educational role. Resident Advisor roles and responsibilities are also addressed.

HDCO 502. Cnsl Ethic Prof Orient. 2 Credits. (2 Rct) Su
PREREQUISITE: Graduate standing in counseling program. This course will prepare the student with a strong orientation to professional and ethical issues as they apply to counseling. Contents of the course will examine historical aspects of counseling professions, professional counseling roles, professional organizations, consultation models, professional preparation standards, and credentialing. It will also introduce appropriate ethical codes for conduct and study case studies representing ethical dilemmas a counselor may face in schools, agencies, and private practice.

HDCO 503. Prof Issues in Counseling. 3 Credits. (3 Sem) F
PREREQUISITE: Graduate standing in counseling program. This course focuses on providing students with an understanding of the professional identity and roles of the counselor in prevention, consultation, crisis management, specialization, public policy, legal and ethical issues unique to working with schools, families, and community organizations.

HDCO 505. Prof Iss in School Couns. 3 Credits. (3 Rct) F
PREREQUISITE: Graduate standing in counseling program. Presentation of professional and ethical issues in school counseling. Group discussion and various experiential activities will provide students with numerous opportunities to understand current issues and trends in the field of school counseling.

HDCO 506. School Counsel Programs. 3 Credits. (3 Lec) Su
PREREQUISITE: Graduate standing in counseling program. Foundations of the school counseling profession including historical and conceptual perspectives of the field, and the knowledge and skills necessary to be a professional school counselor. Particular emphasis will be placed on a thorough understanding of planning, design, implementation, and evaluation of comprehensive school counseling programs.

HDCO 508. Counseling Theories I. 3 Credits. (3 Lec) Su
PREREQUISITE: Graduate standing in counseling program. Students will learn a wide range of systems theories used in the diagnosis and treatment of individuals, couples, children, and families.

HDCO 510. Counseling Theories II. 3 Credits. (3 Lec) F
PREREQUISITE: Graduate standing in counseling program. This course provides an overview of the major counseling theories and practical applications with various populations. Teaching modalities will include lecture, class discussion, study of taped counseling sessions, and small group interaction.

HDCO 521. Counseling Skills Lab. 1 Credit. (1 Lab) F
PREREQUISITE: HDCO 502 and graduate standing in counseling program. Students will learn, practice, and apply basic counseling skills in preparation for their practicum experience.

HDCO 522. Group Counseling. 3 Credits. (2 Lec, 1 Lab) F
PREREQUISITE: HDCO 502 and graduate standing in counseling program. The following information will be covered in relation to group counseling theories, research, developmental stages, therapeutic factors, leadership functions, consultation and ethics. Use of leadership skills in structured and unstructured groups will be practiced.

HDCO 523. Theory and Practice of Addiction. 2 Credits. (2 Rct) S
PREREQUISITE: HDCO 510 and graduate standing in counseling program. This course is designed to review current developments in the field of addictions, as well as, evaluate research and treatment trends within addiction practice. Students will demonstrate an understanding of addictions theory and apply it to practice cases.

HDCO 524. Consultation and Crisis: Theory and Practice. 3 Credits. (3 Lec) Su
PREREQUISITE: Graduate standing in counseling program. The study of consultation and crisis counseling theories, strategies, and models. Includes specific applications related to collaboration among schools, mental health agencies, and private practitioners.

HDCO 525. Counsel Child & Adolescents. 3 Credits. (3 Rct) S
PREREQUISITE: HDCO 508 and graduate standing in counseling program. Application of counseling theories and techniques to preschool and school age (K-12) children and their families. A special emphasis will be placed on implementing appropriate intervention strategies according to age, developmental level, and the counseling setting.

HDCO 526. Adventure Counseling. 3 Credits. (3 Lec) On Demand
PREREQUISITE: Graduate standing in counseling program. An introduction to the theory and practice of adventure-based counseling and experiential learning. The course will focus on the goals, concepts, and techniques of adventure work. Students will learn numerous adventure games, problem-solving initiatives, and how to design adventure programs.

HDCO 530. Mind-Body Well-Being Self-Care. 3 Credits. (3 Lec) S
PREREQUISITE: HDCO 510 and graduate standing in counseling program. The objectives of this course are two-fold: 1) familiarize students with mind-body, well-being, and self-care interventions; and 2) train students in preventive methods.

HDCO 550. Counseling Research and Evaluation. 2 Credits. (2 Lec) S
PREREQUISITE: Graduate standing in counseling program; HDCO 502. This course will provide an understanding of research methods, statistical analysis, needs assessment, and program evaluation as they apply to the field of counseling.

HDCO 551. Appraisal. 3 Credits. (2 Lec, 1 Lab) S
PREREQUISITE: HDCO 571 and graduate standing in counseling program. Topics include test standardization, reliability and validity; developing understanding of appraisal instruments and needs assessment used with individuals and systems; using information derived from selected appraisal instruments.

HDCO 554. Develop Theory Across Lifespan. 3 Credits. (3 Lec) F
PREREQUISITE: HDCO 521 and HDCO 571 and graduate standing in the counseling program. An introduction to the complex developmental relationships among individuals in the family across the life span. Systems, developmental, learning and personality theories across the life span are surveyed. Contextual variables on developmental processes are stressed.

HDCO 556. Sexuality Counseling. 3 Credits. (2 Lec, 1 Lab) On Demand
PREREQUISITE: HDCO 510, Graduate standing in counseling program. Exploration of sexual issues and the counseling process. Examination of foundations needed to respond to clients’ sexual concerns.

HDCO 558. Career Counseling. 2 Credits. (2 Lec) Su
PREREQUISITE: Graduate standing in counseling program. This course will prepare the student in the area of career guidance and counseling. Emphasis will be placed on the understanding of career development theories, use of occupational informational sources including computer programs, assessment of the individual and various working environments, and the design of career developmental programs from elementary school through retirement. The student will also be introduced to the impact social issues have on work, leisure and families.

HDCO 563. Multicultural Awareness. 3 Credits. (3 Lec) F
PREREQUISITE: Graduate standing. This course explores the relationships between social organizations, processes of historical change, social stratification (race, gender, sexuality), individuals and family structure.

HDCO 564. Diagnosis and Mental Health. 3 Credits. (3 Lec) S
PREREQUISITE: Graduate standing in counseling program. This course will provide students with conceptual understanding of mental disorders within physiological, developmental, familial, and social cultural contexts. Students will learn how to use DSM diagnosis in the appraisal and differential diagnosis of mental disorders.

HDCO 565. Marital & Relationship Counsel. 3 Credits. (2 Lec) F
PREREQUISITE: HDCO 508 and graduate standing in counseling program. Theoretical foundations and interventions for working with marital and intimate relationships. Includes promotion of healthy couple relationships and treatment of couples in crisis and/or transition. Emphasizes gender roles, sexuality, and issues related to intimacy from a systemic perspective.

HDCO 568. Mental Health Methods. 3 Credits. (3 Lec) S
PREREQUISITE: HDCO 510 and graduate standing in counseling program. Mental health counseling methods for treatment of mental disorders, including adults with serious mental illness and severely emotionally disturbed children. Appraisal, treatment planning, evidence-based interventions, medications, crisis intervention, case management, consultation, referral, and professional issues/ethics in treatment of DSM disorders.
HDCO 569. Advanced Family Counseling. 3 Credits. (3 Rct) S
PREREQUISITE: HDCO 508 and graduate standing in counseling program. Advanced theoretical foundations and interventions for the practice of family therapy. Includes current research regarding family therapy and treatment. Emphasizes assessment and interventions for families dealing with mental health diagnoses, substance abuse, sexual abuse, violence, divorce/remarriage, and child/adolescent issues.

HDCO 571. Prof Counsel Practicum. 3 Credits. (3 Lab; 15 cr max) S
PREREQUISITE: HDCO 508, HDCO 521; graduate standing in counseling program and consent of instructor. Supervised clinical practice with individuals, children, families, and groups. Weekly individual and group supervision.

HDCO 575. Prof Paper/Project. 1-4 Credits. (1-4 Ind; 6 cr max) F,S,Su
PREREQUISITE: Graduate standing in counseling program. A research or professional paper or project dealing with a topic in the field. The topic must have been mutually agreed upon by the student and his or her major advisor and graduate committee.

HDFP 588. Professional Development. 1-3 Credits. (1-3 Lec; 3 cr max) On Demand
PREREQUISITE: Graduate standing, teaching experience and/or current employment in a counseling organization and consent of instructor. Courses offered on a one-time basis to fulfill professional development needs of in-service educators or counselors. A specific focus is given to each course which is appropriately titled. May be repeated.

HDFP 589. Graduate Consultation. 1-3 Credits. (3 Ind; 3 cr max) F,S,Su
PREREQUISITE: Graduate standing in counseling program and approval of committee chair. This course may be used only by students who have completed all of their course work (and thesis, if on a thesis plan) but who need additional faculty or staff time or help.

HDFP 590. Master’s Thesis. 1-10 Credits. (1-10 Ind; max unlimited) F,S,Su
PREREQUISITE: Graduate standing in counseling program and consent of instructor.

HDFP 591. Special Topics. 1-4 Credits. (1-4 Lec; 4 cr max) On Demand
Max 4 cr. PREREQUISITE: Upper division courses and others as determined for each offering. Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

HDFP 592. Independent Study. 1-3 Credits. (1-3 Ind; 6 cr max) F,S,Su
PREREQUISITE: HDCO 508, graduate standing in counseling program and permission of instructor. Advanced theoretical foundations and interventions for the practice of family therapy. Includes current research regarding family therapy and treatment. Emphasizes assessment and interventions for families dealing with mental health diagnoses, substance abuse, sexual abuse, violence, divorce/remarriage, and child/adolescent issues.

HDFP 594. Seminar. 1 Credit. (1 Sem; 4 cr max) On Demand
Max 4 cr. PREREQUISITE: Graduate standing in counseling program or seniors by petition. Course prerequisites as determined for each offering. Topics offered at the graduate level which are not covered in regular courses. Students participate in preparing and presenting discussion material.

HDFP 598. Internship. 2-12 Credits. (2-12 Ind; 12 cr max) F,S,Su
Max 12 cr. PREREQUISITE: HDFP 571 and graduate standing in counseling program and clinical review. An individualized assignment arranged with an agency, school or other organization to provide guided experience in the field.

HDFP - Human Devel Family Fin Plan
HDFP 510. Fundamentals of Family Financial Planning. 3 Credits. (3 Lec) F
PREREQUISITE: Graduate standing. This course provides an overview of family financial planning by integrating concepts and issues with planning and counseling applications. Students will be introduced to the key concepts of family financial planning, including insurance, tax investments, retirement, and estate planning. The family financial planning process is introduced with an emphasis on the integration and application of concepts in meeting individual and family financial goals and objectives. Other topics presented include an ethics overview, compensation trends within the industry, and regulatory frameworks. This course is offered as a distance-delivered course from Kansas State University.

HDFP 515. Insurance Planning for Families. 3 Credits. (3 Lec) F,S
PREREQUISITE: Graduate standing. The course covers risk management concepts, tools, and strategies for individuals and families, as well as ethical considerations. Case studies provide experience in selecting insurance. This course is offered as a distance-delivered course from the University of Nebraska.

HDFP 520. Investing for Family’s Future. 3 Credits. (3 Lec) F,Su
PREREQUISITE: Graduate standing. This course covers various aspects of the principles of investments and their application to family financial planning. Topics include risk analysis, risk reduction, expected returns of various investments, and the nature of securities markets and investment companies. This course is offered as a distance-delivered course from Iowa State University.

HDFP 525. Retirement Planning, Employee Benefits, and Families. 3 Credits. (3 Lec) F,S
PREREQUISITE: Graduate standing. This course covers retirement planning for the individual and the family. Topics include qualified retirement plans, nonqualified plans, IRAs and other plans that offer tax advantages to the individual and family. This course is offered as a distance-delivered course from the University of Nebraska.

HDFP 530. Estate Planning for Families. 3 Credits. (3 Lec) F,S
online only PREREQUISITE: Graduate standing. Course covers the basics of estate planning for families including understanding the basic elements of estate planning, analyzing case studies of estate planning situations, and developing skills to work with families on estate planning problems.

HDFP 540. Personal Income Taxation. 3 Credits. (3 Lec) F,S
online only PREREQUISITE: Graduate standing. Course covers the basics of personal income taxation including taxation terminology, taxation issues in investments, taxes and retirement planning, tax management techniques, tax implications in marriage and other close relationships, and other tax topics related to family financial well-being.

HDFP 545. Family Theory and Research 1. 3 Credits. (3 Lec) S
PREREQUISITE: Graduate standing. This course will cover the major issues relative to the economics of families, including household production and human capital development. It will also cover the economics of crises, public policy and family life cycle spending, saving and borrowing. A theoretical and research perspective will be used to illuminate the concepts in the course. This course is offered as a distance-delivered course from South Dakota State University.

HDFP 550. Housing/Real Estate. 3 Credits. (3 Lec) S
online only PREREQUISITE: Graduate standing. An overview of the role of housing and real estate in the financial planning process from a theoretical perspective. Taxation, legal aspects, mortgages, and financial calculations related to home ownership and real estate investments are included. New and emerging issues in the context of housing and real estate will be emphasized. The role of ethics in financial planning with housing and real estate will also be included. This course is offered as a distance-delivered course from Oklahoma State University.

HDFP 555. Financial Counseling. 3 Credits. (3 Lec) F,S
online only. PREREQUISITE: Graduate standing. This course emphasizes the development of professional skills for assisting individuals and families to become responsible financial managers through the financial counseling process. Professionals with financial counseling preparation may assist in preventing, alleviating, and/or eliminating financial problems. This course is offered as a distance-delivered course from North Dakota State University.

HDFP 560. Professional Practices in Family Financial Planning. 3 Credits. (3 Lec) F
online only. This course will cover the professional practice of family financial planning including the process of planning and counseling, ethics of professional practice, types of organizations offering planning and counseling services, and the evaluation of effectiveness in planning and counseling. This course is offered as a distance-delivered course from Kansas State University.

HDFP 572. Financial Plan Case Studies. 3 Credits. (3 Lec) F
PREREQUISITE: Graduate standing. This course is a capstone course in the FFP majors and involved the analysis and presentation of case studies that require the application of all material gained in the masters courses to the financial planning process for families. This course is offered as a distance-delivered course form Kansas State University.

HDFP 575. Professional Paper. 1-4 Credits. (1-4 Ind; 6 cr max) F,S,Su
online only. PREREQUISITE: Graduate standing. A research or professional paper or project dealing with a topic in the field. The topic must have been mutually agreed upon by the student and his or her major advisor and graduate committee.

HDFP 576. Professional Practicum. 3 Credits. (3 Lec) F,S,Su
online only. PREREQUISITE: Graduate standing and consent of instructor. Practicum experience in the field of family financial planning.

HDFP 590. Thesis. 1-10 Credits. (1-10 Ind; max unlimited) F,S,Su
PREREQUISITE: Master’s standing. Directed graduate research/creative activity.
HDFP 591. Special Topics. 1-4 Credits. (1-4 Lec; 4 cr max) On Demand
PREREQUISITE: Upper division courses and others as determined for each offering. Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

HDFP 592. Individual Problems. 1-3 Credits. (1-3 Und; 6 cr max) F,S,Su
PREREQUISITE: Graduate standing, consent of instructor, and approval of department head. Directed research and study on an individual basis.

HDFP 594. Seminar. 1 Credit. (1 Sem; 4 cr max) On Demand
PREREQUISITE: Graduate standing in counseling program or seniors by petition. Course prerequisites as determined for each offering. Topics offered at the graduate level which are not covered in regular courses. Students participate in preparing and presenting discussion material.

HEE - Health Enhancement

HEE 195. Paraprofessional Experience I. 1 Credit. (1 Lab) S
CORREQUISITE: HEE 305. Observation of teaching and data collection in elementary, middle, and high school physical education/health enhancement classes. Placement of students to assist in youth coaching or intramural programs. This course is specifically for future teachers in the public schools. Students must clear background check.

HEE 290R. Undergraduate Research. 1-6 Credits. (1-6 Ind; max unlimited) F,S
Directed undergraduate research which may culminate in a written work or other creative project. Course will address responsible conduct of research. May be repeated.

HEE 305. Methods of Teaching Mvmt Expl. 3 Credits. (3 Lec, 1 Lab) S
CORREQUISITE: HEE 195. Practice skills in music fundamentals; teaching and learning folk, square, social, and various types of rhythmic activities and movement exploration. This course is specifically for future teachers in the public schools.

HEE 306. Methods of Cond Act. 3 Credits. (3 Lec) F
Teaching practices for physical activity and fitness concepts appropriate for children and adolescents in school and recreational programs. Content includes pedagogical methods, strategies, styles, and techniques that encourage individuals to participate in and adhere to physical activity programs.

HEE 310. Methods of Adapted H. 3 Credits. (3 Lec) S
PREREQUISITE: KIN 221. Health enhancement (physical education and health) issues for school-aged populations who have physical, mental, and/or emotional disabilities. This course is specifically for future teachers in the public schools.

HEE 430. Instrc Design in H. 3 Credits. (3 Lec) S
PREREQUISITE: CHTH 205, EDU 397, HEE 305, HEE 306, HTH 220 and upper division standing and acceptance into the professional teacher education program. A conceptual and practical approach to the design, implementation, and maintenance of various curricula for future teachers.

HEE 490R. Undergraduate Research. 1-6 Credits. (1-6 Ind; 12 cr max) F,S,Su
Directed undergraduate research which may culminate in a research paper, journal article, or undergraduate thesis. Course will address responsible conduct of research. May be repeated.

HEE 492. Independent Study. 1-3 Credits. (1-3 Ind; 6 cr max)
PREREQUISITE: Junior standing, consent of instructor, and approval of department head. Directed research and study on an individual basis.

HEE 506. Exercise and Chronic Disease. 3 Credits. (3 Lec) S
Alternates years offered odd years. PREREQUISITE: HEE 310, graduate standing. Theory and practice in the effects of exercise on various diseases, disabilities, and atypical conditions.

HEE 588. Professional Development. 1-3 Credits. (1-3 Lec; 3 cr max) On Demand
PREREQUISITE: Graduate standing, teaching experience and/or current employment in a counseling organization and consent of instructor. Courses offered on a one-time basis to fulfill professional development needs of in-service educators or counselors. A specific focus is given to each course which is appropriately subtitled. May be repeated.

HHD - Health and Human Development

HHD 501. Prof Comm Skills in HHD. 3 Credits. (3 Lec) F
PREREQUISITE: Graduate standing in HHD. Students will develop writing and verbal communication skills as they relate to scholarly pursuits in the areas of health and human development. They will also gain a working understanding of the various types of grants and their applications within public and private settings. Students will develop skills needed to write a successful grant concept paper and will have a working knowledge of the various components of a grant proposal and research papers and thesis.

HHD 512. Research Methods in HHD. 3 Credits. (3 Lec) S
PREREQUISITE: Graduate standing in HHD. A study of the tools necessary to conduct research in the movement sciences and health fields. Includes the writing of a research proposal.

HHD 550. Sport Physiology. 3 Credits. (3 Lec)
On demand, offered on-line. PREREQUISITE: Graduate standing in HHD. Course will provide an overview of the bioenergetics of muscular work, neuromuscular and cardiorespiratory function, physical training and performance in various environments, nutrition and ergogenic aids, body composition, temperature regulation, endocrine response, and sport testing techniques utilizing virtual laboratory experiences.

HHD 551. Sport Nutrition. 3 Credits. (3 Lec)
On demand, offered on-line. PREREQUISITE: Graduate standing in HHD. Course will provide an overview of macronutrient and micronutrient metabolism and function, popular ergogenic aids and sports performance, nutritional quackery, nutritional recommendations for improved physical performance, fluid and electrolyte needs, thermoregulation, and nutritional analyses and consultation techniques.

HHD 552. Sport Psychology. 3 Credits. (3 Lec)
On demand, offered on-line. PREREQUISITE: A Bachelor’s degree; prior undergraduate course(s) in the exercise, sport or health sciences, psychology, or equivalent; experience with computers/software. An overview of basic concepts, behavioral principles, and history; anxiety, arousal, and motivation; leadership, cohesion, and audience effects; aggression and violence; populations including ethnicity, gender, high risk, injured, youth, and elite; coaching psychology; and personality assessment techniques.

HIST - History

HIST 500. Seminar. 0 Credits. (0 Sem) On Demand
PREREQUISITE: Graduate standing or seniors by petition. Course prerequisites as determined for each offering. Topics offered at the graduate level which are not covered in regular courses. Students participate in preparing and presenting discussion material.

HIST 502. Public History. 3 Credits. (3 Sem) F
ON DEMAND PREREQUISITE: May be repeated. Maximum 6 cr. Advanced readings and discussion in the practice of public history; including oral history, historic preservation, and museum studies.

HIST 503. America Before 1860. 3 Credits. (3 Sem; 6 cr max) F
PREREQUISITE: HSTA 311 or HSTA 416. Topics in the social, cultural, economic, and political history of Early America in the Atlantic world. May be repeated, not to exceed 6 credits.

HIST 504. Topics in Environ History. 3 Credits. (3 Sem)
On demand Max 6 cr. Advanced readings and discussions in environmental history. May be repeated.

HIST 505. U.S History 1860-1939. 3 Credits. (3 Sem; 6 cr max) S
PREREQUISITE: Graduate Standing Graduate research and analysis of important issues in recent American history. May be repeated.

HIST 506. Hist of Science/Tech/Society. 3 Credits. (3 Sem) On Demand Max 6 cr. Advanced readings and discussion in the history of science, technology, and society. May be repeated.

HIST 507. Writing History. 3 Credits. (3 Sem) On Demand
PREREQUISITE: HIST 540 or equivalent. Advanced seminar in the practice of writing history.

HIST 508. Historic Preserv/Theory & Prac. 3 Credits. (3 Lec) F
This course examines the built environment as a basis for understanding historic significance, discusses the American approach to history preservation and introduces the public policies and agencies which protect cultural resources.

HIST 512. Topics in World History. 3 Credits. (3 Sem) F
PREREQUISITE: Graduate standing. May be repeated. Maximum 6 cr. Examination of topics of current scholarly concern in history other than United States.

HIST 513. Social & Cultural Hist. 3 Credits. (3 Sem) S
PREREQUISITE: Graduate standing. May be repeated. Maximum 6 cr. Examination of topics in social and cultural history of current scholarly concern.

HIST 515. The American West. 3 Credits. (3 Lec) S
PREREQUISITE: HSTA 464 or equivalent. May be repeated. Maximum 6 cr. Directed readings and analysis of major problems in the history of the American West.

HIST 540. History Methods. 3 Credits. (3 Lec; 6 cr max) F
Max 6 cr. Consideration of historical thinking, the uses of evidence and historical methodology. May be repeated.
HIST 575. Prof Paper & Project. 1-4 Credits. (1-4 Ind; 6 cr max) F,S,Su
Max 6 cr. PREREQUISITE: Graduate standing. A research or professional paper or project dealing with a topic in the field. The topic must have been mutually agreed upon by the student and his or her major adviser and graduate committee.

HIST 588. Professional Development. 1-3 Credits. (1-3 Lec; 3 cr max) On Demand
Max 3 cr. PREREQUISITE: Graduate standing, teaching experience and/or current employment in a school organization, consent of instructor and Dean of Graduate Studies. This course may be used only by students who have completed all of their course work (and thesis, if on a thesis plan) but who need additional faculty or staff time or help. May be repeated.

HIST 589. Graduate Consultation. 3 Credits. (3 Ind) F,S,Su
PREREQUISITE: Master’s standing and approval of the Dean of Graduate Studies. This course may be used only by students who have completed all of their course work (and thesis, if on a thesis plan) but who need additional faculty or staff time or help.

HIST 590. Master’s Thesis. 1-10 Credits. (1-10 Ind; max unlimited) F,S
Su PREREQUISITE: Master’s standing. May be repeated.

HIST 591. Special Topics. 1-4 Credits. (1-4 Lec; 12 cr max) On Demand
Max 12 cr. PREREQUISITE: Upper division courses and others as determined for each offering. Courses not required in any curriculum for which there is a particular one time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

HIST 592. Independent Study. 1-3 Credits. (1-3 Ind; 6 cr max) On Demand
Max 6 cr. PREREQUISITE: Graduate standing, consent of instructor, approval of department head, and Dean of Graduate Studies. Directed research and study on an individual basis.

HIST 598. Internship. 2-12 Credits. (2-12 Ind; 12 cr max) On Demand
PREREQUISITE: Graduate standing, consent of instructor and approval of department head. An individualized assignment arranged with an agency, business or other organization to provide guided experience in the field.

HIST 689. Doctoral Reading & Research. 1-10 Credits. (1-10 Ind; 15 cr max) On Demand
Max 15 cr. Presentation and discussion of dissertation research and writing. May be repeated.

HIST 690. Doctoral Thesis. 1-10 Credits. (1-10 Ind; max unlimited) On Demand
May be repeated.

HONR - Honors College

HONR 123. Hike and Read. 1 Credit. (1 Rct) F
PREREQUISITE: Restricted entrance; admission to the Honors College. Reading and analysis of a text in the humanities, arts, or sciences. Course held off campus for a weekend.

HONR 124. Ski and Read. 1 Credit. (1 Rct; 3 cr max) S
PREREQUISITE: Honors College student. HONR 201US. Corequisite: HONR 202IH. Reading and analysis of a text in the humanities, arts, or sciences. Course held off campus for a weekend. Honors College.

HONR 131. Freshman Research Symposium. 1 Credit. (1 Lec) F
PREREQUISITE: Restricted entrance. Presentations of research by current MSU faculty. Tours of laboratory facilities at MSU.

HONR 201US. Texts and Critics: Knowledge. 4 Credits. (4 Sem) F
PREREQUISITE: Restricted entrance; admission to the Honors College. University Seminar in critical reading/analysis of fundamental texts in the humanities, arts, communication, social studies, science, and history of ideas. Socratic teaching methodology. Particular emphasis on development of analysis and criticism through argument, writing, and oral communication. Academic writing and oral argumentation presentations. Course may not be repeated.

HONR 202IH. Texts and Critics: Imagination. 4 Credits. (4 Sem) S
PREREQUISITE: Restricted entrance; admission to the Honors College. Critical reading/analysis of fundamental texts in the humanities, arts, communication, social studies, science, and history of ideas. Socratic teaching methodology. Particular emphasis on development of analysis and criticism through argument, writing, and oral communication. Academic writing and oral argumentation presentations. Course may not be repeated.

HONR 204D. Great Expeditions. 3 Credits. (3 Sem; max unlimited) S
PREREQUISITE/CO-REQUISITE: Restricted entrance; HONR 201US and HONR 202IH or HONR 301US. Preparation and execution of a journey paralleling a portion of a historically and/or culturally significant expedition. Students study the original expedition journals, history, social, scientific, artistic, and environmental context as well as plan their own expedition. The expedition usually occurs following the conclusion of spring semester and students are required to make a public presentation on the expedition and their specific research project during the subsequent semester.

HONR 210. Mentoring Gifted Students. 2 Credits. (2 Sem; 4 cr max) F,S
PREREQUISITE/CO-REQUISITE: Restricted entrance; HONR 201US and HONR 202IH or HONR 301US. Honors students mentor gifted students from the Bozeman Public Schools. Students meet together in seminar discussion, plan and implement projects, and evaluate their projects.

HONR 291. Special Topics. 1-4Credits. (1 Sem; 12 cr max) On Demand
PREREQUISITE/CO-REQUISITE: Restricted entrance; HONR 201US and HONR 202IH or HONR 301US. Consent of instructor and approval of Dean. Directed research and study on an individual basis.

HONR 301US. Texts and Critics II. 4 Credits. (4 Sem) On Demand
PREREQUISITE: Restricted entrance; admission to the Honors College. Critical reading/analysis of fundamental texts in the humanities, arts, communication, social studies, science, and history of ideas. Socratic teaching methodology. Particular emphasis on development of analysis and criticism through argument, writing, and oral communication. Academic writing and oral argumentation presentations. Course may not be repeated.

HONR 450. Advanced Honors Tutorial. 4-6 Credits. (4 Ind; 12 cr max) F,S
Maximum 12 cr. PREREQUISITE: HONR 201US and HONR 202IH or HONR 301US. Weekly seminar and tutorial supervision with extensive interdisciplinary reading, analytic writing, and oral argument, leading to comprehensive examinations. May be repeated.

HONR 490R. Undergrad Rsh/Thesis. 1-6 Credits. (1-6 Ind; 12 cr max) F,S,Su
PREREQUISITE: Restricted entrance, HONR 201US and HONR 202IH or HONR 301US. Approval of Dean. Directed undergraduate research/creative activity which may culminate in a research paper, journal article, or undergraduate thesis. Course will address responsible conduct of research. May be repeated.

HONR 492. Independent Study. 1-3 Credits. (1 Ind; 12 cr max) On Demand
Maximum 12 cr. PREREQUISITE: HONR 201US and HONR 202IH or HONR 301US; Junior standing, consent of instructor and approval of Dean. Directed research and study on an individual basis.

HONR 494. Honors Seminar. 2-4 Credits. (2-4 Sem; max unlimited) On Demand
PREREQUISITE: HONR 201US and HONR 202IH or HONR 301US. Advanced Honors seminars are interdisciplinary courses which emphasize class discussion, development of analytic thinking and writing skills, and encourage independent creativity/research.

HONR 494CS. Honors Seminar in Contemp Sci. 4 Credits. (4 Sem) On Demand
PREREQUISITE: HONR 201US and HONR 202IH or HONR 301US. Advanced Honors seminars are interdisciplinary courses which emphasize class discussion, development of analytic thinking and writing skills, and encourage independent creativity/research.

HONR 494D. Honors Seminar in Diversity. 2-4 Credits. (2-4 Sem; max unlimited) On Demand
PREREQUISITE: HONR 201US and HONR 202IH or HONR 301US. Advanced Honors seminars are interdisciplinary courses which emphasize class discussion, development of analytic thinking and writing skills, and encourage independent creativity/research.

HONR 494A. Honors Seminar in Arts. 4 Credits. (4 Sem; max unlimited) On Demand
PREREQUISITE: HONR 201US and HONR 202IH or HONR 301US. Advanced Honors seminars are interdisciplinary courses which emphasize class discussion, development of analytic thinking and writing skills, and encourage independent creativity/research.
HONR 494H. Honors Seminar in Humanities. 4 Credits. (4 Sem; max unlimited)
On Demand
PREREQUISITE: HONR 201US and HONR 202H1 or HONR 301US. Advanced Honors seminars are interdisciplinary courses which emphasize class discussion, development of analytic thinking and writing skills, and encourage independent creativity/research.

HONR 494N. Honors Seminar in Nat Sciences. 4 Credits. (4 Sem; max unlimited)
On Demand
PREREQUISITE: HONR 201US and HONR 202H1 or HONR 301US. Advanced Honors seminars are interdisciplinary courses which emphasize class discussion, development of analytic thinking and writing skills, and encourage independent creativity/research.

HONR 494S. Honors Seminar in Soc Sciences. 4 Credits. (4 Sem; max unlimited)
On Demand
PREREQUISITE: HONR 201US and HONR 202H1 or HONR 301US. Advanced Honors seminars are interdisciplinary courses which emphasize class discussion, development of analytic thinking and writing skills, and encourage independent creativity/research.

HONR 494RA. Honors Seminar in Arts. 2-4 Credits. (2-4 Sem; max unlimited) On Demand
PREREQUISITE: HONR 201US and HONR 202H1 or HONR 301US. Advanced Honors seminars are interdisciplinary courses which emphasize class discussion, development of analytic thinking and writing skills, and require independent creativity/research.

HONR 494RH. Honors Seminar in Humanities. 4 Credits. (4 Sem; max unlimited) On Demand
PREREQUISITE: HONR 201US and HONR 202H1 or HONR 301US. Advanced Honors seminars are interdisciplinary courses which emphasize class discussion, development of analytic thinking and writing skills, and require independent creativity/research.

HONR 494RN. Honors Seminar in Natural Sci. 2-4 Credits. (2-4 Sem; max unlimited) On Demand
PREREQUISITE: HONR 201US and HONR 202H1 or HONR 301US. Advanced Honors seminars are interdisciplinary courses which emphasize class discussion, development of analytic thinking and writing skills, and require independent creativity/research.

HORT - Horticulture & Landscape Des

HORT 105. Miracle Growing. 3 Credits. (3 Lec) F
Science in the context of horticulture. Learn environmental factors affecting horticulture and current measurement technology. Projects explore global and regional issues, careers, and tools necessary to be a successful horticulturist. Culminates in a presentation at the Horticulture Open House.

HORT 131. Landscape Dsgn/Hist/Theory. 3 Credits. (3 Lec) F
Introduction to the history of landscape design from ancient civilizations to the present. The evolution of design theory as it relates to visual arts, material palettes, climate, ecology, cultural, and social issues. Current trends in landscape industry and the work of major designers will be studied.

HORT 225. Landscape Graphics I. 3 Credits. (1 Lec, 2 Lab) F
PREREQUISITE: ARCH 151RA. Hand graphic communication methods for landscape designers throughout the design process. Exploration and assessment of representation skills for site analysis, site planning, planting design, and design presentation.

HORT 226. Landscape Graphics II. 3 Credits. (3 Lab) S
PREREQUISITE: DDSD 101, DDSD 114 (may be taken as a co-requisites), and HORT 225. Understanding of the opportunities offered by computer graphic techniques for landscape architectural drawings, including plans, elevations, axonometric, perspectives, and layouts. Includes instruction in three major areas of computer applications for the different phases of a design project: computer-aided design, digital image editing and manipulation, and three-dimensional modeling. Focuses on AutoCAD, Photoshop Suite, SketchUp, and integration of hand graphics.

HORT 231. Woody Ornamentals. 3 Credits. (1 Lec, 2 Lab) F
PREREQUISITE: BIOL 170IN (may be used as a corequisite). Identification, culture, and the uses of deciduous and evergreen trees, shrubs and vines commonly used as ornamentals in Montana, and some species utilized outside of Montana. Lab includes extensive plant walks.

HORT 232. Herbaceous Ornamentals. 3 Credits. (2 Lec, 1 Lab) S
PREREQUISITE: BIOL 170IN (may be taken as a co-requisite). Identification, characteristics, cultural requirements and ornamental uses of indoor tropical foliage and flowering plants, herbaceous landscape annuals and perennials and flowering bulbs. This is a hybrid course requiring student participation in one lab each week, with all other course information and participation via the web.

HORT 245. Plant Propagation. 3 Credits. (2 Lec, 1 Lab) S
PREREQUISITE: CHMY 121HIN or CHMY 141 and BIOL 170IN. Traditional sexual and asexual reproduction of plants including seed germination, stem and leaf cuttings, grafting, and layering. Includes discussion of the biology and physiology of propagation methods. Lab includes experimentation with the various propagation methods using native plants as model systems.

HORT 291. Special Topics. 1-4 Credits. (1-4 Lec; 12 cr max) On Demand
PREREQUISITE: None required, but some may be necessary by each offering department. Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

HORT 298. Internship. 2-12 Credits. (2-12 Int; 12 cr max) F,S,Su
PREREQUISITE: Consent of instructor and approval of department head. An individualized assignment arranged with an agency, business, or other organization to provide guided experience within the field.

HORT 310. Turfgrass Management. 3 Credits. (2 Lec, 1 Lab) F
PREREQUISITE: BIOL 170IN, Quantitative Reasoning Core, and HORT 105. Turfgrass propagation, fertilization, establishment, and maintenance. Recognition and adaptabilities of Northern and Southern turfgrasses used for landscape and sports use. Includes irrigation principles and basic hydraulics, establishment and fertilizer calculations, and pest management. Lab includes experimentation with establishment techniques, equipment calibration, soil testing, and turfgrass maintenance.

HORT 331. Planting Design. 3 Credits. (1 Lec, 2 Lab) F
PREREQUISITE: HORT 225 and HORT 226, and HORT 231 and HORT 232 (may be taken as co-requisites). Focuses on planting design elements and principles, landscape trends, styles and theory; involves application of planting design to a variety of project types including engineering, architectural, climate control, habitat, sensory, and aesthetic uses. Emphasis on plant and environmental relationships. Construction documentation and cost estimating for planting landscape installation.

HORT 335. Site Development. 4 Credits. (3 Lec, 1 Lab) S
PREREQUISITE: M 105Q (formerly M 145Q), HORT 331. Introductory site engineering course for landscape architects. Course explores concepts and methods related to grading and drainage. Topics include landform as design, site grading problem solving, storm water management principles and ecological design strategies, graphic communication for grading plans.

HORT 336. Landscape Construction. 4 Credits. (2 Lec, 2 Lab) S
PREREQUISITE: HORT 331; HORT 335 (may be taken as a co-requisite). Understanding of construction materials used to create the built landscape. Design and production of computer-aided working drawings and models of structures and surfaces including paving, retaining walls, fences, decks and other landscape features. Production of landscape construction portfolio which details a complete site development project.

HORT 337. Vegetable Production. 3 Credits. (3 Lec) F
alternate, odd years PREREQUISITE: BIOL 110CS or BIOO 230. Modern production practices for all major temperate-zone vegetable crops, including crop management, development, storage, and post-harvest physiology. The class will include production of transplants and detailed discussion of several major vegetable crop families, including Solanaceae, Curcurbitaceae, Brassicaceae, Liliaceae, and the Fabaceae.

HORT 338. Fruit Production. 3 Credits. (3 Lec) F
alternate years, to be offered even years.
PREREQUISITE: BIOL 110CS or BIOO 230. Modern production practices for all major temperate-zone tree and small fruit, including crop management, fruit crop growth and development, storage, and post-harvest physiology. The class will include a discussion of rootstocks, grafting, pruning, trellising, and quality control as they impact today’s fruit production system.
HORT 435. Landscape Planning. 4 Credits. (1 Lec, 3 Lab) S
PREREQUISITE: HORT 331, HORT 335, HORT 336. Capstone course for landscape design option. Sustainable site design of community green spaces like parks, civic properties, playgrounds, and trails. Service-learning design project focused on advanced graphic and verbal communication, stakeholder participation, individual and group work skills, and construction detailing.

HORT 432. Advanced Landscape Design. 4 Credits. (1 Lec, 3 Stu) F
PREREQUISITE: HORT 331, HORT 335, HORT 336. Studio explores the challenges and opportunities for integrating biophysical characteristics and ecological assets with development. Topics include landscape ecology for land use planning, PROST (parks, recreation, open space and trails) planning, ArcGIS for landscape planning, and landscape performance. Studio projects focus on master planning of green infrastructure at community and regional scales.

HORT 447. Advanced Plant Propagation. 3 Credits. (1 Lec, 2 Lab) F
PREREQUISITE: Senior standing. Students will learn specialized sexual and asexual propagation techniques, with an emphasis on the physiological and environmental manipulation of plants associated with in vitro, seed, and grafting production. Students will receive extensive tissue culture experience.

HORT 485R. Horticulture Capstone I. 1 Credit. (1 Lec) F
PREREQUISITE: Senior standing. Students will receive extensive tissue culture experience. From the colonial period to the present. Functions as the gateway to examine issues of labor, gender, race, and class in America since the end of World War II. The development of the British American colonies and the establishment of the United States before 1800. Topics include pre-Columbian Native Americans, the European invasion and settlement of America, the social, economic, and political evolution of the colonies, the American Revolution, and the establishment of the new nation. An examination of the colonial world of the Americas and the development of the United States as a nation. An analysis of the ways the Truman and Eisenhower administrations dealt with anti-communism, with a focus on McCarthyism.

HSTA 318. Origins of Modern America: From the Civil War to WWII. 3 Credits. (3 Lec)
PREREQUISITE: HISTA 101 or HISTA 102. This course examines the rise of feminism. An examination of the United States after the Civil War through the 20th Century. An examination of the United States after the Civil War through the 20th Century.

HSTA 322. Am History: WWII to Present. 3 Credits. (3 Lec)
PREREQUISITE: HISTA 102. Political, cultural, and economic history of the U.S. since the end of World War II. An examination of the experiences of women in the western U.S. and Canada. Focus on topics of race and ethnicity, families and intimacy, politics and the law, paid and unpaid work, art and culture.

HSTA 407. Gender in US & Canadian West. 3 Credits. (3 Lec)
PREREQUISITE: HISTA 101 or HISTA 102. History of women in America from colonial times to the present. Examination of gender relations, the family, the struggle by women to achieve civil rights and social reform, the problems of working women, and the rise of feminism.

HSTA 406. McCarthy/Ike/Truman. 3 Credits. (3 Lec)
PREREQUISITE: HISTA 101 or HISTA 102. An analysis of the ways the Truman and Eisenhower administrations dealt with anti-communism, with a focus on McCarthyism.

HSTA 407. Gender in US & Canadian West. 3 Credits. (3 Lec)
PREREQUISITE: HISTA 101 or HISTA 102. An examination of the experiences of women in the western U.S. and Canada. Focus on topics of race and ethnicity, families and intimacy, politics and the law, paid and unpaid work, art and culture.

HSTA 408. Gender in America. 3 Credits. (3 Lec)
PREREQUISITE: HISTA 101 or HISTA 102. History of women in America from colonial times to the present. Examination of gender relations, the family, the struggle by women to achieve civil rights and social reform, the problems of working women, and the rise of feminism.

HSTA 409. Food in America. 3 Credits. (3 Lec)
PREREQUISITE: HISTA 101 or HISTA 102. This course examines the history of the production, consumption, and cultural meaning of food in America. This class food functions as the gateway to examine issues of labor, gender, race, and class in America from the colonial period to the present.
HSTA 412IH. American Thought and Culture. 3 Credits. (3 Lec) On Demand
PREREQUISITE: Junior standing and HSTA 101 or HSTA 102. The fundamental purpose of this course is to show the interconnectedness of science, philosophy, literature, and religion in shaping the American intellectual tradition from the Puritan founding to the present.

HSTA 416. Race and Class in America. 3 Credits. (3 Lec) S
PREREQUISITE: HSTA 101 or HSTA 102. Race in the history of the U.S. from early European and Native American contact until the present. Considers issues of racism, race relations, slavery, African-American culture, jazz, the modern Civil Rights movement, and current policy and racial questions.

HSTA 450. History of American Indians. 3 Credits. (3 Lec) PREREQUISITE: HSTA 101 or HSTA 102. Indian affairs in America from 1600-1970. Emphasis on white reaction to the American Indians and the effect of the European invasion on Indian culture.

HSTA 460. Montana and the West. 3 Credits. (3 Lec) PREREQUISITE: HSTA 101 or HSTA 102. A survey of Montana history which will cover the development of the territory and state, and will examine the social, economic, cultural, and political patterns that connect Montana with the rest of the American West.

HSTA 464. Trans-Mississippi West. 3 Credits. (3 Lec) PREREQUISITE: HSTA 101 or HSTA 102. Exploration of major themes in the development of the American West, such as conquest and settlement, economic development, racial and ethnic diversity, urbanization, and popular culture.

HSTA 468. History of Yellowstone. 3 Credits. (3 Lec) PREREQUISITE: HSTA 101 or HSTA 102. Historical analysis of changing perceptions of nature on development of Yellowstone and of the Park's place in the context of a modernizing American nation.

HSTA 470. American Environmental History. 3 Credits. (3 Lec) PREREQUISITE: HSTA 101 or HSTA 102. Survey of changing perceptions and uses of the natural world from the colonial era to the present.

HSTA 482. History of American Technology. 3 Credits. (3 Lec) PREREQUISITE: HSTA 101 or HSTA 102. This course investigates fundamental questions about the role of technological change in U.S. history, focusing on issues such as the environment, concepts of progress, consumerism, power, work, and freedom.

HSTA 490R. Undergraduate Research. 1-6 Credits. (1 Ind; 12 cr max) F,S,Su
PREREQUISITE: Consent of instructor and approval of department head. Course will address responsible conduct of research. Directed research on an individual basis.

HSTA 491. Special Topics. 1-4 Credits. (1-4 Lec; 12 cr max) PREREQUISITE: Course prerequisites as determined for each offering. Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

HSTA 492. Independent Study. 1-4 Credits. (1-4 Ind; 6 cr max) On Demand PREREQUISITE: Consent of instructor and approval of department head. Directed research and study on an individual basis.

HSTA 498. Internship. 2-12 Credits. (2-12 Ind; 12 cr max) On Demand PREREQUISITE: Consent of instructor, consent of internship supervisor, and approval of department head. An individualized assignment arranged with an agency, business, or other organization to provide guided experience in the field.

HSTA 591. Special Topics. 1-4 Credits. (1-4 Lec; 12 cr max) Max 12 cr. PREREQUISITE: Course prerequisites as determined for each offering. Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

HSTR - History-World

HSTR 101IH. Western Civilization I. 4 Credits. (3 Lec) F,S,Su
Survey of the ancient Near East, Greece, Rome, and the European world through 1600. Emphasis on social, economic, and cultural history.

HSTR 102IH. Western Civilization II. 4 Credits. (3 Lec) F,S
This course explores the political, social, and cultural transformation of Europe from the absolute monarchies of the 1600s through the birth of the European Union. Possible topics include overseas trade, revolutions, cityscapes, class and gender identities, environmental transformations, and/or the memory of war. Introduces students to historical methods for analyzing primary sources such as architectural plans, maps, paintings, photographs, music, diaries, political treaties, and propaganda films.

HSTR 130D. Latin American History. 4 Credits. (3 Lec, 1 Lab) S
The history of Latin America from the Pre-Columbian period to the present day, focused primarily on the period since Independence in the 1820’s. The course examines the origins and legacies of economic and political inequalities both within Latin America and the “first world”, with attention to questions of class, race, ethnicity, and gender.

HSTR 135D. The Modern Middle East. 4 Credits. (3 Lec) F
This introductory course examines the Middle East from the early twentieth century until the present day. Beginning with the Ottoman and Safavid empires, this course explores a variety of themes relating to the region and its place in the world.

HSTR 140D. Modern Asia. 4 Credits. (3 Lec) S
Explores the legacies of imperialism, war, and revolution in the rise of modern East Asia, primarily Japan and China.

HSTR 145D. Reinventing Japan. 4 Credits. (3 Lec) F,Su
Explores the political and cultural development of Japan from earliest time to the present. Special attention will be given to Japanese relations with Asia and the West.

HSTR 160D. Modern World History. 4 Credits. (3 Lec) F
Introduction to themes important for understanding the world in the 20th century through an examination of commodities from 1000 - present: world systems, global interconnections, identity and difference, the rise of mass society, technology, and the environment.

HSTR 205CS. The World Environment. 3 Credits. (3 Lec)
-- Examines the history, science, and ethics of risk, focusing on the complex relationship of science, technology, and risk in modern age. Includes exploration of knowledge production in science and technology; case studies such as industrial health and safety, the atomic age, "natural" disasters, and global warming to understand how risk has been defined, perceived, and remedied; and team research projects on such topics as automobile safety, earthquakes, and maquiladores.

HSTR 207CS. Sci and Tech in World History. 3 Credits. (3 Lec)
-- Surveys the role of science and technology in relation to social, political, and economic change in global history. Special attention is given to the historical development of scientific and technological knowledge, the ways different societies have linked ideas of progress and science, and how history can provide valuable perspective to contemporary debates over potentially revolutionary scientific and technological practices.

HSTR 208RH. Sci,Envir,Tech,Soc: Common Exp. 3 Credits. (3 Sem)
Science and technology have become pervasive instigators of social change. This course aims to understand the nature, causes, and consequences of the growth of science and technology from a humanistic perspective, including recent advances in stem-cell research, the human genome, atomic energy and weapons, and space technology. We will explore the immense social, cultural, political, and economic consequences of these advances and how they have affected our relationship to the natural world.

HSTR 232D. Religion in Latin America. 3 Credits. (3 Sem)
-- This course examines the history of religion in Latin America from pre-conquest times to the present.

HSTR 282CS. Darwinian Revolution. 3 Credits. (3 Lec)
-- Covers the history, philosophy, and our current understanding of the biological sciences, focusing especially on the theory of evolution. Explores Darwin’s ideas, the manner in which he came to them, his argument’s explanatory power, and the diverse ramifications of evolutionary theory, including the modern debates in science and religion, stem cell research, cloning, sociobiology, and other tricky contemporary issues.

HSTR 291. Special Topics. 1-4 Credits. (1-4 Lec; 12 cr max) PREREQUISITE: None required but some may be determined necessary by each offering department. Course not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

HSTR 298. World History Internship. 1-12 Credits. (1-12 Int; 12 cr max) On Demand PREREQUISITE: Consent of instructor, and approval of department head. An individualized assignment arranged with an agency, business, or other organization to provide guided experience in the field.

HSTR 302. Ancient Greece. 3 Credits. (3 Lec) PREREQUISITE: HSTR 101IH or HSTR 102. Origins to Alexander the Great, with special attention to life in classical Athens. Emphasis on reading ancient sources in translation.

HSTR 304. Ancient Rome. 3 Credits. (3 Lec) PREREQUISITE: HSTR 101 or HSTR 102. From the foundations of the city to the fall of the empire, with special attention to social and military history. Emphasis on reading ancient sources in translation.
culminated in the nation's longest war: Vietnam.

Vietnam, investigating the geopolitical, economic, social, and cultural factors that

HSTR 376. Twentieth Century War. 3 Credits.

The Comparative and Thematic Approach to a Series of Issues Related to the Theme of Cross-

HSTR 375. Eurasian Borderlands. 3 Credits.

History of Mexico. 3 Credits.

HSTR 353. Modern France. 3 Credits.

HSTR 342. Japan's Long 19th Century. 3 Credits.

HSTR 341. Modern China. 3 Credits.

HSTR 340. Age of the Shoguns. 3 Credits.

HSTR 330. History of Mexico. 3 Credits.

HSTR 324. 20th Century Europe. 3 Credits.

HSTR 322. 19th Century Europe. 3 Credits.

HSTR 319. Latin American Perspectives. 3 Credits.

HSTR 318. Latin American Social History. 3 Credits.

HSTR 317. Latin America: Human Rights. 3 Credits.

HSTR 316. Mapping the World. 3 Credits.

HSTR 315. Gender and Technology. 3 Credits.

HSTR 314. Soviet Union: Rise & Fall. 3 Credits.

HSTR 313. Race in Latin America. 3 Credits.

HSTR 312. Cultural Change, Institutional and Political History, and the Organization of Colonial

HSTR 311. Social History of Latin America from Colonial Times to the Present.

HSTR 310. Latin Amer Soc History. 3 Credits.

HSTR 309. Russia to 1917. 3 Credits.

HSTR 308. Middle East/20th Century. 3 Credits.

HSTR 307. Twentieth Century War. 3 Credits.

HSTR 306. Eurasian Borderlands. 3 Credits.

HSTR 305. Modern Britain. 3 Credits.

HSTR 304. Modern Germany. 3 Credits.

HSTR 303. Modern China. 3 Credits.

HSTR 302. Modern India. 3 Credits.

HSTR 301. Modern France. 3 Credits.

HSTR 300. Modern Latin America. 3 Credits.
HSTR 444. Gender in Japan. 3 Credits. (3 Sem)
PREREQUISITE: HSTR 140 or HSTR 145. Investigates the role of gender in Japanese history from ancient times to the present.

HSTR 445. Environ, Health & Sci in Japan. 3 Credits. (3 Lec)
PREREQUISITE: HSTR 140 or HSTR 145. Investigates the complex relationship between the Japanese and the natural world, including the history of disease and medicine.

HSTR 446. Science and Medicine in China. 3 Credits. (3 Lec)
PREREQUISITE: HSTR 140 or HSTR 145 or consent of instructor. An exploration of the transformations of medicine, technology, and natural knowledge in imperial and modern China.

HSTR 467. History of Mining Engineering. 3 Credits. (3 Sem) S
PREREQUISITES: Any HSTA 1XX or HSTR 1XX. This course will focus on the dynamic relationship between the advance of science and the exploration, conception, and use of the world’s mountains. Environmental history will form a major component of the course.

HSTR 468. The Making of Modern Turkey. 3 Credits. (3 Lec) S, alternate years.
PREREQUISITE: Lower division HSTR (non-US history) course or junior standing or consent of the instructor. This course focuses upon the major political, cultural, social, and economic developments taking place in the history of Turkey from its establishment in 1923 up to the present day. Of particular importance to this course is the question of what the study of Turkey’s modern history can teach us about the modern era more generally.

HSTR 482. Animal Histories. 3 Credits. (3 Lec)
PREREQUISITE: Junior standing or consent of instructor. An intensive and creative research experience, this course allows students to explore the multidisciplinary side of history by investigating the interrelationship of human and nonhuman animals in a historical setting.

HSTR 484. World Environmental History. 3 Credits. (3 Lec) S, alternate years.
PREREQUISITE: Any lower division HSTR (non-American) course. This course examines the interaction of the natural world with major themes in world history. Topics may include diseases, agriculture, pollution, and environmentalism in global context.

HSTR 486. Museum History. 3 Credits. (3 Lec) S alternate years, to be offered odd years.
PREREQUISITE: Consent of instructor. An examination of the development of American museums and their relationship to other exhibitionary forms including wild west shows and world’s fairs. The course also introduces students to theoretical arguments about the nature and function of cultural representations.

HSTR 490R. Undergraduate Research. 1-6 Credits. (1 Ind) On Demand
Max 12 cr. May be repeated. PREREQUISITE: Consent of instructor and consent of department head. Course will address responsible conduct of research. Directed research on an individual basis.

HSTR 491. Special Topics. 1-4 Credits. (1-4 Lec; 12 cr max)
Max 12 cr. PREREQUISITE: Course prerequisites as determined for each offering. Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

HSTR 492. Independent Study. 1-4 Credits. (1-4 Ind; 6 cr max) On Demand
PREREQUISITE: Consent of instructor, and approval of department head. Directed research and study on an individual basis.

HSTR 498. Internship. 1-12 Credits. (1-12 Ind; 12 cr max) On Demand
PREREQUISITE: Consent of instructor, and approval of department head. An individualized assignment arranged with an agency, business, or other organization to provide guided experience in the field.

HSTR 499R. Senior Capstone: Hist Methodology. 3 Credits. (3 Sem) S
PREREQUISITE: Senior standing and consent of instructor. Must register in History Department Office. Senior capstone course. History majors practice sound research and writing methods, using appropriate bibliographical tools and in light of contemporary historiography.

HTH - Health

HTH 220. Human Sexuality. 3 Credits. (3 Lec) S, Su On Demand
A study of all aspects of human sexuality including the sexual reproductive systems, sexual behaviors, contraception, gender roles, sexual functioning, and sexually transmitted diseases.

HTH 455. The Ethic of Care. 3 Credits. (5 Lec) F,S,Su On Demand
PREREQUISITE: PCS 101, PSYX 100 or SOC 101 and junior standing. This course, intended for students interested in working in human service professions (education, health, social work, counseling, human relations and resources) will focus on understanding and applying the theory of the ethic of care in real world situations. Theoretical support for the ethic of care found in diverse areas of philosophy, social justice, education, feminism, parenting, nursing, theology, and medicine will be explored. Utilizing a service learning approach, students will be engaged in understanding theories related to the ethic of care through both in-class lecture and discussion and outreach in the community.

HUM - Humanities

HUM 291. Special Topics. 1-4 Credits. (1-4 Lec; 12 cr max) On Demand
Max 12 cr. PREREQUISITE: None required but some may be determined necessary by each offering department. Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

HUM 491. Special Topics. 1-4 Credits. (1-4 Sem; 12 cr max) On Demand
Max 12 cr. PREREQUISITE: Course prerequisites as determined for each offering. Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

ICS - Intercultural Studies

ICS 291. Special Topics. 1-4 Credits. (1-12 Lec; 12 cr max) On Demand
Maximum 12 cr. PREREQUISITE: None required but some may be determined necessary by each offering department. Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

ICS 292. Independent Study. 1-3 Credits. (1 Ind; 6 cr max) On Demand
IND Maximum 6 cr. PREREQUISITE: Consent of instructor and approval of department head. Independent study on topics related to intercultural and/or global issues.

ICS 404. Intercultural Experience. 1-3 Credits. (1-3 Lec; 3 cr max) On Demand
Students must spend a minimum of three weeks in a non-US cultural setting, and must be accompanied by one or more MSU faculty members. Number of credits to be awarded will be determined by the Director of International Programs.

ICS 490R. Undergraduate Research. 1-6 Credits. (1 Ind; 12 cr max) F,S,Su
Max 12 cr. Directed undergraduate research/creative activity which may culminate in a research paper, journal article, or undergraduate thesis. Course will address responsible conduct of research. May be repeated.

ICS 491. Special Topics. 1-4 Credits. (1-4 Lec; 12 cr max) On Demand
Maximum 12 cr. PREREQUISITE: Course prerequisites as determined for each offering. Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

ICS 492. Independent Study. 1-3 Credits. (1 Ind; 6 cr max) On Demand
IND Maximum 6 cr. PREREQUISITE: Junior standing, consent of instructor, and approval of department head. Directed research and study on an individual basis of intercultural and/or global issues.

IDSN - Interior Design

IDSN 101. Intro to Interior Design. 3 Credits. (3 Lec) F,S
This course introduces design as it relates to interior design, architecture and related professions, through the study of the elements and principles of design and the ways in which humans interact with designed environments and elements.

IDSN 110. Hist of Int Dsgn I Ancnt-1900. 3 Credits. (3 Lec) F
This course offers exposure to stylistic variations found in interior design of the ancient world and traditional Europe. Students will become aware of how these styles have been the impetus for pre-1900 architecture and decorative arts in America.

IDSN 111. Hist Int Dsgn II 1900-Contemp. 3 Credits. (3 Lec) S
This course is a continuation of the study of the development of the interior environment from the 19th century to the present. The difference in the basic philosophy between 19th and 21st century design is emphasized.
IDSN 122. Textiles and Interior Finishes. 3 Credits. (3 Lec) S
This course includes the study of textiles and interior finishes used by interior designers. Students will gain familiarity with a wide range of textile products used in both residential and commercial interiors including fiber content and yarn type, application and labeling, performance and maintenance. Students will also study the range and application of wall, ceiling and floor finish materials commonly used in interior design.

IDSN 130. Interior Design Graphics. 3 Credits. (2 Lec, 1 Lab) F,S
Interior Design Graphics provides interior design students with a basic knowledge of building construction techniques, and introduces the technical skills needed to read and to produce drawings used in the practice of interior design, including floor plans, interior elevations, reflected ceiling plans, and detail drawings.

IDSN 131. Presentation Drawing. 3 Credits. (3 Lec) S
PRE- or CO-REQUITIST: IDSN 130 This course presents the elements of two- and three-dimensional design as related to interior representational drawings. Emphasis is on one- and two-point perspective drawings and sketching. Addition of color to drawings by use of hand and digital methods is introduced.

IDSN 135. Fundamentals of Space Planning. 3 Credits. (2 Lec, 1 Lab) S
PREREQUISITES: IDSN 101 and IDSN 130 This course explores the physical and psychological concepts pertaining to interior spaces. Students work with commercial design programs, schematic planning tools, commercial furniture, and universal design concepts to create functional space plans that meet program criteria. Students will explore space planning in relationship to plumbing and mechanical systems and apply NKBA kitchen and bath space planning guidelines. The basic space planning skills and terminology learned are applicable to the NCIDQ exam.

IDSN 150. Digital Technology Lab. 1 Credit. (1 Lab) F,S
PREREQUISITES: DDSN 101 or CAD 1 & 2 or DDSN 118 This course reinforces basic digital principles and commands through the repetition and skill building in a lab setting. Students are required to bring their assignments and outside work to gain practice and competence in digital drafting. This is a collaborative studio environment where students will gain knowledge from shared experiences. Students will advance and apply digital skills through the production of course work assigned in other classes. Students will learn production tips and shortcuts from faculty.

IDSN 225. Light/Color/Lighting Systems. 3 Credits. (3 Lec) S
Prerequisite: IDSN 101, IDSN 130. Students will explore color theory, human response to color, and the properties of light and color. Students will also gain knowledge in lighting systems and specification of lamps and fixtures. The student will learn practical methods for applying these elements of design and demonstrate competency in color usage and lighting systems by designing projects including reflected ceiling plans, lighting and color specification.

IDSN 240. Studio I Residential. 4 Credits. (8 Lab) S
Prerequisite: IDSN 110 and WRIT 101 and DDSN 118 and IDSN 131 and CSTN 173 and IDSN 135 and IDSN 225 and M 108. This course is a laboratory experience with real-life & hypothetical design projects. The focus of Studio I is primarily residential. Students will develop 2-3 complete presentations including but not limited to floor plans, interior elevations, interior perspectives, color board, room finish schedule, and a budget. Students will make oral presentations using the presentation boards to illustrate their design solutions.

IDSN 250. Studio II Commercial. 4 Credits. (3 Lec, 1 Lab) S
Prerequisite: IDSN 240. Studio II is an advanced laboratory class which focuses on commercial design projects, some for actual clients. Advanced space planning, utilization of appropriate codes and specification writing will be covered. Students will develop 2-3 complete presentations including but not limited to floor plans, interior elevations, interior perspectives, color boards, and specification schedules. Students will make oral presentations using the presentation boards and CAD drawings to illustrate their design solutions.

IDSN 255. Environmental Design Studio. 4 Credits. (4 Lab) S
PREREQUISITES: Interior Design students only who have met the prerequisite completion of all first year classes with a C- or better. This course is a lecture/ laboratory experience with a focus on an environmentally sustainable design project. Students will develop complete presentations including floor plans, interior elevations, interior perspectives, finish schedules, and make presentations digitally. Emphasis is on the design process and LEED goals. Gallatin College.

IDSN 266. Kitchen and Bath I. 4 Credits. (3 Lec 1 Lab) F
Prerequisite: IDSN 110 and WRIT 101 and DDSN 118 and IDSN 131 and CSTN 173 and IDSN 135 and IDSN 225 and M 108. Using the National Kitchen and Bath Association guidelines, students will learn the fundamentals of kitchen and bath design, using NKBA’s drawing and presentation standards. Analysis of client needs, specifying products, creating design solutions, residential plumbing and mechanical systems, project drawing and documentation will also be covered.

IDSN 267. Kitchen and Bath II. 4 Credits. (3 Lec 1 Lab) S
Prerequisite: IDSN 266. This studio course is a continuation of Kitchen and Bath I, with emphasis on materials. There will be further exploration into products, and more advanced design solution.

IDSN 275. Professional Practices. 3 Credits. (3 Lec) S
Prerequisite: IDSN 240 and IDSN 266. This course is an introduction to business principles and practices related to the interior design profession. Topics include business procedures, methods of charging, and steps involved in business formation. Use of contracts and specifications to achieve desired objectives is covered, as is marketing of professional services and promotion of the firm. A portfolio, resume and cover letter will be completed during this class.

IMID 290R. Independent Study. 1-3 Credits. (1 Ind; 6 cr max) On Demand
Max 6 cr. PREREQUISITE: Consent of instructor. Directed research and study on an individual basis.

IMID 291. Special Topics. 1-3 Credits. (1-3 Ind; 12 cr max) On Demand
Max 12 cr. PREREQUISITE: Consent of instructor. Directed research and study on an individual basis.

IMID 292. Independent Study. 1-3 Credits. (1-3 Ind; 6 cr max) On Demand
Max 6 cr. PREREQUISITE: Consent of instructor and approval of department head. Directed research and/or study on an individual basis.

IMID 452. Protein Biochemistry. 1 Credit. (1 Lab) On Demand
PREREQUISITE: IMID series or consent of instructor. Principles and techniques involved in biochemical analysis of proteins.

IMID 475. Preveterinary Internship. 2-4 Credits. (2-4 Ind; 4 cr max) F,S,Su
PREREQUISITE: Junior standing and consent of instructor. An individualized assignment arranged with an agency, business, or other organization to provide guided experience in the field.

IMID 475R. Preveterinary Internship. 2-4 Credits. (2-4 Ind; 4 cr max) F,S,Su
PREREQUISITE: Junior standing and consent of instructor. An individualized assignment arranged with an agency, business, or other organization to provide guided experience in the field.

IMID 490R. Undergraduate Research. 1-6 Credits. (1-6 Ind; 12 cr max) On Demand
Max 12 cr. Directed undergraduate research/creative activity which may culminate in a research paper, journal article, or undergraduate thesis. Course will address responsible conduct of research. May be repeated.

IMID 491. Special Topics. 1-4 Credits. (1-4 Ind; 12 cr max) On Demand
Max 12 cr. PREREQUISITE: Course prerequisites as determined by each offering. Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

IMID 492. Independent Study. 1-3 Credits. (1-3 Ind; 6 cr max) On Demand
Max 6 cr. PREREQUISITE: Consent of instructor and approval of department head. An individualized assignment arranged with an agency, business, or other organization to provide guided experience in the field.

IMID 498R. Biotech Internship. 4 Credits. (4 Ind) ON DEMAND
PREREQUISITE: Junior standing, consent of instructor, and approval of department head. An individualized assignment arranged with an agency, business, or other organization to provide guided experience in the field.
IMID 499. Biotechnology Capstone. 2 Credits. (2 Sem) F.S
PREREQUISITE: IMID 498. Senior capstone course. Participants in this seminar section will bring closure to the student’s required internship. Students will have the opportunity to refine their public speaking and writing skills through synthesis of the goals, progress, and outcome of their industrial or research laboratory experience. Exposure to many different types of internship outcomes will broaden the student’s perception of the disciplines which contribute to the field of biotechnology.

IMID 501. Expur Immunology/Pathology. 3 Credits. (3 Lec) S

IMID 505. Eukaryotic Gene Regulation. 3 Credits. (3 Lec) S
PREREQUISITE: CHMY 442 and graduate standing. Students in this course study the fundamental mechanisms of eukaryotic gene expression and this knowledge is placed within the context of modern genomics approaches. The course is divided between traditional lectures and a review of current literature in genome science, functional genomics (mRNA expression), and proteomics. Students learn basic informatics skills through a hands-on analysis of genome data with an emphasis on what can, and cannot, be learned from genome data.

IMID 521. Laboratory Rotation I 2 Credits. (1 Lab) F
PREREQUISITE: Must be a first year IMID Graduate Student. An independent scientific project within a IMID research laboratory. Students should identify a question, master the necessary methods, collect and analyze data, and interpret how the data addresses the question. Final results are presented in a 15-minute departmental seminar.

IMID 522. Laboratory Rotation II. 2 Credits. (1 Lab) S
PREREQUISITE: Must be a first year IMID Graduate Student. The IMID laboratory in which IMID 522 is performed must be different from the laboratories in which IMID 521 was performed. An independent scientific project within a IMID research laboratory. Students should identify a question, master the necessary methods, collect and analyze data, and interpret how the data addresses the question. Final results are presented in a 15-minute departmental seminar.

IMID 523. Laboratory Rotation III. 2 Credits. (1 Lab) S
PREREQUISITE: Must be a first year IMID Graduate Student. The IMID laboratory in which IMID 523 is performed must be different from the laboratories in which IMID 521 and IMID 522 were performed. An independent scientific project within a IMID research laboratory. Students should identify a question, master the necessary methods, collect and analyze data, and interpret how the data addresses the question. Final results are presented in a 15-minute departmental seminar.

IMID 575. Professional Paper. 1-4 Credits. (1-4 Ind; 6 cr max) On Demand
PREREQUISITE: Graduate Standing. A research or professional paper or project dealing with a topic in the field. The topic must have been mutually agreed upon by the student, the major advisor, and graduate committee.

IMID 589. Graduate Consultation. 3 Credits. (3 Ind; max unlimited) F,S,Su
PREREQUISITE: Master’s standing and approval of the Dean of Graduate Studies. This course may be used only by students who have completed all of their course work (and thesis, if on a thesis plan) but who need additional faculty or staff time or help.

IMID 590. Master’s Thesis. 1-10 Credits. (1-10 Ind; max unlimited) F,S,Su
PREREQUISITE: Master’s standing.

IMID 591. Special Topics. 1-4 Credits. (1-4 Lec; 12 cr max) On Demand
PREREQUISITE: Upper division courses and others as determined for each offering. Courses not required in any curriculum for which there is a particular one time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

IMID 592. Independent Study. 1-4 Credits. (1-4 Ind; 8 cr max) On Demand
PREREQUISITE: Graduate standing, consent of instructor, approval of department head and Dean of Graduate Studies. Directed research and study on an individual basis.

IMID 594. Seminar. 1 Credit. (1 Sem; 4 cr max) F,S
PREREQUISITE: Graduate standing or seniors by petition. Course prerequisites as determined for each offering. Topics offered at the graduate level which are not covered in regular courses.

IMID 590. Doctoral Thesis. 1-10 Credits. (1 Ind; max unlimited) F,S,Su
PREREQUISITE: Doctoral standing.

ITS - Information Technology Systems

ITS 280. Computer Repair Maintenance. 4 Credits. (4 Lec) S
This course teaches advanced hardware theory and practical application with the emphasis on individual computer components. Successful students will know how to identify and install appropriate computer hardware.

JPNS - Japanese

JPNS 101. Elementary Japanese I. 4 Credits. (4 Cr)
Elementary course designed to help students acquire basic language skills in Japanese: reading, writing, listening, speaking. Introduction to Japanese writing systems (hiragana, katakana, kanji). Emphasis on establishing correct pronunciation and grasp of grammar. Cultural perspectives such as greetings, simple dialogues.

JPNS 102D. Elementary Japanese II. 4 Credits. (4 Lec; 4 Rec)
PREREQUISITE: JPNS 101 or equivalent, or placement interview with instructor. Continuation of JPNS 101. Expansion of cultural knowledge.

JPNS 150D. Japanese Culture & Civ. 3 Credits. (3 Lec) F
PREREQUISITE: WRIT 101W or consent of instructor. Survey of Japanese society, literature, art, and religion from earliest times to the modern period. All readings and discussions in English. No knowledge of Japanese necessary.

JPNS 201D. Intermediate Japanese I. 4 Credits. (4 Cr)
PREREQUISITE: JPNS 202D or equivalent, or placement interview with instructor. Review of skills acquired in elementary Japanese, followed by additional study of grammatical patterns and vocabulary acquisition. Emphasis on gaining basic conversational skills and improving reading. Expansion of cultural knowledge.

JPNS 202D. Intermediate Japanese II. 4 Credits. (4 Cr)
PREREQUISITE: JPNS 201D or equivalent, or placement interview with instructor. Continuation of JPNS 201D. Students who successfully complete this course will have “survival” skills for daily life in Japan, and will be ready for more advanced course work using authentic materials. Expansion of cultural knowledge.

JPNS 305. Japanese Adv Conversations. 3 Credits. (3 Cr) On Demand
PREREQUISITE: JPNS 202 or placement interview with instructor. Review and further development of communication skills with an emphasis on both speaking and writing for various occasions. Cultural and social topics are explored through authentic materials to enhance knowledge of Japan and its people.

JPNS 320. Classical Japanese Literature. 3 Credits. (3 Cr) On Demand
PREREQUISITE: WRIT 101W or consent of instructor. Study of novels, short stories, and poems written by Japanese authors from the mid-nineteenth century onward. Covers Japan’s initial encounter with the West and the establishment of individual identity. All readings and discussions in English. No knowledge of Japanese necessary.

JPNS 321. Modern Japanese Literature. 3 Credits. (3 Cr) On Demand
PREREQUISITE: WRIT 101W or consent of instructor. Study of novels, short stories, and poems written by Japanese authors from the mid-nineteenth century onward. Covers Japan’s initial encounter with the West and the establishment of individual identity. All readings and discussions in English. No knowledge of Japanese necessary.

JPNS 325IH. Others in Japanese Lit/Culture. 3 Credits. (3 Cr) On Demand

JPNS 340. Japanese Adv Reading & Grammar. 3 Credits. (3 Cr) On Demand

JPNS 361IH. Japanese Text and Cinema. 3 Credits. (3 Cr) On Demand
PREREQUISITE: WRIT 101W or consent of instructor. A study of several fine Japanese films and the literary works upon which they were based. Emphasis is on the transformation of written text into image. All readings and discussions in English. No knowledge of Japanese necessary.

JPNS 450R. Sem: Japanese Lit and Culture. 3 Credits. (3 Sem) On Demand
PREREQUISITE: JPNS 315 or JPNS 350. Senior capstone course. Topics offered at the upper division level which are not covered in regular courses. Students conduct individual research projects while also preparing and presenting discussion materials.
KIN 105. End of Exercise Science. 3 Credits. (3 Lec) F,S
The aim of this course is to integrate the subdisciplines of exercise science (nutrition, biomechanics, exercise physiology, motor control, and exercise psychology) from the perspectives of definitions, basic science with application to health, fitness, and athletic performance.

KIN 221. Health Anatomy & Physiology. 3 Credits. (3 Lec) F,S
This course will focus on the key elements of anatomy and physiology necessary for students in allied health professions, specifically those who will work the areas of community health, health enhancement education, health promotion, and kinesiology. The aim of this course is for students to demonstrate working knowledge of the muscular, skeletal, nervous, cardiovascular, and respiratory, endocrine, and digestive systems, as well as body metabolism.

KIN 270. Exercise Prog for Older Adults. 3 Credits. (2 Lec, 1 Lab) S
Students will examine the special exercise-related needs of older adults and learn how to safely and effectively meet those needs. The lab will provide practical experience working with older adults in exercise program for seniors.

KIN 304. Tech Applications in Hlth Sci. 3 Credits. (3 Lec) S
Skills, knowledge, and applications necessary for integrating technology into developmentally appropriate teaching practices in Health Enhancement. Identities theories, principles, and strategies for the integration of technology into physical education, physical activity, and health settings.

KIN 320. Exercise Physiology. 4 Credits. (3 Lec, 1 Lab) S
PREREQUISITE: Grade of "C" or better in BIOH 201 or KIN 221, or permission of instructor. Topics include factors and mechanisms involved with causing changes and adaptations in the physiological responses to training and participating in strength and endurance sports and activities. Lectures and labs emphasize explaining observations and practices from the physiological view point.

KIN 322. Kinesiology. 4 Credits. (3 Lec, 1 Lab) S
PREREQUISITE: BIOH 201 or KIN 221, and M core or permission of instructor. Emphasis on the effects of joint structures and muscles on movement of the upper extremity, lower extremity, and spine while providing an introduction to the principles of biomechanics.

KIN 325R. Biomechanics. 4 Credits. (3 Lec, 1 Lab) S
PREREQUISITE: M 151 or M 161, BIOH 201, PHSX 205 and KIN 322. COREQUISITE: FCS 371 and STAT 217. This course emphasizes the effects of structure, motion, forces, and their effects on and within the human body using both qualitative and quantitative analyses. Additional emphasis will be placed on the development of critical thinking skills associated with biomechanics-related research and interpretation.

KIN 410. Adv Strength Training and Cond. 3 Credits. (3 Lec) S
PREREQUISITE: KIN 320. Emphasizes the use of critical thinking skills for exercise development and progressions based on fundamental principles from kinesiology, biomechanics, exercise physiology, motor control, and motor learning. Preparation to obtain the Certified Strength and Conditioning Specialist (CSCS) certification, and practical application of this material to the areas of personal training, physical therapy, health enhancement teaching, and exercise physiology is emphasized.

KIN 412. Field-Based Fitness Assessment. 3 Credits. (2 Lec, 1 Lab) S
PREREQUISITE: KIN 320, AND KIN 322 OR KIN 325R CO-REQUISITES: With permission of the instructor, the pre-requisites may be taken concurrently. This course is designed to provide the students with the opportunity to examine and conduct physical performance field-based assessments. Field-based assessments take place in an environment that is less controlled than in laboratory settings, and where the variables that are collected are typically used to predict physiological variables.

KIN 415. Adv Exercise Test and Prescrip. 4 Credits. (3 Lec, 1 Lab) S
PREREQUISITE: KIN 320, STAT 216Q, with grade "C" or better in each course, or permission of instructor. Senior capstone course. Students are familiarized with the hands-on training and theoretical background needed to competently assess levels of health/fitness in a "low-risk" healthy adult population. Lecture/lab content is structured to prepare students for taking the ACSM Health Fitness Specialist (HFS) certification exam.

KIN 430. Physical Fitness Program Design and Delivery. 3 Credits. (2 Lec, 1 Lab) S
PREREQUISITE: KIN 320. This course focuses on the development, organization, and implementation/administration of physical fitness programs. Includes extensive field experience.
KIN 598. Internship. 2-12 Credits. (2 Ind; 12 cr max) On Demand
Max credits unlimited PREREQUISITE: Graduate standing, and consent of instructor. An individualized assignment arranged with an agency, business or other organization to provide guided experience in the field.

LAC - Licensed Addiction Counselor

LAC 491. Special Topics. 1-4 Credits. (1-4 Lec; 12 cr max) On Demand
Max 12 cr. PREREQUISITE: Course prerequisites as determined for each offering. Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

LAC 501. Chemical Dependency Counseling. 3 Credits. (3 Lec) S
offered on-line. PREREQUISITE: Admission to program. This course will provide an overall introduction to addiction counseling. The class will also provide an introduction to the assessment and treatment of alcoholism and other chemical dependencies, with emphasis on the application of specific clinical strategies to this specialized problem area. Since substance abuse may underlie or coexist with a variety of other problems, including family violence, mental illness, health issues, etc., the mental health professional trained in the assessment and treatment of chemical dependency will be better able to assess and intervene appropriately.

LAC 502. Psychopharmacology and Addictions. 3 Credits. (3 Lec) S
offered on-line. PREREQUISITE: Admission to program. This course examines medications that are commonly prescribed for psychiatric disabilities; descriptions of medication effects, interaction, and side effects.

LAC 503. Assessment, Treatment Planning and Ethics of Addiction Counseling. 3 Credits. (3 Lec) F
offered on-line. PREREQUISITE: Admission to program. This course is designed to examine the psychological, behavioral, sociological, and cultural underpinnings in the assessment and treatment of clients affected by addictions. The course explores a variety of helping strategies for reducing the negative effects of substance use, abuse, dependence, and addictive disorders (CACREP, Section III, C.5.). Ethical issues related to the field of Addictions Counseling will also be explored.

LAC 504. Alcohol and Drug Studies. 3 Credits. (3 Lec) F
offered on-line. PREREQUISITE: Admission to program. This course is designed to offer in-depth exploration of alcohol and drug studies. Students will integrate overview information with cutting edge research within the field of addictions as it pertains to a particular population or topic specific to addiction counseling.

LAC 505. Cross Cultural & Ethical Considerations in Addictions Counseling. 3 Credits. (3 Lec) Su
PREREQUISITE: Admission to program. This course is designed to examine cultural and ethical constructs related to addictions counseling. The focus will be on current literature, theories, approaches, strategies, and techniques shown to be effective when working with populations of clients with addictions.

LAC 506. Group Counseling in Addiction Settings. 3 Credits. (3 Lec) F
PREREQUISITE: Admission to program. This course will provide students with the foundational concepts of group counseling as it relates to the addiction settings. Topics will include group development theory, membership roles, establishing an alliance, skills of group, multicultural issues, leadership styles and skills.

LAC 507. Group Counseling in Addiction Settings. 3 Credits. (3 Lec) S
PREREQUISITE: Admission to the program. LAC 506. This course will build upon material presented in LAC 506 with greater emphasis on group work in an addictions setting. Topics will include motivational interviewing and cognitive behavioral technique in group work.

LAC 508. Counseling Theories in Addiction Settings. 3 Credits. (3 Lec) Su
PREREQUISITE: Admission to the program. This course examines multiple counseling theories and their application in the addictions setting. Development across the lifespan and theoretical approaches specific to addiction will also be examined.

LAC 509. Assess Treat Plan Addiction II. 3 Credits. (3 Lec) S
PREREQUISITE: Admission to the program. This course covers addiction assessment and patient placement, including the American Society of Addiction Medicine Patient Placement Criteria. The course explores a variety of helping strategies for reducing the negative effects of substance use, abuse, dependence, and addictive disorders.

LAC 510. Chem Dependency Counseling II. 3 Credits. (3 Lec) F
PREREQUISITE: Admission to the program. This course provides instruction on chemical dependency counseling, emphasizing specific clinical strategies. Substance abuse may coexist with other problems, professionals trained in comprehensive understanding of addiction will be better able to assess, intervene and counsel clients.

LIBR - Library

LIBR 289R. Undergrad Resrch/Instruction. 1-3 Credits. (1-3 Rct; max unlimited) F
Classroom instruction associated with directed undergraduate research/creative activity projects. May be repeated.

LIBR 291. Special Topics. 1-3 Credits. (1 Lec; 12 cr max) On Demand
Max 12 cr. Information literacy involves the capacity to recognize when information is needed and the ability to locate, evaluate, and use it effectively. Students in this course will learn to find information of increasing degrees of complexity in print and electronic formats.

LIBR 489R. Undergraduate Research. 1-2 Credits. (1-2 Rct; 4 cr max) F,S,Su
Max 4 cr. COREQUISITE: LIBR 490. Classroom instruction associated with directed undergraduate research/creative activity projects. May be repeated.

LIBR 491. Special Topics. 1-3 Credits. (1 Lec; 12 cr max) On Demand
Max 12 cr. Information literacy involves the capacity to recognize when information is needed and the ability to locate, evaluate, and use it effectively. Students in this course will learn to find information of increasing degrees of complexity in print and electronic formats.

LIBR 592. Independent Study. 1-4 Credits. (1-4 Ind; 8 cr max) F,S,Su
Max 8 cr. PREREQUISITE: Graduate standing, consent of instructor, approval of Associate Dean of Libraries, and Dean of Graduate Education. An individual assignment arranged with an agency, business, school, or other organization to provide guided experience in the field.

LIBR 598. Internship. 1-4 Credits. (1-4 Ind; 8 cr max) F,S,Su
Max 8 cr. PREREQUISITE: Graduate standing, consent of instructor, approval of Associate Dean of Libraries, and Dean of Graduate Education. Directed research and study on an individual basis.

LING - Linguistics

LING 2101H. Intro to Language/Linguistics. 3 Credits. (3 Lec) F,S
Examines the nature and function of linguistic systems, the psychology of language, the relationship between language and culture, usage patterns, linguistic variety and change, and levels of linguistic analysis.

LING 238. Structure and Function of Language. 3 Credits. (3 Lec) F,S
Focused study of how meaning is made in the English language, primarily through grammar. From parts of speech to sentence construction, this course will assist students in evaluating literary writing styles as well as in improving their own.

LING 338. Language and English Education. 3 Credits. (3 Rct) F
Explores the various roles language has in secondary English pedagogy and policy. Special attention given to issues related to language diversity, language and identity, discourse analysis, and socio-political functions of language.

LIT - Literature

LIT 1101H. Intro to Lit: Explorations in Literature. 3 Credits. (3 Rct) F,S
Introduction to basic concepts including but not limited to: plot, character, theme, symbol, and the primary literary modes of poetry, fiction, and drama. Students will be introduced to terms through a standard handbook which should accommodate all future English courses.

LIT 201. Intro to Literary Studies. 3 Credits. (3 Sem) F,S
PREREQUISITE: Restricted to English majors and English Literature minors. This writing-intensive introduction to the English major will prepare students for advanced study in literature by providing them with the foundational skills of literary analysis, literary theory, disciplinary methodologies, and close readings of literary texts.

LIT 203H. Great Books. 3 Credits. (3 Rec) F
An introduction to some of the ‘great books’ of literary history and an exploration of why and how they have been regarded as great. Students engage with major, canonical literary works from classical antiquity to the present.

LIT 214D. Regional Literature. 3 Credits. (3 Rct) F,S
Examination of American literary regions in the context of critical multiculturalism. Analyzes topics such as the development of local color writing, borderlands/ transnational studies, and the concept of the frontier as contact zone. May focus on a specific regional literature or adopt a comparative approach.

LIT 223. Classical Foundations of Literature. 3 Credits. (3 Rct) S
Study of the literature of Classical Greece and Rome and how this tradition has influenced subsequent literature.
LIT 240. The Bible as Literature. 3 Credits. (3 Rct) F
Study of the Bible and related texts and how this tradition has influenced subsequent literature.

LIT 285D. Mythologies. 3 Credits. (3 Rct) F-S
The study of specific cultural mythologies to explore the nature, function, and theory of myth.

LIT 291. Special Topics. 1-4 Credits. (1-4 Lec; 12 cr max) On Demand
Maximum 12 cr. PREREQUISITE: None required but some may be determined necessary by the department. Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

LIT 300. Literary Criticism. 3 Credits. (3 Lec) F-S
PREREQUISITES: Sophomore standing and a 200 level LIT course. Historical survey of principles, problems, and strategies of literary criticism.

LIT 308. Multicultural Literature. 3 Credits. (3 Lec) S
PREREQUISITES: Sophomore standing and any 200-level literature course. Designed specifically for English Education students. Focuses on literature by American minorities, women, and ethnic subcultures. Includes young adult literature, popular literature, and the work of one or more Montana Native American writers.

LIT 310. American Literature to 1900. 3 Credits. (3 Lec) S alternate years, to be offered every even year.
PREREQUISITES: Sophomore standing and any 200-level Literature course. Intensive studies in early American literature, with attention to development of a distinct national literature and culture.

LIT 311. American Literature after 1900. 3 Credits. (3 Lec) F alternate years, to be offered odd years.
PREREQUISITES: Sophomore standing and any 200-level Literature course. Intensive studies in selected literary works by 19th-century American writers, with attention to historical context, particularly America's evolving national culture.

LIT 320. Advanced British Literature I (Formerly LIT 324). 3 Credits. (3 Rct) F
PREREQUISITES: Sophomore standing and any 200-level Literature course. Formerly LIT 324. Intensive studies in selected literary works of the 16th and 17th centuries, with attention to historical and cultural context.

LIT 321. Advanced British Literature II (Formerly LIT 325). 3 Credits. (3 Rct) F
PREREQUISITES: Sophomore standing and any 200-level Literature course. Formerly LIT 325. Intensive studies in selected literary works by writers of the Restoration period and 18th-century England, with attention to historical and cultural context.

LIT 322. Advanced British Literature III (Formerly LIT 326). 3 Credits. (3 Rct) F
PREREQUISITES: Sophomore standing and any 200-level Literature course. Formerly LIT 326. Intensive studies in selected literary works by 19th-century British writers, with attention to historical and cultural context.

LIT 335. Women and Literature. 3 Credits. (3 Rct) F
Alternate Odd Years PREREQUISITE: LIT 201. A study of the relationship between women and literature, with some attention to feminist approaches to critical interpretation.

LIT 371. 20th Century British/American Lit. 3 Credits.

LIT 372. Contemporary British and American Literature. 3 Credits.

LIT 382. Literature for Children and Adolescents. 3 Credits. (3 Lec) F alternate years, to be offered every even year.
PREREQUISITE: LIT 201. Studies in selected literary works for children and young adults. The course may focus on genres, authors, themes, and/or critical approaches.

LIT 431RH. Studies in Major Author/s. 3 Credits. (3 Lec; 6 cr max) F
Max 6 cr. PREREQUISITE: Sophomore standing and a 200-level LIT course. Intensive study in the works, biography, and criticism of a particular author.

LIT 437. Studies in Literary Genres. 3 Credits. (3 Rct; 6 cr max) alternate years, to be offered every even year.
Max 6 cr. PREREQUISITE: Sophomore standing and a 200-level LIT course. Intensive study of a single genre, such as the epic, novel, poem, dream vision, hypertext, or the idea of "genre" itself. Selection and approach will vary with each offering.

LIT 438. Studies in Literary Topics. 3 Credits. (3 Lec; 12 cr max) F
Max 12 cr. PREREQUISITE: Sophomore standing and at least one 200 level LIT course. Provides an in-depth, rigorous analysis of current trends in literary scholarship. Organized around a specific theme, this course will expose students to new groups of literary works that cut across traditional historical, national, or generic boundaries.

LIT 440. Studies in World Literature. 3 Credits. (3 Lec) S
PREREQUISITE: Sophomore standing and at least one 200 level LIT course. Selected literary works in translation from non-English cultures and/or from English speaking cultures outside the United States and Britain.

LIT 473RH. Studies in Shakespeare. 3 Credits. (3 Rct) S
PREREQUISITE: Sophomore standing and at least one 200 level LIT course. Studies in selected Shakespearean works, drawn from tragedies, comedies, histories, romances, and poetry. Development of Shakespeare's philosophy, poetics, and dramaturgy in the context of the Renaissance.

LIT 490R. Undergraduate Research. 1-6 Credits. (1 Ind; 12 cr max)
-- Directed undergraduate research/creative activity which may culminate in a research paper, journal article, or undergraduate thesis. Course will address responsible conduct of research.

LIT 492. Independent Study. 1-3 Credits. (1 Ind; 6 cr max)
-- Independent study of literature.

LIT 494RH. Seminar: Research Issues. 3 Credits. (3 Rct) F-S
PREREQUISITE: Senior standing. Consent of instructor. Senior capstone course for literature majors. Integration and assessment of students' cumulative experiences as English literature majors through specific seminar-style research issues which vary with each offering. Restricted entry.
LRES 529. Sustainable Cropping Systems. 3 Credits. (3 Lec) S
PREREQUISITE: ENSC 245 and either AGSC 341 or AGSC 342; graduate standing or consent of instructor. The course goal is to elevate agricultural students’ awareness of peer-reviewed literature that demonstrates application of principles to address issues of sustainability in agriculture. The course will use a student-lead discussion format to highlight issues and principles in review of a series of papers that the class will read. The course will focus on the interaction among agronomy, ecology, economics, and sociology to create awareness of the interdisciplinary issues associated with sustainability in agriculture. Topical issues associated with climate change impacts, system resilience and thresholds and ways to understand complex interactions will be considered for discussion.

LRES 530. Natural Resource Law. 3 Credits. (3 Lec) S
3 cr. LEC The course examines major natural resources laws, emphasizing the federal model. A modified case study approach is used to review legislation and related court cases governing natural resources, including water, minerals, timber, range, wildlife, recreation, and wilderness.

LRES 531. Applied Watershed Hydrology. 3 Credits. (3 Lec) S
PREREQUISITES: ENSC 245 or GEO 325 Patterns of streamflow, their measurement, quantitative characterization, underlying physical processes including precipitation, evapotranspiration, soil water dynamics, snowmelt, overland and subsurface hillside runoff, and channel flow are examined. Applications to aquatic and riparian resources, environmental problems, and human safety are emphasized.

LRES 532. Soil Ecosystems and Processes. 3 Credits. (3 Lec) S
PREREQUISITES: BIOB 160 This course focuses on biological and non-biological processes in soil ecosystems. Topics covered are soil’s function and role within our environment, nutrient and carbon cycling in soil, and effects of human activities and disturbance on soil and ecosystem function.

LRES 533. Wetland Ecology & Management. 3 Credits. (3 Lec) S
PREREQUISITES: General Biology, General Ecology This class will examine wetland ecology and the management of resources. Students will study hydrological and geomorphic processes at wetlands and site scales, how processes drive wetland hydrology and hydraulic soil development and maintenance, and the interaction with biological systems.

LRES 534. Environmental Data Analysis. 3 Credits. (3 Lec) S
PREREQUISITE: M 121Q or equivalent. Modern sciences are data-driven and this course focuses on making sense of data, both quantitatively and conceptually. Topics include a review of relevant algebra skills, methods to describe data, inferential statistical methods, sampling, experimental design, & regression focusing on interpretation.

LRES 535. Tech of Spatial Analysis. 3 Credits. (2 Lec, 1 Lab) F alternate years to be offered even years 3 cr. LEC 2 LAB 1 PREREQUISITE: STAT 410 or consent of instructor. Exploration and understanding of analytical techniques needed to deal with spatially correlated data. Emphasis is placed on practical applications within geographic information systems and image processing.

LRES 536. Ecology of Invasive Plants II. 1 Credit. (1 Lec) Su
PREREQUISITES: LRES 569 Through this course, students will learn to organize plant population data and analyze it to determine population temporal and spatial dynamics. In addition they will learn how to apply the conclusions drawn from the analysis to invasive species management decisions.

LRES 540. Ecology Plants & Community. 3 Credits. (3 Rct) F
PREREQUISITES: General biology (BIOB 160), and general ecology (BIOM 258) and general statistics (STAT 216Q) and college mathematics. This course will explore plant ecology at the individual, population and community levels. Topics include plant response to stress, population biology, and community assembly, and possibly non-native species and restoration. Quantitative measures for assessing populations and communities will be addressed.

LRES 543. Agroecology/App Plant Ecology. 3 Credits. (2 Lec, 1 Lab) S alternate years to be offered even years 3 cr. LEC 2 LAB 1 PREREQUISITE: BIOM 370, M 171, ENSC 443, STAT 216 Focus on the principles and theories of population and community ecology as they relate to invasive plant species in natural and agroecosystems. Measuring plant interference and assessing population interactions and dynamics through empirical and theoretical models. Review theory and methodology concerning plant population demographics, dispersal, and natural trait selection. Examine the role of biodiversity and evolution in determining sustainable management of ecosystems.

LRES 544. Water Quality. 3 Credits. (3 Lec) F
PREREQUISITES: ENSC 110 or equivalent This course covers water quality fundamentals (physical, biological, and chemical) and integrates science-policy, management and research. This course uses examples from county Extension, watershed groups, conservation districts, and agencies across Montana interfaced with MSU hydrology and water quality research.

LRES 545. Watershed Analysis. 3 Credits. (3 Lec) S
3 cr. LEC 2 LAB 1 PREREQUISITE: ENSC 444 and STAT 216 or BIOM 318 Conceptual and quantitative analysis of watershed processes with an emphasis on modeling surface water hydrology and water resources management. Watershed modeling concepts including analysis of time series, spatially variable data, model calibration, and uncertainty analysis will be studied and demonstrated. The course will emphasize critical analysis of current hydrologic computational methods and hands-on use of watershed models.

LRES 546. Quant Methods Environmental. 3 Credits. (3 Lec) S alternate years to be offered odd years 3 cr. LEC 3 PREREQUISITE: STAT 410 and ENSC 444 Introduction and application of numerical skills desirable for watershed and environmental models, including applied time series analysis, applied spatial statistics, probabilistic approaches to data analysis, uncertainty analysis and introductory programming skills. The course will focus on the use of real life and relevant environmental/watershed case studies and examples to illustrate theory.

LRES 552. Adv Soil/Envr Microbiology. 3 Credits. (3 Lab) S alternate years to be offered even years 3 cr. LAB 3 PREREQUISITE: Graduate standing or consent of instructor. Advanced laboratory course wherein students define a project de novo, design, and execute the appropriate experiments, interpret data appropriately, and then assemble the results into a written format that thoroughly discusses the project and outcomes. Projects may include the isolation and characterization of specific microorganisms or the study and in-depth characterization of select biogeochemical cycles catalyzed by microorganisms. Classic, novel, and ecologically relevant incubation approaches are used with the pertinent environmental samples that typically include soil, lake, or groundwater samples.

LRES 554. Soil Landscape Modeling. 3 Credits. (2 Lec, 1 Lab) S alternate years to be offered odd years LEC 2 LAB 1 PREREQUISITE: ENSC 454 and STAT 410 Quantitative soil-landscape modeling with an emphasis on multi-variate spatial statistics, digital terrain modeling, and underlying landscape processes. The course is built around “hands-on” projects and discussions of peer-reviewed literature.

LRES 555. Aqueous Geochemistry. 3 Credits. (2 Lec) S alternate years to be offered odd years 3 cr. LEC 2 REC 1 PREREQUISITE: CHMY 211, CHMY 228, ENSC 245 or equivalent. Advanced coverage of aqueous geochemistry in terrestrial and aquatic systems including chemical processes such as complexation, precipitation-dissolution, sorption-desorption, partitioning, oxidation-reduction and gas-water equilibria. Applications of these principles will be demonstrated in subject areas including biogeochemical cycling, bioremediation, contaminant fate and transport, salt-affected soils and wetland processes. Recitation will focus on current literature, applied problems, and case studies.

LRES 557. Thermal Biology in YNP. 2 Credits. (1 Lec, 1 Lab) Su
PREREQUISITE: Consent of instructor. This course covers temperature as a fundamental ecological variable and its effects on biota. Topics include: heat stress and temperature acclimation in organisms, energy requirements and assimilation in diverse habitats, and the role of temperature as a powerful selective force in Darwinian evolution.

LRES 558. Isotope Biogeochemistry. 2 Credits. (1 Lec) S alternate years to be offered even years PREREQUISITE: Consent of instructor. Fundamentals and applications of isotopes useful in the environmental sciences, including light elements such as carbon, oxygen, nitrogen, and hydrogen. Topics covered include: stable isotopes in water, carbon cycling, and the effects of climate change on isotope ratios.

LRES 561. Belowground Plant Ecology. 3 Credits. (3 Lec) S alternate years to be offered odd years PREREQUISITE: STAT 401 or equivalent; BIOE 370 or equivalent; BIOE 433 or equivalent. Application of basic ecological principles to belowground interactions of plant communities. Topics include plant competition, belowground herbivory, plant-microbe interactions including mycorrhizae, and biodiversity/productivity links in soil systems. Case studies will include invasive species, restoration scenarios, sustainable agriculture, and wildland communities.
LRES 562. Land Rehab Field Problem. 2 Credits. (2 Lab) Su alternate years, to be offered odd years. 
PREREQUISITE: ENSC 460, ENSC 461. Extended field trip to numerous dramatically disturbed sites across the Northern Plains. On-site review of land rehabilitation problems, solutions, and methodologies. Participation by industry, regulatory agency staff, and rehabilitation professionals will occur at most sites.

LRES 563. Restoration Ecology. 3 Credits. (3 Lec) F
PREREQUISITE: BIOE 370 or equivalent ecology course. Review of ecosystem structure and function, and community and population processes in intact systems, along with the effects of major disturbances on natural systems. Restoration amendments will be discussed in terms of their effects on ecosystem structure and function. The course includes case studies, and focuses on plant and soil systems.

LRES 564. Fundamentals of Environmental Monitoring. 2 Credits. (1 Lec, 1 Lab) Provides a graduate level perspective on field measurement methodology in environmental science. Foci are electronic transducers, data loggers, and programmatic approaches to measurement and uncertainty analysis. Incoming students are expected to have a quantitative undergraduate degree related to environmental science.

LRES 565. Environmental Biophysics. 3 Credits. (2 Lec, 1 Lab) S
3 cr. LEC 2 LAB 1 PREREQUISITE: BIOE 170 or equivalent and PHSX 205. The study of physical relationships between organisms, ecosystems, and their environment. Basic principles of Micrometeorology, Biometeorology, Ecological Climatology, and Biophysical Ecology as applied to contemporary ecological challenges. Laboratory sessions will focus on computer exercises using ecosystem models and field observations.

LRES 567. Biogeochem Analy Synthesis. 1 Credit. (1 Sem) S, alternate years to be offered even years. The course is meant to serve as an introduction to the study of biogeochemical dynamics from an Earth-systems perspective. The course will consist mostly of readings from primary literature and student-lead discussion. We will choose a problem/question, work together to survey relevant literature through a meta-analysis, and strive to produce a manuscript for publication.

LRES 568. Ecosystem Biogeochem. 3 Credits. (3 Lec) S
PREREQUISITE: CHMY 143, PHY 111, ENSC 110 and ENSC 245 (or equivalent understanding). Introduction to the study of biogeochemistry and ecosystem dynamics from an Earth-systems perspective. Discussion will emphasize factors governing the "grand elemental cycles" of carbon, nitrogen, and phosphorous of Earth’s major ecosystems and how modern human activities are affecting these cycles.

LRES 569. Ecol of Invasive Plants in GYE. 2 Credits. (1 Lec, 1 Lab) Su 2 cr. LEC 1 Lab 1 Current theories on what makes species invasive and what ecosystem conditions invite or resist non-indigenous plant species will be considered. Direct involvement in field research associated with testing methodology for monitoring the invasive potential of several exotic species in the otherwise pristine mountain environments.

LRES 571. Landscape & Ecosys Ecology. 3 Credits. (3 Rct) F
PREREQUISITE: General Biology, General Ecology, General Statistics Focuses on principles and applications of landscape and ecosystem ecology. Students will explore factors that shape landscape patterns in space and time and consequences for ecosystem processes. The course explores the methods and tools of landscape and ecosystem analysis.

LRES 572. Frontiers in Remote Sensing. 1 Credit. (1 Sem) S
PREREQUISITE: ENSC 460 or GPHY 426 or LRES 525 or equivalent. This course focuses on the emerging trends, technologies, and applications in remote sensing. Each time the course is taught, it will focus on a novel aspect of remote sensing science. Potential topics include UAS, lidar, radar, newly deployed satellites/seasos, and emerging scientific applications in remote sensing. Students who have a background and/or interest in remote sensing applications will be exposed to cutting-edge science, technologies and applications which will broaden their exposure to this rapidly developing field.

LRES 573. Remote Sensing Env Sci. 3 Credits. (3 Rct) S
PREREQUISITE: General Ecology (BIOE 370) and general statistics (STAT 216Q). This course focuses on understanding the basics of remote sensing science geared towards critical interpretation of the applications of remote sensing in environmental science. In addition, students will be exposed to hands-on exercises in basic digital image processing and analysis.

LRES 575. Prof Paper & Project. 1-4 Credits. (1-4 Lec) On Demand 1-4 IND Maximum 6 cr. PREREQUISITE: Graduate standing A research or professional paper or project dealing with a topic in the field. The topic must have been mutually agreed upon by the student, the major advisor, and graduate committee.

LRES 588. Professional Development. 1-3 Credits. (1-3 Lec) On Demand 1 - 3 cr. May be repeated; maximum 3 cr. PREREQUISITE: Graduate standing, teaching experience and/or current employment in a school organization, consent of instructor and Dean of Graduate Studies. Courses offered on a one-time basis to fulfill professional development needs of in service educators. A specific focus is given to each course which is appropriately subtitled.

LRES 590. Master’s Thesis. 1-10 Credits. (1 Ind; max unlimited) F,S,Su 1 - 10 cr. IND Maximum credits unlimited. PREREQUISITE: Master’s standing.

LRES 591. Special Topics. 1-4 Credits. (1 Rct; 12 cr max) On Demand 1 - 4 cr. Maximum 12 cr. PREREQUISITE: Upper division courses and others as determined for each offering. Courses not required in any curriculum for which there is a particular one-time need or given on a trial basis to determine acceptability and demand before requesting a regular course number.

LRES 592. Independent Study. 1-3 Credits. (1 Ind; 6 cr max) On Demand 1 - 3 cr. IND Maximum 6 cr. PREREQUISITE: Graduate standing, consent of instructor, approval of department head, and Dean of Graduate Studies. Directed research and study on an individual basis.

LRES 594. Seminar. 1 Credit. (1 Sem; 6 cr max) F,S,Su 1 cr. SEM Maximum 6 cr. PREREQUISITE: Graduate standing or seniors by petition. Course prerequisites as determined for each offering. Students prepare, present, and critique scientific presentations.

LRES 598. Internship. 2-4 Credits. (2 Ind; 12 cr max) On Demand 2 - 4 IND Maximum 12 cr. PREREQUISITE: Graduate standing, consent of instructor and approval of department head, and Dean of Graduate Studies. An individualized assignment arranged with an agency, business or other organization to provide guided experience in a field of study.

LRES 690. Doctoral Thesis. 1-10 Credits. (1 Ind; max unlimited) F,S,Su 1 - 10 cr. IND Maximum credits unlimited. PREREQUISITE: Doctoral standing.

LS - Liberal Studies

LS 101US. Ways of Knowing. 3 Credits. (3 Sem) F Introduction to the processes of academic inquiry through examination of topics in disciplines encompassed by the Fine Arts, Humanities, Natural Sciences, and Social Sciences.

LS 102. Intro Liberal Studies. 1 Credit. (1 Sem) S PREREQUISITE: University Seminar (US Course) or consent of instructor. An introduction to the history and philosophy of liberal education and a review of the Fine Arts, Humanities, Social and Natural Science disciplines. The LS degree components and options will be explained, as will career opportunities.

LS 290R. Undergraduate Research. 1-6 Credits. (1-6 Ind; max unlimited) F,S,Su Directed undergraduate research/creative activity which may culminate in a written work or other creative project. Course will address responsible conduct of research. May be repeated.

LS 301. Integrative Seminar. 1-3 Credits. (1-3 Sem; 6 cr max) F,S,Su PREREQUISITE: University Seminar and sophomore standing. The integration of knowledge, theories, and concepts across different disciplines in the Fine Arts, Humanities, Natural Sciences, and Social Sciences.

LS 401. Senior Project. 4 Credits. (4 Sem) F,S,Su PREREQUISITE: Senior status and Foreign language/Foundation courses completed. Senior capstone course. Opportunity for Liberal Studies majors to apply knowledge and experiences acquired throughout the program in researching and designing solutions to contemporary public policy issues.

LS 411. Sustainability & Human Values. 3 Credits. (3 Lec) S PREREQUISITE: Junior standing & ‘Q’ core course This course examine sustainability historically and from a contemporary cultural values perspective as a moral, ethical, and philosophical, and practical question in the context of current issues such as conservation, alternative energy, local foods, local economy, and the community deal.

LS 450. Evolution and Public Opinion. 3 Credits. (1 Lec, 2 Rec) S This course will explore what evolution is and how it works. We will examine the creationist and Intelligent Design arguments against evolution, as well as the implications of this debate on public education and the public perception of science.
LS 451. Film, Photos, and Culture: A Global Perspective. 3 Credits. (3 Sem) S
This course is designed to improve student’s intercultural competence—the ability to work effectively with cultural difference. Films, television, TEDs and photos are used to identify and analyze the differing dimensions of global culture, and to learn various methods of adaptation.

LS 452. This is Your Brain on Art and Music. 3 Credits. (3 Sem) F
This course will also discuss the neurological effects as well as the emotional effects that art and music have on human beings. In addition to this, it will also discuss the alleged healing properties of art and music (i.e. music therapy, art therapy).

LS 460. Teaching Internship. 2 Credits. (2 Ind) F,S
PREREQUISITE: US core and consent of instructor. As co-facilitators of a section of LS 101US, students will acquire and have the opportunity to practice classroom teaching strategies and mentoring skills.

LS 490R. Undergraduate Research. 1-6 Credits. (1-6 Ind; 12 cr max) F,S,Su
Max 12 cr. Directed undergraduate research/creative activity which may culminate in a research paper, journal article, or undergraduate thesis. Course will address responsible conduct of research. May be repeated.

LS 491. Special Topics. 1-4 Credits. (1-4 Ind) F
Maximum 12 cr. Max 12 cr. PREREQUISITE: Course prerequisites are dependent on the offering. Courses not required in any curriculum for which there is a particular one-time need or given on a trial basis to determine acceptability and demand before requesting a regular course number.

LS 492. Independent Study. 1-3 Credits. (1-3 Ind; 6 cr max) On Demand Max 6 cr. Directed research and study on an individual basis.

LSCI - Library Science

LSCI 121. Library Research Skills. 2 Credits. (2 Lec) F,S
Library Research Skills is a course focusing on both the concepts and skills needed to conduct library research with an emphasis on electronic information sources. The purpose of the course is to provide individuals with a basic understanding of the library research process and the skills by which they can successfully find information for research, presentations, and other class assignments. This course may be taught solely online or as hybrid course that contains both classroom and online components.

LSCI 290R. Undergraduate Research. 1-6 Credits. (1-6 Ind; max unlimited) F,S
Directed undergraduate research/creative activity which may culminate in a written work or other creative project. Course will address responsible conduct of research. May be repeated.

LSCI 316. Bus Info Research Skills. 3 Credits. (3 Lec) F
PREREQUISITE: Junior standing or consent of instructor. Focuses on both the concepts and skills needed to conduct research in various areas of business. Provides individuals with an understanding of the research process and the skills by which they can successfully find business related information for research, presentations, class assignments and personal use.

LSCI 490R. Undergraduate Research. 1-6 Credits. (1-6 Ind; 12 cr max) F,S,Su
Max 12 cr. Directed undergraduate research/creative activity which may culminate in a research paper, journal article, or undergraduate thesis. Course will address responsible conduct of research. May be repeated.

LSCI 491. Special Topics. 1-3 Credits. (1 Lec) On Demand Max 12 cr. Information literacy involves the capacity to recognize when information is needed and the ability to locate, evaluate, and use it effectively. Students in this course will learn to find information of increasing degrees of complexity in print and electronic formats.

LSCI 492. Independent Study. 1-3 Credits. (1 Ind; 6 cr max) On Demand Max 6 cr. PREREQUISITE: HIST 156 Internship for archival arrangement and description.

LSCI 498. Internship. 1-12 Credits. (1-12 Ind; 12 cr max) On Demand PREREQUISITE: Junior standing, consent of instructor, and approval of Department Head. An individual assignment assigned with an agency, business or other organization to provide guided experience in the field.

M - Mathematics

M 065. Pre-Algebra. 4 Credits. (4 Lec) F,S
Offered by Gallatin College. This instructor-taught course covers basic concepts relating to fractions, decimals, ratios, proportions, percent, selected geometry topics, topics of signed numbers, and 1-variable linear equations. The course is offered as a review and/or preparation for further studies in Mathematics. This course is equivalent to M 085.

M 066. Pre-Algebra Lab and Study. 1 Credit. (1 Rct) F
Offered by Gallatin College. Students enrolled in M 065 co-enroll in this course for additional instruction and practice with M 065 curriculum and Math study skills. This course will help students understand Math concepts, practice course material, and prepare for Math tests. Course is offered pass/fail.

M 085. Prealgebra. 4 Credits. (4 Ind) F,S
Offered by Gallatin College. An accelerated lab-based course designed for students who need a review of prealgebra concepts and are prepared to learn in a self-paced, accelerated mode. Topics include signed numbers, fractions, decimals, ratios, proportions, percent, 1-variable linear equations, an introduction to 2-variable linear equations, and selected geometry topics. The course is offered as a review and as preparation for further studies in mathematics. This course is equivalent to M 065.

M 088. Mathematical Literacy. 4 Credits. (4 Lec) F,S
Offered by Gallatin College. Develop mathematical literacy through problem solving, critical thinking, writing, and communicating mathematics. Represent and solve relevant, real-world problems using various forms of numbers, equations, and graphs. Topics include proportional reasoning, algebra, geometry, and measurement.

M 096. Survey of Algebra. 4 Credits. (4 Ind) F,S,Su
Offered by Gallatin College. PREREQUISITE: M 065 or M 085 or Math Placement Test 'Test within the past 12 months. This instructor-taught course is designed to develop in students’ ability to organize thought processes and systematically solve problems while preparing students for studies in other courses. Topics include linear equations and inequalities and their graphs, systems of linear equations, exponents, polynomials, factoring, rational expressions, and square roots. This course is equivalent to M 097.

M 097. Survey of Algebra (Mastery Learning). 4 Credits. (3 Rct, 1 Lab) F,S
Offered by Gallatin College. PREREQUISITE: M 065 or M 085 or Math Placement Test 'Test within the past 12 months. A flexible-paced course which prepares students for further math study. Topics include linear equations and inequalities and their graphs, systems of linear equations, exponents, polynomials, factoring, rational expressions, and square roots. This course is equivalent to M 096.

M 105Q. Contemporary Mathematics (formerly M 145Q, Math for Liberal Arts). 3 Credits. (3 Lec) F,S,Su
PREREQUISITE: M 088, M 096, M 097 or Math Placement Test 'Test within the past 12 months. Formerly M 145Q. Designed to give liberal arts students the skills required to understand and interpret quantitative information that they encounter in the news and in their studies, and to make numerically-based decision in their lives. Topics include working with large numbers and units, linear and exponential relations, financial mathematics, and essentials of probability and statistics.

M 108. Business Mathematics. 3 Credits. (3 Lec) S
Offered by Gallatin College. Prerequisite: M 065. Students of this course will examine the mathematics of business ownership and will demonstrate an understanding of business decisions. Concepts to be covered include cash flow, simple and compound interest, inventory valuation, purchasing discounts, cost markup, business and consumer loans, and analysis of financial statements. Additional topics which may be covered include payroll, depreciation, and bonds and annuities.

M 111. Technical Mathematics. 3 Credits. (3 Lec; F,S)
Offered by Gallatin College. This course presents basic mathematical topics as they are applied in a trades program. Topics covered include: use of measuring tools, measurement systems, dimensional arithmetic, percent, proportion, applied geometry, basic trigonometry. NOTE: This course is intended for specific programs and does NOT provide sufficient Pre-Algebra material to serve as a prerequisite for students wanting to take additional mathematics.

M 116. Math for Health Careers. 3 Credits. (3 Lec) S
Offered by Gallatin College. Inductive reasoning; logic; mathematical number systems; linear, quadratic, exponential, and logarithmic functions; graphing; probability; English. 3 credits. Offered by Gallatin College. Prerequisite: M 065 or Math Placement Test 'Test within the past 12 months. Formerly M 145Q. Designed to give liberal arts students the skills required to understand and interpret quantitative information that they encounter in the news and in their studies, and to make numerically-based decision in their lives. Topics include working with large numbers and units, linear and exponential relations, financial mathematics, and essentials of probability and statistics.

M 121Q. College Algebra. 3 Credits. (3 Lec) F,S,Su
PREREQUISITE: M 096, M 097 or Math Placement Test 'Test within the past 12 months. Further development of algebraic skills through the study of linear, quadratic, polynomial, exponential, and logarithmic functions.

M 132. Numbers & Operations for K-8 Teachers. 3 Credits. (3 Lec) F,S
PREREQUISITE: Math Placement Test 'Test within the past 12 months or M 121 (see advisor). The study of number and operations for prospective elementary and middle school teachers, including whole numbers, decimals, fractions, percents, integers, operations, numeral systems, and problem solving.

M 133Q. Geometry & Measure K-8 Teachers. 3 Credits. (3 Lec) F,S
PREREQUISITE: M 132. The study of geometry and geometric measurement for prospective elementary and middle school teachers, including synthetic, transformational, and coordinate geometry, constructions, congruence and similarity, 2-dimensional and 3-dimensional measurement, and problem solving.
M 147Q. Language of Mathematics. 3 Credits. (3 Lec) S
PREREQUISITE: M 088, M 096, M 097 or Math Placement Test within the past 12 months. Reading comprehension and writing skills in the language of mathematics; vocabulary, grammar, syntax and logic; emphasis on understanding, expressing, proving, and thinking mathematical thoughts.

M 149Q. Secrets of the Infinite. 3 Credits. (2 Lec, 1 Lab) F,S
PREREQUISITE: M 088, M 096, M 097 or Math Placement Test within the past 12 months. Intriguing problems, puzzles, and paradoxes studied from a historical perspective. Hands-on thought experiments follow mathematical ideas as they evolved from ancient beginnings into their modern contexts. Topics vary by semester.

M 151Q. Precalculus. 4 Credits. (4 Lec) F,S,Su
PREREQUISITE: M 121Q or Math Placement Test within the past 12 months. Functions, graphs, and the use symbols for expressing mathematical thoughts. Polynomials, rational, exponential, logarithmic, and trigonometric functions.

M 161Q. Survey of Calculus. 4 Credits. (4 Lec) F,S,Su
PREREQUISITE: M 121Q or Math Placement Test within the past 12 months. A survey of basic calculus including limits, differentiation, and integration with applications to business, biology, and social science problems.

M 165Q. Calculus for Technology I. 3 Credits. (3 Lec) F,S
PREREQUISITE: M 151Q or Math Placement Test within the past 12 months. Calculus with emphasis on problems of interest to engineering technologists. Includes analytic geometry, differentiation, and introduction to integration.

M 166Q. Calculus for Technology II. 3 Credits. (3 Lec) F,S
PREREQUISITE: M 165Q. Calculus with emphasis on problems of interest to engineering technologists. Includes integration, infinite series, and differential equations.

M 171Q. Calculus I. 4 Credits. (4 Lec) F,S,Su
PREREQUISITE: M 151Q or Math Placement Test within the past 12 months. Functions, elementary transcendental functions, limits and continuity, differentiation, applications of the derivative, curve sketching, and integration theory.

M 172Q. Calculus II. 4 Credits. (4 Lec) F,S
PREREQUISITE: M 171Q. Methods of integration, applications of the integral, Taylor's theorem, infinite sequences and series, polar coordinates.

M 181Q. Honors Calculus I. 4 Credits. (4 Lec) F
PREREQUISITE: M 151Q with an "A" grade, 700 on the SAT Math exam, 31 on the ACT Math exam, 4 on an AP Calculus exam, or consent of the instructor. Honors section of M 171Q. Topic coverage parallels M 171Q but with a greater emphasis on theory and more difficult problems. 2-4 credits, 2-4 cr max.

M 182Q. Honors Calculus II. 4 Credits. (4 Lec) S
PREREQUISITE: M 171Q with an "A" grade or M 181Q with a "B" grade. Honors section of M 172Q. Topic coverage parallels M 172Q but with a greater emphasis on theory and more difficult problems.

M 221. Introduction to Linear Algebra. 3 Credits. (3 Lec) F,S,Su
PREREQUISITE: M 166Q or M 172Q. Matrix algebra, systems of linear equations, determinants, vector algebra and geometry in Euclidean 3-space, eigenvalues, eigenvectors.

M 234. Higher Math for K-8 Teachers. 3 Credits. (3 Lec) F,S,Su
PREREQUISITE: M 132 and M 133Q. The study of algebra, number theory, probability and statistics for prospective elementary and middle school teachers, including proportional reasoning, functions, elementary number theory, statistical modeling and inference, and elementary probability theory.

M 242. Methods of Proof. 3 Credits. (3 Lec) F,S
PREREQUISITE: M 172Q. Reasoning and communication in mathematics, including logic, generalization, existence, definition, proof, and the language of mathematics. Topics include functions, relations, set theory, recursion, algebra, number theory, and other areas of mathematics.

M 273Q. Multivariable Calculus. 4 Credits. (4 Lec) F,S,Su
PREREQUISITE: M 172Q. Topics in two and three dimensional geometry. Manipulation and application of vectors. Functions of several variables, contour maps, graphs, partial derivatives, gradients, double and triple integration, vector fields, line integrals, surface integrals, Green's Theorem, Stokes' Theorem, the Divergence Theorem.

M 274. Introduction to Differential Equation. 4 Credits. (4 Lec) F,S,Su
PREREQUISITE: M 172Q. An introduction to qualitative, quantitative, and numerical methods for ordinary differential equations. Topics include modeling via differential equations, linear and nonlinear first order differential equations and systems, elementary phase plane analysis, forced oscillations, and Laplace transform techniques.

M 283Q. Honors Multivariable Calculus. 4 Credits. (4 Lec) F
PREREQUISITE: M 182Q with a 'B' grade, M 172Q with an 'A' grade; AP Calculus BC exam with a 5, or consent of the instructor. Honors section of M 273Q. Topic coverage parallels M 273Q but with a greater emphasis on theory and more difficult problem solving.

M 284. Honors Introduction to Differential Equations. 4 Credits. (4 Lec) S
PREREQUISITE: M 283Q with a 'B' grade, M 273Q with an 'A' grade, or consent of the instructor. Honors section of M 274. Topic coverage parallels M 274 but with a greater emphasis on theory and more difficult problem solving.

M 290R. Undergraduate Research. 1-8 Credits. (1-8 Ind; 8 cr max) F,S,Su
PREREQUISITE: Consent of the department head. Directed undergraduate research. Course will address responsible conduct of research.

M 291. Special Topics. 1-4 Credits. (1-4 Lec; 1-4 cr max) On Demand
PREREQUISITE: None required but some may be determined necessary. Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

M 328. Higher Math for Sec. Teachers. 3 Credits. (3 Lec) F
PREREQUISITE: M 242. Concepts, processes, and proof relevant to school mathematics, including number theory, abstract algebra, combinatorics and probability; a focus on standards-based content for teachers in secondary schools.

M 329. Modern Geometry. 3 Credits. (3 Lec) S
PREREQUISITE: M 242. A study of Euclidean and non-Euclidean geometries, chosen from: hyperbolic, spherical, projective, finite, transformational, and fractal geometries; computer tools for geometry; a focus on standards-based content for teachers in secondary schools.

M 330. History of Mathematics. 3 Credits. (3 Lec) F alternate years, to be offered every other year.
PREREQUISITE: M 237Q and M 274 or consent of instructor. Topics will be selected from the entire span of history from Egyptian, Babylonian, and Greek times through the 20th century. The course may focus on milestones that lead to the development of modern mathematics as well as the contributions of great mathematicians from ancient times until today. Some ideas will require mathematical sophistication at the upper division level.

M 333. Linear Algebra. 3 Credits. (3 Lec) F

M 348. Techniques of Applied Math I. 3 Credits. (3 Lec) F
PREREQUISITE: M 273Q and M 274. An introduction to advanced analytical techniques frequently used by scientists and engineers to study ordinary differential equations and two-point boundary value problems. Topics include series solution techniques, method of Frobenius, Laplace transforms, Fourier series, and boundary value problems.

M 349. Techniques of Applied Mathematics II. 3 Credits. (3 Lec) S
PREREQUISITE: M 348. Science and engineering majors often encounter partial differential equations in the study of heat flow, vibrations, electric circuits, and similar areas. Topics include Sturm-Liouville theory, partial differential equations boundary value problems, and Laplace Transform methods.

M 383. Introduction to Analysis I. 3 Credits. (3 Lec) F
PREREQUISITE: M 273Q and either M 242, M 333, or consent of instructor. A rigorous development of calculus with formal proofs. Functions, sequences, limits, continuity, differentiation, and integration.

M 384. Introduction to Analysis II. 3 Credits. (3 Lec) S

M 386R. Software Applications in Mathematics. 3 Credits. (3 Lec) S
PREREQUISITE: M 221, M 273Q, and M 274. An introduction to modern mathematical and scientific computing. Software such as MAPLE and MATLAB will be used to explore, solve, and visualize solutions of standard mathematical problems as well as simple models of various physical and/or biological systems.

M 420. Geometry, Measurement, and Data in the Middle Grades. 3 Credits. (3 Lec) F alternate years, to be offered every other year.
PREREQUISITE: M 234, or M 242, and corequisite EDU 382. Develop content knowledge necessary to teach standards based middle school mathematics. Investigate the underlying conceptual structure of topics in geometry, measurement and data analysis appropriate to middle school. Explore the use of manipulative materials and technologies, and discuss related pedagogical issues and national standards.
M 440. Algebraic Thinking and Number Sense in the Middle Grades. 3 Credits. (3 Lec) F to be offered odd years. PREREQUISITE: M 234 or M 242, and corequisite EDU 382. Develop algebraic knowledge necessary to teach standards-based middle school mathematics. Investigate the underlying conceptual structure of topics in algebra and number appropriate to middle school. Explore the use of manipulative materials and technologies, and discuss related pedagogical issues and national standards.

M 428. Mathematical Modeling for Teachers. 3 Credits. (3 Lec) F PREREQUISITE: M 242, M 221 and STAT 217Q. Senior capstone course. Applications of the modeling process in key areas of mathematics and statistics. Simulation and other activities, use of relevant technology, modeling in the secondary curricula, and the classroom assessment of modeling activities. Emphasis on technology and authentic applications using pre-college mathematics.

M 430. Mathematical Biology. 3 Credits. (3 Lec) S PREREQUISITES: M 273Q and M 274 or consent of the instructor. Mathematical modeling of basic biological processes in ecology, physiology, neuroscience, epidemiology and molecular biology using difference equations, differential equations, and partial differential equations.

M 431. Abstract Algebra I. 3 Credits. (3 Lec) S PREREQUISITE: M 333. Senior capstone course. The integers, integers modulo n, the Euclidean algorithm. Groups, subgroups, normal subgroups, quotient groups, homomorphism and isomorphism theorems, and abelian groups. Rings, ideals, homomorphism and isomorphism theorems. Integral domains, fields, and fields of quotients.


M 450. Applied Mathematics I. 3 Credits. (3 Lec) F alternate years, to be offered odd years. PREREQUISITE: M 273Q and M 274. An introduction to modern methods in applied mathematics. Topics include introductions to dimensional analysis and scaling, perturbation and WKBJ methods, boundary layers, calculus of variations, stability, and bifurcation analysis.

M 451. Applied Mathematics II. 3 Credits. (3 Lec) S alternate years, to be offered even years. PREREQUISITE: M 450. This is the second semester of a course that introduces modern methods in applied mathematics. Topics involve methods for linear and nonlinear partial differential equations, including introductions to Green’s functions, Fourier analysis, shock waves, conservation laws, maximum and minimum principles, and integral equations.

M 454. Introduction of Dynamical Systems I. 3 Credits. (3 Lec) F alternate years, to be offered even years. PREREQUISITE: M 273Q and M 274. Existence and uniqueness of solutions to ordinary differential equations, linearization, phase portraits, stability theory, and the analysis of specific examples.

M 455. Introduction to Dynamical Systems II. 3 Credits. (3 Lec) S alternate years, to be offered odd years. PREREQUISITE: M 454. Gradient systems, Poincare’-Bendixon theory, Poincare’ maps, structural stability and chaotic systems.

M 472. Introduction to Complex Analysis. 3 Credits. (3 Lec) S alternate years, to be offered even years. PREREQUISITE: M 273Q and M 274. An introduction to the techniques of complex analysis that are frequently used by scientists and engineers. Topics include complex numbers, analytic functions, Taylor and Laurent expansions, Cauchy’s theorem, and evaluation of integrals by residues.

M 490R. Undergraduate Research. 1-6 Credits. (1-6 Ind; 12 cr max) F,S,Su PREREQUISITE: Junior standing in mathematics and consent of department head. Directed undergraduate research which may culminate in a research paper, journal article, or undergraduate thesis. Course will address responsible conduct of research. May be repeated.

M 491. Special Topics. 1-4 Credits. (1-4 Lec; 12 cr max) On Demand PREREQUISITE: Course prerequisites as determined for each offering. Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

M 492. Independent Study. 1-3 Credits. (1-3 Ind; 6 cr max) F,S,Su PREREQUISITE: Junior standing, consent of instructor, and approval of department head. Directed research and study on an individual basis.

M 494. Seminar. 1 Credit. (1 Sem; 4 cr max) On Demand PREREQUISITE: Junior standing and as determined for each offering. Topics offered at the upper division level which are not covered in regular courses. Students participate in preparing and presenting material.

M 497. Educational Methods: Teaching Fellowship. 1-3 Credits. (1-3 Ind; 2 cr max) F,S,Su PREREQUISITE: Junior standing, consent of instructor, and approval of department head. As co-teachers of a Mathematics or Statistics course, students will learn and have the opportunity to practice classroom teaching strategies as well as mentoring skills.

M 498. Internship. 2-12 Credits. (2-12 Ind; 12 max) F,S,Su PREREQUISITE: Junior standing, consent of instructor, and approval of department head. An individualized assignment arranged with an agency, business, or other organization to provide guided experience in the field.


M 503. Advanced Linear Algebra. 3 Credits. (3 Lec) S PREREQUISITE: M 333 or consent of instructor. Topics include abstract vector spaces, diagonalization, Schur’s Lemma, Jordan canonical form and spectral theory for finite dimensional operators.

M 504. Abstract Algebra. 3 Credits. (3 Lec) S PREREQUISITE: M 431 or consent of instructor. The theory of groups, rings and fields with particular emphasis on finite groups, polynomial rings and fields of characteristic zero.

M 505. Principles of Mathematical Analysis. 3 Credits. (3 Lec) F PREREQUISITE: M 384 or consent of instructor. Principles of analysis in Euclidean spaces and metric spaces.

M 509. Stochastic Processes. 3 Credits. (3 Lec) S alternate years, to be offered even years. PREREQUISITE: STAT 421. Conditional probability theory, discrete and continuous time markov chains including birth and death processes and long run behavior, Poisson processes; queueing systems; system reliability. Cross-listed with STAT 509.

M 511. General Topology. 3 Credits. (3 Lec) F PREREQUISITE: M 384 or consent of instructor. Definition of a topology, relative topology, metric topology, quotient topology, and the product topology. Connectedness, local connectedness, components and path components. Compactness and local compactness, countability and separation axioms, the Urysohn Lemma, metrization and compactification.

M 512. Geometry & Algebraic Topology. 3 Credits. (3 Lec) S PREREQUISITE: M 511 or consent of instructor. Topics in continua theory, topics in dimension theory, covering spaces and the fundamental group, simplicial complexes, topics in homology and cohomology theory.

M 516. Language of Mathematics for Teachers. 3 Credits. (3 Lec) Su On Demand. Distance format. PREREQUISITE: Graduate standing in mathematics education, teaching endorsement in mathematics, or consent of instructor. Features of the language of mathematics, including syntax, vocabulary, and structure. Logic, proof and mathematical communication for high school classrooms.

M 517. Advanced Mathematical Modeling for Teachers. 3 Credits. (3 Lec) Su for two consecutive years; alternates with M 526 PREREQUISITE: Graduate standing in mathematics education, teaching endorsement in mathematics, or consent of instructor. Focus on the use of modeling to solve real-world problems. Topics include the modeling process, an overview of relevant technology, strategies to engage students in modeling in the secondary classroom, and classroom assessment of modeling activities. Extensive use of mathematics to explore application areas, leading to the construction of original models.
M 518. Statistics For Teachers. 3 Credits. (3 Lec) Su
Distance format. PREREQUISITE: Graduate standing in mathematics or science education, teaching endorsement in mathematics or science, or consent of instructor. Stochastic concepts including probabilistic underpinnings of statistics, measures of central tendency, variability, correlation, distributions, sampling, and simulation. Exploratory data analysis including experiments, surveys, measures of association and inferential statistics. Discussion of methods for teaching statistics in secondary mathematics and science.

M 520. Standards-Based Math for Teachers. 3 Credits. (3 Lec) Su, to be offered odd years.
Distance format. PREREQUISITE: Graduate standing in mathematics education, teaching endorsement in mathematics, or consent of instructor. Study of key content themes and connections in algebra, geometry, probability/data analysis, number, and measurement with a focus on mathematical practices. Exploring, extending, designing, and teaching standards-based classroom activities for middle/high school students and reflecting on student outcomes.

M 521. Mathematics Learning Theory for Teachers. 3 Credits. (3 Lec) F alternate years, to be offered even years.
Distance format. PREREQUISITE: Graduate standing in mathematics education, teaching endorsement in mathematics, or consent of instructor. Examine theories of learning as they apply to the mathematics classroom. The course focuses on theories of and research about learning, human development, personality and motivation. The theories and research are used (a) to understand mathematics learning among students of all cultural, linguistic and socioeconomic backgrounds, and (b) to formulate effective teaching and learning strategies.

M 522. Assessment of Mathematics for Teachers. 3 Credits. (3 Lec) S On Demand.
Distance format. PREREQUISITE: Graduate standing in mathematics education, teaching endorsement in mathematics, or consent of instructor. Connects assessment theory and models to teachers’ practice through classroom observations and hand-on activities. Focuses on assessment practices consistent with standards-based mathematics, classroom assessment of student learning, evaluation of mathematics programs and curricula, and standardized testing practices.

M 523. Number Structure for Teachers. 3 Credits. (3 Lec) Su, to be offered even years.
Distance format. PREREQUISITE: Graduate standing in mathematics education, teaching endorsement in mathematics, or consent of instructor. Develop the relationship and distinction between the mathematics that underlies the structure of number and the learning and teaching of number structure in schools. Explore representation, abstraction, and basic proof in the context of number and operations. Develop foundations of the real number system and examine relevant research about students’ understanding of number.

M 524. Linear Algebra for Teachers. 3 Credits. (3 Lec) Su
Distance format. PREREQUISITE: Graduate standing in mathematics education, teaching endorsement in mathematics, or consent of instructor. Algebraic systems, special matrices, determinants, vector spaces, and linear programming. Includes applications relevant to industry and business and connections to topics in secondary mathematics.

M 525. Analysis for Teachers. 3 Credits. (3 Lec) F
Distance format. PREREQUISITE: Graduate standing in mathematics education, teaching endorsement in mathematics, or consent of instructor. A study of calculus concepts and processes from graphical, numerical and algebraic perspectives. Extensive use of activities and projects. Modeling and technology are incorporated throughout the course.

M 526. Discrete Mathematics for Teachers. 3 Credits. (3 Lec) Su
for two consecutive years; alternates with M 517 PREREQUISITE: Graduate standing in mathematics education, teaching endorsement in mathematics, or consent of instructor. A study of classical topics in discrete mathematics, chosen from combinatorics, probability, graph theory, and other areas relevant to secondary mathematics. Emphasis on problem solving and justification.

M 527. Geometry for Teachers. 3 Credits. (3 Lec) S
Distance format. PREREQUISITE: Graduate standing in mathematics education, teaching endorsement in mathematics, or consent of instructor. Exploration of special topics in geometry, such as geometry of transformations including Euclidean motions and similarity, projective geometry, geometric topology and geometry of inversion.

M 528. Curriculum Design. 3 Credits. (5 Lec) S alternate years, to be offered even years.
Distance format. PREREQUISITE: Graduate standing in mathematics education, teaching endorsement in mathematics, or consent of instructor. Focuses on the design, implementation, and evaluation of curricula in mathematics. Includes historical changes and trends in mathematics curriculum and an examination of current research.

M 529. Assessment Models and Issues. 3 Credits. (3 Lec) F alternate years, to be offered odd years.
Distance format. PREREQUISITE: Graduate standing in mathematics education, teaching endorsement in mathematics, or consent of instructor. Examines critical K-12 issues including: alignment and interaction of assessment with standards, curriculum, instruction; role of assessment systems at local, state, and national levels; evaluation of assessment tools and programs; equity considerations in assessment.

M 533. History of Mathematics for Teachers. 3 Credits. (3 Lec) F On Demand.
Distance format. PREREQUISITE: Graduate standing in mathematics education, teaching endorsement in mathematics, or consent of instructor. Focus on the history of mathematics as a context for classroom instruction. Includes the changing nature of mathematics, classical problems, proofs and mathematical processes, and the development of teaching units that incorporate the history of mathematics.

M 534. Research in Mathematics Education. 3 Credits. (3 Lec) F, to be offered even years.
PREREQUISITE: Consent of instructor. Examination of quantitative and qualitative research findings and methodology in mathematics education. Review of current trends and literature. Writing for publication and proposals.

M 535. Technology and Mathematics for Teachers. 3 Credits. (3 Lec) Su On Demand
PREREQUISITE: Graduate standing in mathematics education, teaching endorsement in mathematics, or consent of instructor. Calculators, computer and Web-based technologies for K-12 mathematics education. Analysis of the influence of technology on the K-12 mathematics curriculum, instruction, and assessment.

M 540. Introduction to Calculus on Manifolds. 3 Credits. (3 Lec) F alternate years.
Distance format. PREREQUISITE: M 503 and M 505 or consent of instructor. An introduction to manifolds and their atlases, fiber bundles, vector fields and differential forms, the exterior and Lie derivatives, Stokes Theorem, and de Rham cohomology.

M 544. Partial Differential Equations I. 3 Credits. (3 Lec) F alternate years, to be offered odd years.
PREREQUISITE: M 384 and M 451, or consent of instructor. An extended survey of the origins of a large number of scientific and mathematical partial differential equations and an overview of the theoretical techniques which are available to solve them.

M 545. Partial Differential Equations II. 3 Credits. (3 Lec) S alternate years, to be offered even years.
PREREQUISITE: M 544 and M 547. Linear partial differential equations and the function spaces and functional analysis which one uses to study them. Topics include: Holder and Sobolev functions, Sobolev and Poincare inequalities, embedding density, semigroup theory for evolution equations.

M 547. Measure Theory. 3 Credits. (3 Lec) F

M 551. Complex Analysis. 3 Credits. (3 Lec) S
PREREQUISITE: M 505. Analytic functions and conformal maps, contour integrals, Cauchy’s theorem, Cauchy’s integral formula, the maximum modulus theorem, harmonic functions, Taylor’s theorem and Laurent series. Classification of singularities, the residue theorem and evaluation of definite integrals, Rouche’s theorem and the argument principle.

M 560. Methods of Applied Mathematics I. 3 Credits. (3 Lec) F alternate years, to be offered even years.

M 561. Methods of Applied Mathematics II. 3 Credits. (3 Lec) S alternate years, to be offered odd years.

M 570. Individual Problems. 1-3 Credits. (1-3 Ind; 6 cr max) F,S
PREREQUISITE: Graduate standing, consent of instructor, approval of department head and Dean of Graduate Studies. Directed research and study on an individual basis.
M 571. Action Research in Mathematics Education. 2 Credits. (2 Lec) Su On Demand
PREREQUISITE: Graduate standing in mathematics education and consent of instructor. Prepares practicing mathematics teachers to study a mathematics education problem within their classroom, school or district with supervision by a faculty member. Course topics include how to interpret educational research and literature; design and implement reliable and valid action research; identify worthwhile problems; and formulate questions that can be addressed through action research.

M 572. Investigating Problems in Mathematics Education. 2 Credits. (2 Lec) F On Demand.
Distance format. PREREQUISITE: M 571, graduate standing in mathematics education and consent of instructor. With guidance from faculty, students research and investigate a problem related to mathematics education and student success in the context of their classroom, school, or district.

M 575. Professional Paper and Project. 1-4 Credits. (1-4 Ind; 6 cr max) F,S,Su
PREREQUISITE: Graduate standing. A research or professional paper or project dealing with a topic in the field. The topic must have been mutually agreed upon by the student and his or her major advisor and graduate committee.

M 576. Internship. 2-12 Credits. (2-12 Ind; unlimited max) F,S,Su
PREREQUISITE: Graduate standing, consent of instructor and approval of department head. An individualized assignment arranged with an agency, business or other organization to provide guided experience in the field.

M 577. Improving Mathematics Edu. Through Action Research. 3 Credits. (3 Lec) S, alternate years, to be offered odd years.
Distance format. PREREQUISITE: Graduate standing in mathematics education, teaching endorsement in mathematics and consent of instructor. With guidance from faculty, students conduct action research addressing a problem in the context of their classroom, school or district that influences student success in mathematics. Students work with a faculty advisor to implement an intervention, collect and analyze data, summarize results. Findings are presented orally to peers and faculty.

M 580. Special Topics. 4 Credits. (1-4 Lec, 12 max) On Demand
PREREQUISITE: Upper division courses and others as determined for each offering. Courses not required in any curriculum for which there is a particular one time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

M 581. Numerical Solution of Partial Differential Equations I. 3 Credits. (3 Lec) F
PREREQUISITE: M 462. Finite difference and finite element solution techniques for elliptic, parabolic, and hyperbolic partial differential equations, numerical linear algebra.

M 582. Numerical Solution of Partial Differential Equations II. 3 Credits. (3 Lec) S
PREREQUISITE: M 581. A continuation of topics from M 581.

M 584. Functional Analysis I. 3 Credits. (3 Lec) F alternate years, to be offered every other year.
PREREQUISITE: M 547. Banach spaces, fixed point theorems, Hilbert spaces, the Dirichlet principle, generalized Fourier series, and spectral theory.

M 585. Functional Analysis II. 3 Credits. (3 Lec) S alternate years, to be offered odd years.
PREREQUISITE: M 584. The Hahn-Banach theorem, variational principles, weak convergence, uniform boundedness theorem, the open mapping theorem and the implicit function theorem.

M 586. Probability Theory. 3 Credits. (3 Lec) S alternate years, to be offered odd years.

M 588. Professional Development. 1-3 Credits. (1-3 Lec; 3 cr max) On Demand
PREREQUISITE: Graduate standing, teaching experience and/or current employment in a school organization, consent of instructor and Dean of Graduate Studies. Courses offered on a one time basis to fulfill professional development needs of in-service educators. A specific focus is given to each course which is appropriately subdivided. It may be repeated.

M 589. Graduate Consultation. 3 Credits. (3 Ind) F,S,Su
PREREQUISITE: Master’s standing. This course may be used only by students who have completed all of their course work (and thesis, if on a thesis plan) but who need additional faculty or staff time.

M 590. Master’s Thesis. 1-10 Credits. (1-10 Ind; max cr unlimited) F,S,Su
PREREQUISITE: Master’s standing.

M 591. Topics in Applied Math I. 3 Credits. (3 Lec) F
PREREQUISITE: Graduate standing and consent of instructor. Topics may include numerical solution of linear and nonlinear problems, eigenvalue problems, continuation methods, numerical optimization, computational mechanics, spectral methods, bifurcation theory, invariant manifold theory, index theory, nonlinear analysis, reaction-diffusion equations, nonlinear oscillations, asymptotic methods and perturbation methods.

M 592. Topics in Applied Math II. 3 Credits. (3 Lec) S
PREREQUISITE: Graduate standing and consent of instructor. Topics may include numerical solution of linear and nonlinear problems, eigenvalue problems, continuation methods, numerical optimization, computational mechanics, spectral methods, bifurcation theory, invariant manifold theory, index theory, nonlinear analysis, reaction-diffusion equations, nonlinear oscillations, asymptotic methods and perturbation methods.

M 594. Seminar. 1 Credit. (1 Sem; 6 cr max) F,S,Su
PREREQUISITE: Graduate standing or seniors by petition. Course prerequisites as determined for each offering. Topics offered at the graduate level which are not covered in regular courses. Students participate in preparing and presenting discussion material.

M 595. Dynamical Systems I. 3 Credits. (3 Lec) F alternate years, to be offered odd years.
PREREQUISITE: M 503. Topics in differential equations including existence and uniqueness, continuous dependence on parameters, extendibility, the existence and stability of equilibria and limit cycles and the Poincare-Bendixson theorem.

M 596. Dynamical Systems II. 3 Credits. (3 Lec) S alternate years, to be offered every other year.
PREREQUISITE: M 595. Topics include Hartman’s theorem, invariant manifold theory, Smale-Birkhoff theorem, horseshoe chaos, and the Melnikov method. Topics in discrete dynamical systems may also be covered.

M 597. Topics in Math I. 3 Credits. (3 Lec) F
PREREQUISITE: Graduate standing and consent of instructor. Topics selected from: differential topology, differential geometry and complex dynamics.

M 598. Topics in Math II. 3 Credits. (3 Lec) S
PREREQUISITE: Graduate standing and consent of instructor. Topics selected from: continuum theory, symbolic dynamics, ergodic theory and low dimensional topology.

M 689. Doctoral Reading & Research. 3-5 Credits. (3-5 Ind; 15 cr max) F,S,Su
PREREQUISITE: Doctoral standing. This course may be used by doctoral students who are reading research publications in the field in preparation for doctoral thesis research.

M 690. Doctoral Thesis. 1-10 Credits. (1-10 Ind; max unlimited) F,S,Su
PREREQUISITE: Doctoral standing.

MART - Media Arts

MART 145RA. Web Design. 3 Credits. (2 Lec, 1 Lab) F,S
Basic design principles and how these principles apply to web site construction. HTML and HTML editors. Laboratory projects reflect practical usage of course concepts. Cross-listed with CS 145RA.

MAS - Military Aerospace Studies

MAS 100. AF Physical Fitness. 1 Credit. (1 Lab; 8 cr max) F
Maximum 8 cr. Provides students a framework of fitness skills, planning, and testing for a lifetime of health. Consists of two Physical Training sessions per week that include running, swimming, strength and flexibility, core development sports, and team building exercises. This course may be repeated for credit.

MAS 110. Foundations of The Air Force I. 1 Credit. (1 Lec) F
COREQUISITE: MAS 115. Survey course designed to introduce students to the United States Air Force and provides an overview of the basic characteristics, missions, and organization of the Air Force. Communication Studies are woven throughout the four year program.

MAS 111. Foundations of The Air Force II. 1 Credit. (1 Lec) S
COREQUISITE: MAS 116. Survey course designed to introduce students to the United States Air Force and provides an overview of the basic characteristics, missions, and organization of the Air Force. Communication Studies are woven throughout the four year program.
MAS 115. Leadership Laboratory 115. 0 Credits. (non-credit lab) F
PREREQUISITE: Consent of instructor and approval of department head.
COREQUISITE: MAS 110. A student planned, organized, and executed practicum with leadership developmental activities for prospective Air Force second lieutenants. Acquaints cadets with basic Air Force knowledge and skills to help them determine whether they wish to continue with the AFROTC program.

MAS 116. Leadership Lab 116. 0 Credits. (non-credit lab) S
PREREQUISITE: Consent of instructor and approval of Department Head.
COREQUISITE: MAS 111. A student planned, organized, and executed practicum with leadership developmental activities for prospective Air Force second lieutenants. Acquaints cadets with basic Air Force knowledge and skills to help them determine whether they wish to continue with the AFROTC program.

MAS 201. The Employment of Air and Space Power I. 1 Credit. (1 Lec) F
COREQUISITE: MAS 215. Introduction to air power through examination of the Air Force Core Functions; and continued application of communication skills. Instills an appreciation of the development and employment of air power and transition sophomores from AFROTC cadet to AFROTC officer candidate.

MAS 211. The Employment of Air and Space Power II. 1 Credit. (1 Lec) S
COREQUISITE: MAS 216 Introduction to air power through examination of the Air Force Core Functions; and continued application of communication skills. Instills an appreciation of the development and employment of air power and transition sophomores from AFROTC cadet to AFROTC officer candidate.

MAS 212. Flight Ground School. 2 Credits. (2 Lec) S
PREREQUISITE: Approval of instructor. (This MAS course is available only through Burns Telecom Center under separate registration). Basics required for learning to fly single-engine land type aircraft. Covers material tested on the FAA Private Pilot written exam, to include performance, the science of flight, meteorology, FAA regulations, navigation, and the physiology of flight.

MAS 215. Leadership Laboratory 215. 0 Credits. (non-credit lab) F
PREREQUISITE: Consent of instructor and approval of department head. COREQUISITE: MAS 210. A student planned, organized, and executed practicum with leadership developmental activities for prospective Air Force second lieutenants. Provides training to ensure every cadet is mentally and physically prepared for the rigorous field training environment.

MAS 216. Leadership Lab 216. 0 Credits. S
PREREQUISITE: Consent of instructor and approval of department head. COREQUISITE: MAS 211. A student planned, organized, and executed practicum with leadership developmental activities for prospective Air Force second lieutenants. Provides training to ensure every cadet is mentally and physically prepared for the rigorous field training environment.

MAS 260. USAF Aerospace Weapons. 3 Credits. (3 Lec) S
The study of the weapons systems employed by the United States Air Forces. It also presents the basics of their integration and employment at the operational level.

MAS 281. Leadership & Fitness. 2 Credits. (2 Lab) F,S
An introduction to leadership principles and practice through organized group fitness. Leadership and Fitness uses group fitness workouts as a means to improve personal fitness, examine leadership techniques, and give students hands-on leadership experience by personally leading the group.

MAS 291. Special Topics. 1-4 Credits. (1 Lec; 12 cr max) On Demand
Max 12 cr. PREREQUISITE: None required but some may be determined necessary by each offering department. Courses not required in any curriculum for which there is a particular one time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

MAS 292. Independent Study. 1-4 Credits. (1 Lec; 6 cr max) On Demand
Max 6 cr. PREREQUISITE: Consent of instructor and approval of the director. Directed research and study on an individual basis.

MAS 309. Fld Training. 6 Week. 2 Credits. (2 Lab) F
PREREQUISITE: MAS 110, MAS 111, MAS 210, MAS 211 and junior standing. Required for all AFROTC cadets except those who have completed MAS 209. Orientation on an Air Force base, flying orientation, survival and small arms training, physical training, drill and ceremonies.

MAS 310. Air Force Leadership and Management I. 3 Credits. (3 Lec) F
COREQUISITE: MAS 315. Teaches cadets advanced skills and knowledge in management and leadership. Special emphasis is placed on enhancing leadership skills. Cadets have an opportunity to try out these leadership and management techniques in a supervised environment as juniors and seniors.

MAS 311. Air Force Leadership and Management II. 3 Credits. (3 Lec) S
COREQUISITE: MAS 316. Teaches cadets advanced skills and knowledge in management and leadership. Special emphasis is placed on enhancing leadership skills. Cadets have an opportunity to try out these leadership and management techniques in a supervised environment as juniors and seniors.

MAS 315. Leadership Laboratory 315. 0 Credits. (non-credit lab) F
PREREQUISITE: Consent of instructor and approval of department head. COREQUISITE: MAS 310. A student planned, organized, and executed practicum with leadership developmental activities for prospective Air Force second lieutenants. Provides cadets the opportunity to further develop the leadership and followship skills learned at field training, sharpening planning, organizational and communications skills.

MAS 316. Leadership Lab 316. 0 Credits. (non-credit lab) S
PREREQUISITE: Consent of instructor and approval of department head. COREQUISITE: MAS 311. A student planned, organized, and executed practicum with leadership developmental activities for prospective Air Force second lieutenants. Provides cadets the opportunity to further develop the leadership and followship skills learned at field training, sharpening planning, organizational and communications skills.

MAS 410. National Security Affairs/Preparation for Active Duty I. 3 Credits. (3 Lec) F
PREREQUISITE: Approval of department head (for students not pursuing a commission in the U.S. Air Force) COREQUISITE: MAS 415. Designed for seniors, provides the foundation to understand their role as military officers in American society. An overview of the complex social and political issues facing the military profession; requires a measure of sophistication commensurate with the senior college level.

MAS 411. National Security Affairs/Preparation for Active Duty II. 3 Credits. (3 Lec) S
PREREQUISITE: MAS 410, approval of department head (for students not pursuing a commission in the U.S. Air Force). COREQUISITE: MAS 416. Designed for seniors, provides the foundation to understand their role as military officers in American society. An overview of the complex social and political issues facing the military profession; requires a measure of sophistication commensurate with the senior college level.

MAS 415. Leadership Laboratory 415. 0 Credits. (non-credit lab) F
PREREQUISITE: Consent of instructor and approval of department head. COREQUISITE: MAS 410. A student planned, organized, and executed practicum with leadership developmental activities for prospective Air Force second lieutenants. Provides additional opportunities to develop leadership and supervisory capabilities, and prepares cadets for their first active duty assignment.

MAS 416. Leadership Lab 416. 0 Credits. (non-credit lab) S
PREREQUISITE: Consent of instructor and approval of department head. COREQUISITE: MAS 411. A student planned, organized, and executed practicum with leadership developmental activities for prospective Air Force second lieutenants. Provides additional opportunities to develop leadership and supervisory capabilities, and prepares cadets for their first active duty assignment.

MAS 491. Special Topics. 1-4 Credits. (1-4 Lec; 12 cr max) On Demand
Max 12 cr. PREREQUISITE: Course prerequisites as determined for each offering. Courses not required in any curriculum for which there is a particular one time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

MAS 492. Independent Study. 1-3 Credits. (1 Ind; 6 cr max) On Demand
Max 6 cr. PREREQUISITE: Consent of instructor and approval of department head. Directed research and study on an individual basis.

MCH - Machining & Manufacturing Tech

MCH 103. Intro to Computer Aided Manufacturing Lvl 1 1 Credit
This is an online course run through the Immerse 2Learn platform that supports all the hands-on activities offered in the CAS CNC Machine Technology program. Course will be supported by faculty in the CNC program.

MCH 104. Introduction to Computer Aided Manufacturing Level II. 2 Credits. (2 Lec) S
PREREQUISITES: MCH 103. This class is a blended online and lecture to provide an online tutorial for CNC Machining on a Haas GUI interface. This class will serve to reinforce basic machine setup, and programming skills introduced in other classes.
MCH 120. Blueprint Reading. 2 Credits. (2 Lec) F
This is a face to face course introducing the fundamental concepts necessary to interpret drawings and produce sketches for machine tool applications as applied to CNC Machining. Topics include advanced sectioning, geometric dimensioning, geometric tolerance, assembly and drawing.

MCH 122. Introduction to CAM (GibbsCAM). 3 Credits. (2 Lec, 1 Lab) S
PREREQUISITE: MCH 120, and MCH 231 or MCH 234. MCH 122, Intro to CAM (GibbsCAM), is designed to give students practical experience in the application of a Computer Aided Machining Program to create production code for CNC Mills and Lathes. The class includes basic CAM drafting practices, Coordinate Systems, Modeling (surface and solid) and tool development.

MCH 130. Machine Shop. 3 Credits. (Lec 1, Lab 2) F
The content covers a broad range of manual and CNC machining with the emphasis on shop and work area safety. The course will include an introduction to measurement and materials. Job planning, bench work and layout will be presented.

MCH 160. Machine Shop Level I. 3 Credits. (1 Lec, 2 Lab) F
Machine Shop 1 introduces students to the common shop equipment used in the modern machining and manufacturing. Through a combination of lectures and practical lab exercises, the student will utilize common and essential machine shop tools and develop safe and correct practices thru proper use. During this class students will be trained in basic operation of metal lathes, Milling machines, pedestal/bench grinders, saws, and drill press. This course is also an introduction to measurement, materials, job planning, bench work and precision layout.

MCH 230. Tooling and Work Holding for CNC. 2 Credits. (2 Lec) S
PREREQUISITE: MCH 234. MCH 230, Tooling and Fixturing is a course designed to introduce students to the wide variety and complexity of work holding and tooling available for CNC Machining. This class will discuss tool design/shape and its effect on machining. Work holding and its effect on part density, repeatability and rigidity will also be discussed.

MCH 231. CNC Turning Operations Level I. 3 Credits. (3 Lec) F
CO-REQUISITES: MCH 234 CNC Milling Operations Level 1. This course is an introduction to CNC Turning Centers and the safe operation of common operating procedures, set-up and maintenance and control panel. The student will become acquainted with the ways in which various companies utilize CNC machine tools.

MCH 232. CNC Lathe Operation Level II. 3 Credits. (3 Lec) S
PREREQUISITE: MCH 231. MCH 232, CNC Lathe Operation Level II, reinforces student's understanding of CNC Lathe operation and programming developed in MCH 231. Concepts to be covered include program planning (setup sheets, tool setup, offsets) metrology, program troubleshooting and intro to bar pulling.

MCH 234. CNC Milling Operations Level I. 3 Credits. (3 Lec) F
CO-REQUISITES: MCH 231 CNC Turning Operations Level 1. This course is an introduction to CNC Milling Centers. The common operating procedures, set-up, and maintenance of the machine and control panel will be introduced and implemented. The student will become acquainted with the way CNC machine tools are utilized while learning programming setup and operations, methods for the installation of tools, establishing machine, fixture, and part zero reference offsets.

MCH 235. CNC Milling Programmer Level II. 3 Credits. (3 Lab) S
PREREQUISITE: MCH 234. MCH 235, CNC Milling Programmer Level II, reinforces student’s understanding of CNC Mill operation and programming. Concepts to be covered include program planning, setup sheets, tool setup, offsets, metrology and intro to fourth axis.

MCH 292. Independent Study. 1-3 Credits. (1-3 Lab) F
S The MCH 292 Independent Study is a one to three credit course that teaches to the specific goals of the students. This course builds on the MCH foundation to increase skill development in general machining processes and fabrication skills.

MB - Microbiology

MB 515. Microbial Ecology. 3 Credits. (3 Lec) S alternate years, to be offered odd years.

MB 520. Microbial Physiology. 3 Credits. (3 Lec) F
PREREQUISITE: BIOM 360 and BCH 380. An in-depth examination of microbial cell structure and function, bioenergetics, and intermediary metabolism and control. Students will also be expected to consider biochemical function within the context of genomic sequences, and be able to formulate predictions for carbon and energy flow.

MB 525. Advanced Immunology. 3 Credits. (3 Lec) S alternate years, to be offered even years.

MB 527. Toxicology. 3 Credits. (3 Lec) S
PREREQUISITES: CHMY 141 and CHMY 143 and BIOL 160. Corequisite: CHCM 380. This course introduces mechanisms of toxicity; effects of toxicants on major organ systems: major classes of toxicants; absorption, distribution, biotransformation and elimination of toxicants. Human exposure to drugs of abuse and environmental agents, case studies, and risk assessment are discussed.

MB 528. Advanced Genetics. 3 Credits. (3 Lec) S alternate years, to be offered odd years.
PREREQUISITE: BIOM 450 or equivalent. Recent advances in microbial genetics with an emphasis on molecular genetics and eukaryotic gene expression.

MB 530. Virology. 3 Credits. (3 Lec) F
PREREQUISITE: BCPH 380, BCPH 441, or BCPH 444. Fundamentals of virology with emphasis on animal viruses of medical importance. Molecular aspects of structure, replication transmission and host response to viral infection will be covered.

MB 535. Genomic Analysis Lab. 4 Credits. (3 Lec, 1 Lab) F
PREREQUISITE: Permission of instructor needed. The quantity of sequence information deposited into databases necessitates that scientists train in both discovery and hypothesis-based research that utilizes these resources. This class will cover experimental design, database searching and management, sequence alignment, molecular pattern recognition, and phylogenetics.

MB 536. Exploring Microbiology. 3 Credits. (3 Lab) S
PREREQUISITE: BS in Biology or equivalent degree. Graduate standing or petition approval from the Vice Provost of Graduate Education. Explore microbiology, prokaryotes, microbial eukaryotes, viruses, acellular agents, microbial evolution, diversity, by focusing on an experimental microcosm. Ideal for middle/high school/lower level college teachers and others in education and outreach roles, e.g. museums, zoos, National Parks, nature preserves, environmental health.

MB 537. Advance in Molecular Evol. 3 Credits. (3 Lec) F
PREREQUISITE: BIOM 410 or 450 or 455 or 528 or 538 or BIOL 402 or BCH 380 or BCH 441 or BIOL 475. The educational objectives of this course are to provide graduate students with a basic introduction to molecular evolution. The study of molecular evolution encompasses the origin and evolution of life on earth at the molecular level.

MB 538. Cell & Molecular Biol. 2 Credits. S
PREREQUISITE: BIOM 360, BCH 380 or BIOL 402. MB 536, or the equivalent. Corequisite: Graduate standing or petition approval from the Vice Provost of Graduate Education. An inquiry-based laboratory in prokaryotic and eukaryotic C&M provides training in microbiological techniques: recombinant DNA, phylogenetic analyses, growth, cell cycle regulation, gene expression, protein purification, and immunoassays. Current literature and laboratory discussions cover molecular approaches for investigating complex cellular mechanisms.

MB 539. Infection and Immunity. 3 Credits. S alternate years, to be offered even years.
PREREQUISITE: BIOL 410 or BIOL 435 or BIOL 431. Corequisite: Graduate standing or petition approval from the Vice Provost of Graduate Education. An inquiry-based study of recent advances in understanding the etiology, pathogenesis, chemotherapy and prevention of infectious disease which includes analysis of current literature, case histories, and online sources of information. This course is intended for practicing teachers and those in the MSSE program.

MB 540. Environmental Microbiology. 3 Credits. (3 Ind) F
PREREQUISITE: MB 536 and MB 541 or equivalent course. Corequisite: BS in biology or equivalent; Graduate standing or petition approval from the Vice Provost of Graduate Education. Biotechnology, industrial microbiology, antimicrobial chemotherapy, public health, epidemiology, climate change, food water, wastewater, extreme environments, space travel, biodegradation, bioremediation and bioaugmentation. Ideal for middle/high school/college teachers, and others in education/outreach, e.g., museums, zoos, National Parks, nature preserves, environmental health.

MB 541. Microbial Genetics. 3 Credits. (3 Lec) S alternate years, to be offered odd years.
Prokaryotes provide much of the understanding of fundamental genetics for all organisms, especially through in vivo and in vitro genetic tools. Transcription, translation, mutation and recombination are considered, so that science teachers understand the fundamentals of genetics. This course is intended for practicing teachers and those in the MSSE program.
MB 542. Microbial Ecology. 3 Credits. (3 Lec) S
PREREQUISITE: MB 536 or equivalent course or BS in Biology. COREQUISITE: BS in biology or equivalent. Graduate standing or petition approval from the Vice Provost of Graduate Education. Ecolgy of microorganisms, their nutrition, growth, control, metabolism, biogeochemical cycling, natural environments, habitats and interactions. Centered on an experiment, this discovery-based course is ideal for middle/high school/lower level college teachers, and others in education/outreach roles, e.g., nature facilities, environmental health.

MB 544. Advanced Bioinformatics. 4 Credits. (3 Lec, 1 Lab) S alternate years to be offered on even years. This course will cover advanced topics in Bioinformatics, including genome assemblies and functional annotations of proteins. The course is meant to support experimental work by training students to make confident predictions from biological sequences and to develop testable hypotheses that will guide their experimental work. Students will learn about using local and worldwide prediction servers.

MB 547. Thermal Biology of YNP. 2 Credits. (1 Lec, 1 Lab) Su
Thermal Biology, an interdisciplinary science that incorporates biology, geology, and chemistry to discover how life exists and under what conditions life can exist in the thermal features of Yellowstone National Park. As such, it lends itself easily to incorporation to most science curricula. The two goals of this course are to: 1) provide a basic understanding of the ecology of a variety of life forms and their thermal habitats, and 2) provide a survey of observational techniques and hands-on activities appropriate for science educators.

MB 552. Adv Soil & Env Microbiology. 3 Credits. (3 Lab) S alternate years, to be offered even years.
PREREQUISITE: BIOM 452 or consent of instructor. Advanced laboratory course. Microorganisms are targeted for isolation and characterization, emphasizing those not normally encountered in general microbiology laboratory. Biochemical cycling, contaminant biodegradation, extremophiles, and plant-microbe interactions are typical topics is investigated. Students employ classic and novel cultivation approaches, identifying microbes based morphology, physiology, and phylogeny. Cross-listed with LRES 552.

MB 575. Professional Paper. 1-4 Credits. (1-4 Ind; 6 cr max)
PREREQUISITE: Graduate standing and committee approval. A research or professional paper or project dealing with a topic in the field. The topic must have been mutually agreed upon by the student and his or her major adviser and graduate committee.

MB 589. Graduate Consultation. 3 Credits. (3 Ind) F,S,Su
PREREQUISITE: Master’s standing and approval of the Dean of Graduate Studies. This course may be used only by students who have completed all of their coursework (and thesis, if on thesis plan) but who need additional faculty or staff time or help.

MB 590. Master’s Thesis. 1-10 Credits. (3 Ind; 20 cr max) F,S,Su
PREREQUISITE: Master’s standing.

MB 591. Special Topics. 1-4 Credits. (1-4 Lec; 12 cr max) On Demand
PREREQUISITE: Upper division courses and others as determined for each offering. Courses not required in any curriculum for which there is a particular one time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

MB 592. Independent Study. 1-3 Credits. (1 Ind; 6 cr max) On Demand
PREREQUISITE: Graduate standing, consent of instructor, approval of department head and Dean of Graduate Studies. Directed research and study on an individual basis.

MB 594. Seminar. 1 Credit. (1 Sem; 4 cr max) F,S
PREREQUISITE: Graduate standing or seniors by petition. Course prerequisites as determined for each offering. Topics offered at the graduate level which are not covered in regular courses. Students participate in preparing and presenting discussion material. There are separate sections for departmental seminar, general/environmental and biomedical microbiology journal clubs and graduate reading; consult the.

MB 598. Internship. 2-12 Credits. (2 Ind; max unlimited)
PREREQUISITE: Graduate standing, consent of instructor and approval of department head. An individualized assignment arranged with an agency, business or other organization to provide guided experience in the field.

MB 600. Doctoral Thesis. 1-10 Credits. (3 Ind; 30 cr max) F,S,Su
PREREQUISITE: Doctoral standing.

MBEH - Microbiology Environmental Hlt

MBEH 475. Field Project. 1-4 Credits. (1 Ind; 4 cr max) F,S,Su
Max 4 cr. PREREQUISITE: Consent of instructor and department head. Research and field experience in some aspect of environmental health science.

MBEH 490R. Undergraduate Research. 1-6 Credits. (1 Ind; 12 cr max) F,S,Su
Max 12 cr. Directed undergraduate research/creative activity which may culminate in a research paper, journal article, or undergraduate thesis. Course will address responsible conduct of research. May be repeated.

MBEH 492. Independent Study. 1-3 Credits. (1 Ind; 6 cr max) On Demand
Max 6 cr. PREREQUISITE: Junior standing, consent of instructor, and approval of department head. Directed research and study on an individual basis.

MBEH 498. Internship. 2-12 Credits. (2 Ind; 12 cr max) On Demand
PREREQUISITE: Junior standing, consent of instructor, and approval of department head. An individual assignment arranged with an agency, business, or other organization to provide guided experience in the field.

MBSP - Molecular Biosciences Program

MBSP 561. Molec Biosci Lab Rotation I. 1 Credit. (1 Lab; 1 cr max) F,S
Each Molecular Biosciences Program graduate student will complete three laboratory rotations during their first year of graduate study. Each Laboratory Rotation provides students with a six-week period of active research experimentation time. Each Laboratory Rotation is a mini-research project and is designed to allow the student to explore a potential avenue of research for their thesis/dissertation research project in Years 2 and beyond. Students should become familiar with the relevant literature, concepts, methods, reagents, and instruments that will be needed to conduct their experiments and achieve the goals of their research projects. Intensive bench research time will be required to obtain meaningful results.

MBSP 562. Molec Biosci Lab Rotation II. 1 Credit. (1 Lab; 1 cr max) F,S
Each Molecular Biosciences Program graduate student will complete three laboratory rotations during theirfirst year of graduate study. Each Laboratory Rotation provides students with a six-week period of active research experimentation time. Each Laboratory Rotation is a mini-research project and is designed to allow the student to explore a potential avenue of research for their thesis/dissertation research project in Years 2 and beyond. Students should become familiar with the relevant literature, concepts, methods, reagents, and instruments that will be needed to conduct their experiments and achieve the goals of their research project. Extensive bench research time will be required to obtain meaningful results.

MBSP 563. Molec Biosci Lab Rotation III. 1 Credit. (1 Lab; 1 cr max) F,S
Each Molecular Biosciences Program graduate student will complete three laboratory rotations during their first year of graduate study. Each Laboratory Rotation is a mini-research project and is designed to allow the student to explore a potential avenue of research for their thesis/dissertation research project in Years 2 and beyond. Students should become familiar with the relevant literature, concepts, methods, reagents, and instruments that will be needed to conduct their experiments and achieve the goals of their research project. Extensive bench research time will be required to obtain meaningful results.

MBSP 564. Molec Biosci Lab Rotation IV. 1 Credit. (1 Lab; 1 cr max) F,S
Each Molecular Biosciences Program graduate student will complete three laboratory rotations during their first year of graduate study. Each Laboratory Rotation is a mini-research project and is designed to allow the student to explore a potential avenue of research for their thesis/dissertation research project in Years 2 and beyond. Students should become familiar with the relevant literature, concepts, methods, reagents, and instruments that will be needed to conduct their experiments and achieve the goals of their research project. Extensive bench research time will be required to obtain meaningful results.

MBSP 575. Mol BioSci Prgm Rsch Project. 1 Credit. (1 Lab) F,S
1 cr. LAB 1 This course will fulfill the research requirement of the first year Molecular Biosciences Program (MBSP) doctoral fellows. The fellow (students) will work on a research project under the direction of their advisor.

MBSP 579. Programming for Life Scientist. 3 Credits. (2 Lec, 1 Lab) S
PREREQUISITE: Permission from the Molecular Biosciences Program. The purpose of this course is to provide students with all the knowledge needed to design and then write (or program) data analysis toolkits on their computer. Programming is used to process vast amount of information by filtering, correlating, aggregating it, tremendously speeding up analyses. Graduate Studies Department.

MBSP 591. Special Topics. 1-4 Credits. (1-4 Lec; 12 cr max) On Demand
PREREQUISITE: Upper division courses and others as determined for each offering. This course focuses on the impact of basic science on medicine and medical practice. Basic science, clinical research, and investigative medicine will be integrated across five major topics: inflammation, vascular disease, obesity, cancer, and therapeutics.
MBSP 594. Molecular Biosc Prgm Sem. 1 Credit. (1 Sem) F,S
This course will fulfill the seminar requirement of the first year Molecular Biosciences Program (MBSP) and graduate fellow. The fellow (students) will attend three seminars sponsored by the MBSP focused on molecular biosciences research. Students will also attend twelve additional departmental or research center-based seminars from the participating MBSP centers and departments. Each student will write a summary of the fifteen attended seminars and turn it into the instructor by the last day.

MBSP 613. Scientific Proposal Writing. 3 Credits. (3 Lec) Su
PREREQUISITE: Students need to be in their second year of a STEM discipline. Research scientists and engineers in today’s highly competitive world need to develop and acquire research proposal writing skills and knowledge as part of their training for a successful career. The goal of this course is to provide doctoral students with strategies, practical skills and experience in seeking funding for their research as well as writing and evaluating scientific proposals. The student will leave this course with a research proposal that is ready to submit for funding.

Meds - Medical Science

Meds 140. Intro Medicine Health. 1 Credit. (1 Lec) S
This course will assist students in exploring various departments at MSU and choosing a major that best fits their passions, career goals, and educational interests. This course will also provide an opportunity to explore the breadth of health care professions.

Meds 160. EMT Basic. 6 Credits. (4 Lec, 2 Lab) F
The EMT course focuses on the core responsibilities which are to provide medical care to victims of emergencies, stabilize their condition and to transport them safely. After completion students are eligible to take the National Registry’s certification.

Meds 240. Ug Clinical Observation. 1 Credit. (1 Lab) F
PREREQUISITE: GPA greater than 3.0, consent of instructor. This course will provide fundamentals in health care professionalism through discussions of professionalism, HIPAA, medical ethics, and case studies. Following successful completion of the didactic component of the course, students will participate in a series of clinical observation rotations.

Meds 291. Special Topics. 1-4 Credits. (1-4 Lec; 12 cr max) On Demand
Max 12 cr. PREREQUISITE: None required but some may be determined necessary by each offering department. Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

Meds 340. Introduction to Dentistry. 1 Credit. (1 Lec) S
PREREQUISITE: CHMY 141 and CHMY 143; BI0B 256 and BI0B 260; at least junior standing, GPA > 3.0 and consent of instructor. This course is ideal for students who want to confirm an interest in a career in dentistry. An overview of tooth anatomy, development and vocabulary will position students to better understand the various specialties presented at the clinics of community dentists.

Meds 440. Clinical Observation. 2 Credits. (2 Lab) F,S
PREREQUISITE: CHMY 141 and CHMY 143; BI0B 256 and BI0B 260; at least junior standing, GPA > 3.0 and consent of instructor. This shadowing experience will provide students with the opportunity to observe providers in a clinical setting and position them to meet, in part, the requirements for application to health professional school.

Meds 491. Special Topics. 1-4 Credits. (1-4 Lec; 12 cr max) On Demand
PREREQUISITE: None required but some may be determined necessary by each offering department. Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

Meds 500. Seminar. 1 Credit. (1 Sem; 4 cr max) On Demand
Max 4 cr. PREREQUISITE: WWAMI medical student or consent of the WWAMI Medical Program and Dean of The Graduate School. Yearly conference dealing with topics related to Montana’s colorful medical history.

Meds 502. Introductory Primary & Continuity Care. 3 Credits. (1 Lec, 2 Rec) F,S,Su
PREREQUISITE: WWAMI Medical Student. This course introduces medical students to continuity of care by working with practicing physicians. This course is new as of Fall 2015 and is not equivalent to MEDS 502, Spanish for Health Professionals, offered prior to Fall 2015.

Meds 503. Clinical Reasoning. 3 Credits. (1 Lec, 2 Lab) F,S,Su
PREREQUISITE: WWAMI Medical Student. This course will involve instruction and communication skills, abnormal physical examination techniques, physical examination skills and clinical reasoning. This course is new as of Fall 2015 and is not equivalent to MEDS 503, Poetics of Healing, offered prior to Fall 2015, WWAMI.

Meds 505. Rural Health Care Delivery. 1 Credit. (1 Lec) F
PREREQUISITE: WWAMI medical student. Provide historical and current information about the health care industry, health care delivery systems and economics of health care and health care policy; with emphasis on rural health care. The purpose is to encourage WWAMI students to consider practicing in rural communities and/or providing health care to underserved populations. The infrastructure of the Montana health Care Delivery system will be presented in detail. Prior to Fall 2015, "Rural Health Care Delivery" was offered as MEDS 560.

Meds 506. Spanish for Health Professionals. 1 Credit. (1 Lec) S
PREREQUISITE: WWAMI medical student. This course is new as of Fall 2015 and is not equivalent to MEDS 502, Intro Primary & Continuity Care, beginning Fall 2015.

Meds 507. The Healer’s Art. 1 Credit. (1 Lec) S
PREREQUISITE: WWAMI Medical Student. Encourages cultivation of human dimensions in practice of medicine while strengthening personal commitment to medicine as a life’s work. Facilitates student recognition of commonality of personal concerns among peers and student response to the dimension of mystery in the experience of illness as well as development of the capacity for awe. WWAMI.

Meds 508. Medical History Conference. 1 Credit. (1Sem; 4 cr max) On Demand
PREREQUISITE: WWAMI medical student. Guest lecturers discuss a variety of topics WWAMI Medical Program.

Meds 510. Molecular & Cellular Basis of Disease. 9 Credits. (4 Lec, 1 Lab, 4 Rtc) F
PREREQUISITE: WWAMI Medical Student. This course teaches the principles of cell and molecular biology, physiology, biochemistry, and genetics. Aspects include the organization of the genome and units of heredity, properties of macromolecules, and cytoarchitecture. Students will gain an understanding of intracellular communication, cell-cell interactions, properties of differentiated cells and the diversity of their physiological properties and functions. Introduction to anatomy, histology, and pharmacology content will be incorporated into the course. This course is not equivalent to MEDS 510 Micro Anatomy (Histology), last offered Fall 2014. WWAMI.

Meds 520. Invaders & Defenders. 8 Credits. (4 Lec, 1 Lab, 3 Rtc) F
PREREQUISITE: WWAMI Medical Student. This course will involve integrated content in immune system, microbial biology, infectious diseases, inflammation and repair, and skin and connective tissue. Introduction to anatomy, histology, and pharmacology content will be incorporated into the course. Prior to Fall 2015, MEDS 520 was “Molecular & Cellular Basis of Disease” this course is not equivalent to earlier MEDS 520 courses. WWAMI.

Meds 530. Circulatory System. 13 Credits. (5 Lec, 2 Lab, 6 Rtc) F
PREREQUISITE: WWAMI Medical Student. Circulatory systems will present students with an integrated approach to the key supply chain and waste management systems of the body. Students will follow the movement of oxygen from the environment to the tissues, and movement of waste products of metabolism along the opposite path, examining the coordinated roles of the lungs, heart and kidney in the control and regulation of these processes. Introduction to anatomy, histology and pharmacology content will be incorporated into the course. WWAMI Medical Education Program.

Meds 540. Blood & Cancer. 4 Credits. (1 Lec, 1 Lab, 2 Rtc) S
PREREQUISITE: WWAMI Medical Student. This course familiarizes students with the basic pathophysiologic mechanisms leading to disturbances of red cell, white cell, and platelet production, as well as abnormalities of hemostasis presenting clinical problems, with an emphasis on pathophysiology. Additionally, this course will include reference to fundamental scientific principles in anatomy, pathology, and pharmacology. Prior to Fall 2015, MEDS 540 was “Clinical Practicum.” Beginning Summer 2015, Clinical Practicum is MEDS 541. WWAMI.

Meds 541. Clinical Practicum. 1 Credit. (1 Lab) F,S,Su
PREREQUISITE: Graduate level standing and acceptance into Post-Bacc Pre-Med or M.S. Health Sciences program. A practical course for students going into the medical field to observe and learn about the services provided by different health care professionals at various stages of patient care. Prior to Summer 2015, MEDS 541 was MEDS 540.
Meds 550. Energetics & Homeostasis. 8 Credits. (4 Lec; 1 Lab, 3 Rct) Su
PREREQUISITE: WWAMI Medical Student This course will involve integrated content in metabolism, nutrition, obesity, diabetes, gastrointestinal/liver physiology, and endocrinology. Additionally, this course includes relevant fundamental scientific principles in anatomy, pathology, and pharmacology. WWAMI Medical Education Program.

Meds 560. Mind, Brain, and Behavior. 13 Credits. (5 Lec; 2 Lab, 6 Rct) F
PREREQUISITE: WWAMI Medical Student. In this course, students will learn the fundamental scientific principles of the structure and function of the normal human nervous system in situ, define major neurologic, psychiatric, and behavior disorders, and develop a systematic approach to their differential diagnosis and management. WWAMI Medical Education Program.

Meds 565. The Healer’s Art. 1 Credit.

Meds 570. Lifecycles & Reproduction. 8 Credits. (4 Lec; 1 Lab, 3 Rct.) F
PREREQUISITE: WWAMI Medical Student. This course will cover normal and abnormal human development, reproductive functions including formation and maturation of ova and sperm, menstruation, normal pregnancy, and labor and delivery. Additionally, this course includes relevant fundamental scientific principles in pelvic anatomy, pathology, and pharmacology. WWAMI Medical Program.

Meds 575. Professional Paper and Project. 1-4 Credits. (1-4 Ind; 6 cr max) On Demand Max 6 cr. PREREQUISITE: Graduate standing, Mechanism for M.S. students to complete scholarly project.

Meds 580. Special Topics. 1-4 Credits. (1 Lec; 12 cr max) On Demand Max 12 cr. PREREQUISITE: Upper division courses and others as determined for each offering. Courses not required in any curriculum for which there is a particular one time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

Meds 592. Independent Study. 1-3 Credits. (1-3 Ind; 6 cr max) PREREQUISITE: Graduate standing, consent of instructor and approval of the Director of the WWAMI Medical Program. Directed research and study on an individual basis.

Meds 594. Seminar. 1 Credit. (1 Sem; 4 cr max) On Demand PREREQUISITE: WWAMI medical student. Topics offered at the graduate level which are not covered in regular courses.

ML - Modern Languages

ML 100IH. Intro to World Cultures. 3 Credits. (3 Rct) S
Introduces students to a range of issues in the field of international studies through an interdisciplinary approach to world regions. Through lectures, discussion, and project-based learning, students gain knowledge of key cultural, historical, and economic concepts in an international context. Students develop an understanding of national, regional, and area studies models for learning about global issues.

ML 290R. Undergraduate Research. 1-6 Credits.

ML 291. Special Topics. 4 Credits. (0-4 Lec; 12 cr max) On Demand Max 12 cr. PREREQUISITE: None required but some may be determined necessary by each offering department. Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

ML 344. Instructional Perspectives. 1 Credit. (1 Lec; 3 cr max) F,S,Su Max 3 cr. PREREQUISITE: RFCH 323 or RFCH 324; GRMN 330 or GRMN 331; SPNS 323 or SPNS 324. Students learn how various pedagogical approaches are realized through class discussion, observation, and practice under the direction of the faculty mentor.

ML 490R. Undergraduate Research. 1-6 Credits. (1 Ind; 12 cr max) F,S,Su Max 12 cr. Directed undergraduate research/creative activity which may culminate in a research paper, journal article, or undergraduate thesis. Course will address responsible conduct of research. May be repeated.

ML 491. Special Topics. 1-3 Credits. (1 Lec; 12 cr max) On Demand Max 12 cr. PREREQUISITE: Course prerequisites as determined for each offering. Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

ML 492. Independent Study. 1-3 Credits. (1 Ind; 6 cr max) On Demand Max 6 cr. PREREQUISITE: Junior standing, consent of instructor and approval of department head. Directed research and study on an individual basis.

ML 497. Teaching Language for Proficiency. 3 Credits. (3 Sem) F
PREREQUISITE: Intermediate level proficiency. This course is designed specifically for volunteer student language teachers who are participating in the outreach program with the Bozeman Public Schools. The course will cover three general areas: the K-5 language curriculum developed by MSU for the Bozeman Public Schools along with classroom management strategies, the ACTFL proficiency guidelines and their implications for language teaching and curricular design, and second language teaching methodologies. Students must participate in the community outreach program to take this class.

ML 588. Professional Development. 1-3 Credits. (1 Lec; 3 cr max) On Demand Max 3 cr. PREREQUISITE: Graduate standing, teaching experience and/or current employment in a school organization, consent of instructor and Dean of Graduate Studies. Courses offered on a one-time basis to fulfill professional development needs of in service educators. A specific focus is given to each course which is appropriately subtitled.

ML 591. Special Topics. 1-3 Credits. (1 Lec; 12 cr max) On Demand Max 12 cr. PREREQUISITE: Upper division courses and others as determined for each offering. Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

ML 592. Independent Study. 1-3 Credits. (1 Ind; 6 cr max) On Demand Max 6 cr. PREREQUISITE: Graduate standing, consent of instructor, approval of department head and Dean of Graduate Studies. Directed research and study on an individual basis.

MOR - Museum of the Rockies

MOR 289R. Undergrad Rsch/Instruction. 1-3 Credits. (1-3 Rct; max unlimited) F,S Classroom instruction associated with directed undergraduate research/creative activity projects. May be repeated.

MOR 290R. Undergraduate Research. 1-6 Credits. (1-6 Ind; max unlimited) F,S Directed undergraduate research/creative activity which may culminate in a written work or other creative project. Course will address responsible conduct of research. May be repeated.

MOR 301. Museum Practices. 3 Credits. (3 Lec) F
PREREQUISITE: Junior standing or permission of instructor. Team-taught by Museum of the Rockies staff, the course will introduce students to the museum profession with emphasis on collections and exhibitions. Topics covered include museum missions, object-based learning, collecting theory, curatorial research, managing collections, and developing exhibitions.


MOR 492. Independent Study. 1-3 Credits. (1-3 Ind; 6 cr max) On Demand Max 6 cr. PREREQUISITE: Junior standing, consent of instructor and approval of department head. Directed research and study on an individual basis.

MSEM - Master of Sci & Engineer Mngmt

MSEM 501. Leading Human & Fin Ent. 9 Credits. (9 Lec) F
PREREQUISITE: Undergraduate Degree. Course will develop and enhance your business management skills as they relate to the technical, scientific, or professional enterprise. The course topics will be delivered in an integrated fashion using multiple instructors with expertise in several areas. The course will focus on the following three areas: leading people, leading the financial enterprise, and leading new product development.

MSEM 502. Leading the Tech Enterprise. 6 Credits. (6 Rct) S
PREREQUISITE: Undergraduate Degree, and admission to PMSEM program. The course will cover the technical enterprise from the strategic level to the tactical implementation of engineering management fundamentals. Students will investigate ways to increase efficiencies of a technical enterprise through project, process, and people management.

MSL - Military Science Leadership

MSL 101. Leadership and Personal Development. 3 Credits. (2 Lec, 1 Lab) F
2 An introduction to issues and competencies that are central to a commissioned officer’s responsibilities. These initial lessons establish a framework for understanding officerhip, leadership and Army values. The class also addresses “life skills” including fitness and time management. Laboratory component is required.
MSL 102. Intro to Tactical Leadership. 2 Credits. (1 Lec, 1 Lab) F
PREREQUISITE: Recommended MSG 101. Building on problem solving, communications and leadership. "Life skills" include problem solving, goal setting, interpersonal communication skills and assertiveness skills. Further information about life in the Army. Laboratory component is required.

MSL 106. Army Physical Fitness. 1 Credit. (1 Lab) F,S
Max 4 cr. COREQUISITE: Must be signed up for a MSL 100, 200, 300, 400 level course. MSG 106 is designed to provide students a framework of fitness skills, planning and testing for a lifetime of health. The course consists of three Physical Training sessions per/week that include running, swimming, upper body and core development, sports, and team building exercises. This course may be repeated for credit.

MSL 201. Innovative Team Leadership. 2 Credits. (1 Lec, 1 Lab) F
Leadership studies. An understanding of how to build teams, influence, communicate, decision making, creative problem solving, planning and organizing. Laboratory component is required which includes physical fitness training, and other outdoor skills.

MSL 202. Found of Tactical Leadership. 2 Credits. (1 Lec, 1 Lab) S
An advanced look at leadership principles and the application and practice of those principles. Laboratory component is required and includes the operation of military radios and telephones, and a continued emphasis on physical fitness training.

MSL 204. Leader's Training Course. 3 Credits. (3 Lec, 1.5 Lab) F
PREREQUISITE: Consent of Professor of Military Science – Practical application of basic knowledge required of an army officer. Subject matter parallels 100 and 200 level courses. Satisfies prerequisites for advanced course in lieu of the basic course.

MSL 205. American Military History. 3 Credits. (3 Lec) F,S
The study of the evolution of the American Military, with concentration on the evolution of the American military within the context of national historical development, specifically with regard to industrialization, national security, and the United States’ evolving international role and policies. Study of significant battles throughout our history of warfare which includes a field trip to a historical battleground.

MSL 291. Special Topics. 1-4 Credits. (1-4 Lec; 12 cr max) On Demand
Max 12 cr. PREREQUISITE: None required but some may be determined necessary by each offering department. Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

MSL 292. Independent Study. 1-3 Credits. (1 Ind; 6 cr max)
On demand Max 6 cr. PREREQUISITE: Consent of instructor and approval of department head. Directed research and study on an individual basis.

MSL 301. Adaptive Team Leadership. 3 Credits. (2 Lec, 1 Lab) F
PREREQUISITE: MSG 101, MSG 103, MSG 201, MSG 200, or MSG 204. The study, practice and evaluation of adaptive leadership skills. Small unit tactical operations are used to develop self-awareness and critical thinking. Preparation for Leader Development and Assessment Course. A lab component including a field training exercise is required.

MSL 302. Applied Team Leadership. 3 Credits. (2 Lec, 1 Lab) S
PREREQUISITE: MSG 301. Situational leadership challenges are used to build awareness and skills in leading small units. Skills in decision-making, persuading and motivating team members are explored, evaluated and developed. Preparation for Leader Development and Assessment Course. A lab component including a field training exercise is required.

MSL 305. Leadership Dev Assess Course. 3 Credits. (1.5 Lab) F
PREREQUISITE: MSG 302. Enrollment restricted to successful completion of MSG 301 and MSG 302 and the Professor of Military Science’s approval. Practical exercise in tactical, technical, and administrative duties common to all branches of the Army. Development of leadership and the ability to function effectively in small unit operations.

MSL 401. Adaptive Leadership. 3 Credits. (2 Lec, 1 Lab) F
PREREQUISITE: MSG 302, approval of instructor. Develops proficiency in planning, executing and assessing complex operations, function as a member of a staff and providing leadership feedback to subordinates. A lab component is required.

MSL 402. Leadership in a Complex World. 3 Credits. (2 Lec, 1 Lab) S
PREREQUISITE: MSG 401, approval of instructor. Study of military justice system and international military law. Study of Army organization and administrations. Exploration of the dynamics of leading in complex situations. Preparation for transition from college student to commissioned officer in the Army. A lab component is required.

MSL 490R. Undergraduate Research. 1-6 Credits. (1-6 Ind; 12 cr max) F,S,Su
Max 12 cr. Directed undergraduate research/creative activity which may culminate in a research paper, journal article, or undergraduate thesis. Course will address responsible conduct of research. May be repeated.

MSL 491. Special Topics. 1-4 Credits. (1 Lec; 12 cr max) On Demand
Max 12 cr. PREREQUISITE: Course prerequisites as determined for each offering. Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

MSL 492. Coop Education/Internship. 1-3 Credits. (1 Ind; 6 cr max) On Demand
Max 6 cr. PREREQUISITE: Junior standing, consent of instructor, and approval of department head. Directed research and study on an individual basis.

MSSE - Master of Science Education

MSSE 501. Inquiry Sci Eng Prac. 2 Credits. (2 Lec) F,S
PREREQUISITE: Approved education methods course. This course provides students in the use of Science and Engineering Practices for grade K to 10 teachers in science education. Students will identify the components of inquiry in the context of Science and Engineering Practices as described in the NRC Framework for K-12 Science Education. Course goals include development and implementation of inquiry-based instruction and classroom research; and increased understanding of the role of assessment in an inquiry-based science classroom.

MSSE 589. Graduate Consultation. 1-3 Credits. (1-3 Ind; 3 cr max) F,S,Su
PREREQUISITE: Master’s standing and approval of the Dean of Graduate Studies. This course may be used only by students who have completed all of their coursework (thesis, if on a thesis plan) but who need additional faculty or staff time or help.

MSSE 591. Special Topics. 1-4 Credits. (1-4 Lec; 12 cr max) On Demand
Max 12 cr. PREREQUISITE: Upper division courses and others as determined for each offering. Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

MSSE 592. Independent Study. 1-3 Credits. (1-3 Ind; 6 cr max) On Demand
Max 6 cr. PREREQUISITE: Bachelor degree, consent of instructor, and admission to MSSE program. Directed research and study on an individual topic.

MTA - Media & Theatre Arts

MTA 291IH. Special Topics. 1-4 Credits. (1 Lec; 12 cr max) On Demand
Max 1 - 4 cr. Maximum 12 cr. PREREQUISITE: None required but some may be determined necessary by each offering department. Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

MTA 348. Interdisciplinary Projects II. 3 Credits. (3 Rct) S
PREREQUISITE: MTA majors: MTA 222 and MTA 254 and permission of instructor. Studies the theoretical practice of sound and lighting design for live performances. Students gain hands-on experience for designing and executing light and sound.

MTA 370. Professional Practices. 2-4 Credits. (2 Rct; 12 cr max) F,S,Su
Max 12 cr. PREREQUISITE: Junior standing in FILM. Projects pursued under faculty supervision, emphasizing an area of specialization in Theatre, Film or Video relating to professional practices. Details of individual sections and the supervising faculty will be posted by the department prior to pre-registration. May be repeated.

MTA 371. Junior Production/NonFiction. 4 Credits. (4 Rct) F,S
PREREQUISITE: Junior standing in FILM. Projects pursued under faculty supervision, emphasizing fiction production using traditional and non-traditional approaches, from conception and pre-production to post-production. Details of individual sections and the supervising faculty will be posted by the department prior to pre-registration.

MTA 511. Production Field Techniques I. 2 Credits. (2 Rct) F
Basic field production techniques in film, video, sound, editing. Train on digital video, 16 mm cinematography, sound recording and digital nonlinear editing.

MTA 512. Prod Mgmt & Studies I. 2 Credits. (2 Lec) F
COREQUISITE: MTA 510, 511. An introduction to working professionals and faculty that examines successful filmmaking methodologies. May include presentations, forums or seminars designed to explore specific actual production scenarios on a variety of documentary subjects including producing, directing, cinematography, sound, editing, grant writing, distribution and funding.
MTSI 516. Production Field Techniques II. 2 Credits. (2 Rec) S
PREREQUISITE: MTA 510, 511. COREQUISITE: MTA 515. Advanced field and studio production exercises in equipment use and applications, including high definition digital imaging, 16mm cinematography, location and studio sound recording and advanced editing and digital effects.

MTA 531. Bus Legal Aspects Film. 1 Credit. (1 Lec) Su
PREREQUISITES: MTA 504, MTA 505, MTA 507, MTA 510, MTA 515, MTA 518, MTA 519 or permission of instructor. This course will examine business and legal issues relating to the production of documentary films.

MTA 532. Underwater Cinematography. 1 Credit. (1 Lab) Su
PREREQUISITES: MTA 515 and MTA 516 and permission of instructor. This course will focus on the skills and training necessary to begin filming in the underwater environment.

MTA 552. Adv Production Practices I. 4-6 Credits. (1-6 Lab; 6 cr max) F,S
PREREQUISITE: MTA 510, 511, 512, 515, 516, 517. COREQUISITE: MTA 572. Pre-production and production of the second year agenda-based professional project sponsored by a hosting agency that finds significant usage. Proposals and treatments are to be polished and refined so that dialogues with broadcasters and hosting agencies can be effectively initiated and funding fully secured. With approval of advisor and graduate committee, production sequence may begin.

MTA 553. Adv Production Practices II. 4-6 Credits. (4 Rec; 6 cr max) S
PREREQUISITE: MTA 510,511,512,515,516,517,512. COREQUISITE: MTA 572. Production and post-production of the second year agenda-based professional project that finds significant usage. Production and/or post production work is to be completed and deliverables presented to the hosting agency. Selects and all cuts are to be screened and critiqued by the hosting agency and by the advisor and graduate committee. The post production phase concludes with the completion of the second year project and the presentation of deliverables to the hosting agency and/or broadcast and distribution venues.

MTA 554. Prod Pract:Post-Production. 3-4 Credits. (3 Ind) S
PREREQUISITE: MTA 550 and 552. A committee directed course in which the students begin the post-production phase and concludes with the completion of their second year project.

MTA 572. Thesis Preparation. 1 Credit. (1 Lab) S
PREREQUISITE: MTA 510,511,512,515,516,517. COREQUISITE: MTA 552 or 553. Proposals and treatments are distributed to project advisor and to the graduate committee by the first day of fall semester for workshop review and critique. Pre-production, production and post-production schedule milestones must be determined in conjunction with advisor and graduate committee who provide oversight for the entire second year project production sequence. Due to the widely varying nature and unique demand of each project, those unable to meet the preferred residency requirements for their second year project and this course must adhere to a strict teleconference meeting schedule with their advisor and graduate committee and meet all due date requirements for materials review.

MUSE - Materials Science

MTSI 500. Survey of Mat Science. 1 Credit. (1 Sem) F,S
Topics offered at the graduate level which are not covered in regular courses focusing on relevant specialty areas of materials science and engineering research. Students will participate in preparing and presenting discussion material.

MTSI 501. Advanced Materials Science I. 4 Credits. (4 Lec) F
Ionic and covalent bonding; quantum mechanical foundation of the cohesion of solids, evolution of band structure; three dimensional crystallography including point groups, stereographic projections, Bravais lattices and space groups; crystalline defects; and the foundation of defect chemistry in ionic crystals.

MTSI 502. Adv Materials Science II. 3 Credits. (3 Lec) S
Fundamental principles of how materials are designed and synthesized to achieve specific performance. The team taught course is broken up into three 12-lecture segments. Each segment will cover a specific topic including ceramics, polymers, magnetic materials, biomaterials, glasses, etc.

MTSI 511. Thermodynamics of Materials. 3 Credits. (3 Lec) F
Advanced thermodynamic principles are presented in the context of materials science and processing. The course focuses on the application of thermodynamic principles to materials structure, properties and processing. Subject matter includes elements of solution thermodynamics and application to equilibrium diagrams.

MTSI 512. Kinetics Phase Transformations. 3 Credits. (3 Lec) S
Treatment of mechanisms controlling the rates of structural/chemical changes in materials. Quantitative diffusion theory and the behavior of surfaces and interfaces. Nucleation and growth as a mechanism for phase transformations and application of phase transformations in materials manipulation and processing.

MTSI 551. Adv Material Character I. 2 Credits. (2 Lec) F

MTSI 552. Adv Material Character II. 3 Credits. (3 Lec) S

MUSE 594. Seminar. 1 Credit. (1 Lab; 1 cr max) F,S

MUSE - Music-Education

MUSE 123. Techniques Voice. 1 Credit. (1 Lab) F
PREREQUISITE: Music Major or consent of instructor. COREQUISITES: MUSI 105; MUSI 140 Introductory vocal training and diction for instrumentalists and beginning singers. Students develop voice production and performance skills for solo and small group singing through a lab setting.

MUSE 130. Techniques: Flute & Clarinet. 1 Credit. (1 Lab) F
Teaching techniques, materials and basic playing approaches for flute and clarinet. For music education students.

MUSE 131. Techniques: Sax, Oboe, Bassoon. 1 Credit. (1 Lab) S
Teaching techniques, materials, and basic playing approaches for saxophone, oboe, and bassoon. For music education students.

MUSE 132. Techniques: Brass. 1 Credit. (1 Lab) S
Teaching techniques, materials, and basic playing approaches for brass instruments. For music education students.

MUSE 134. Techniques: Percussion. 1 Credit. (1 Lab) S
Teaching techniques, materials, and basic playing approaches for percussion. For music education students.

MUSE 135. Techniques: Strings. 1 Credit. (1 Lab) F
Teaching techniques, materials, and basic playing approaches for strings. For music education students.

MUSE 140. Lab Instrumental Ensemble. 1 Credit. (1 Lab; 8 cr max) F,S
Max 8 cr. Repertoire suitable for beginning and advanced secondary school ensembles (band and/or orchestra) will be reviewed. Students are asked to play their secondary instrument. May be repeated.

MUSE 141. Laboratory Choral Ensemble. 1 Credit. (1 Lab; 8 cr max) S
Max 8 cr. Repertoire suitable for beginning and advanced secondary school vocal ensembles will be reviewed. The ensemble will present a recital at the end of the semester under the direction of student conductors. May be repeated.

MUSE 220. Intro to Comp App Music Ed. 2 Credits. (1 Lec, 1 Lab) F
PREREQUISITE: Music Education Major An introduction to computer applications in music, including music notation, marching band and basic music notation, marching band and basic musicianship software programs, as well as audio recording. This course is particularly geared toward music education majors.

MUSE 239. Beginning Conducting. 1 Credit. (1 Lab) S
PREREQUISITE: MUSI 240 and MUSI 205 and MUSI 231. COREQUISITE: MUSI 241 and MUSI 206 and MUSI 232. This course will introduce students to the aural and technical skills necessary to conduct an ensemble. It provides an introduction to practice strategies, issues related to movement and sound and basic conducting technique.

MUSE 290R. Undergraduate Research. 1-6 Credits. (1-6 Ind; max unlimited) F,S
1-6 cr. IND may be repeated Directed undergraduate research/creative activity which may culminate in a written work or other creative project. Course will address responsible conduct of research.

MUSE 291. Special Topics. 1-6 Credits. (1 Ind; 12 cr max) On Demand
Max 12 cr. PREREQUISITE: None required but some may be determined necessary by each offering department. Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand.

MUSE 339. Conducting Practicum. 1 Credit. (1 Lab) F,S
COREQUISITES: MUSI 335 (fall) or MUSI 336 (spring). Leadership of ensemble, opportunity to apply rehearsal techniques and conducting skills learned in MUSI 335 or MUSI 336. Experience teaching in small ensemble setting.

MUSE 340. Marching Band Techniques. 2 Credits. (2 Lec) On Demand
PREREQUISITE: MUSI 206. COREQUISITE: MUSI 155. Organization, administration, and creative skills necessary for directing a successful public school marching band.
MUSE 385. Assessment in Music Education. 3 Credits. (3 Rct) F,S,Su
3 cr. RCT 3 PREREQUISITE: EDU 222IA or EDU 223A. Fundamental concepts of differentiated educational assessment for classroom teachers including the alignment of assessment to curriculum standards and essential understandings, quality of assessment, evaluation of student responses, interpretation of results, and improvement of techniques.

MUSE 395. Tchng Practicum: General Music. 1-3 Credits. (3 Lab; max unlimited) COREQUISITE: MUSE 397. Students will be assigned to school classrooms to observe children, teachers, and teaching strategies and to serve as teacher aides. Students will teach lessons in subject areas corresponding to the methods classes in which they are currently enrolled.

MUSE 397. Methods: General Music. 3 Credits. (3 Lec) S PREREQUISITE: MUSI 241, MUSI 206, MUSI 231, MUSE 383, and good standing in Teacher Education Program. COREQUISITE: MUSE 395. Elementary music methods for the music education majors; in-depth study and application of elementary music methods using singing, listening, instrument playing, creating, and movement; materials, management, sequencing, planning, and assessment for K-6 music classes.

MUSE 437. Instrumental Field Experience. 1 Credit. (1 Lab) S COREQUISITE: MUSE 497. A field experience in secondary (grades 5-12) instrumental music situations prior to student teaching. Observations, interviews, and brief teaching experiences with music ensembles at the secondary level.

MUSE 439. Choral Field Experience. 1 Credit. (1 Lab) F COREQUISITE: MUSE 497 A field experience in secondary (grades 5-12) choral music situations prior to student teaching. Observations, interviews, and brief teaching experiences with music ensembles at the secondary level.

MUSE 445. Studio Teaching Experience. 2 Credits. (2 Ind; 4 cr max) F,S Max 4 cr. PREREQUISITE: Senior standing and one of the following: MUSI 438, MUSI 442, MUSI 432. Supervised teaching in student's performance area. May be repeated.

MUSE 497MC. Methods: Chrl Mtdbs & Lit 5-12. 3 Credits. (3 Lec) F COREQUISITE: MUSI 336, MUSE 497MC. COREQUISITE: MUSE 439. Rehearsal techniques, materials, literature, strategies for classroom management and the administration of the choral program for the middle school and high school choral instructor.

MUSE 497MI. Methods: Inst Mtdbs & Lit 5-12. 3 Credits. (3 Lec) S PREREQUISITE: MUSI 335, MUSE 397. COREQUISITE: MUSE 437. Rehearsal techniques, materials, literature, strategies for classroom management and the administration of the instrumental program for the middle school band and orchestra teacher.

MUSE 530. Music, Society, Education. 3 Credits. (3 Lec) Su alternate years, to be offered odd years. PREREQUISITE: EDEL 410, EDSD 410 Philosophical, historical, psychological and social foundations of music education. Music in public education, music curricula, aesthetics, and music learning theory.

MUSE 532. Music Ed: Res and Practice. 3 Credits. (3 Lec) S alternate years, to be offered odd years. PREREQUISITE: EDEL 410, EDSD 410 Examination and close study of research in music education and its implications for practice.

MUSE 535. Teaching Music Literacy. 2 Credits. (2 Lec) On demand PREREQUISITE: EDEL 337. Analysis of the foundations of music literacy, contemporary trends in music reading and writing instruction and research related to these issues.

MUSE 542. Graduate Vocal Pedagogy. 3 Credits. (3 Sem) On Demand 3 cr. SEM 3 PREREQUISITE: MUSI 442. COREQUISITE: Must be an active music educator. Online/Seminar delivery centers around classroom application of vocal methodologies in the studio and classroom. Course content will include the study of vocal physiology and acoustics.

MUSE 545. General Music Practicum. 3 Credits. (3 Lec) S alternate years, to be offered even years. Current issues and developments, teaching-learning systems, materials, media, strategies, and research relevant to K-8 general music education. Practical application of course content to one's own teaching situation through online readings, research, discussions, and presentations.

MUSE 575. Professional Paper and Project. 1-4 Credits. (1-4 Ind. Study) PREREQUISITE: Graduate Standing Max 6 cr. A research or professional paper or project dealing with a topic in the field. The topic must have been mutually agreed upon by the student and his or her major advisor and graduate committee.

MUSE 588. Professional Development. 1-3 Credits. (1-3 Lec; 3 cr max) On Demand PREREQUISITE: Graduate standing, teaching experience and/or current employment in a school organization, consent of instructor and Dean of Graduate Studies. Courses offered on a one-time basis to fulfill professional development needs of in-service educators. A specific focus is given to each course which is appropriately subtitled. May be repeated.

MUSE 590. Professional Paper and Project. 1-4 Credits. (1 Ind; 6 cr max) F,S,Su Max 6 cr. PREREQUISITE: Graduate standing. A research or professional paper or project dealing with a topic in the field. The topic must have been mutually agreed upon by the student and his or her major advisor and graduate committee.

MUSE 591. Special Topics. 2 Credits. (2 Sem) Su PREREQUISITE: Bachelor's degree in Music, Music Education, or related field. This intensive course presented by music professionals and music educator session presenters will allow the student/teacher total immersion with experts in all areas of music teaching and performance to include woodwinds, brass, percussion, small and large ensembles. Woodwind, brass and percussion instruments will be studied regarding proper technique, pedagogical and physical problems, and the teaching of music through each individual performance area and the full instrumental ensemble. Selected concert band and ensemble literature will be studied and analyzed relating to the teaching of national standards for music through the instrumental ensemble medium and individual teaching techniques and effectiveness.

MUSE 592. Independent Study. 1-3 Credits. On Demand Max 6 cr. PREREQUISITE: Graduate standing, consent of instructor, approval of Director and Dean of The Graduate School. Directed research and study on an individual basis.

MUSE 594. Seminar. 1 Credit. (1 Sem; 4 cr max) On Demand Max 4 cr. PREREQUISITE: Graduate standing or seniors by petition. Course prerequisites as determined for each offering. Topics offered at the graduate level which are not covered in regular courses. Students participate in preparing and presenting discussion material.

MUSE 598. Internship. 2-12 Credits. (2-12 Ind; 12 cr max) On Demand Max credits unlimited PREREQUISITE: Graduate standing, consent of instructor and Director. An individualized assignment arranged with an agency, business or other organization to provide guided experience in the field.

MUSI - Music-General

MUSI 101A. Enjoyment of Music. 3 Credits. (3 Lec) S Introduces students to the rich legacy of Western Art Music, defined as notated musical traditions in Europe and later in the USA from liturgical chant to the present. Explores the historical context that led to the development of important genres and influenced the lives of composers. Facilitates active listening and curious inquiry into the language of music.

MUSI 102. Performance Study. 1 Credit. (1 Studio) F S PREREQUISITES: Performance audition and consent of instructor required; music majors only. CO REQUISITES: Concurrent university ensemble participation. Individual or group vocal or instrumental instruction. Concurrent ensemble participation required. Music Majors only.

MUSI 103RA. Fundamentals of Musical Creation. 3 Credits. (1 Lec, 1 Lab) F,S Open to all students. Study of the elements of music and their combination in musical creation. Activities include the acquisition of keyboard skills, exploration of traditional harmonic theory and exercises in music reading, analysis, and composition.

MUSI 105. Music Theory I. 3 Credits. (3 Lec) F PREREQUISITE: Music fundamentals pre-test. COREQUISITE: MUSI 140. Music fundamentals, diatonic harmony and elementary counterpoint. Successful completion of Music Fundamentals Pre-test administered during the first class meeting and covering scales, rhythm/meter, clefs, and key signatures required for enrollment in this course.

MUSI 106. Music Theory II. 3 Credits. (3 Lec) S COREQUISITE: MUSI 105. Continuation of study of materials used in the previous semester: diatonic harmony and analysis in the common practice style, musical notation and language, function and interaction of the elements of music.

MUSI 112. Choir: University Chorus. 1 Credit. (1 Lab; 8 cr max) F S; may be repeated, max 8 cr. PREREQUISITE: Consent of Instructor. Intermediate, mixed-voice choir performing a variety of concert music. Previous choral experience strongly suggested.
MUSI 114. Band I: MSU University Band. 1 Credit. (1 Lab; 8 cr max) F,S Max 8 cr. Study and performance of traditional and contemporary repertoire for wind and percussion in a large ensemble format. Open to all students with high school instrumental music experience. May be repeated.

MUSI 120A. Musicianship, 3 Credits. (1 Lec, 2 Lab) F This course involves the study of the elements of music. Activities will include exploration of basic music theory, aural perception, and keyboard skills. Class time will also include intensive practice in music reading, writing, and recognition, as well as the development of basic keyboard skills.

MUSI 130A. History of Jazz, 3 Credits. (3 Lec) S Important literature from American jazz, with an emphasis on a detailed study of styles that have developed new directions in music and shaped America's culture.

MUSI 131. Jazz Ensemble I: MSU. 1 Credit. (1 Lab; 8 cr max) F,S Max 8 cr. PREREQUISITE: Successful audition. Ensemble experience performing musical styles that include swing, jazz, commercial, and popular music. Open to all students with high school instrumental music experience. May be repeated.


MUSI 136. Keyboard Skills II. 1 Credit. (1 Lab) S PREREQUISITE: MUSI 135 or placement audition and music major. COREQUISITE: MUSI 106. Continued study of keyboard theory and technique, creative activities, sight reading, and piano repertoire. For music majors.


MUSI 141. Aural Perception II. 1 Credit. (1 Lab) S PREREQUISITE: MUSI 140. COREQUISITE: MUSI 106. Continuation of studies in ear training and sight-singing to develop aural perception of tonal and temporal relationships. Primarily for students with planned concentration in music.

MUSI 155. Marching Spirit of the West. 1-2 Credits. (1 Lab; max unlimited) F 1-2 cr. For Non-auditioned ensemble offering experience in marching techniques and outdoor performances. May be repeated.


MUSI 161. Intermediate Guitar II. 1 Credit. (1 Lab) S PREREQUISITE: MUSI 160 or placement audition. Continuation of MUSI 160.


MUSI 203A. American Popular Music. 3 Credits. (3 Lec) F,S A study of the way in which American popular music is a product of the social, political, and historical context in which it developed, and in turn how this context was shaped by this music.


MUSI 211A. Masterworks in Music. 3 Credits. (3 Lec) F,S Presentation of examples of great music literature to develop informed, perceptive listening and musical understanding.

MUSI 219A. Honors Music & Society. 3 Credits. (3 Sem) S An investigation into the relationship between composers, and the cultural, political, and social influences that impacted their creative work. Various composers and significant musical works representing diverse style periods, cultures, and historical backgrounds will be discussed in depth. Students will be required to present a final paper discussing the work of a specific composer of their choice, incorporating the above criteria. Restricted entry. Priority to University Honors students.

MUSI 230. Internm Keyboard: Repertoire. 1 Credit. (1 Lab) F PREREQUISITE: MUSI 136 OR placement audition and music major. Continuation of the study of keyboard theory and technique, sight reading, and piano repertoire. For non-keyboard music majors.

MUSI 231. Internm Keyboard: Accompanying. 1 Credit. (1 Lab) F PREREQUISITE: MUSI 136 or placement audition and music major. Continuation of the study of keyboard theory and technique, ensemble playing, sight reading, and piano accompanying. For non-keyboard music majors.

MUSI 232. Internm Keyboard: Opn Sere Rdng. 1 Credit. (1 Lab) S PREREQUISITE: MUSI 136 or placement audition and music major. Continuation of the study of keyboard theory and technique, sight reading, and keyboard realization of choral and instrumental ensemble scores. For music majors.

MUSI 233. Internm Keyboard Skill: Jazz. 1 Credit. (1 Lab) S PREREQUISITE: MUSI 136 or placement audition and music major. Continuation of the study of keyboard theory and technique, creative activities, sight reading, improvisation and performance of jazz. For music majors.

MUSI 240. Aural Perception III. 1 Credit. (1 Lab) F PREREQUISITE: MUSI 141. Continued development of aural and vocal skills that deal with tonal and temporal relationships.

MUSI 241. Aural Perception IV. 1 Credit. (1 Lab) S PREREQUISITE: MUSI 240. COREQUISITE: MUSI 206. Continued development of aural and vocal skills that deal with tonal and temporal relationships.


MUSI 291. Special Topics. 1-4 Credits. (1 Lab; 12 cr max) On Demand Max 12 cr. PREREQUISITE: None required but some may be determined necessary by each offering department. Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand.


MUSI 301. Music History I. 3 Credits. (3 Lec) S PREREQUISITE: MUSI 106. Music as it relates to other arts and humanities from an historical and stylistic perspective. From Antiquity through the Baroque era.

MUSI 302. Music History II. 3 Credits. (3 Lec) F PREREQUISITE: MUSI 106. Music as it relates to other arts and humanities from an historical and stylistic perspective. The Classical and Romantic eras.

MUSI 303. Music History of 20th Century. 3 Credits. (3 Lec) S PREREQUISITE: MUSI 106 and MUSI 301 or MUSI 302. Music as it relates to other arts and humanities from an historical and stylistic perspective. 20th Century and Jazz.

MUSI 307A. World Music, 3 Credits. (3 Lec) F,S PREREQUISITE: Junior standing. Music, culture, and meaning within different traditions and styles from around the world.

MUSI 308. Orchestras II: MSU Symph Orch. 1 Credit. (1 Lab; 8 cr max) F,S Maximum 8 cr. PREREQUISITE: Successful audition. Advanced training in the performance repertoire for orchestra. May be repeated.

MUSI 309A. Sing the Hallelujah Chorus - Performance & Study. 3 Credits. (3 Lec) S PREREQUISITE: MUSI 195 and successful audition. Continued instruction in techniques of performance and interpretation to develop musical ability, expression, accuracy, and stylistic awareness in student’s performance area. May be repeated (maximum of three enrollments).

MUSI 310. Opera Theatre II. 1 Credit. (1 Lab) F,S 1 cr. May be repeated, max 8 cr. PREREQUISITE: Successful audition Advanced training in the performance of opera and musical theater repertoire.

MUSI 312. Choir III: MSU Chorale. 1 Credit. (1 Lab; 8 cr max) F,S Maximum 8 cr. PREREQUISITE: Successful audition. Advanced choral performance. May be repeated.
MUSI 314. Band III: MSU Wind Symphony. 1 Credit. (2 Lec; 8 cr max) F,S Max 8 cr. PREREQUISITE: Enrollment by audition. Study and performance of advanced, traditional, and contemporary wind band repertoire.

MUSI 322. Percussion Ensemble. 1 Credit. (1 Lab; 8 cr max) F,S Max 8 cr. PREREQUISITE: Successful audition Advanced ensemble performance experience focusing primarily on music written for percussion during the 20th century. May be repeated.

MUSI 331. Jazz Ens II: One O'Clock Jazz. 1 Credit. (1 Lab; 8 cr max) F,S Max 8 cr. PREREQUISITE: Successful audition. Advanced performance training in jazz literature from all style periods, guided improvisational experience. May be repeated.

MUSI 335. Instrumental Conducting. 2 Credits. (1 Lec) F PREREQUISITE: MUSI 241, MUSI 206. Basic conducting and instrumental rehearsal techniques, instrumental score study, laboratory experiences.

MUSI 336. Choral Conducting. 2 Credits. (1 Lec) S PREREQUISITE: MUSI 335. Basic conducting and choral rehearsal techniques, choral score study, laboratory experiences.

MUSI 348. Ensemble. 1 Credit. (1 Lab; 8 cr max) F,S,Su Max 8 cr. PREREQUISITE: Successful audition. Selected students perform in small, coached instrumental and vocal ensemble performance. May be repeated.

MUSI 351. Accompanying. 2 Credits. (2 Lec) F alternate years, to be offered every year. PREREQUISITE: MUSI 295. Study of repertoire and principles of accompaniment in all style periods. Laboratory experiences include accompanying instrumentalists and vocalists.

MUSI 362. Chamber Ens III: MSU. 1 Credit. (1 Lab; 8 cr max) F,S Max 8 cr. COREQUISITE: MUSI 195, MUSI 295, MUSI 395, MUSI 495, or MUSD 560; or successful audition. Students perform in small, coached instrumental and vocal chamber music ensembles. Students study and perform chamber music repertory composed between 1650 and the present. Vocal chamber ensembles limited to eight members and one rehearsal per week.

MUSI 382. Dict: Grm & French (equiv 282). 2 Credits. (2 Lec) F alternate even years PREREQUISITE: MUSI 281 Correct pronunciation of German and French for singers using the International Phonetic Alphabet. Study of standard art song and operatic repertoire in German and French.


MUSI 407. Counterpoint. 3 Credits. (3 Lec) S alternate years, to be offered every year. PREREQUISITE: MUSI 206. Study and practice of the techniques of writing two- and three-voice counterpoint. 16th, 18th, and 20th-Century styles.

MUSI 410. Analysis. 3 Credits. (3 Lec) S alternate years, to be offered odd years. PREREQUISITE: MUSI 206. Advanced analysis and in depth study of selected and representative works from specific categories, such as chamber, orchestral, vocal, or choral music.

MUSI 422. MSU Chamber Orchestra. 1 Credit. (1 Lab) S PREREQUISITE: Audition or Consent of Instructor. A small (20-30member) auditioned orchestra of strings and a few winds suitable for playing appropriate literature, such as works from the Baroque of Classical era, or more modern works written for smaller forces.

MUSI 426. Montanans. 1 Credit. (1 Lab; 8 cr max) F,S Max 8 cr. PREREQUISITE: Successful audition. Advanced performance in small vocal ensemble using stylistic variety in programming.

MUSI 428. Gamelan. 1 Credit. (5 Lab; 8 cr max) F,S Max 8 cr. PREREQUISITE: MUSI 105 or MUSI 307 and consent of instructor. Balinese gamelan orchestra rehearsal and performance using authentic instruments. Both traditional music for the angklung gamelan as well as newer directions in music will be addressed. Traditional role learning and musical notation will be used. May be repeated.

MUSI 430. Keyboard Studio Pedagogy. 2 Credits. (2 Lec) F alternate years, to be offered odd years. PREREQUISITE: Junior standing and MUSI 295. Study of studio and class piano teaching techniques, beginning piano methods, beginning keyboard literature and materials needed for studio/class piano teaching. Observations and supervised teaching experiences are included.

MUSI 432. Keyboard Literature. 2 Credits. (1 Lec, 1 Lab) S alternate years, to be offered every year. PREREQUISITE: MUSI 430. Study of historical keyboard instruments and literature from the 1600s to the present.

MUSI 438. Instrmntl Studio Pedagogy & Lit. 2 Credits. (2 Lec) F,S and on demand. PREREQUISITE: Junior standing, MUSI 295. Studio teaching techniques and relevant etudes, solo, and ensemble literature in the student’s major applied area. Evaluation of literature and progression of a young player. Required observation of experienced private lesson teachers.

MUSI 440. Orchestration. 2 Credits. (1 Lec, 1 Lab) S PREREQUISITE: MUSI 206. Training in scoring principles for instrumental ensembles with emphasis on arranging and adapting music for public school programs.

MUSI 442. Vocal Studio Pedagogy and Lit. 2 Credits. (1 Lec, 1 Lab) S PREREQUISITE: Junior standing, and one of the following: MUSE 123 or MUSI 295 (voice) and MUSI 231. Students will know the anatomy and physiology relating to the singing voice, develop and design teaching techniques, and select literature for the singing voice.

MUSI 446. Advanced Applied Conducting. 1-2 Credits. (1-2 Lab; 2 cr max) F,S PREREQUISITE: Junior standing, and one of the following: MUSI 335 and MUSI 350 and MUSI 231 or MUSI 232. Provides BA-Music and BME-Music Education majors with practical experience in conducting, leadership, and management. Students will study advanced conducting and rehearsal techniques, and perhaps have the opportunity to conduct large ensembles as Student Conductors.

MUSI 450. Recital. 1 Credit. (1 Ind; max unlimited) F,S,Su COREQUISITE: MUSI 395 or MUSI 495. Selection of appropriate program of works suited to student’s abilities, preparation for performance. May be repeated.

MUSI 460. Guitar Master Class. 1 Credit. (1 Ind) S and on demand. PREREQUISITE: MUSI 295 (Guitar). Pedagogical and performance techniques in classical guitar.

MUSI 485. Acoustic Composition. 1-3 Credits. (1 Ind; 6 cr max) F,S,Su on demand. Max 6 cr. PREREQUISITE: MUSI 106. Individual study of compositional practices for acoustic/orchestral instruments, compositional processes and techniques, standard notation and part-writing, and aesthetic concepts. Students meet minimum weekly progress standards and a total requirement for minutes of music written, adjustable for the complexity of the medium. May be repeated.

MUSI 491. Special Topics. 4 Credits. (1-2 Lec; 12 cr max) On Demand PREREQUISITE: Course prerequisites as determined for each offering. Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

MUSI 492. Independent Study. 1-3 Credits. (1 Ind; 6 cr max) On Demand 1-3 cr. Max 6 cr. PREREQUISITE: Junior standing, consent of instructor and approval of the director. Directed research and study on an individual basis.

MUSI 494. Seminar. 1 Credit. (1 Sem; 4 cr max) F,S,Su Max 4 cr. PREREQUISITE: Junior standing and as determined for each offering. Topics offered at the upper division level which are not covered in regular courses. Students participate in preparing and presenting discussion material.


MUSI 498. Internship. 2-6 Credits. (2-6 Ind; 12 cr max) -- internship in music.

MUSI 499R. Senior Capstone Project. 3 Credits. (2 Lec) COREQUISITE: MUSI 395 or MUSI 495.

MUSI 504. Studies in Hist and Analysis. 3 Credits. (3 Lec) S alternate years, to be offered every year. PREREQUISITE: MUSI 206, MUSI 301, MUSI 302. Review and study of the history of music, with an emphasis on specific works. Review and practice of analytical and theoretical procedures and concepts in a variety of musical genres and styles.


MUSI 519. World Music. 2 Credits. (2 Lec) On demand PREREQUISITE: MUSI 302. Approaches to and use of music in world cultures. The influence of world musics on Western music.
MUSI 520. Montana Chamber Music Workshop. 2 Credits. (2 Lab) Su
PREREQUISITE: MUSI 295, MUSI 295 and consent of instructor. Students investigate the wealth of chamber music literature that includes their own instrument in various instrumental combinations, through coached playing assignments and in performance forums.

MUSI 540. Advanced Conducting. 1-3 Credits. (1-3 Rct) F,S,Su
PREREQUISITE: MUSI 335 or MUSI 356. Conducting techniques, score study and rehearsal procedures for direction of instrumental and choral groups in the public schools. Online readings, research, and discussions with on-campus and off-site conducting of ensembles. May be repeated for credit.

MUSI 550. Graduate Recital. 1 Credit. (1 Ind) F,S,Su
PREREQUISITE: MUED 566. Formal recital to include works from different eras.

MUSI 595. Applied Music. 1-2 Credits. (1-2 Sru) F,S,Su
PREREQUISITE: MUSI 495 or demonstrated proficiency and consent of instructor. Advanced studies of techniques of performance and interpretation to develop musical ability, expression, accuracy and stylistic awareness in student’s performance area.

MUST - Music-Technology

MUST 112. Basic Home Recording. 3 Credits. (3 Lab) S
This class will familiarize students with information and processes in a functioning home studio using Pro Tools. Through hands-on tutorials, the students will develop essential techniques for setup, recording, editing, and basic mixing.

MUST 115. Introduction to Digital Music. 3 Credits. (3 Lec) F
S First course in the Music Technology Sequence. Concepts and terms, creative projects using software and hardware, historical background, an introduction to the music industry, and tools for building self-directed careers within the changing field of music technology.

MUST 125. MIDI and Electro-Acoustic Comp. 3 Credits. (3 Lec) S
PREREQUISITE: MUST 115, and consent of instructor. Continuation of the MIDI component of Introduction to Digital Music. Composition and music notation, synthesizer programming, constructing an integrated music technology studio, and advanced applications for film and theatre.

MUST 217. Entertainment Business. 3 Credits. (3 Lec) F
PREREQUISITE: W and US core. Explore the business of Music, Entertainment, and Film industries. Artist Copyright, Royalties, Mechanical Licensing, Performance Contract, and basic contracts will be discussed with regard to business history, organization, media channels, and customer base.

MUST 220. Recording I. 3 Credits. (2 Lec, 1 Lab) F
PREREQUISITE: MUST 125, MUSI 106, MUSI 136, MUSI 141, and consent of instructor. Introduction to, and exploration of, technologies and concepts used to create, record, edit, format, manufacture, reinforce and reproduce audio. Combination of lecture and hands-on learning.

MUST 225. Elect Monster Laptop Ensemble. 2 Credits. (2 Lab) On Demand 2 cr. Lab 2; max 6 cr. PREREQUISITE: consent of instructor. Performance and study of music making in an ensemble of mainly laptop computers. Computer music programming skills as well as music performance experience desirable.

MUST 294. Seminar/Workshop. 1 Credit. (1 Sem) F,S,Su
Introduction to faculty research through faculty mini seminars. Departmental research facilities. Research groups. Research planning decisions (MSU laboratory, summer internship, student exchange, REU, USP, etc).

MUST 305. Orchestration for New Media. 3 Credits. (2 Lec, 1 Lab) F
3 cr. LEC 2 LAB 1 PREREQUISITE: MTEC majors: MUST 125, MUSI 106, MUSI 136, MUSI 141. Applied Music (MUSI 195 or MUSI 260) and consent of instructor; other music majors: permission of instructor only. Study of the full orchestra , its subgroups, and integration of software instruments for orchestrating music in today’s world.

MUST 320. Recording II. 3 Credits. (3 Lab) F
PREREQUISITE: MUST 220, and consent of instructor. An advanced laboratory course in recording and mixing, to include microphone techniques, outboard gear, recording and mixing individual instruments and ensembles, mastering techniques, session management, and business organization.

MUST 341. Sound Design and Synthesis. 3 Credits. (3 Lec) F
PREREQUISITE: MUST 220, MUSI 106, MUSI 136, MUSI 141, Applied Music (MUSI 195 or MUSI 260), consent of instructor. Students will explore artistic and scientific applications of recent research in sound, including software for analysis-synthesis, noise reduction, cross-synthesis, physical modeling, and acoustical analysis. Links between music composition, acoustics, computer science, and multimedia post production are emphasized.

MUST 350. Real-Time Computer Music. 3 Credits. (3 Lec) S
PREREQUISITE: MUST 125 and consent of instructor. Study of the real-time interactive computer music programming and application through performance. Students will learn standard objects and operational strategies in the program by building small modules and assembling them into larger patches, which then facilitate compositions and performances.

MUST 380. Interdisciplinary Proj I: Film. 3 Credits. (3 Rct) F

MUST 382. Interdisciplinary Projects II. 3 Credits. (3 Rct; 12 cr max) S
PREREQUISITE: consent of instructor. Topics vary by semester in this interdisciplinary course connecting Music Technology with other areas of study. Possible projects include sound design and composition for large theatre productions, audio equipment design with Electrical Engineering students, studio design and acoustics, and others.

MUST 384. Film Scoring. 3 Credits. (1 Lec, 2 Lab) F
PREREQUISITE: MUST 305 or consent of instructor. The course objective is to provide the student with knowledge and guidance through the various stages of the process of creating original music to accompany a visual medium. While no previous film scoring experience is required, a fundamental background in music theory, keyboard skills, and music technology is preferred.

MUST 482. Electronic Composition. 1-3 Credits. (1-3 Ind; 6 cr max) On Demand PREREQUISITE: MUST 125, and consent of instructor. Individual study of compositional practices employing electronic media, electronic/computer music, compositional processes and techniques, and aesthetic concepts. Students meet minimum weekly progress standards and a total requirement for minutes of music written, adjustable for the complexity of the medium.

MUST 494. Seminar. 1 Credit. (1 Sem; 4 cr max) F,S,Su
Max 4 cr. PREREQUISITE: Junior standing and as determined for each offering. Topics offered at the upper division level which are not covered in regular courses. Students participate in preparing and presenting discussion material.

MUST 498. Internship. 1-6 Credits. (2-6 Int; 12 cr max) On Demand Max 12 cr. PREREQUISITE: Consent of instructor. An individualized assignment arranged with an agency, business, or other organization to provide guided experience in the field.

MUST 499R. Senior Recital/Capstone Pjt. 3 Credits. (2 Lec) F
PREREQUISITE: Senior standing in MTEC program (MTEC and Composition/Organization coursework must be completed or in progress). Creation and public performance of a large-scale work incorporating original sound design (film score, multimedia work, EP-length album, or theatrical soundtrack) plus research paper synthesizing knowledge and inquiry in the Music Technology major.

MUST 544. Comp App Mus Ed. 3 Credits. (1 Lec, 2 Lab) Su
PREREQUISITE: Admission to the Master of Education with emphasis in Music program. Other graduate programs and non-degree-seeking graduate students by permission of instructor. An introduction to computer applications in music, including music notation, audio recording, and basic composition with audio and MIDI. This course is particularly geared toward music educators.

NAS - Native American Studies

NASX - Native American Studies

NASX 105D. Intro Native Amer Studies. 3 Credits. (2 Lec, 1 Rct) F,S
A survey of traditional and contemporary American Indian cultures, the historical development of the unique relationship between the federal government and Indian nations, and current issues among Indian peoples.

NASX 205D. Native Americans in Contemporary Society. 3 Credits. (3 Lec) F
3 Selected contemporary economic, social, political, educational, and cultural issues facing American Indians today, with special emphasis on tribal groups in Montana.

NASX 232D. MT Indians: Cultures, Histories, Current Issues. 3 Credits. (3 Lec) F
5 Movements of Indians into Montana. Social structures including kinship, political affiliations; military, warrior societies, and religion. Establishment of Montana’s reservations; treaties and agreements with the federal government; vested rights of Indians; sovereignty and self-government; contemporary tribal governments; contemporary Indian societies; socioeconomic problems.
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
<th>Schedule</th>
<th>Prerequisites</th>
<th>Notes</th>
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</thead>
<tbody>
<tr>
<td>NASX 239</td>
<td>Native North American History through Art and Material Culture. 3 Credits.</td>
<td>(3 Lec)</td>
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<tr>
<td>NASX 253</td>
<td>Indigenous Literature and the West. 3 Credits. (3 Sem) S</td>
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<td>This course will familiarize us with Indigenous literature and its relation to</td>
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<td>NASX 280IS</td>
<td>NA Studies Rrch Theor/Mlbs. 3 Credits. (3 Sem) S 3</td>
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<td>PREREQUISITE: NASX 105. This course critically examines the political and</td>
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<tr>
<td>NASX 290R</td>
<td>Undergraduate Research. 1-8 Credits. (1-8 Ind; 8 cr max) F,S,Su</td>
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<td>PREREQUISITE: Consent of department head. Directed undergraduate research/</td>
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<tr>
<td>NASX 291</td>
<td>Special Topics. 1-4 Credits. (1-4 Lec; 12 cr max) On Demand</td>
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<td>Courses not required in any curriculum for which there is a particular one-time</td>
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<td>NASX 292</td>
<td>Independent Study. 1-3 Credits. (1-3 Ind; 6 cr max) F</td>
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<td>PREREQUISITE: Consent of instructor and approval of department head. Directed</td>
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<tr>
<td>NASX 294R</td>
<td>Seminar/Workshop. 1-2 Credits. (1 Ret; 2 cr max) On Demand Corequisite</td>
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<td>NASX 290. Classroom instruction associated with directed undergraduate research</td>
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<tr>
<td>NASX 304</td>
<td>Native Americans Beliefs and Philosophy. 3 Credits. (3 Lec) On Demand</td>
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<td>PREREQUISITE: Junior standing. An in-depth analysis of specific contemporary and</td>
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<tr>
<td>NASX 310</td>
<td>Native Cultures of North America. 3 Credits. (3 Lec) On Demand</td>
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<td>PREREQUISITE: Junior standing. Histories and cultures of representative Native</td>
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<tr>
<td>NASX 340</td>
<td>Native American Literature. 3 Credits. (3 Lec) F</td>
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<td>PREREQUISITE: Junior standing and WRIT 101 W. Traditional and contemporary</td>
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<tr>
<td>NASX 360</td>
<td>Native Americans and Cinema. 3 Credits. (3 Lec) S</td>
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<td>Analysis of images and representations of American Indians in feature, independent,</td>
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<tr>
<td>NASX 405</td>
<td>Gender Issues in Native American Studies. 3 Credits. (3 Lec) On Demand</td>
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<td>PREREQUISITE: Previous course in NAS and junior standing, or permission of</td>
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<td>NASX 415</td>
<td>Native Food Systems. 3 Credits. (1 Lec) F alternate years will be offered</td>
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<td>PREREQUISITE: NASX 105 or NASX 232 and upper division standing. This course</td>
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<tr>
<td>NASX 430</td>
<td>American Indian Education. 3 Credits. (3 Lec) On Demand Corequisite</td>
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<td>This course will familiarize us with Indigenous literature and its relation to</td>
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<tr>
<td>NASX 440</td>
<td>Montana Indian Literature. 3 Credits. (3 Sem) F alternate years will be</td>
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<td>PREREQUISITE: Junior standing, or consent of instructor. Examination of</td>
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<tr>
<td>NASX 450</td>
<td>History of American Indians. 3 Credits. (3 Lec) On Demand</td>
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<td>PREREQUISITE: HSTA 101 or HSTA 102. Indian affairs in America from 1600-1970.</td>
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<tr>
<td>NASX 476</td>
<td>American Indian Policy and Law. 3 Credits. (3 Lec) F</td>
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<td>PREREQUISITE: NASX 105, and Junior standing. Survey of institutions, laws,</td>
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<tr>
<td>NASX 490R</td>
<td>Undergraduate Research. 1-6 Credits. (1-6 Ind; 12 cr max) F,S</td>
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<td>PREREQUISITE: Consent of instructor and approval of department head. Directed</td>
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<tr>
<td>NASX 494R</td>
<td>Seminar. 1 Credit. (1 Sem; 4 cr max) F,S,Su</td>
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<td>COREQUISITE: NASX 490. Classroom instruction associated with directed</td>
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<tr>
<td>NASX 498</td>
<td>Internship/Cooperative Educ. 2-12 Credits. (2-12 Ind; 12 cr max) On Demand</td>
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<td>PREREQUISITE: Graduate standing. This course is intended to explore gender</td>
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<td>NASX 505</td>
<td>Proseminar Native Amer Studies. 3 Credits. (3 Sem) F</td>
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<td>This course is a Graduate introduction to Native American Studies.</td>
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<tr>
<td>NASX 515</td>
<td>Native Food Systems. 3 Credits. (3 Sem) F</td>
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<td>PREREQUISITE: Consent of instructor and approval of department head. Directed</td>
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<tr>
<td>NASX 520</td>
<td>Fem/Gender Theories IN NAS. 3 Credits. (3 Lec) On Demand PREREQUISITE:</td>
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<td>This course engages indigenous practices and beliefs, focusing particularly on</td>
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<td>NASX 521</td>
<td>Tribal Government: Yesterday &amp; Today. 3 Credits. (3 Lec) F</td>
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<td>PREREQUISITE: Graduate standing. The course examines the complexities of</td>
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<tr>
<td>NASX 523</td>
<td>Am Indians/Minority in High Ed. 3 Credits. (3 Lec) On Demand PREREQUISITE:</td>
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<td>The course will develop and build the students' understanding of the historical</td>
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<td>NASX 524</td>
<td>Contemporary Issues in American Indian Studies. 3 Credits. (3 Lec) On Demand</td>
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<td>PREREQUISITE: Graduate standing. The course is intended to develop and refine</td>
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**Notes:**
- F indicates a full semester course.
- S indicates a spring semester course.
- Su indicates a summer course.
- On Demand indicates courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.
- COREQUISITE indicates a corequisite course.
- PREREQUISITE indicates a prerequisite course.
NASX 525. Indigen Phil/Sacred Ecologies. 3 Credits. (3 Lec) F alternate years to be offered odd years. PREREQUISITE: Graduate standing. This course begins by examining indigenous philosophies of sacred ecologies, contrasting these views with those held by Europeans regarding the natural world. It traces the impact of historical colonialism in the environment up to contemporary conflicts over sacred sites and environmental resources.

NASX 530. Federal Law and Indian Policy. 3 Credits. (3 Lec) S PREREQUISITE: Graduate standing. Advanced analysis of theories, doctrines, case law, and legislation with a focus on key legal and policy concerns for contemporary Native America including treaties, criminal jurisdiction, land, environmental regulation, water rights, fishing and hunting, child welfare, gaming, taxation, repatriation, and religious freedom.

NASX 540. Theoretical Positions in NAS. 3 Credits. (3 Lec) S PREREQUISITE: Graduate standing. An introduction to the central conceptualizations of the academic discipline of Native American Studies and several of the theoretical paradigms operative within it. Students will gain an understanding of the contributions of Native American Studies to theoretical understandings within, across, and beyond dominant academic disciplines.

NASX 541. Critical Approach to NAS Methods. 3 Credits. (3 Lec) S PREREQUISITE: Graduate standing. A critical survey of the interdisciplinary approaches used in NAS grounded in a sociopolitical context with emphasis on ethical questions raised by research of Native Americans. Students receive individual attention toward formulating an effective methodology for their major's project.

NASX 550. Native Americans: Dispelling the Myths. 3 Credits. (3 Lec) On Demand PREREQUISITE: Graduate standing or consent of instructor. This course is designed around a series of commonly held assumptions or "myths". When unexamined, these assumptions undermine our ability to communicate across cultures, and ultimately form the basis for some of the worst forms of racism and stereotyping. We wrestle with these preconceptions while learning the most basic elements of American Indian--which is to say American-history.

NASX 551. American Indian Art Survey. 3 Credits. (3 Lec) On Demand PREREQUISITE: Graduate standing. Exploration of the functions and purposes of the unique arts of North American indigenous peoples by culture area, in both the past and the present, within the overlapping contexts of culture area politics, cosmology, religion and spirituality, and gender.

NASX 552. Indigenous Nations of Montana. 3 Credits. (3 Lec) On Demand PREREQUISITE: Graduate standing or consent of instructor. NASX 552 is a graduate level introduction to Montana's contemporary Indigenous Nations, with a summary overview of Montana's PaleoIndian prehistory and post-contact history. Students explore the traditional culture and history of each Montana tribe, and focus on the contemporary life and issues pertinent to each tribe.

NASX 553. Indigenous Literature and the West. 3 Credits. (3 Lec) S This course will familiarize us with Indigenous literature and its relation to the American and Canadian West. We will seek to retrace the creation of the Western myths while placing Indigenous perspectives and literature at the center of our discussions.

NASX 554. Indian Education for All. 3 Credits. (3 Lec) PREREQUISITE: Graduate standing. This course is an in-depth analysis of the theory and practice of cultural diversity in educational contexts. It examines the historical, political, and cultural forces that foster systematic disparities based on ascribed characteristics, and critically examines strategies for addressing such disparities. The evolution and implementation of Indian Education for All is explored.

NASX 560. Native American Lit Tradition. 3 Credits. (3 Lec) F alternate years to be offered odd years. PREREQUISITE: Graduate standing. A survey of prose writing, mainly long fiction, by and about contemporary Native Americans.

NASX 575. Professional Paper. 1-6 Credits. (1-6 Ind; 6 cr max) F,Su 1-6 cr. IND Maximum 6 cr. PREREQUISITE: Graduate standing. A research or professional project or paper dealing with a topic in the field. The topic must have been mutually agreed upon by the student and his or her major advisor and graduate committee.

NASX 589. Graduate Consultation. 1-3 Credits. (1-3 Ind; 3 cr max) F,S SU PREREQUISITE: Master's standing and approval of the Dean of Graduate Studies. This course may be used only by graduate students who have completed all of their course work and their theses, if on a thesis plan, but who need additional faculty or staff time and assistance.

NASX 590. Master's Thesis. 1-10 Credits. (1-10 Ind; max unlimited) F,S,Su PREREQUISITE: Master's standing.

NASX 591. Special Topics. 1-4 Credits. (1-4 Lec; 6 cr max) On Demand PREREQUISITE: Upper division courses and others as determined for each offering. Courses not required in any curriculum for which there is a particular one time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

NASX 592. Independent Study. 1-3 Credits. (1-3 Ind; 3 cr max) On Demand PREREQUISITE: Graduate standing, consent of instructor, approval of department head and Dean of Graduate Studies. Directed research and study on an individual basis.

NASX 594. Seminar. 1-4 Credits. (1-4 Sem; 4 cr max) On Demand PREREQUISITE: Graduate standing or seniors by petition. Course prerequisites as determined for each offering. Topics offered at the graduate level which are not covered in regular courses. Students participate in preparing and presenting discussion material.

NASX 598. Internship. 1-6 Credits. (1-6 Ind; 6 cr max) F,S,Su PREREQUISITE: Graduate standing, consent of instructor and approval of department head. An individualized assignment arranged with an agency, business or other organization to provide guided experience in the field.

NRSG - Nursing

NRSG 115. Nursing as a Profession. 2 Credits. (2 Lec) F,S Su The purpose of this course is to initiate and foster the professional socialization process. Content and activities expose students to issues surrounding the profession of nursing, multiple roles of nursing in society and health care, and concepts related to the dimensions of nursing practice: nurse, client, health and environment.

NRSG 220. Fundamentals Ethcal Nrsng Research. 2 Credits. (1 Lec, 1 Rec) F,S,Su, Su Drawing on contemporary issues in bioethics this foundational course explores influential moral values, philosophical principles and theories as formal grounding for ethical decision making and action in health care. A broad historical, cultural and societal perspective is emphasized to provide the background for understanding the everyday ethical problems that health professionals encounter in their practices. A psychological and social framework of analysis is used to foster sensitivity, skills of analysis and ethical behavior in situations of moral conflict.

NRSG 225. Foundns Png Pngvng Cln Nrs Gr. 4 Credits. (2 Lec, 2 Lab) F,S,L Su PREREQUISITES: BIOH 201, BIOH 211, FCS 101H, and BIOM 250. COREQUISITES: NRSG 238 or consent of instructor. Application of nursing principles, concepts and related skills for the individual needing assistance. The clinical decision-making process is utilized in the provision of nursing care in clinical settings.

NRSG 238. Hlth Asstmt Acros Lifespan. 4 Credits. (2 Lec, 2 Lab) F,S,L Su PREREQUISITES: BIOH 201 and BIOH 211. COREQUISITE: NRSG 225 or consent of instructor. This course is designed to teach the student a health oriented approach to nursing assessment of clients across the life span in a variety of community based settings. The primary focus of the course is on normal health assessment findings, with recognition of abnormal variations. This course emphasizes development of the skills needed to perform a comprehensive health assessment of children, adults, and the elderly. Data collection through comprehensive history taking and physical assessment is emphasized. Utilizations of assessment findings in clinical decision making is discussed throughout the course.

NRSG 242. Complementary Healing. 2 Credits. (2 Lec) S PREREQUISITE: Undergraduate nursing students or permission of the instructor. The purpose of this course is to explore the time honored medical models and treatments of Complementary and Alternative Medicine (CAM). Using quality of life as a foundation, students will explore the integration of these models into practice.

NRSG 258. Principles of Pathophysiology. 3 Credits. (3 Lec) F,S,Su 3 cr. LEC 3 PREREQUISITES: BIOH 201 and BIOH 211. COREQUISITE: NRSG 225 or consent of instructor. This course is designed to teach the student a health oriented approach to nursing assessment of clients across the life span in a variety of community based settings. The primary focus of the course is on normal health assessment findings, with recognition of abnormal variations. This course emphasizes development of the skills needed to perform a comprehensive health assessment of children, adults, and the elderly. Data collection through comprehensive history taking and physical assessment is emphasized. Utilizations of assessment findings in clinical decision making is discussed throughout the course.

NRSG 290R. Undergraduate Research. 1-6 Credits. (1-6 Ind; 6 cr max) On Demand PREREQUISITE: Undergraduate research/creative activity which may culminate in a written work or other creative project. Course will address responsible conduct of research.

NRSG 291. Special Topics. 1-4 Credits. (1-4 Lec; 12 cr max) On Demand PREREQUISITE: As determined for each offering. Courses not required in any curriculum for which there is a particular one time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.
NRSG 292. Independent Study. 1-3 Credits. (1-3 Ind; 0 cr max) On Demand
Max 6 cr. PREREQUISITES: Consent of instructor and approval of department head. Directed research and study on an individual basis.

NRSG 294. Workshop/Seminar. 1-4 Credits. (Sem; 12 cr max) On Demand
1-4 cr. SEM Maximum 12 credits PREREQUISITE: As determined for each offering. Topics offered at the lower division level which are not covered in regular courses. Students participate in preparing and presenting discussion material.

NRSG 336. Nursing Pharmacotherapeutics. 3 Credits. (2 Lec, 1 Lab) F,S,Su
PREREQUISITES: CHMY 121, CHMY 123, NUTR 221, NRSG 258, and NRSG 238. The focus of this course is to examine pharmacotherapeutics in nursing practice. Clinical application of pharmacological and pathophysiologic principles are integrated. Physical, psychological, social and cultural factors; age related variations; and alternative therapies are highlighted.

NRSG 341. Psychosocial Nursing Concepts. 3 Credits. (2 Lec, 1 Lab) F,S,Su
PREREQUISITES: PSYX 100, SOCI 101, NRSG 115, NRSG 220, NRSG 225, NRSG 258 and NRSG 238. This course explores selected psychosocial concepts and theories basic to nursing practice with clients in a variety of settings. Topics include family therapy, palliative care, crisis theory, anxiety, loss, grief & other human responses; and related psychosocial nursing strategies.

NRSG 346. Nurs Care of Childbearing Family. 5 Credits. (2 Lec, 3 Lab) F,S
PREREQUISITES: NRSG 341, NRSG 352 and NRSG 336. The focus of this course is the nursing care of childbearing women, neonates and their families in a variety of settings. Normal pregnancy and childbirth are addressed, as well as the identification and management of high risk childbirth situations. Selected health care of women content is included.

NRSG 348. Nursing Care of Child & Family. 5 Credits. (2 Lec, 3 Lab) F,S
PREREQUISITES: NRSG 258, NRSG 336, NRSG 341, and NRSG 352. The focus of this course is health promotion, disease prevention, illness management and nursing care of children within the family context in a variety of settings. This course builds upon and integrates knowledge gained from nursing, sciences and the humanities.

NRSG 352. Acute and Chronic Illness. 5 Credits. (2 Lec, 3 Lab) F,S
PREREQUISITES: NRSG 225, NRSG 258 and NRSG 238. COREQUISITE: NRSG 336. The focus of this course is application of theoretical and empirical knowledge to nursing care for clients across the adult lifespan with acute and chronic illness in a variety of settings. Health promotion, disease prevention, and symptom management are emphasized. This course builds upon and integrates knowledge gained from nursing, sciences and the humanities.

NRSG 377. Intro to Community Based Nursng. 2 Credits. (2 Lec) F,S
The focus of this course is to introduce the student to community based nursing practice for individuals, families, populations and communities. There is an emphasis on health promotion, disease prevention and health determinants in a variety of settings.

NRSG 387R. Research in Health Care. 3 Credits. (2 Lec, 1 Lab) F,S
PREREQUISITE: STAT 216 or Consent of Instructor. Students are introduced to the research process and evidence-based practice. They develop knowledge, skills, and values necessary to be informed consumers of health related research. Students engage in research processes, examine research reports, and describe practice applications.

NRSG 418. Hlth Policy/Hlth Care Econ Clsn. 2 Credits. (1 Lec, 1 Rct) S
Focus is on economics, public policy and political factors which affect the delivery of health and nursing care at the local, state, national and international levels. Students are encouraged to participate in efforts to influence health policy.

NRSG 434. Critical Care and Emergency Nursing. 3 Credits. (3 Lec) F,S
PREREQUISITES: NRSG 437, NRSG 444, and NRSG 454. The focus of this course is application of theoretical and empirical knowledge to nursing care for complex clients across the adult lifespan requiring emergency and critical care in a variety of settings. Advanced skills, critical thinking and decision making, safe practice and interdisciplinary collaboration are emphasized.

NRSG 435. Spirituality in Healthcare. 2 Credits. (2 Ind) F,S
PREREQUISITES: PSYX 100 and NRSG 115 or consent of instructor. This elective course explores aspects of spirituality and the use of spiritually-based therapies in healthcare from various faith traditions. Spiritual assessment and spiritually-based strategies to promote health and wellness are emphasized. Although a multidisciplinary approach to spiritual care is presented, a nursing prospective is highlighted.

NRSG 437. Psychiatric Nursing. 6 Credits. (3 Lec, 3 Lab) F,S
PREREQUISITES: NRSG 341 and NRSG 377 and NRSG 346 or NRSG 348 or NRSG 352. The focus of this course is nursing care of clients with acute and chronic psychiatric disorders, including psychopathology associated with major mental illness. Community based experiences provide opportunity for continued development of therapeutic skills. Social, cultural, spiritual and environmental issues influencing mental health are explored.

NRSG 444. Care Management. 3 Credits. (2 Lec, 1 Ret) F
PREREQUISITES: NRSG 352 and NRSG 387R. This course focuses on care management with application of ethical and legal concepts. The care management process is explored. Case management is examined as a method of managing health care.

NRSG 454. Urgent and Palliative Care. 6 Credits. (3 Lec, 3 Lab) F,S
PREREQUISITE: NRSG 352. The focus of this course is application of theoretical and empirical knowledge to nursing care for complex clients across the adult lifespan requiring urgent and palliative care in a variety of settings. Clinical decision making, triage and symptom management are emphasized. This course builds upon and integrates knowledge gained from nursing, sciences and the humanities.

NRSG 469. Cultural Apps in Nursing. 1-6 Credits. (1-6 Lab/Cr) F,S,Su
PREREQUISITE: Enrolled in the undergraduate nursing program. This elective course is designed as an intense but time-limited immersion into another culture and is focused on health benefits, health care, and nursing applications. The experience is preceded by analysis of cultural principles applicable to nursing and concluded by analysis of actual clinical participation with (specific culture) nurses and clients.

NRSG 477. Pop Based Nursing Care in Comm. 6 Credits. (3 Lec, 3 Lab) F,S,Su
PREREQUISITES: NRSG 437 and NRSG 454. The focus of this course is health and well-being of the community. Global and national health problems are examined from a public health perspective. Community assessment and epidemiologic methods are used to identify populations at risk and potential areas for intervention.

NRSG 479. Population Health & Leadership. 6 Credits. (4 Lec, 2 Lab) S
The purpose of this course is to apply a population-based, epidemiological approach to discover risk factors and evidence-based health promotion and disease prevention practices. Interdisciplinary leadership and management concepts will be incorporated to guide improved outcomes for populations. College of Nursing.

NRSG 487. Nursing Ldrshp/Mgmnt Dvlpmnt. 6 Credits. (2 Lec, 2 Lab) F,S
PREREQUISITES: NRSG 437, NRSG 444 and NRSG 454. Senior capstone course. The focus of this course is to provide an integration of theory and skill development in leadership, management and organizational concepts for the design, coordination, and management of health care using the community based philosophy.

NRSG 489. Research & Statistics to Support Evidence Based Practice. 6 Credits. (Lec 5, Lab 1) F
This course provides an introduction to research principles, methodologies and statistical procedures used to analyze data to support evidence-based practice. Emphasis is placed on critical analysis of nursing and health care research and correct application and interpretation of statistics. College of Nursing.

NRSG 489R. Research & Statistics to Support Evidence Based Practice. 6 Credits. (Lec 5, Lab 1) F
This course provides an introduction to research principles, methodologies and statistical procedures used to analyze data to support evidence-based practice. Emphasis is placed on critical analysis of nursing and health care research and correct application and interpretation of statistics. College of Nursing.

NRSG 490R. Undergraduate Research. 1-6 Credits. (1 Ind; 12 cr max) On Demand
Max 12 cr. PREREQUISITE: Junior standing. Directed undergraduate research/creative activity which may culminate in a research paper, journal article, or undergraduate thesis. Course will address responsible conduct of research. May be repeated.

NRSG 491. Special Topics. 1-4 Credits. (1-4 Lec; 12 cr max) On Demand
Max 12 cr. PREREQUISITE: Junior standing and as determined for each offering. Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

NRSG 492. Independent Study. 1-3 Credits. (1-3 Ind; 6 cr max) On Demand
Max 6 cr. PREREQUISITES: Junior standing, consent of instructor, and approval of department head. Directed research and study on an individual basis.

NRSG 494. Workshop/Seminar. 1-4 Credits. (1 Sem; 12 cr max) On Demand
Max 12 credits PREREQUISITE: Junior standing, consent of instructor, and approval of department head. Directed research and study on an individual basis.

NRSG 498. Internship. 3 Credits. (3 Lab) Su
PREREQUISITE: Satisfactory completion of all 1st semester junior level clinical nursing courses. Placement subject to availability. This elective course is designed to work with a registered nurse (RN) in a cooperating clinical agency for a period of intensified clinical experience.
NRSG 501. Tchg Concepts Nursing Educator. 2 Credits. (2 Lec) F
PREREQUISITE: Graduate Standing. Designed for students interested in nursing education (academic or practice environment). Emphasizes teaching strategies and delivery of nursing education for diverse learners in a variety of settings. Roles and responsibilities are explored. Includes history and evolution of teaching and learning.

NRSG 502. Effective Clinical Teaching. 2 Credits. (2 Lec) S
PREREQUISITE: Graduate Standing. Focuses on educator roles and responsibilities in teaching clinical nursing (academic or practice environments). Designed for students interested in developing clinical teaching skills. Major themes: development of learning activities, evaluation of student performance, concepts of student supervision, and agency coordination.

NRSG 503. Curriculum Development. 3 Credits. (3 Lec) Su, alternate years to be offered Su even years. PREREQUISITE: Graduate Standing. Theories and models of curriculum development are explored and designed for nurses teaching in either academic or practice environments. Variables associated with design and planning of educational interventions are explored. Students synthesize appropriate theoretical concepts to develop a model curriculum.

NRSG 504. Assessm and Eval of Education. 3 Credits. (3 Lec) Su, alternate years to be offered Su odd years. PREREQUISITE: Graduate Standing. Students engage in discussions around design, assessment, and evaluation of instruction by nurses. Topics include writing instructional objectives and constructing activities to assess student learning outcomes. Students complete a project to gain skills in evaluating learning related to a specific unit of study.

NRSG 508. Clinical Leadership Practicum. 7 Credits. (5.333 Lab) F,S,Su PREREQUISITE: NRSG 509, NRSG 604, NRSG 608, and NRSG 611. In collaboration with the faculty and clinical preceptor, students will design, manage, and evaluate care to improve health outcomes for a selected population. Designed to promote integration of coursework through immersion in the CNL role.

NRSG 509. Clinical Nurse Leader Lab I. 2 Credits. (1 Lec) F PREREQUISITE: NRSG 604, NRSG 608 or consent of instructor. Students will engage in activities that promote development of CNL competencies. Strategies used to promote patient-centered care and interprofessional collaboration in selected settings will be examined.

NRSG 511. Pathophysiology and Pharmacology for the Clinical Nurse Leader. 3 Credits. (3 Lec) F Designed for the advanced nurse generalist. Understanding of symptoms/patterns of pathophysiology experienced in populations requiring interventions and management within healthcare delivery systems. Health maintenance, preventive, acute, chronic, palliative, and end of life care will be considered.

NRSG 518. Pharm for Infant Child Adults. 1 Credit. (1 Lec) S PREREQUISITE: NRSG 517 or consent of instructor. Addresses pharmacological intervention in managing common health care problems of childcare families. Students will apply knowledge of medication management of commonly encountered pediatrics and women’s health care concerns.

NRSG 519. Pharm for Middle Aged Adults. 1 Credit. (1 Lec) S PREREQUISITE: NRSG 517 or consent of instructor. Addresses pharmacological intervention in managing common health problems of middle age adults and their families. Students will apply knowledge of pharmacological management of commonly encountered health problems of middle age adults.

NRSG 520. Pharm for Older Adults. 1 Credit. (1 Lec) F PREREQUISITE: NRSG 517 or consent of instructor. Addresses pharmacological interventions in managing common health problems of elders and their families. Students will apply knowledge of pharmacological management of commonly encountered health problems for the aging population. Regulatory issues regarding prescriptive practice for APRNs are addressed.

NRSG 528. Family Mental Hlth Nsg IV. 6 Credits. (1 Lec, 3.333 Lab) F PREREQUISITE: NRSG 527. Students will integrate the conceptual and theoretical foundations for working with individuals and families with mental health problems or psychiatric disorders. Interventions include health promotion, coordination and use of organizational or community resources, consultation, teaching/coaching, and application of nursing leadership skills.

NRSG 561. Primary Care I. 6 Credits. (3 Lec, 3 Lab) S PREREQUISITE: NRSG 517, NRSG 521, NRSG 530 and NRSG 560. COREQUISITE: NRSG 531 and NRSG 555. Focuses on comprehensive assessment, intervention and preventive care for childbearing and child rearing families in primary health care for the advanced practice nurse. Includes content on physiological, pathophysiological, psychological, developmental, sociocultural and spiritual care.

NRSG 562. Primary Care II. 6 Credits. (3 Lec, 3 Lab) Su PREREQUISITE: N 561. This course includes content on the physiological, pathophysiological, psychological, development, sociocultural and spiritual primary health care needs of middle families. Addresses assessment, intervention and preventive care.

NRSG 563. Primary Care III. 6 Credits. (3 Lec, 3 Lab) F PREREQUISITE: NRSG 562. Assessment, treatment and preventive care for aging families in primary health care settings. Physiological, pathophysiological, psychological, developmental, sociocultural and spiritual responses to acute and chronic conditions will be explored along with the advocacy role of the nurse practitioner.

NRSG 571. Clinical Preceptorship. 6 Credits. (4 Lab) S PREREQUISITE: Final semester of course work. This practicum allows students to further refine family nurse practitioner skills in practice settings such as family health, pediatrics, women’s health or gerontology or a broad based general practice based on availability.

NRSG 574. Teaching Practicum. 1-4 Credits. (.667-.2.667 Lab; 4 cr max) F,S,Su PREREQUISITE: NRSG 504 or consent of instructor. Teaching/learning principles are integrated into nursing education in academic or practice environments. Students practice, observe, and evaluate teaching/learning processes. The instructor and student negotiate laboratory activities.

NRSG 575. Professional Paper and Project. 1-4 Credits. (1 Lec; 6 cr max) F,S,Su Max 6 cr. PREREQUISITE: Graduate standing. A research or professional paper or project dealing with a topic in the field. The topic must have been mutually agreed upon by the student and his or her major advisor and graduate committee.

NRSG 590. Master’s Thesis. 1-10 Credits. (1 Ind; max unlimited) F,S,Su PREREQUISITE: Master’s standing. May be repeated.

NRSG 591. Special Topics. 1-4 Credits. (1 Lec; 12 cr max) On Demand PREREQUISITE: Upper division courses and others as determined for each offering. Courses not required in any curriculum for which there is a particular one time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

NRSG 592. Independent Study. 1-3 Credits. (1 Lec; 6 cr max) On Demand 1 - 3 cr. IND Maximum 6 cr. PREREQUISITE: Graduate standing, consent of instructor, approval of department head and Dean of Graduate Studies. Directed research and study on an individual basis.

NRSG 594. Seminar. 1 Credit. (1 Lec; 4 cr max) PREREQUISITE: Graduate standing or seniors by petition. Course prerequisites as determined for each offering. Topics offered at the graduate level which are not covered in regular courses. Students participate in preparing and presenting discussion material.

NRSG 601. Advanced Health Assessment. 3 Credits. (2 Lec, .667 Lab) F Advanced health assessment of individuals. Documenting and validating information, analyzing, synthesizing, and making clinical decisions about the client’s health status. Includes assessment of normal and abnormal physiological and psychosocial processes relevant to gender and culture across the lifespan.

NRSG 602. Adv Physio/Pathophysiology. 4 Credits. (4 Lec) F COREQUISITE: NRSG 601 Comprehensive examination of physiological functioning and common pathophysiological alterations in humans. Builds on fundamentals of anatomy, physiology, and pathology examined from subcellular level through major body systems. Focus on etiology, pathogenesis, developmental and environmental influences and clinical manifestations of injury and disease.

NRSG 603. Advanced Pharmacology I. 2 Credits. (2 Lec) S PREREQUISITE: NRSG 602 This course provides an understanding of the science of therapeutics and principles of pharmacokinetics and pharmacodynamics.

NRSG 604. Evidence Based Practice I. 4 Credits. (4 Lec) F PREREQUISITE: NRSG 387R or equivalent and STAT 216Q or equivalent Focuses on the various methods and processes used to translate knowledge into evidence based practice. Students explore processes for acquiring, appraising, and using evidence to improve clinical outcomes.

NRSG 605. Evidence Based Practice II. 3 Credits. (3 Lec) S PREREQUISITE: NRSG 604; NRSG 606 Focuses on the methods for evaluating and using information to inform practice. Students will become skilled using a variety of tools from research, biostatistics, epidemiology, and other data based disciplines to address clinical problems.
NRSG 606. Statistical Applications. 2 Credits. (2 Lec) F
PREREQUISITE: STAT 2160Q or equivalent Builds on basic understanding of quantitative methods and resulting statistical analyses. Particular application to critique health sciences research. Students will gain facility in statistical techniques of correlation, regression, Chi square, t-test, analysis of variance, logistic regression and confidence limit estimation.

NRSG 607. Diagnostic Reasoning. 3 Credits. (2 Lec, .667 Lab) S
PREREQUISITE: NRSG 601; NRSG 602 This graduate nursing course promotes the development of the practitioners' comprehensive assessment proficiency, critical thinking and diagnostic reasoning. The practitioner will utilize a systematic approach for clinical decision making, diagnosis and documentation.

NRSG 608. Design H C Delivery Systems. 3 Credits. (3 Lec) S
PREREQUISITE: NRSG 604, EIND 458 for IE students or instructors permission Examines the role of nurses and industrial engineers in healthcare. Examines major systems within healthcare organizations which affect care delivery. Learn strategies for analyzing, improving processes, and coordinating interdisciplinary healthcare teams to enhancing healthcare quality management and reducing health risk through medical error elimination.

NRSG 609. Adv Practice Nurs Ldrshp. 2 Credits. (2 Lec) Su
PREREQUISITE: NRSG 601, 602, 603. Prepares doctor of nursing practice students for direct and indirect advanced practice nursing roles and core competencies in organizational and systems leadership. Emphasis on leadership, communication, collaboration, negotiation, team functioning, conflict resolution and scholarship.

NRSG 610. Health Care Informatics. 3 Credits. (3 Lec) F
PREREQUISITE: Graduate Standing. Explores health care information systems and computer technology to optimize health information management and communication systems while maintaining privacy and security of data.

NRSG 611. Program Planning & Evaluation, Outcomes, & Quality Improvement. 3 Credits. (3 Lec) F
PREREQUISITE: Graduate Standing. This graduate course focuses on the role of the graduate nurse in health-related program planning and evaluation. Principles of quality improvement and outcomes management are integrated into the methods. Formative and summative evaluation models will be integrated throughout the course.

NRSG 612. Ethics, Law, and Policy for Advocacy in Healthcare. 3 Credits. (3 Lec) S
PREREQUISITE: Graduate Standing. The graduate nursing student will integrate knowledge of bioethics, current legal issues, ethical comportment, clinical decision-making, and functions of law and policy analysis as applied to clinical practice.

NRSG 613. Finance & Budget H C Systems. 2 Credits. (2 Lec) S
PREREQUISITE: Graduate Standing. This course focuses on the application of fiscal management principles of health care systems. Emphasis is on health care economics, fiscal management, and budgeting concepts as they relate to healthcare.

NRSG 614. Vulnerability and Health Care in Diverse Communities. 4 Credits. (2 Lec, 2 Lab) F
PREREQUISITE: Graduate standing. This graduate nursing course addresses concepts of vulnerability and disparity in health and healthcare among diverse and rural populations. Students will examine vulnerable populations. Interactions with the healthcare systems, including access, utilization, and outcomes will be examined. Students will address strategies for addressing disparities in healthcare.

NRSG 615. Translational Research Adv Pra. 3 Credits. (3 Lec) F
PREREQUISITE: NRSG 601, 602, 603, 604, and 605. This graduate nursing course provides students opportunities to explore translational research. The course focuses on understanding complementary disciplines with the goal of enhancing communication and collaboration among researchers.

NRSG 620. Adv Pharm II. 3 Credits. (3 Lec) Su
PREREQUISITE: NRSG 601, 602, 603, 604, 605 and 607. Focus on comprehensive assessment, intervention and preventive care for childbearing and childrearing families in primary health care. Includes content on physiological, pathophysiological, psychological, developmental, sociocultural and spiritual primary health care needs of childbearing and childrearing families.

NRSG 621. Advanced Clinical I-FI. 6 Credits. (3 Lec, 3 Lab) Su
PREREQUISITE: NRSG 601, 602, 603, 604, 605 and 607. Focus on comprehensive assessment, intervention and preventive care for childbearing and childrearing families in primary health care. Includes content on physiological, pathophysiological, psychological, developmental, sociocultural and spiritual primary health care needs of midwife families.

NRSG 622. Advanced Clinical II Primary Care for Midlife Families. 6 Credits. (3 Lec, 3 Lab) F
PREREQUISITE: NRSG 621 Adv Clin I; NRSG 620 Adv Pharm II Comprehensive assessment, intervention and preventative care for midlife families in primary health care settings. Recognizing the holistic nature of individuals within families, this course will include content on the physiological, pathophysiological, psychological, developmental, sociocultural, and spiritual primary health care needs of midlife families.

NRSG 623. Advanced Clinical III Primary Care for Aging Families. 6 Credits. (3 Lec, 3 Lab) Su
PREREQUISITE: NRSG 622. Focus on assessment, treatment and preventative care for aging families in primary health care settings. Physiological, pathophysiological, psychological, developmental, sociocultural and spiritual responses to acute and chronic conditions will be explored emphasizing the importance of advocacy.

NRSG 624. Advanced Clinical IV (NP, Family/Individual) Primary Care Clinical Preceptorship. 7 Credits. (1 Lec, 6 Lab) S
PREREQUISITE: Advanced Clinical III. In this graduate nursing practicum, students will further refine their role as a doctor of nursing practice demonstrating expertise, specialized knowledge, and expanded responsibility and accountability in the care and management of individuals and families. Students in the Family Nurse Practitioner (FNP) option participate in the selection of a practice setting such as family health, pediatrics, women's health, gerontology, a broad based primary care, or specialty practice. Students will incorporate a holistic perspective in the management of patients and engage in the formation of therapeutic partnerships in a clinical practice. College of Nursing.

NRSG 630. Adv Psychopharm II. 3 Credits. (2 Lec) Su

NRSG 631. Advanced Clinical I – Psych/Mental Health. 6 Credits. (3 Lec, 3 Lab) Su
PREREQUISITE: NRSG 601, 602, 603, 604, 605, 607. The role and scope of advanced psychiatric nursing practice and foundational legal and ethical issues are explored. The neuroanatomy and neurophysiology of psychiatric disorders are reviewed. Conduct comprehensive and systematic psychiatric assessments in complex situations.

NRSG 632. Advanced Clinical II: Psychotherapeutic Modalities. 6 Credits. (3 Lec, 3 Lab) F
PREREQUISITE: NRSG 631, 631 Conceptual and theoretical foundations for psychotherapy, including selected therapeutic modalities for individuals, group psychotherapy, and the integration of multicultural skills for health promotion and management of mental health problems and psychiatric disorders are introduced and examined.

NRSG 633. Advanced Clinical III, Psych/Mental Health. 6 Credits. (3 Lec, 3 Lab) Su
PREREQUISITE: NRSG 632 In this course, students will explore the conceptual and theoretical foundations for providing psychotherapy with families and couples. Continuation of psychopharmacology concepts presented in Advanced Clinical I and II will be provided with an emphasis on expanded pharmacology concepts.

NRSG 634. Advanced Clinical IV, NP, Psych/Mental Health. 7 Credits. (1 Lec, 6 Lab) S
PREREQUISITE: NRSG 633, Advanced Clinical III. This graduate nursing course builds upon content and skills attained in Advanced Clinical I, II, and III. In this practicum students will further refine their role as a doctor of nursing practice demonstrating expertise, specialized knowledge, and expanded responsibility and accountability in the advanced psychiatric care and management of individuals and families.

NRSG 674. DNP Scholarly Project Seminar. 2 Credits. (1 Lec, 1 Lab) F
PREREQUISITE: NRSG 601, 602, 604 COREQUISITES: NRSG 601 The DNP scholarly project exemplifies the discovery, application, and synthesis of advanced nursing knowledge to improve health outcomes for individuals, families, communities, or systems.

NRSG 675. Professional Paper and Project. 1-6 Credits. (1-6 Ind; 6 cr max) F,S
PREREQUISITE: NRSG 674. Professional paper or project dealing with a topic in the field. The topic must have been mutually agreed upon by the student and his or her major advisor and graduate committee.
NRSM - Natural Resource Sci & Mgmt

NRSM 101. Natural Resource Conservation. 3 Credits. (3 Lec) F
An overview of soils, water, rangelands and wildlife conservation from the global to the local level. Impacts of human population growth, economics, ethics and agriculture on the sustainability of natural resources will be examined using basic principles of ecology.

NRSM 102. Montana Range Plants. 1 Credit. (1 Lab) F
The laboratory exercises are designed to complement the lectures of NRSM 101. Rangeland inventory and classification methods will be reviewed. Sixty common native and introduced plants will be identified in the field and the classroom.

NRSM 235. Range and Pasture Monitoring. 1 Credit. (1 Lab) F
1 cr. LAB 1 PREREQUISITE: ANSC 100, NRSM 101, NRSM 102. Methods which can be used by private operators as well as state and federal land managers to identify site potential, inventory forage resources, evaluate range and pasture condition, estimate stocking rates, and measure forage utilization by wildlife and livestock.

NRSM 236. Small Pasture Management. 1 Credit. (1 Lec) S
PREREQUISITE: ANSC 100, NRSM 101, NRSM 102 or permission of the instructor. Management of small acreages (<50 acres) to produce forage for horses and non-commercial livestock. Topics include determination of site productivity, plant and animal response to grazing, forage production, protection of water quality and controlling invasive plants. Field trips include operations with successful grazing programs and problem areas.

NRSM 240. Natural Resource Ecology. 3 Credits. (2 Lec, 1 Lab) F
3 cr. LEC 2 LAB 1 PREREQUISITE: NRSM 101. Focus on the role of physical and biotic processes on ecosystem function, including natural and managed ecosystems. Emphasis on rangelands, wildlife habitat, watersheds, and disturbed environments.

NRSM 290R. Undergraduate Research. 1-6 Credits. (1-6 Ind; max unlimited) F,S
Directed undergraduate research which may culminate in a written work or other creative project. Course will address responsible conduct of research. May be repeated.

NRSM 291. Special Topics. 1-3 Credits. (1 Lec; 12 cr max) S
On Demand PREREQUISITE: None required but some may be determined necessary by each offering department. Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

NRSM 292. Independent Study. 1-3 Credits. (1 Ind; 6 cr max) S
On Demand PREREQUISITE: Consent of instructor and approval of department head. Directed research and study on an individual basis.

NRSM 330. Fire Ecology and Mgmt. 3 Credits. (2 Lec, 1 Lab) F
PREREQUISITE: NRSM 101 or NRSM 240 or BIOE 370. This course covers the wildlife patterns that shape and define western rangeland and forest ecosystems. Discussions on the historical role of fire will provide the background for using prescribed fire to accomplish a broad range of habitat management goals.

NRSM 350. Vegetation of Western Wildlands. 3 Credits. (2 Lec, 1 Lab) S
PREREQUISITE: NRSM 240, BIOE 350, and either AGSC 454 or BIOE 455. COREQUISITE: NRSM 351. Identification of commonly occurring plants of western North American wildlands and rangelands. Important ecological and management relationships of the plants will be emphasized.

NRSM 351. Biomes of Western Wildlands. 2 Credits. (2 Lec) S
PREREQUISITE: NRSM 240. COREQUISITE: NRSM 350. Climatic, physical, and biological interactions of natural biomes. The structure of western North American wildland and rangeland biomes will be considered in detail.

NRSM 353. Grazing Ecology and Management. 3 Credits. (2 Lec, 1 Lab) S
PREREQUISITE: NRSM 101, NRSM 102, and NRSM 240. Ecological perspectives of livestock grazing in the major rangeland biomes of the western United States and southern Canada. Impacts on soils, individual plants, plant communities, livestock, wildlife, and hydrology will be reviewed in the scientific literature.

NRSM 421. Holistic Thought/Mgmt. 4 Credits. (4 Lec) S
4 cr. LEC 4 PREREQUISITE: Junior standing. Application of holism and systems thinking to natural and human resource management issues. Use of Holistic Management for decision-making, research, and policy formation. Use of real case studies involving BioRegions Program work in Greater Yellowstone, Japan, Mongolia, Nepal, or other locations.

NRSM 430. Natural Resource Law. 3 Credits. (3 Lec) S
PREREQUISITE: Junior standing, WRIT 201 or WRIT 221, or consent of instructor. Examines major natural resources laws, emphasizing the federal model. A modified case study approach is used to review legislation and related court cases governing natural resources, including water, minerals, timber, range, wildlife, recreation, and wilderness.

NRSM 453. Habitat Inventory and Analysis. 3 Credits. (2 Lec, 1 Lab) F
PREREQUISITE: NRSM 240 or BIOE 370, STAT 216 or BIOB 318, and Junior standing. Focus on collecting, analyzing, and interpreting measures of rangeland resources including plant, animal, soil, and watershed components. Emphasis on sampling objectives, field procedures, monitoring, and evaluation.

NRSM 455. Riparian Ecology & Management. 3 Credits. (2 Lec, 1 Lab) S
PREREQUISITE: ENSC 245 and NRSM 240 or ENSC 272 or ERTH 303 or BIOE 370. This course will provide an overview of one of the most ecologically diverse ecosystems in western North America. Students will have the opportunity to study the physical and biological processes which shape and maintain riparian ecosystems. A field laboratory will provide experience in biological and physical monitoring methodologies that are central to land management decisions.

NRSM 490R. Undergrad Research. 1-6 Credits. (1 Ind; 12 cr max) F,S,Su
Directed undergraduate research which may culminate in a research paper, journal article, or undergraduate thesis.

NRSM 491. Special Topics. 1-4 Credits. (1-4 Ind; 12 cr max) S
On Demand PREREQUISITE: Course prerequsetes as determined for each offering. Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

NRSM 492. Independent Study. 1-3 Credits. (1-3 Ind; 6 cr max) On Demand PREREQUISITE: Junior standing, consent of instructor and approval of department head. Directed research and study on an individual basis.

NRSM 494. Seminar. 1 Credit. (1 Sem; 6 cr max) On Demand PREREQUISITE: Junior standing and as determined for each offering. Topics offered at the upper division level which are not covered in regular courses. Students participate in preparing and presenting discussion material.

NUTR - Nutrition

NUTR 221CS. Basic Human Nutrition. 3 Credits. (3 Lec) F,S,Su
Basic concepts of human nutrition which include carbohydrates, lipids, proteins, vitamins, minerals, absorption, digestion, metabolism, and energy utilization as they relate to health and food consumption at different stages of the life cycle.

NUTR 226. Food Fundamentals. 3 Credits. (3 Lec) S
PREREQUISITE: NUTR 221CS. Principles of food composition, preparation, selection, food safety and storage with special reference to physical and chemical changes which occur during normal food handling. Includes an introduction to meal planning, sensory evaluation, and cultural food perspectives.

NUTR 227. Food Fundamentals Lab. 2 Credits. (2 Lab) S
PREREQUISITE OR COREQUISITE: NUTR 226 or equivalent course. Practical experiences which illustrate the principles of ingredient functionality, methods of preservation, preparation, food safety and sensory evaluation. Utilizes knowledge from NUTR 226.

NUTR 292. Independent Study. 1-3 Credits. (1 Ind; 6 cr max) F,S,Su
On Demand PREREQUISITE: Consent of instructor and approval of department head. Directed research and study on an individual basis.

NUTR 321. Nutrition in the Life Cycle. 3 Credits. (3 Lec) S
PREREQUISITE: NUTR 221CS. Nutritional needs and health concerns during the different stages of life: pregnancy, lactation, infancy, preschool years, middle childhood, adolescence, adulthood, and later maturity. Major service-learning project with agencies offering nutrition services.

NUTR 322. Food Service System Management. 3 Credits. (3 Lec) F
PREREQUISITE: NUTR 221CS. Topics in foodservice management, including purchasing, production, and service quality control.

NUTR 351. Nutrition and Society. 3 Credits. (3 Lec) F
PREREQUISITE: NUTR 221CS. Social and cultural, economic, policy, and environmental factors in the community influencing nutritional status, and public health, techniques to assess community nutritional needs, and methodology for designing, implementing, and evaluating community nutrition programs, policies, and practices. Major service-learning project completed for a person or organization.

NUTR 352. Pract: Quant Foods Prod & Mgmt. 3 Credits. (1 Lec, 2 Lab) S
PREREQUISITE: NUTR 221CS, NUTR 226, NUTR 227, and NUTR 322 or consent of instructor. Hands-on food lab experience in culinary purchasing, production, analysis, and presentation activities. Applied food safety and sanitation principles. Application of organizational management theories in culinary businesses.
NUTR 401. Nutrition Assessment/Counsel. 3 Credits. (3 Lec) S

NUTR 411. Nutrition for Sports/Exercise. 3 Credits. (3 Lec) F,S
PREREQUISITE: NUTR 221CS and KIN 221, or BIOH 211/211 and junior standing. Nutrition for physical activity, sport performance, health and fitness. Nutritional needs are discussed for endurance, strength, low-body weight, team sport athletes and other physically active people. Energy balance and weight management examined.

NUTR 421. Macronutrient Metabolism. 3 Credits. (3 Lec) F
PREREQUISITE: NUTR 221CS, BCH 380, BIOH 211. Digestion, absorption, and metabolism of macronutrients, metabolic pathways utilizing carbohydrates, fats, and proteins, and changes that occur in metabolism under different physiological conditions.

NUTR 422. Micronutrient Metabolism. 3 Credits. (3 Lec) S
PREREQUISITE: BCH 380, BIOH 211, NUTR 221CS. Digestion, absorption, and metabolism of micronutrients, metabolic roles of vitamins and minerals, and changes that occur in metabolism under different physiological conditions.

NUTR 425. Medical Nutrition Therapy I. 3 Credits. (3 Lec) F
PREREQUISITE: NUTR 221CS, NUTR 321, NUTR 401, BCH 380, and BIOH 211. COREQUISITE: NUTR 426 Examination of metabolic and physiological changes in selected conditions and implications for medical nutrition therapy. Extensive case studies utilized to facilitate critical thinking for appropriate nutritional care.

NUTR 426. Medical Nutrition Therapy II. 2 Credits. (2 Lec) F
PREREQUISITE: NUTR 221CS, NUTR 321, NUTR 401, BCH 380, and BIOH 211. COREQUISITE: NUTR 425 Application of principles of clinical nutrition. Further development of critical thinking skills and application of medical nutrition therapy concepts in the nutrition care process format.

NUTR 490R. Undergraduate Research. 1-6 Credits. (1 Ind; 12 cr max) F,S,Su
Directed undergraduate research/creative activity which may culminate in a research paper, journal article, or undergraduate thesis. Course will address responsible conduct of research. May be repeated.

NUTR 491. Special Topics. 1-4 Credits. (1-4 Lec; 12 cr max) F,S,Su
PREREQUISITE: Course prerequisites as determined for each offering. Courses are not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

NUTR 492. Independent Study. 1-3 Credits. (1-3 Ind; 6 cr max) F,S,Su
PREREQUISITE: Junior standing, consent of instructor, and approval of department head. Directed research and study on an individual basis.

NUTR 494. Seminar. 1 Credit. (1 Sem; 4 cr max) F
PREREQUISITE: Senior standing. Preparation of an application for a dietician internship or graduate program. Emphasizes resume and portfolio development, ethics, professionalism, and interviewing.

NUTR 498. Internship. 2-12 Credits. (2 Ind) On Demand PREREQUISITE: Consent of internship director in academic area. An individualized professional assignment arranged for specific discipline. Some academic areas will offer specific sections in sequence for their students. All students must receive department permission prior to registration, and register for a senior seminar in their major area.

NUTR 499. Capstone for Dietetics. 1 Credit. (1 Sem) S
PREREQUISITE: NUTR 425 and NUTR 462. Emphasizes the use of evidence based research, professional communication skills, effective counseling and behavior change techniques in the application for the Nutrition Care Process to a wellness setting and a variety of community based settings.

NUTR 511. Exercise Metabolism and Health. 3 Credits. (3 Lec) S alternate years to be offered even years PREREQUISITE: Knowledge in areas of anatomy and physiology, upper division courses in one or combination of: exercise physiology, biochemistry, or nutrition. This course examines how cellular demands influence the need for carbohydrates, amino acids, lipids, vitamins, and minerals, how the availability of these nutrients influences adaptations, and the influence of these adaptations on exercise performance and disease risk.

NUTR 526. Nutrition for Fitness/Perform. 3 Credits. (3 Lec) F
PREREQUISITE: NUTR 221CS, BIOH 211, CHMY 121, BCH 380. Examine energy metabolism and physical activity. Use nutrition strategies to meet the energy power output, and nutrient demands of exercise, and athletic performance. Examine behavioral relationships that affect fitness and health, including disordered eating and the female athlete triad, evaluation of nutrition information and dietary supplements, with extensive use of internet resources.

NUTR 575. Research/Prof Paper/Project. 1-3 Credits. (1-3 Ind; 6 cr max) F,S,Su
PREREQUISITE: Graduate standing. A research or professional paper or project dealing with a topic in the field. The topic must have been mutually agreed upon by the student and his or her major advisor and graduate committee.

NUTR 588. Professional Development. 1-3 Credits. (1-3 Lec; 3 cr max) On Demand PREREQUISITE: Graduate standing, teaching experience and/or current employment in a school organization, and consent of instructor. Courses offered on a one-time basis to fulfill professional development needs of in-service educators. A specific focus is given to each course which is appropriately subtitled.

NUTR 589. Graduate Consultation. 1-3 Credits. (1-3 Ind; 3 cr max) F,S,Su
PREREQUISITE: Graduate standing in nutrition major. This course may be used only by students who have completed all of their course work (and thesis if on a thesis plan) but who need additional faculty or staff time or help.

NUTR 590. Master's Thesis. 1-10 Credits. (1-10 Ind; max unlimited) F,S,Su
PREREQUISITE: Master's standing, Directed graduate research/creative activity.

NUTR 591. Special Topics. 1-4 Credits. (1-4 Lec; 12 cr max) On Demand PREREQUISITE: Upper division courses and others as determined for each offering. Courses not offered in any curriculum for which there is a particular one time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

NUTR 592. Independent Study. 1-3 Credits. (1-3 Ind; 6 cr max) F,S,Su
PREREQUISITE: Graduate standing, consent of instructor, approval of department head and Dean of The Graduate School. Directed research and study on an individual basis.

NUTR 594. Seminar. 1 Credit. (1 Sem; 4 cr max) F
PREREQUISITE: Graduate standing or seniors by petition. Course prerequisites as determined for each offering. Topics offered at the graduate level that are not covered in regular courses. Students participate in preparing and presenting discussion material.

NUTR 598. Internship. 2-12 Credits. (2-12 Ind; 12 cr max) F,S,Su
PREREQUISITE: Graduate standing, consent of instructor. Individualized supervised practice assignments arranged with agencies, businesses or other organizations to provide guided experience in the field.

PHL - Philosophy

PHL 101H. Intro Phil:Reason and Reality. 3 Credits. (3 Lec) F,S Exploration of the nature of reality and human knowledge. A critical look at the presuppositions of our common sense world view.

PHL 103D. Philosophy and Popular Culture. 3 Credits. (2 Lec) S alternate odd years Introduces philosophy to students through popular culture. Basic philosophical concepts, methods, and theories will be learned through discussion of technology, video games, films, television, therapy, sports, race, gender, alternative sexuality and drug use.

PHL 110H. Intro Ethics/Good and Evil. 3 Credits. (3 Lec) F,S,Su An examination of traditional and contemporary conceptions of good and evil.

PHL 205CS. Other Animals. 3 Credits. (3 Lec)
Explores how animals have been understood over time from scientific, philosophical, and cultural perspectives. The various methodologies employed, their underlying assumptions and possible limits, will be discussed, as well as the larger moral issues that they raise.

PHL 212BH. Morality and Society. 3 Credits. (3 Lec) S
PREREQUISITE: Consent of instructor. The philosophical study of contemporary moral issues such as capital punishment, euthanasia, racism, and terrorism. The term will culminate in a substantial piece of original research on a moral issue chosen by the individual student.

PHL 236Q. Logic. 3 Credits. (3 Lec) F
PREREQUISITE: Q core or Level 4 math placement. Modern forms of valid inference with applications.
PHL 242CS. Science/Philosophy & Subjectivity. 3 Credits. (3 Lec)
-- Introduces both deductive and inductive aspects of scientific reasoning as a foundation for addressing broader questions such as, "Is there demarcation between science and non-science?"; "Is science subjective?"; Is scientific knowledge cumulative?; and many more.

PHL 255D. Philosophy and Culture. 3 Credits. (3 Lec) S
PREREQUISITE: Consent of instructor. Addresses questions of how philosophy and culture interact, as well as exploring the differences and commonalities between philosophical traditions. Themes may include social justice, identities, society, and culture.

PHL 270. Philosophies of Asia. 3 Credits. (3 Lec) S
A critical examination of some classical schools of Indian and Asian philosophy such as Confucianism, Hinduism, or Buddhism.

PHL 278CS. Origins of Life. 3 Credits. (3 Lec) F
Examination of philosophical theories regarding the nature of life and the methods for scientific discovery of its origin. What are the defining characteristics of life? How would we look for life on other planets? Is artificial life possible?

PHL 291. Special Topics. 1-4 Credits. (1-4 Lec; 12 cr max)
Max 12 cr. PREREQUISITE: None required but some may be determined necessary by each offering department. Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

PHL 303. Approaches to Epistemology. 3 Credits. (3 Lec)
PREREQUISITE: Two previous courses in Philosophy or consent of instructor. The course gives an introduction to some epistemological problems like the problem of skepticism, the problem concerning the nature of justification, the problem of induction, and the problem associated with the nature and existence of God.

PHL 304. Metaphysics. 3 Credits. (3 Lec) S, even years
PREREQUISITE: PHL. 101IH or PHL. 110IH, and PHL. 263Q. The most basic questions human beings rise in reflecting on their world, themselves and their place in the world. Sample questions concern the possibility of freedom, the relation of mind and brain, and the nature of being.

PHL 305. Contemporary Philosophy. 3 Credits. (3 Lec)
PREREQUISITE: Previous course in Philosophy or consent of instructor. This course introduces students to recent trends in analytical philosophy. Among the topics the course addresses are philosophy of mind that involves problems concerning the mind/body relationship, the nature of consciousness, artificial intelligence, and others. 

PHL 308. Language and the World. 3 Credits. (3 Lec)
PREREQUISITE: PHL. 101IH or PHL. 110IH, and PHL. 263Q. A discussion of linguistic meaning, the concept of truth, and the relation between thought and language as viewed by contemporary philosophers.

PHL 310. Moral Theory. 3 Credits. (3 Lec)
PREREQUISITE: Previous course in Philosophy or consent of instructor. An examination of moral theory. The focus is on such issues as whether morality is objective or subjective as well as methods of moral reasoning.

PHL 312. Contemporary Moral Problems. 3 Credits. (3 Lec)
PREREQUISITE: Previous course in Philosophy or consent of instructor. An examination of general moral theory with applications to moral problems of current interest such as abortion, the legal enforcement of morality, the death penalty, and nuclear war.

PHL 321. Philosophy & Biomedical Ethics. 3 Credits. (3 Lec)
PREREQUISITE: Previous course in Philosophy or consent of instructor. An examination of moral problems in medicine such as abortion, euthanasia, human experimentation, and the distribution of scarce medical resources.

PHL 322. Philosophy & Environmental Ethics. 3 Credits. (3 Lec)
PREREQUISITE: Previous course in Philosophy or consent of instructor. This course reviews the major readings, both classical and contemporary, on environmental ethics, and isolates the major issues. It provides the appropriate theoretical background. It applies these readings and this background to the investigation and resolution of several environmental policy questions.

PHL 327. Aesthetics and the Arts. 3 Credits. (3 Lec)
PREREQUISITE: Previous course in Philosophy or consent of instructor. Philosophical examination of the nature and function of the arts and the aesthetic experience.

PHL 328. Philosophy and Film. 3 Credits. (3 Lec) On Demand
PREREQUISITE: Previous course in Philosophy or permission of instructor. Philosophical study of the moving image. Examines topics such as ontology of the image, theory of cinematic narrative, problem of realism versus illusion in film, its aesthetic, moral, and cultural value; and what constitutes appropriate interpretative activity in judging film.

PHL 345. Philosophy of Science. 3 Credits. (3 Lec) F alternate years, to be offered even years.
PREREQUISITE: Previous course in Philosophy or consent of instructor. An examination of the concepts of explanation, confirmation, and theory and their application to classic works in the history of the natural and social sciences.

PHL 350RH. State, Community & Individual. 3 Credits. (3 Lec)
PREREQUISITE: One course in Philosophy or consent of instructor. The philosophical study of the state and society. Topics include the nature and limits of political legitimacy and the nature of just economic systems.

PHL 351. Philosophy and Feminism. 3 Credits. (3 Lec) S alternate years, to be offered odd years.
Philosophical analysis of concepts and assumptions central to feminist theories. Topics may include the nature of gender and oppression, masculinity, the relationship between sexism and other forms of oppression, the ideal society, and feminist challenges to traditional philosophical theories.

PHL 353. Philosophy and Technology. 3 Credits. (3 Lec)
PREREQUISITE: Previous course in Philosophy or consent of instructor. An examination of certain concepts used to describe and explain technology and their application to questions concerning the limitations of a technological way of life.

PHL 354. Philosophy of Race. 3 Credits. (3 Lec) F alternate years, to be offered even years.
PREREQUISITE: Previous course in Philosophy or consent of instructor. Examines the development of the concept of race in philosophy since the 17th century. Traces the effects race has had on concepts such as the person, self-respect, rationality, knowledge, state of nature, science, social justice, and ordinary life.

PHL 361RH. Hist of Philo:Antique/Medieval. 3 Credits. (3 Lec) F
PREREQUISITE: Previous course in Philosophy or consent of instructor. Great systems of philosophic thought and their originators during ancient and medieval times.

PHL 362. History of Philosophy: Modern. 3 Credits. (3 Lec) S
Great systems of philosophic thought, Descartes to Kant.

PHL 365. Phil. Mind and Consciousness. 3 Credits. (3 Lec) S alternate years, to be offered odd years.
PREREQUISITE: Previous course in Philosophy or consent of instructor. In this course we will examine different philosophical theories regarding the workings of the mind and the nature of consciousness. Are you the same thing as your mind? What is thought? Is conscious experience explainable by the physical sciences?

PHL 370. Philosophy of Religion. 3 Credits. (3 Lec)
PREREQUISITE: Previous course in Philosophy or consent of instructor. Analysis of concepts of revealed truth, God, and immortality; the nature of religious emotion and experience, and of religious language; relation of faith to reason; traditional proofs of God's existence; the problem of evil; religious diversity, spirituality.

PHL 383. Reason and Revolution. 3 Credits. (3 Lec)
PREREQUISITE: Previous course in Philosophy or consent of instructor. An examination of the scope and limits of reason and their role in revolution as exemplified by leading nineteenth century philosophers.

PHL 385. Existentialism and After. 3 Credits. (3 Lec)
PREREQUISITE: Previous course in Philosophy or consent of instructor. Existentialism and related developments such as phenomenology and post modernism.

PHL 490R. Undergraduate Research. 1-6 Credits. (1 Ind; 12 cr max) F,S,Su
Max 12 cr. Directed undergraduate research which may culminate in a research paper, journal article, or undergraduate thesis. Course will address responsible conduct of research. May be repeated.

PHL 491. Special Topics. 1-4 Credits. (1-4 Lec; 12 cr max) On Demand
Max 12 cr. PREREQUISITE: Course prerequisites as determined for each offering. Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

PHL 492. Independent Study. 1-3 Credits. (1-3 Ind; 6 cr max) On Demand
Max 6 cr. PREREQUISITE: Consent of instructor and approval of department head. Directed research and study on an individual basis.
PHOT 494. Seminar. 3 Credits. (Sem; 9 cr max) F,S
Max 9 cr. PREREQUISITE: Junior standing. Senior capstone course. Each semester is given over to the detailed study of a major figure or problem in philosophy. Since the figures and problems studied vary from semester to semester, the course may be repeated for credit. Two semesters of PHL 400 are required for all philosophy majors.

PHOT 498. Internship. 1-12 Credits. (2-12 Ind; 12 cr max) On Demand
PREREQUISITE: Junior standing, consent of instructor, and approval of department head. An individualized assignment arranged with an agency, business, or other organization to provide guided experience in the field.

PHL 591. Special Topics. 1-4 Credits. (1-4 Lec; 4 cr max)
On demand Prerequisite: Course prerequisites as determined for each offering. Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

PHL 592. Independent Study. 1-3 Credits. (1-3 Ind; 6 cr max) On Demand
Max 6 cr. PREREQUISITE: Graduate standing, consent of instructor, approval of department head, and Division of Education. Directed research and study on an individual basis.

PHL 594. Seminar. 3 Credits. (Sem; 9 cr max) On Demand
Max 4 cr. PREREQUISITE: Graduate standing or seniors by petition. Course prerequisites as determined for each offering. Topics offered at the graduate level which are not covered in regular courses. Students participate in preparing and presenting discussion material.

PHOT - Photography

PHOT 113RA. Understanding Photography. 3 Credits. (2 Lec, 1 Lab) F,S,Su
An introduction to traditional black and white photographic practice, theory and visual principles, including camera operation, use of B&W darkroom technique. Photography majors must take this class fall semester to fit into the sequential nature of the Photography program. A 35mm film camera is required for this class. School of Film and Photography.

PHOT 154AI. Exploring Digital Photography. 3 Credits. (1 Lec) F,S,Su
(non-majors only) Introduces technical and aesthetic ways of creating digital photographic images. Emphasis is on the production of photographic images, from acquiring them with digital cameras to manipulating them using computer software for manipulating digital images. Instructor and peer critique of student work is an integral part of the course.

PHOT 213. Intermediate Photography. 3 Credits. (2 Lec, 1 Lab) S
PREREQUISITE: B or better in PHOT 113RA and registration as a Photography major. Theory and continued application of image control in B&W photography, through the use of a variety of 35mm and medium format films and the introduction of basic zone system principles. Advanced traditional B&W printing techniques in preparation for portfolio review. A 35 mm film camera is required for this class. School of Film and Photography.

PHOT 255. Intro to Color Photography. 4 Credits. (2 Lec, 2 Lab) S
PREREQUISITE: PHOT 213 and Photography portfolio review. Introduction and analysis of color theory, color imagery and color materials. Exploration of image capture via film, scanning and digital cameras. Technical skills are developed in digital systems, applications and printing along with critical exploration of color visual language and aesthetic issues. School of Film and Photography.

PHOT 258. View Camera. 4 Credits. (2 Lec, 2 Lab) F
PREREQUISITE: PHOT 213 and Photography portfolio review. Introduction to view camera theory and practice. Basic studio and lighting techniques will be addressed as well as advanced contrast control through application of the zone system, large format black and white photography, digital view camera, and large format digital and analog printing techniques. School of Film and Photography.

PHOT 290R. Undergraduate Research. 1-6 Credits. (1-6 Ind; 12 cr max) F,S
Directed undergraduate research which may culminate in a written work or other creative project, course will address responsible conduct of research. School of Film and Photography.

PHOT 291. Special Topics. 1-4 Credits. (1 Lec; 12 cr max) On Demand
1 - 4 cr. Maximum 12 cr. PREREQUISITE: None required but some may be determined necessary by each offering department. Courses not required in curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

PHOT 295. Practicum. 1-3 Credits.

PHOT 303. Early History of Photography. 3 Credits. (3 Lec) S
alternate even years PREREQUISITE: WRIT 101W. The visual and technical evolution of photography within the cultural context. Personalities, ideas, and style of individual photographers are explored. Prehistory to 1913.

PHOT 304. Recent History of Photography. 3 Credits. (3 Lec) S
alternate odd years PREREQUISITE: WRIT 101W. Continued exploration of the visual and technical evolution of photography from 1913 to the present, including study of criticism and the relationship to contemporary culture and art.

PHOT 331. Prof Practices in Photography. 4 Credits. (2 Lec) On Demand
PREREQUISITE: PHOT 255 and PHOT 258. Introduction to professional practices in photography. Emphasis on the fundamentals of business and marketing. Class is strongly recommended for those who plan on entering the photographic profession.

PHOT 350. Advanced Color Photography. 4 Credits. (2 Lec, 2 Lab) On Demand
PREREQUISITE: PHOT 255 and PHOT 258. Further applied study of color visual theory and the control of materials for color photographic expression. Emphasis on individual aesthetic practices through handmade photography books.

PHOT 352. Advanced Lighting Practices. 4 Credits. (2 Lec, 2 Lab) On Demand
PREREQUISITE: PHOT 255 and PHOT 258. Advanced photographic theory and practice in studio and on location. Emphasis given to creative aspects of artificial lighting and staged subject matter in all camera formats.

PHOT 359. Alternative Photographic Techniques. 4 Credits. (2 Lec, 2 Lab) On Demand
PREREQUISITE: PHOT 255 and PHOT 258. Image creation through the use of historical contact printing processes. A variety of alternative processes will be addressed such as gum printing, cyanotype, and platinum/palladium. Extensive aesthetic exploration will be supported through a blend of the old processes and current digital negative making techniques.

PHOT 371. Portraiture. 4 Credits. (2 Lec, 2 Lab) On Demand
PREREQUISITE: PHOT 255 and PHOT 258. Advanced portrait techniques, theory, and practice in studio and on location. Emphasis on creative exploration and application of a variety of styles in portraiture, such as informal, editorial, environmental, etc.

PHOT 373. Non-Fiction Photography. 4 Credits. (2 Lec) F
PREREQUISITE: PHOT 255 and PHOT 258. The applied study of image, text and design to effectively communicate an intended message. The topic of truth in photography will be explored.

PHOT 374. Experimental Photography. 4 Credits. (2 Lec, 2 Lab) On Demand
PREREQUISITE: PHOT 255 and PHOT 258. The applied study of experimental photographic techniques. These techniques will be explored in image capture as well as traditional darkroom working methods.

PHOT 395. Practicum. 1-3 Credits. (1-3 Ind; 12 cr max) F,S,Su
Max 12 cr. total for both PHOT 395 & FILM 395 combined. PREREQUISITE: PHOT 255 and PHOT 258. Practical experience associated with research projects in photography.

PHOT 401. Contemp Issues in Photography. 3 Credits. (3 Lec) F
PREREQUISITE: PHOT 303 or PHOT 304. The critical exploration of photography as cultural phenomenon, personal expression and art form. Emphasis on aesthetic, ethical, and political issues raised through application of the medium and consumption of its products.

PHOT 490R. Undergrad Research. 1-6 Credits. (1-6 Ind; 12 cr max) On Demand
Max 12 cr. PREREQUISITE: Senior standing in photography. Directed undergraduate research which may culminate in a research paper, journal article, or undergraduate thesis. Course will address responsible conduct of research. May be repeated.

PHOT 491. Special Topics. 1-4 Credits. (1 Lec; 12 cr max) On Demand
1 - 4 cr. Maximum 12 cr. PREREQUISITE: Consent of Instructor. Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

PHOT 492. Independent Study. 1-3 Credits. (1 Ind; 6 cr max) On Demand
1 - 3 cr. IND. May be repeated. Maximum 6 cr. total for FILM, PHOT & THTR 492 combined. PREREQUISITE: PHOT 255 and PHOT 258, consent of instructor and approval of school director. Directed research and study on an individual basis.

PHL 593. Seminar. 3 Credits. (Sem; 9 cr max) F,S
Max 9 cr. PREREQUISITE: Junior standing. Senior capstone course. Each semester is given over to the detailed study of a major figure or problem in philosophy. Since the figures and problems studied varied from semester to semester, the course may be repeated for credit. Two semesters of PHL 400 are required for all philosophy majors.

PHL 594. Internship. 1-12 Credits. (2-12 Ind; 12 cr max) On Demand
PREREQUISITE: Junior standing, consent of instructor, and approval of department head. An individualized assignment arranged with an agency, business, or other organization to provide guided experience in the field.

PHL 591. Special Topics. 1-4 Credits. (1-4 Lec; 4 cr max)
On demand Prerequisite: Course prerequisites as determined for each offering. Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

PHL 592. Independent Study. 1-3 Credits. (1 Ind; 6 cr max) On Demand
Max 6 cr. PREREQUISITE: Graduate standing, consent of instructor, approval of department head, and Division of Education. Directed research and study on an individual basis.

PHL 594. Seminar. 3 Credits. (Sem; 9 cr max) On Demand
Max 4 cr. PREREQUISITE: Graduate standing or seniors by petition. Course prerequisites as determined for each offering. Topics offered at the graduate level which are not covered in regular courses. Students participate in preparing and presenting discussion material.
PHOT 494. Seminar/Workshop. 1-4 Credits. (1-4 Sem; 12 cr max) PREREQUISITE: PHOT 253 and PHOT 258 or consent of instructor. Topics offered at the upper division level that are not covered in regular courses. Students participate in preparing and presenting discussion material.

PHOT 498. Career Internship. 2-12 Credits. (2-12 Ind; 12 cr max) PREREQUISITE: Consent of School Director. An individualized assignment arranged with an agency, business, or other organization to provide guided experience in the field.

PHOT 499. Sr Production Photography. 5 Credits. (5 Sem; 10 cr max) F,S,Su PREREQUISITE: Senior standing in the Photography option and consent of the instructor. Senior capstone course. Independent production of a significant body of work in photography; extensive production combined with group critique and faculty consultation.

PHSX - Physics

PHSX 101. Freshman Physics Experience. 1 Credit. (1 Lec) F,S,Su An introduction to frontier areas of physics, including the “Standard Model” of elementary particle physics, quantum mechanics, and big-bang cosmology. Students explore these topics using order-of-magnitude estimates, dimensional analysis, and simple observations. Intended for physics majors or those considering a major or minor in physics.

PHSX 103IN. The Physics of How Things Work. 3 Credits. (3 Lec) F,S Su PREREQUISITE: High School Algebra. A practical approach to a broad array of fundamental topics in physics for non-science majors taught by analyzing things that are used and observed in everyday life. Classroom demonstrations will provide the opportunity for in-class analysis, discussions, and hands-on activities. Physics principals will be used to scrutinize issues such as energy and recycling from economic and environmental perspectives. The latest technology in transportation, electronics, and energy production will be analyzed. The connection between basic research in physics and modern technology will be examined. Students will not receive credit if they have passed PHSX 205, PHSX 220, or PHSX 240.

PHSX 200. Research Programs in Physics. 1 Credit. (1 Lec) F,S,Su An introduction to some of the exciting ideas, developments, problems, and experiments of modern day physics.

PHSX 201IN. Physics by Inquiry. 3 Credits. (3 Lab) F,S,S Su PREREQUISITE: High school trigonometry or M 151Q. First semester of sequence. Topics include kinematics and dynamics of linear and rotational motion; work and energy; impulse and momentum; and fluids. Students will not receive credit if they have passed PHSX 202 or PHSX 221.

PHSX 207. College Physics II. 4 Credits. (3 Lec, 1 Lab) F,S,S Su PREREQUISITE: PHSX 205 or PHSX 220. Second semester of sequence. Topics include simple harmonic motion; electric forces and fields; electric circuits; magnetic forces and fields; and magnetic induction and motors. Students will not receive credit if they have passed PHSX 222 or PHSX 242.

PHSX 220. Physics I (w/ calculus). 4 Credits. (3 Lec, 1 Lab) F,S,Su COREQUISITE: M 171Q or M 181Q. First semester of a three-semester sequence primarily for engineering and physical science students. Covers topics in mechanics (such as motion, Newton’s laws, conservation laws, work, energy, systems of particles, and rotational motion) and in mechanical waves (such as oscillations, wave motion, sound, and superposition).

PHSX 222. Physics II (w/ calculus). 4 Credits. (3 Lec, 1 Lab) F,S Su PREREQUISITE: PHSX 220 or PHSX 224; M 171Q or M 181Q. COREQUISITE: M 172Q or M 182Q. Covers topics in electricity and magnetism (such as Coulomb’s law, Gauss’ law, electric fields, electric potential, dc circuits, magnetic fields, Faraday’s law, ac circuits, and Maxwell’s equations) and optics (such as light, geometrical optics, and physical optics).

PHSX 224. Physics III. 4 Credits. (3 Lec, 1 Lab) F PREREQUISITE: PHSX 222 or PHSX 242; M 172Q or M 182Q. Covers topics in thermodynamics (such as temperature, heat, laws of thermodynamics, and the kinetic theory of gases) and modern physics (such as relativity; models of the atom; quantum mechanics; and atomic, molecular, solid state, nuclear, and particle physics).

PHSX 240. Honors Gen & Mod Phys I. 4 Credits. (3 Lec, 1 Lab) S COREQUISITE: M 171Q or M 181Q. The honors section of PHSX 220. The concepts are discussed in more depth and the range of applications is greater.

PHSX 242. Honors Gen & Mod Phys II. 4 Credits. (3 Lec, 1 Lab) F PREREQUISITE: PHSX 220 or PHSX 224; M 171Q or M 181Q. COREQUISITE: M 172Q or M 182Q. The honors section of PHSX 222. The concepts are discussed in more depth and the range of applications is greater.

PHSX 253. Physics of Photography. 2 Credits. (2 Lec) F PREREQUISITE: High school algebra. Improvement of photographic skills through an understanding of the basic principles of photography. The nature of light and color and the physical principles involved in the operation of a camera will be presented. Unusual effects and recent developments will be discussed. Numerous demonstrations, photographs, and slides will be used to illustrate the principles.

PHSX 261. Laboratory Electronics I. 3 Credits. (1 Lec, 1 Lab) F COREQUISITES: PHSX 222 or PHHSX 242. Laboratory electronic measurements and analysis, and design of basic linear circuits.

PHSX 262. Laboratory Electronics II. 2 Credits. (1 Lec, 1 Lab) S PREREQUISITE: PHSX 261. Analysis and design of basic digital circuits and advanced laboratory electronic measurements.

PHSX 290R. Undergraduate Research. 1-8 Credits. (1 Ind; 8 cr max) F,S,Su PREREQUISITE: Consent of instructor and approval of department head. Directed undergraduate research. Course will address responsible conduct of research.

PHSX 291. Special Topics. 1-4 Credits. (1 Lec; 12 cr max) F,S,Su On Demand Max 12 cr. PREREQUISITE: None required but some may be determined necessary by each offering department. Courses not required in any curriculum for which there is a particular one time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

PHSX 292. Independent Study. 1-3 Credits. (1 Ind; 6 cr max) F,S Su On Demand Max 6 cr. PREREQUISITE: Consent of instructor and approval of department head. Directed study on an individual basis.

PHSX 301. Intro Theoretical Physics. 3 Credits. (3 Lec) F,S,Su COREQUISITE: M 273Q or M 283Q. PHSX 222 or PHSX 242. COREQUISITE: M 274 or M 284. Mathematical methods essential to the practice of theoretical physics, such as matrices, vector calculus, differential equations, complex variables, and Fourier series, with applications to examples from mechanics and electromagnetism.

PHSX 305RN. Art & Science of Holography. 3 Credits. (2 Lec, 1 Lab) S PREREQUISITE: Junior standing. M 151Q or equivalent M Placement Test. Beginner’s course on creating holograms. Pictorial and geometric interpretations of lasers, interference, coherence, film, and holography enable students with limited science and M backgrounds to create their own holographic masterpieces. Lab techniques and documenting the creative process are emphasized.


PHSX 331. Meth of Computational Physics. 1 Credit. (1 Lec) F,S,Su PREREQUISITE: PHSX 301. Introduction to the use of computational methods in physics. Emphasis will be placed on common methods of casting problems into forms amenable to numerical solution and for displaying numerical results.

PHSX 341. Special Relativity. 1 Credit. (1 Lec) S On alternate years to be offered odd years, 2011 for last time) PREREQUISITE: PHSX 220 or PHSX 224. Einstein’s theory of special relativity is presented from the modern viewpoint, with emphasis on the geometry of space time.

PHSX 343. Modern Physics. 3 Credits. (3 Lec) F,S,Su PREREQUISITE: PHSX 224, PHSX 301, and M 284 or M 274. Waves in classical physics and quantum mechanics: complex representation, amplitude mechanics, and interference; Special relativity: postulates, Lorentz transformations, applications in nuclear and particle physics; Quantum mechanics: interpretation of key experiments, Schrodinger equation, particles in potentials, spin, the atom; Introduction to nuclear and particle physics.

PHSX 401. Physics by Inquiry I. 3 Credits. (3 Lec) S PREREQUISITE: Teacher Certification. An in-depth and hands-on exploration of basic physics principles. Scientific model building and proportional reasoning skills will be developed in the context of dc circuits, one and two dimensional kinematics, and dynamics. For middle school and high school science teachers.

PHSX 402. Physics by Inquiry II. 3 Credits. (3 Lec) S PREREQUISITE: PHSX 401. An in-depth and hands-on exploration of basic physics principles. Scientific model building and proportional reasoning skills will be developed in the context of light, color, geometrical optics, heat, and temperature. For middle school and high school teachers.
PHSX 403. Physics by Inquiry III. 3 Credits. (3 Lab) Su
PREREQUISITE: Science Teacher Certification. COREQUISITE: PHSX 401. PHSX 403 is a continuation of the PHSX 401 experience, but it may also be taken concurrently with PHSX 401. The course will begin with a careful investigation of geometrical optics, leading to an understanding of pinhole cameras, lenses, and prisms. This will be followed by an exploration of magnetic interactions and magnetic materials.

PHSX 405. Special Relativity Online. 3 Credits. (3 Rct) On Demand. PREREQUISITE: PHSX 222, M 172Q or M 182Q, Bachelor's degree, and one year teaching experience. This online course addresses the question: What do vertical rods look like when moving? Directed undergraduate research/creative activity, which may culminate in a research paper, journal article, or undergraduate thesis. Course will address responsible conduct of research. May be repeated.

PHSX 491. Special Topics. 1-4 Credits. (1-4 Sem; 1 cr max) On Demand Max 12 cr. PREREQUISITE: Course prerequisites as determined for each offering. Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

PHSX 492. Independent Study. 1-3 Credits. (1 Ind; 6 cr max) On Demand Max 6 cr. PREREQUISITE: Junior standing, consent of instructor and approval of department head. Directed study on an individual basis.

PHSX 494. Seminar/Workshop. 1 Credit. (1 Sem; 4 cr max) On Demand Max 4 cr. PREREQUISITE: Junior standing and as determined for each offering. Topics offered at the upper division level which are not covered in regular courses. Students participate in preparing and presenting discussion material.

PHSX 499. Senior Capstone Seminar. 1 Credit. (1 Sem) S PREREQUISITE: Senior standing, completion of a senior project, and 2 credits of PHSX 490R. Senior capstone course. Participation in this course requires the completion of a senior project that integrates the student's knowledge and skills acquired during the undergraduate curriculum. Students will be required to complete: i.) an APS-style abstract, ii.) an APS-style 10-minute oral presentation, iii.) a poster session, and iv.) a written research report, based on their research/creative activity.

PHSX 512. General Relativity Online. 3 Credits. (3 Lec) S PREREQUISITE: PHSX 506. Time-independent and time-dependent perturbations. Topics offered at the upper division level which are not covered in regular courses. Senior capstone course. Participation in this course requires the completion of a senior project that integrates the student's knowledge and skills acquired during the undergraduate curriculum. Students will be required to complete: i.) an APS-style abstract, ii.) an APS-style 10-minute oral presentation, iii.) a poster session, and iv.) a written research report, based on their research/creative activity.

Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.


PHSX 511. Astronomy for Teachers. 3 Credits. (3 Rct) F,S,Su PREREQUISITE: PHSX 207 or PHSX 222 or PHSX 242; Graduate standing; Currently certified middle and high school teachers with one year of teaching experience. This is an online, distance education course primarily intended for science educators. Topics include: the laws of gravity and orbital dynamics, a survey of the solar system, stars and stellar evolution, galaxies, and Big Bang cosmology.

PHSX 512. General Relativity Online. 3 Credits. (3 Lec) S PREREQUISITE: PHSX 222 or PHSX 242; M 182Q; PHSX 405; Bachelor's degree and one year teaching experience. This online course addresses the theory of general relativity, which underlies our understanding of gravity and the large-scale structure of the cosmos. Designed for practicing high school physics teachers. Assignments and discussions use electronic computer conferencing and simulation software.

PHSX 513. Quantum Mechanics Online. 3 Credits. (3 Sem) S PREREQUISITE: Graduate standing; Currently certified high school teachers with one year of teaching experience; an introductory physics course; and a working knowledge of elementary differential and integral calculus. This online course addresses the key ideas behind quantum mechanical observations and devices, including the fundamental behavior of electrons and photons. Designed for practicing high school physics teachers. Assignments and discussions use electronic computer conferencing and simulation software.
PHSX 514. Comparative Planetology Online. 3 Credits. (3 Lec) S
PREREQUISITE: Bachelor's degree, professional teaching certificate, and at least one year of K-12 teaching experience. Because the use of technology is integral to the course, some familiarity with using technology in the classroom is required. Establishing a Virtual Presence in the Solar System has been developed and tested as an Internet-delivered course for off-campus students. Its audience consists of practicing elementary and secondary teachers who have experience in teaching general science but have little, if any, formal course work in astronomy. Its goal is to help graduate-level teachers learn solar system astronomy concepts to integrate the new National Science Education Standards and NASA resources into existing instructional strategies. Course participants learn advanced solar system concepts, utilize WWW-resources, communicate with research scientists using the Internet, analyze digital images using image processing software, and organize materials for use in K-12 classroom environments.

PHSX 515. Advanced Topics In Physics. 3 Credits. (3 Lec; 6 cr max) On Demand Max 6 cr. PREREQUISITE: Graduate standing. Topics in astrophysics, condensed matter physics, optics, mathematical physics, or particle physics are presented as needed to supplement the curriculum.

PHSX 516. Experimental Physics. 3 Credits. (3 Lec; 6 cr max) F,S Max 6 cr. PREREQUISITE: (PHSX 261, PHSX 423, and PHSX 461) or graduate standing. Experiments chosen from laser optics and atomic, solid-state, and nuclear physics are carried out in depth to introduce the graduate student to methods, instrumentation, and data acquisition techniques useful for experimental thesis projects.

PHSX 519. Electromagnetic Theory I. 3 Credits. (3 Lec) S
PREREQUISITE: PHSX 425 or graduate standing. Electro- and magnetostatics, conservation laws and covariance of Maxwell's equations, and dynamics of relativistic particles and fields.

PHSX 520. Electromagnetic Theory II. 3 Credits. (3 Lec) F

PHSX 523. General Relativity I. 3 Credits. (3 Lec) F alternate years, to be offered every even year.
PREREQUISITE: PHSX 519. Tensor calculus, differential geometry, and an introduction to Einstein's theory of gravity. The Schwarzschild solution and black hole physics.

PHSX 524. General Relativity II. 3 Credits. (3 Lec) S alternate years, to be offered odd years.
PREREQUISITE: PHSX 523. Advanced topics in gravitation theory such as singularities, cosmological models, and gravitational waves.

PHSX 525. Current Topics in General Relativity. 3 Credits. (3 Lec) S
PREREQUISITE: PHSX 523. Current topics in general relativity will be explored.

PHSX 531. Nonlinear Optics/Laser Spectroscopy. 3 Credits. (3 Lec) F alternate years, to be offered odd years.
PREREQUISITE: PHSX 507. Two-level atoms in laser fields and applications to nonlinear optics such as photon echoes, second harmonic generation, and stimulated Raman scattering. Atomic and molecular energy level structure, linear and nonlinear spectroscopy, and applications to gaseous and solid state laser materials.

PHSX 535. Statistical Mechanics. 3 Credits. (3 Lec) S
PREREQUISITE: PHSX 446 or graduate standing. Basic concepts of equilibrium statistical mechanics, with application to classical and quantum systems, will be presented as well as theories of phase transitions in fluid, magnetic, and other systems.

PHSX 544. Condensed Matter Physics I. 3 Credits. (3 Lec) F alternate years, to be offered every even year.
PREREQUISITE: PHSX 446 or graduate standing, and PHSX 507. Crystal structure and the reciprocal lattice. Quantum theory of electrons and phonons.

PHSX 545. Condensed Matter Physics II. 3 Credits. (3 Lec) S alternate years, to be offered odd years.
PREREQUISITE: PHSX 544. Applications to the transport, optical, dielectric, and magnetic properties of metals, semiconductors, and insulators.

PHSX 555. Quantum Field Theory. 3 Credits. (3 Lec) S
PREREQUISITE: PHSX 507. Techniques of canonical and path integral quantization of fields; renormalization theory; Quantum electrodynamics; gauge theories of the fundamental interactions.

PHSX 560. Astrophysics. 3 Credits. (3 Lec) F alternate years, to be offered every year.
PREREQUISITE: PHSX 425, PHSX 462, PHSX 446, and PHYS 435, or graduate standing. The purpose of this course is to prepare graduate students for thesis-level research in astrophysics, solar physics or related fields. Topics covered include: fluid mechanics, hydrodynamics, plasma physics, radiation processes and stability of equilibrium states.

PHSX 565. Astrophysical Plasma Physics. 3 Credits. (3 Lec) F alternate years, to be offered odd years.
COREQUISITE: PHSX 520. An introduction to the physics of fluids and plasma relevant to astrophysical plasmas such as the solar corona. Topics covered include: magnetotrons, one-fluid (MHD) and two-fluid approaches, linear waves and instabilities, shocks, transonic flows and collisional effects.

PHSX 566. Mathematical Physics I. 3 Credits. (3 Lec) F
PREREQUISITE: M 349, M 472, and PHSX 320 or graduate standing. Mathematical methods which find application in physics. Differential equations, contour integration, special functions, integral transforms, boundary value problems, and Green's functions.

PHSX 567. Mathematical Physics II. 3 Credits. (3 Lec) S alternate years, to be offered every odd year.
PREREQUISITE: PHSX 566. Theory of computational techniques, and applications such as numerical integration, differential equations, Monte Carlo methods, and fast Fourier transforms.

PHSX 582. Astrobiology for Teachers Online. 3 Credits. (3 Lec) F,S
PREREQUISITE: (1) a bachelor's degree, including college level biology and college level physics or astronomy (2) two years of experience teaching science (3) must be currently certified and teaching science at the middle or high school level. Astrobiology is the study of the origin, evolution, distribution, and destiny of life in the universe. It defines itself as an interdisciplinary science at the intersection of physics, astronomy, biology, geology, and mathematics, to discover where and under what conditions life can arise and exist in the Universe. The course topics will cover the discovery of planetary systems around other stars, the nature of habitable zones around distant stars, the existence of life in extreme environments. These concepts will serve as a foundation to study possible extraterrestrial ecosystems on planets and moons like Mars and Europa.

PHSX 589. Graduate Consultation. 3 Credits. (3 Ind) F,S,Su
PREREQUISITE: Master's standing and approval of the Dean of Graduate Studies. This course may be used by students who have completed all of their coursework (and thesis, if on a thesis plan) but who need additional faculty or staff time or help.

PHSX 590. Master's Thesis. 1-10 Credits. (1 Ind; max unlimited) F,S,Su
Max credits unlimited. PREREQUISITE: Master's standing.

PHSX 591. Special Topics. 1-4 Credits. (1 Lec; 12 cr max) On Demand Max 12 cr. PREREQUISITE: Upper division courses and others as determined for each offering. Courses not required in any curriculum for which there is a particular one time need, or given on a trial basis to determine acceptability and demand before requiring a regular course number.

PHSX 592. Independent Study. 1-3 Credits. (1-3 Ind; 6 cr max) On Demand Max 6 cr. PREREQUISITE: Graduate standing, consent of instructor, approval of department head and Dean of Graduate Studies. Directed research and study on an individual basis.

PHSX 594. Seminar. 1 Credit. (1 Sem; 8 cr max) On Demand Max 8 cr. PREREQUISITE: Graduate standing or seniors by petition. Course prerequisites as determined for each offering. Topics offered at the graduate level which are not covered in regular courses. Students participate in preparing and presenting discussion material.

PHSX 689. Doctoral Reading & Research. 3-5 Credits. (3 Ind; 15 cr max) On Demand Max 15 cr. PREREQUISITE: Doctoral standing. This course may be used by doctoral students who are reading research publications in the field in preparation for beginning doctoral thesis research.

PHSX 690. Doctoral Thesis. 1-10 Credits. (1 Ind; max unlimited) F,S,Su
Max credits unlimited. PREREQUISITE: Doctoral standing.

PSCI - Political Science

PSCI 200. Introduction to Conducting Political Inquiry. 3 Credits. (3 Lec) S
PREREQUISITE: PSCI 210. Research design and measurement of political behavior at the level of the individual and the political unit. Techniques of gathering and analyzing attitudinal data, voting records, policy outputs, and other political variables. Use of nonparametric statistics.
PSCI 353. British Politics. 3 Credits. (3 Lec) F, alternate years
PREREQUISITE: PSCI 210. While the US and the UK share a common origin and philosophical heritage, their political systems have diverged since the revolution. This course investigates the similarities and differences in their political systems and the ramifications for politics and policy.

PSCI 354. Contemporary Issues in Political Theory. 3 Credits. (3 Lec) S
3 cr. LEC 3 PREREQUISITE: PSCI 200, 210IS, 214IS, 356 and 323. Examines questions of knowledge, discourse, power, and identity in the works of contemporary (often "postmodern") critics, including: Foucault, Habermas, Butler, de Beauvoir, Kuhn, Rorty, Rawls, Chomsky.

PSCI 356. Classical Political Thought. 3 Credits. (3 Lec) S
3 cr. LEC 3 PREREQUISITES: PSCI 210IS, 214IS, 230D, 200. Explores justice, virtue, freedom, and "the good life" (ethics). Texts include early Greek poetry, theatre, classic works by Plato and Aristotle, and some contemporary criticism. Recommended prerequisite for PSCI 354 (Contemporary Political Thought) and PCI 455 (Politics & Virtue).

PSCI 362. Natural Resource Policy. 3 Credits. (3 Lec) S
3 cr. LEC 3 PREREQUISITE: PSCI 200, 210IS. Public lands policy and the economic and political issues that emerge. Special emphasis is placed on the National Parks and federal public lands of the Greater Yellowstone Ecosystem.

PSCI 406. The Political Economy of Energy. 3 Credits. (3 Lec) F alternate years will be offered odd years 3 cr. LEC 3 PREREQUISITE: Junior standing or consent of instructor. We examine the interface between politics and economics for energy issues at the international, national, state and local level. The dynamics of the international oil and gas markets, US energy dependence, alternative energy and state and local energy policies are key topics.

PSCI 407. Public Policy Analysis. 3 Credits. (3 Lec) S alternate years will be offered odd years 3 cr. LEC 3 PREREQUISITE: PSCI 200, 210IS; PSCI 310 is highly recommended. Analysis of impact of public decisions with emphasis placed on secondary data sources and interpretation.

PSCI 418. The Politics of War & Peace. 3 Credits. (3 Lec) S alternate years will be offered odd years 3 cr. LEC 3 PREREQUISITE: PSCI 230D. Junior standing. Combines two well-established subjects in the area of political science concerned with the study of international relations: the causes of war and the study of war and peace (emphasis of class). Covers a broad range of theorizing, research, and practice in both areas and will consider the relationship between them in constructive and critical ways.

PSCI 423. Politics of Development. 3 Credits. (3 Lec) F PREREQUISITE: Junior standing Consideration of explanations for global development patterns, the political economy of development, broader measures of development, approaches for evaluating policy effectiveness, and examples of policy success. Examination of region-specific development challenges and concerns.

PSCI 429. National Security Policy Decision-Making. 3 Credits. (Sem)F, odd years PREREQUISITES: PSCI 200, PSCI 214IS, PSCI 230D, and junior standing. Engage in simulations on national security decision making at the highest level of the US government, taking on role of National Security Council Members. Learn about the organization, analysis of security challenges, and considerations posed by Congress, the media and interest groups.

PSCI 434. International Law. 3 Credits. (3 Lec) S alternate years will be offered odd years 3 cr. LEC 3 PREREQUISITE: PSCI 230D. Junior or Senior standing required. The nature and origin of modern public international law and its role in contemporary world politics. Topics include the rights and duties of states, human rights, law pertaining to armed conflict, aggression and international crimes, and the role of international law in conflict management.

PSCI 436. Politics of Food & Hunger. 3 Credits. (3 Lec) S
3 cr. LEC 3 PREREQUISITE: PSCI 230D and Junior standing. The role of civil society, government and multilateral organizations are examined in a comprehensive analysis of food and hunger, including the issues presented by agricultural policy, famine, biotechnology and food safety, domestic and international food aid, and the right to food.

PSCI 437. International Political Econ. 3 Credits. (3 Lec) F
3 cr. LEC 3 PREREQUISITE: PSCI 230D and Junior standing. Political and economic perspectives are integrated in an analysis of the issues affecting the domestic and international economy and their interface. International institutions, trade, exchange rates and the monetary system, regionalism and development are critiqued with different political perspectives.
PSCI 439. International Human Rights. 3 Credits. (3 Lec) F alternate years
PREREQUISITE: PSCI 230D and junior standing. The development of human rights in legal and political context of the post-World War II period. Civil and political rights of due process; political participation and fundamental democratic freedoms; as well as social, cultural, and economic rights including basic human needs, self-determination, gender equality, and cultural integrity. National and International implementation is also considered.

PSCI 444. Congressional Campaign. 3 Credits. (3 Lec)
Examines the structure of the modern congressional campaign, with specific attention to fundraising, advertising, polling practices, and voter mobilization. Special emphasis on linking political science theory to the practice of electioneering.

PSCI 454. Cinema and Political Theory. 3 Credits. (3 Lec) Su
3 cr. LEC 3 PREREQUISITE: PSCI 200, 210IS, 214IS, 230D or consent of the instructor. Explores the intersection of political theory with topics such as civil society, bureaucracy and public policy through the use of film. Special attention given to both descriptive and prescriptive applications of modern and contemporary political theory to these topics.

PSCI 455. Politics & Virtue. 3 Credits. (3 Sem) S
3 cr. SEM 3 PREREQUISITE: Political Science majors with junior standing, or consent of instructor. What is “virtue”? What different sets of virtues exist in the history of Western thought? What is the nature of contemporary political debates about specific virtues? Course will focus particularly on humility, solidarity, civility, empathy, autonomy, humaneness, temperance, and forgiveness.

PSCI 465. Public Administration and Policy. 3 Credits. (3 Lec) S
3 cr. LEC 3 PREREQUISITE: PSCI 200, 210IS, 214IS and 230D. Examines the major political and strategic processes of public policy development and implantation. Topics covered include agenda setting, stakeholder influence, use of political narratives, decision making and implementation strategies.

PSCI 471. American Constitutional Law. 3 Credits. (3 Lec) S alternate years to be offered odd years 3 cr. LEC 3 PREREQUISITE: Junior standing and PSCI 210IS. Examines the relationship between law, individual rights, and public policy. Legal research and case law approach are stressed. Topics will include, but are not limited to, the aspects of the Bill of Rights and the 14th and 15th Amendments.

PSCI 490BR. Undergraduate Research. 1-6 Credits. (1 Ind; 12 cr max) F,S,Su
1 - 6 cr, IND May be repeated. Max 12 cr. PREREQUISITE: Junior standing, cumulative GPA of 2.5 or higher, consent of the instructor and approval of the department head. Students propose, develop, and complete an individual research project under the direction of a faculty mentor. Written and oral presentation of the results are expected. Course will address responsible conduct of research. May be repeated.

PSCI 491. Special Topics. 1-4 Credits. (1-4 Lec; 12 cr max) On Demand 1 - 4 cr. Maximum 12 cr. PREREQUISITE: Course prerequisites as determined for each offering. Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

PSCI 492. Independent Study. 1-3 Credits. (1-3 Ind; 6 cr max) F,S
On Demand 1 - 3 cr. IND Maximum 6 cr. PREREQUISITE: Junior standing, cumulative GPA of 2.5 or higher, consent of the instructor, and approval of the department head. Directed research and study on an individual basis.

PSCI 494. Seminar/Workshop. 1-3 Credits. (1 Lec, 2 Sem; 4 cr max) F,S,Su
3 cr. SEM 3 PREREQUISITE: Junior standing. Topics offered at the upper division level which are not covered by catalogued courses. Students are expected to do individual research projects leading to an oral and written report of each student’s findings.

PSCI 498. Internship. 2-12 Credits. (2-12 Ind; 12 cr max) F,S,Su
2 - 12 cr, IND 5 - 11 RCT 1 - 2 PREREQUISITE: Junior standing, cumulative GPA of 2.5 or higher, consent of instructor, and approval of department head. An individualized assignment arranged with an agency, business, or other organization to provide guided experience in the field.

PSCI 499R. Senior Project/Thesis. 3 Credits. (3 Sem) F,S
3 cr. SEM PREREQUISITE: Senior standing, PSCLI major. Senior capstone course. Required course for graduation. Students examine the major concerns and issues in the discipline of political science in a mentored research project.

PSCI 520. Government Leadership & Ethics. 3 Credits. (3 Lec) S
PREREQUISITE: PSCI 554. This course exposes students, using the most current theoretical and empirical literature, to the essential competencies need for ethical management and leadership roles in public and non-profit organizations.

PSCI 530. Topics in Public Administration. 3 Credits. (3 Lec)
PREREQUISITES: Graduate Standing This course encompasses two content areas needed for public managers: tools for human resource management and decisions and public budgeting. Topics regarding human resources include historical development of public personnel, position classification, recruitment, selection, equal opportunity, affirmative action, collective bargaining and flexible employment relationships under more limited and decentralized government. Topics regarding public budgeting include the politics of the budgeting process, budgeting forms and processes at the federal, state and local levels, and revenue projection and expenditure decisions.

PSCI 551. Research Methods for Public Administrators. 3 Credits. (3 Lec) S
PREREQUISITE: PREREQUISITE: PSCLI 554 and Graduate Standing. A survey of the research process as a means of acquiring knowledge that is reliable and relevant to the making of public management decisions. Students will prepare and submit a research design that meets social scientific standards.

PSCI 552. Public Policy Processes. 3 Credits. (3 Sem) S
Prerequisites: PSCLI 554 and Graduate Standing. This course explores the major theories of public policy development and implementation.

PSCI 553. Research Methods II: Data Analysis. 3 Credits. (3 Lec) S
PREREQUISITE: PSCLI 551. Students will get an introduction to qualitative and quantitative data collection, manipulation, analysis, and presentation. This fast-paced course will prepare graduates for their research theses and professional papers.

PSCI 554. Foundations of Public Administration. 3 Credits. (3 Lec) F
PREREQUISITE: Graduate standing. An introduction to the theoretical, historical, intellectual foundations of public administration and the relationship between public administration theory and practice, the political context and the intellectual heritage of the field. Examines basic functions and processes of public administration, the relationship between public administration and contemporary issues of governance facing the public sector.

PSCI 555. Human Resources Management. 3 Credits. (3 Lec) S
Alternate even years. PREREQUISITE: PSCLI 554 and Graduate Standing. A survey of the development of the concept of “public service” in the United States. Topics include historical development of public personnel, position classification, recruitment, selection, equal opportunity, affirmative action, collective bargaining and flexible employment relationships under more limited and decentralized government.

PSCI 557. Public Budgeting & Finance. 3 Credits. (3 Lec) S
Alternate even years. PREREQUISITE: PSCLI 554 and Graduate Standing. This course examines public sector budgeting as a tool for financial management and the implementation of fiscal and programmatic policy. The course places an emphasis on the political context and its impact on fiscal management.

PSCI 558. Organization Dynamics. 3 Credits. (3 Lec) S
PREREQUISITE: PSCLI 554 and Graduate Standing. A survey of organization theory in governance organizations. The class explores major theories of organization and their contribution to effective organization performance.

PSCI 559. Program Evaluation and Policy Analysis. 3 Credits. (3 Lec) S
Alternate even years. PREREQUISITE: PSCLI 554 and Graduate Standing. A survey of methods of program evaluation and policy analysis for public programs. Quantitative and qualitative methods of analysis are contrasted. Implementation, utilization, and political context of the analysis and evaluation process are examined. Philosophical and ethical issues underlying alternative methods are explored.

PSCI 560. Ethics and Public Service. 3 Credits. (3 Lec) S
Alternate even years. PREREQUISITE: PSCLI 554 and Graduate Standing. This course explores ethics as applied to issues in public service and policy making through theoretical and case study approaches.

PSCI 575. Directed Professional Research Project. 3-6 Credits. F,S
PREREQUISITE: PSCLI 551 Research Methods I; and PSCLI 553 Research Methods II. Recommended. This is an applied, hands-on course in which students will get an introduction to qualitative and quantitative data collection, management, and analysis techniques. This fast-paced course will prepare graduate students for their research theses and professional papers. Classroom sessions take place in a computer lab for active instruction and data analysis practice.

PSCI 589. Graduate Consultation. 1-3 Credits. (1 Ind; 3 cr max) F,S,Su
PREREQUISITE: Master’s standing and approval of the Dean of The Graduate School. This course may be used only by students who have completed all of their course work (and thesis if on a thesis plan) but who need additional faculty support.

PSCI 591. Special Topics. 1-4 Credits. (1-4 Lec; 12 cr max) On Demand 1 - 4 cr. Maximum 12 cr. PREREQUISITE: Upper division courses and others as determined for each offering, consent of instructor. Courses not required in any curriculum for which there is a particular one time need, or given on a trial basis to determine acceptability and demand.
PSPP 592. Independent Study. 1-3 Credits. (1 Ind; 6 cr max) On Demand 1-3 cr. IND Maximum 6 cr. PREREQUISITE: Graduate standing, consent of instructor, approval of department head and Dean of Graduate Studies. Directed research and study on an individual basis.

PSCI 598. Internship. 3-12 Credits. (3 Ind; 12 cr max) F,S,Su 3-12 cr. IND 10-11 RCT 1-2 Maximum 12 cr. An individualized pre-professional assignment arranged with an agency, business or other organization.

PSPP - Plant Sciences/Plant Pathology

PSPP 516. Research Design and Analysis. 3 Credits. (3 Lec) F PREREQUISITE: STAT 401. Data analysis and interpretation of problems unique to agricultural and biological research. Topics include: sample size determination, transformation of data scale, completely random, randomized block and Latin square designs, comparisons among means, factorial experiments with restricted randomization and analysis of covariance.

PSPP 524. Adv Plant Pathology. 3 Credits. (3 Lec) F alternate years, to be offered odd years. This course is designed to give graduate students in the This course will serve as a companion to Generic Plant Improvement (PSPP 542) taught in Spring odd alternate years by the plant breeding faculty.

PSPP 530. Crop Physiology. 3 Credits. (3 Lec) F PREREQUISITE: BIOC 433; CHMY 211. This online offering examines interactions between plants and the environment. Light, environment, plant canopy development, photosynthesis, source-sink relations, growth analysis, growth regulation, water relations, and environmental stresses are addressed.

PSPP 541. Advanced Plant Genetics. 3 Credits. (3 Lec) F alternate years, to be offered even years. Genome and genetic analysis of flowering plants, including structure of the genome, methods of genetic analysis and the genetic basis of plant morphology and development. A familiarity with current and classical literature is stressed.

PSPP 542. Genetics of Plant Improvement. 3 Credits. (3 Lec) S odd years PREREQUISITE: AGSC 441; STAT 401. The past, present and future of plant improvement. Emphasis on genetic principles underlying classical plant breeding, and on molecular biological principles underlying plant genetic engineering.

PSPP 546. Herbicide Physiology. 3 Credits. (3 Lec) F PREREQUISITE: BCH 380 and BIOC 433 or equivalents. A team-taught, distance delivery course on the biochemistry and physiology of herbicide action in plants. Herbicide discovery, classification, and mechanisms of action and resistance are explored.

PSPP 548. Flower Plants of North Rock Mtn. 2 Credits. (2 Lec) Su odd years A field oriented study of the flowering plants of Montana with an emphasis on plant keying skills. Objectives are: 1) to identify the parts of flowering plants and become familiar with botanical terms; 2) to learn morphological characteristics of common plant families; 3) to learn how to use a plant key to successfully identify flowering plants; application of these skills and botanical texts to the classroom. Mon-Tues are class/lecture days; Wed-Fri are day field trips to local trail heads.

PSPP 565. Plant-Pathogen Interaction. 3 Credits. (3 Lec) S. Alternate Even years PREREQUISITE: BIOC 160. Co-convened with AGSC 455. This course teaches the molecular mechanisms by which plants and pathogens/insects interact during the progress of pathogenesis or resistance, and the methods to study and visualize intercellular interactions during pathogenesis and defense.

PSPP 589. Graduate Consultation. 1-3 Credits. (1-3 Ind) F,S,Su PREREQUISITE: Master’s standing and approval of the Dean of Graduate Studies. This course may be used only by students who have completed all of their coursework (and thesis, if on a thesis plan), but who needs additional faculty or staff time help.

PSPP 590. Master’s Thesis. 1-10 Credits. (1-10 Ind; max cr unlimited) F,S,Su PREREQUISITE: Master’s standing.

PSPP 591. Special Topics. 1-4 Credits. (1-4 Ind; 12 cr max) On Demand PREREQUISITE: Upper division courses and others as determined for each offering. Courses not required in any curriculum for which there is a particular one time need, or given on a trial basis to determine acceptability and demand.

PSPP 592. Independent Study. 1-3 Credits. (1-3 Ind; 6 cr max) On Demand PREREQUISITE: Graduate standing, consent of instructor, approval of Department Head and Dean of Graduate Studies. Directed research and study on an individual basis.

PSPP 594. Seminar. 1 Credit. (1 Sem) F,S PREREQUISITE: Graduate standing or seniors by petition. Course prerequisites as determined for each offering. Students prepare, present, and critique scientific presentations.

PSPP 598. Internship. 2-4 Credits. (2-4 Ind; 12 cr max) F,S,Su PREREQUISITE: Graduate standing, consent of instructor and approval of Department Head, and Dean of Graduate Studies. An individualized assignment arranged with an agency, business or other organization to provide guided experience in the field.

PSPP 690. Doctoral Thesis. 1-10 Credits. (1-10 Ind; max cr unlimited) F,S,Su PREREQUISITE: Doctoral standing.

PSYX - Psychology

PSYX 1001S. Intro to Psychology. 4 Credits. (3 Lec, 1 Lab) F,S,Su PREREQUISITE: Doctoral standing. This course introduces students to the scientific method and its use to understand behavior, emotion, and cognition, and build theories and knowledge within key areas of psychological inquiry. A lab component offers hands-on experiences to demonstrate psychological ideas and principles.

PSYX 223. Research Design and Analysis I. 4 Credits. (3 Lec, 1 Lab) F,S PREREQUISITE: PSYX 100 and either M 105Q (formerly M 145Q) or higher or STAT 216. Introduction to the design and analysis of psychological research. Topics include logic and philosophy of psychological research, conceptualizing research questions, hypothesis testing, data collection and analysis strategies used by researchers in psychology, and introduction to using statistical software for data analysis.

PSYX 225. Research Design and Analysis II. 3 Credits. (3 Lec) F,S,Su PREREQUISITE: PSYX 223. Continuation of PSYX 223. Topics include experimental, quasi-experimental, and non-experimental designs and methodological issues; assessing research questions; reliability and validity of psychological measures; ethics of psychological research; writing research reports; using statistical software for data analysis.

PSYX 230. Developmental Psychology. 3 Credits. (3 Lec) F PREREQUISITE: PSYX 100. Human development across the lifespan using major theories of development including psychoanalytic, psychosocial, learning, and cognitive. Physical, cognitive, social, emotional, and personality development are explored from conception to death.

PSYX 235D. Contemp Issues in Human Sexual. 3 Credits. (3 Lec) S PREREQUISITE: PSYX 100. Issues of diversity and difference in human sexuality will be examined. The development and expression of sexual behavior as a complex sociocultural, biological, psychological, and historic phenomenon will be discussed. Course will examine sexual behavior and identity in both the majority culture and other cultures in the U.S. and world.

PSYX 263CS. The Psychology of Film. 3 Credits. (3 Lec) S,Su PREREQUISITE: College Writing (W) and University Seminar (US) core. Uses psychological science to understand the persuasive power of media as portrayed in popular films. Evaluates the media’s ability to both reflect and affect behavior. Focus is on contemporary themes such as aggression, drug use, sexuality, and prejudice.

PSYX 270. Fund Psychology of Learning. 3 Credits. (3 Lec) On Demand PREREQUISITE: PSYX 100. Introduction to scientific principles, theories, and applications of learning, including respondent and operant conditioning, social learning, verbal learning. Other types and approaches to learning will also be discussed.

PSYX 274. Psychological Measurement. 3 Credits. (3 Lec) On Demand PREREQUISITE: PSYX 225. Principles of psychological testing and measurement as related to intelligence, aptitudes, attitudes, occupations, and personality. Topics include nature and types of psychological tests, test construction, test administration, basic psychometric theory, methods for estimating the reliability and validity of psychological tests, and ethical issues regarding psychological testing and measurement.

PSYX 290R. Undergraduate Research. 1-6 Credits. (1-6 Ind; max cr unlimited) F,S,Su Directed undergraduate research which may culminate in a written work or other creative project. Course will address responsible conduct of research. May be repeated.

PSYX 291. Special Topics. 1-4 Credits. (1 Lec; 12 cr max) On Demand PREREQUISITE: None required but some may be determined necessary by each offering department. Courses not required in any curriculum for which there is a particular one time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

PSYX 292. Independent Study. 1-3 Credits. (1 Ind; 6 cr max) On Demand Max 6 cr. PREREQUISITE: Consent of instructor. Directed research and study on an individual basis.
PSYX 325. Applied Critical Thinking. 3 Credits. (2 Lec) On Demand PREREQUISITE: PSYX 100, and any Quantitative core course. Study of critical thinking skills through an understanding of psychological factors involved. Practical strategies are explored in relation to hypothesis formation and evaluation, decision making, problem solving and creativity, reasoning, and memory. Applications are emphasized.

PSYX 333. Psychology of Aging. 3 Credits. (3 Lec) S PREREQUISITE: PSYX 100 and junior standing or consent of instructor. Surveys different domains in which human behavior is influenced by aging. Topics include the influence of age on cognitive processes (e.g., attention and memory), social processes (e.g., personality and wellbeing), and biological processes (e.g., brain-related changes).

PSYX 335. Psychology of Gender. 3 Credits. (3 Lec) F PREREQUISITE: PSYX 100IS. Traditional and feminist perspectives on psychological needs and concerns specific to women, including gender stereotyping and beliefs, cognitive differences between the sexes, psychological disorders common to women, women’s sexuality; and cultural and biological roles and norms.

PSYX 340. Abnormal Psychology. 3 Credits. (3 Lec) F PREREQUISITE: PSYX 100. Historical and current perspectives on psychopathology, including neuroscience, behavioral cognitive, psychodynamic, and humanistic/existential approaches. Traditional approaches and recent innovations in therapy and diagnosis are considered along with current diagnostic categories, especially DSM.

PSYX 350. Physiological Psychology. 3 Credits. (3 Lec) F PREREQUISITE: PSYX 100 and BIOL 100, BIOL 102, or BCHM 104. Introduction to the biological bases of behavior; brief review of functional neuroanatomy and physiology in relation to such topics as sensation, movement, motivation, emotion, sleep, learning and memory, consciousness, and abnormal behavior.

PSYX 354. Sensation & Perception. 3 Credits. (3 Lec) F PREREQUISITE: PSYX 350. Basic principles of sensory systems (with emphasis on the visual system), contemporary psychophysical procedures, and principles of perception.

PSYX 360. Social Psychology. 3 Credits. (3 Lec) F PREREQUISITE: PSYX 100. Experimental research and theoretical viewpoints in social psychology, including such topics as: interpersonal attraction, perception, aggression, attitudes and attitude change, altruism, group behavior, social influence, stereotypes and prejudice, and the self.

PSYX 370. Psychology of Learning. 3 Credits. (3 Lec) S PREREQUISITE: PSYX 225. Examines basic principles and theories of learning and motivation. Classical and operant conditioning, discrimination learning, incentive motivation, reward and punishment, and concept learning.

PSYX 375. Behavior Modification. 3 Credits. (3 Lec) F PREREQUISITE: PSYX 225 and PSYX 270 or PSYX 370. Human behavior change with emphasis on practical techniques for changing individual and group behavior in real-life situations.

PSYX 380. Memory & Cognition. 3 Credits. (3 Lec) F,S PREREQUISITE: PSYX 100, Junior standing or consent of instructor. Theories and evidence concerning human information processing, focusing especially on attention and memory, problem solving, decision making, reasoning, and related topics.

PSYX 383. Health Psychology. 3 Credits.

PSYX 384. Consciousness. 3 Credits. (3 Lec) On Demand PREREQUISITE: PSYX 225 and PSYX 350. Theories and evidence concerning consciousness and altered states of consciousness, including dreaming, meditation, hypnosis, sensory deprivation, psychoactive drug effects, temporal experience, psychic phenomena, and related topics.

PSYX 385. Psychology of Personality. 3 Credits. (3 Lec) S PREREQUISITE: PSYX 225. Theories and evidence on processes that underlie consistent and enduring differences in behavior, cognition, and affect. Topics include emotion, motivation, temperament, inner experience, identity and the self, personality change, the influence of sociocultural context, and related topics.

PSYX 400. History & System in Psychology. 3 Credits. (3 Lec) On Demand PREREQUISITE: PSYX 225. Examination of the historical development of major concepts, theoretical ideas, and approaches to psychology, with emphasis on perspectives of broad current interest such as behavioral science, cognitive science, and neuroscience.

PSYX 461. Indus & Organiz Psych. 3 Credits. (3 Lec) On Demand PREREQUISITE: PSYX 225. Basic concepts and theoretical frameworks for the fundamental areas of industrial and organizational psychology. Topics include history of I/O psychology, personnel selection, psychological testing, personnel training, performance appraisal, managerial decision making, job satisfaction, work motivation, leadership, job stress, organizational conflict, job design, and organizational development.

PSYX 462. Psychology of Prejudice. 3 Credits. (3 Lec) S PREREQUISITE: PSYX 100IS or consent of instructor. Reviews theory and research on prejudice. Topics include stereotyping and discrimination, cognitive and affective dynamics of prejudice, causes of prejudice, eliminating prejudice, affirmative action and diversity programs, and psychological effects of prejudice.

PSYX 463. Social Cognition. 3 Credits. (3 Lec) F PREREQUISITE: PSYX 100. Addresses how fundamental cognitive processes (e.g., concept activation, attention, memory) influence social behavior and thought. Topics include impression formation, mental simulations of alternative realities, nonconscious mental processes, subliminal stimuli, mental representations, stereotypes, and heuristics and biases.

PSYX 475. Advanced Behavior Analysis. 3 Credits. (3 Lec) S,Su PREREQUISITE: PSYX 225 and PSYX 375. Advanced Behavior Analysis is designed to deepen students’ understanding of antecedent stimuli, behaviors, and consequences. Functional behavioral assessments. systems for increasing appropriate behavior, and ways of promoting generalization will be described. Ethical considerations of Applied Behavioral Analysis will be discussed.

PSYX 477. Science of Psych Well-Being. 3 Credits. (3 Lec) F PREREQUISITE: PSYX 100 (or 191). The Science of Psychological Well-Being examines topics under the rubric of Positive Psychology. Positive psychology focuses upon identifying, researching, and promoting the development of human strengths, thereby shifting the focus in psychology from psychopathology to human growth and potential.

PSYX 481. Judgment & Decision Making. 3 Credits. (3 Lec) On Demand PREREQUISITE: PSYX 100, Quantitative core and Junior standing. Theories and evidence on the psychology of judgment and decision making, including rationality, normative rules for choice, irrationality of some human judgments, and group decision making. Applications of decision theory at the personal, organizational, and societal levels are reviewed.

PSYX 482. Psycholinguistics. 3 Credits. (3 Lec) F PREREQUISITE: PSYX 100 and either PSYX 380 or ENGL 236. Examines the psychological processes that make it possible for humans to learn and acquire language. Emphasizes on how spoken and written language is understood, how speech is produced, and how language is acquired.

PSYX 490R. Undergraduate Research. 1-6 Credits. (1 Ind; 12 cr max) F,Su Max 12 cr. PREREQUISITE: Junior or Senior standing, PSYX 225 and consent of instructor. Directed undergraduate research/creative activity which may culminate in a research paper, journal article, or undergraduate thesis. Course will address responsible conduct of research. May be repeated.

PSYX 491. Special Topics. 1-4 Credits. (1 Lec; 12 cr max) On Demand Max 12 cr. PREREQUISITE: Course prerequisites as determined for each offering, Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

PSYX 492. Independent Study. 1-3 Credits. (1 Ind; 6 cr max) On Demand Max 6 cr. PREREQUISITE: Junior standing, consent of instructor. Directed research and study on an individual basis.

PSYX 494. Seminar. 3 Credits. (3 Sem; 6 cr max) On Demand Max 6 cr. PREREQUISITE: PSYX 225 or consent of instructor. Topics in current Psychological Science offered at the upper division level that are not covered by catalogued courses. Topics vary each semester. Students participate in preparing and presenting discussion material based on primary journal articles. May be repeated twice for credit.

PSYX 495. Field Pract in Applied Psy. 3-12 Credits. (3 Ind; 12 cr max) On Demand Field Practicum gives psychology majors direct experience in applied settings relevant to psychology. Students arrange an internship and submit progress reports summarizing their field experience while relating it to psychological principles and readings. Graded A – F.

PSYX 499R. Senior Thesis/Capstone. 3 Credits. (3 Sem) F,S PREREQUISITE: PSYX 490 (minimum 3 cr.) or PSYX 491. Senior capstone course. Written and oral presentation of senior thesis work.
PSYX 501. Adv Rich Design & Analysis. 3 Credits. (1 Lec, 2 Lab) F
PREREQUISITE: Graduate standing or PSYX 225. Advanced topics in the design and analysis of psychological research.

PSYX 502. Advanced Design/Stat 1. 3 Credits. (3 Sem) S
PREREQUISITE: Graduate standing in psychological science or PSYX 225 and a 3.25 GPA and consent of instructor. This is the first course in a sequence on advanced research design and statistical analysis in psychological science. Topics include design, methodological issues, hypothesis testing, basic (e.g., t-tests, ANOVA) and advanced statistical tests (e.g., factorial ANOVAs, ANCOVA, and Multiple Regression).

PSYX 505. Teaching of Psychology. 1 Credit. (1 Lec; 2 cr. max) F,S
PREREQUISITE: Graduate standing in Psychology or consent of instructor. Theory and practice in selecting, organizing and presenting psychological science to undergraduates. Development of skills for lecture, discussion, student participation and laboratory teaching, including uses of current technologies. (May be repeated once).

PSYX 510. Topics in Psychological Science. 3 Credits. (2 Lec; 1 Rec) F,S
PREREQUISITE: Graduate standing or consent of instructor. Recent advances in topics in Psychological Science with emphasis in different years on either biological, social, or cognitive psychology. (Maximum 9 credits).

PSYX 539. Physiological Processes. 3 Credits. (3 Lec) S
PREREQUISITE: Graduate standing or consent of instructor. Overview of research methods and relevant aspects of neurophysiology, neuromotricity and neuropsychology. Applications of prior work to the problem of discovery in biopsychology.

PSYX 541. Cognitive Processes. 3 Credits. (3 Lec) S
PREREQUISITE: Graduate standing or consent of instructor. Theories, methods, findings, and applications concerning memory and cognitive processes.

PSYX 542. Learning. 3 Credits. (3 Lec) S
PREREQUISITE: Graduate standing or consent of instructor. Principles and theories of learning and motivation. Topics include conditioning, learning, incentive motivation, reward and punishment. Application to organizational and human resource management problems.

PSYX 543. Memory. 3 Credits. (3 Lec) F
PREREQUISITE: Graduate standing or consent of instructor. Theories and applications of human memory from cognitive psychological perspective. Topics include memory in social, legal, and educational contexts; memory conformity; memory across the lifespan, memory and expertise; autobiographical memory; metamemory; and forgetting.

PSYX 544. Social Psychology. 3 Credits. (3 Lec) L
PREREQUISITE: Graduate standing or consent of instructor. Advanced experimental and applied research and theoretical viewpoints in social psychology. Topics include social cognition, interpersonal attraction, aggression, attitudes and attitude change, the self, group dynamics, stereotypes and prejudice, and social influence.

PSYX 546. Social Cognition. 3 Credits. (3 Lec) S
PREREQUISITE: Graduate standing. This course examines decision making, judgment, cognition, and affect from a social-cognitive perspective. Topics may include theory development, stereotypes, prejudice and discrimination, group behavior, attitudes and attitude change, mood and affect, heuristics and biases, memory, the self, and decision making. The primary goal is to understand theory and research in social cognition.

PSYX 575. Professional Paper and Project. 1-6 Credits. (1 Lec; 6 cr max) F,S
Max 6 cr. PREREQUISITE: Graduate standing. A research or professional paper dealing with a topic in the field. The topic must have been mutually agreed upon by the student and his or her major advisor and graduate committee.

PSYX 589. Graduate Consultation. 3 Credits. (3 Ind) F,S
PREREQUISITE: Graduate standing and approval of The Graduate School. This course may be used only by students who have completed all of their course work (and thesis, if on a thesis option) for a master’s degree but who need additional faculty help or time.

PSYX 590. Master’s Thesis. 1-10 Credits. (1 Ind; 15 cr max) F,S
Max 15 cr. PREREQUISITE: Graduate standing.

PSYX 591. Special Topics. 1-4 Credits. (1 Lec; 12 cr max) On Demand PREREQUISITE: Graduate standing and consent of instructor. Courses not required in any curriculum for which there is a particular one time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

PSYX 592. Independent Study. 1-3 Credits. (1 Ind; 6 cr max) On Demand Max 6 cr. PREREQUISITE: Graduate standing, consent of instructor. Directed research and study on an individual basis.

PSYX 594. Seminar. 3 Credits. (3 Sem; 9 cr max) On Demand Max 4 cr. PREREQUISITE: Graduate standing or consent of instructor. Topics offered at the graduate level which are not covered in regular courses. Students participate in preparing and presenting discussion material.

RBPF - Residential Bldg Performance

RBPF 100. Res Build Perf Seminar. 1 Credit. (1 Lec) F
Taught in a discussion format, students learn critical thinking skills and explore issues in building science. Students will research career paths and industry certifications. This course serves as an orientation to MSU and the degree with a short, optional field experience. Intended for students in the Residential Building Performance program.

RBPF 103. Wx Installer Tech Fund. 2 Credits. (2 Lec) F,S
COREQUISITE COURSE: RBPF 100 This course provides an overview of weatherization measure, standards, and residential building performance practices including building science basics and the house as a system. Additionally it introduces basic health & safety issues and heating systems and mechanical codes.

RBPF 104. Weatherization Installer Tech. 2 Credits. (2 Lec) S
PREREQUISITE: RBPF 100. This course provides an overview of weatherization measures, standards, and residential building performance practices including building science basics and the house as a system.

RBPF 110. App Energy Effic Math. 1 Credit. (1 Lec) F
COREQUISITE COURSE: RBPF 100 Students in this course will learn about topics in applied mathematics (heat transfer, air changes per hour, HVAC sizing, etc.) directly connected to weatherization and energy efficiency.

RBPF 116. Energy App Health & Safety. 2 Credits. (2 Lec) F,S
COREQUISITE COURSE: RBPF 100 Energy Applied Health and Safety provides students with a knowledge of energy related molds, combustion gases, building air tightness, lead based paint, asbestos and other risks associated with improving the energy of existing homes.

RBPF 121. Insulation Sys & App. 2 Credits. (2 Lec) F,S
COREQUISITE COURSE: RBPF 100 and RBPF 110 The student will learn types, performance and applications of interior and exterior residential insulation systems.

RBPF 124. Res Green Design Build. 2 Credits. (2 Lec) F
COREQUISITE COURSE: RBPF 100 This course provides an overview of energy efficient residential building concepts including building design, composition, materials, and orientation. The purpose of this course is to provide a foundation for understanding green building systems and processes.

RBPF 129. Manufactured Home Weather. 2 Credits. (2 Lec) S
PREREQUISITE: RBPF 100. This course provides an overview of mobile home weatherization measures, standards, and practices. This is a required course for the Residential Building Performance Program.

RBPF 134. Single Family Envy Audit. 2 Credits. (2 Lec) S
PREREQUISITE: RBPF 100. This course covers basic guidelines for Energy Auditors in Single Family Homes as well as math basics, building assessment strategies, and work order procedures.

RBPF 140. Heat Sys Envy Aud & Inspectors. 2 Credits. (2 Lec) S
PREREQUISITE:RBPF 100. This course covers basic guidelines for evaluating heating systems as an Energy Auditor. Low pressure boilers, forced air furnaces, and sealed combustion system analysis are the main focus of this course.

RBPF 160. Building Performance Software. 2 Credits. (2 Lec) F
PREREQUISITE: RBPF 100. This course provides an overview of various options for Energy Audit and Building Performance Software concentrating on evaluating homes and gathering required data for input.

RBPF 170. Renewable Energy Concepts. 2 Credits. (2 Lec) F
PREREQUISITE: RBPF 100. This course provides an overview of installation and maintenance of renewable energies including wind, solar (pv), geothermal, and solar hot water.

RBPF 181. Combustion Appliances. 2 Credits. (2 Lec) F
PREREQUISITE: RBPF 100 Provides a broad overview of multiple combustion appliances including sealed and non-sealed combustion appliances, natural gas vs. propane appliances, furnaces, RV heating boilers, etc. Also covered is how to perform inspections, health and safety, and installation considerations. This course is recommended for students who are interested in the HVAC (Heating, Ventilation, and Air Conditioning) track.
PREREQUISITES: RBPF 100 Prepares students for key industry certifications such as BPI (Building Performance Institute), RESNET (Residential Energy Network), and the NABCEP (North American Board of Energy Practitioners). Each certification possibility will be explored regarding prerequisites, required experience, knowledge requirements, practical skills, and employment possibilities.

RBPF 198. RBP Program Internship. 4 Credits. (4 Ind) S
PREREQUISITE: RBPF 100. This is a course available for Weatherization Assistance Program (WAP) employees who are currently enrolled at Gallatin College and are working in a Weatherization Office for Human Resource Development Council. It is also available to contractors working currently in building performance.

RBPF 292. Independent Study. 1-3 Credits. (1-3 Ind; 6 cr max) On Demand PREREQUISITE: Consent of instructor and approval of instructor. Directed research and study on an individual basis.

RLST - Religious Studies

RLST 100D. Intro to the Study of Religion. 3 Credits. (3 Lec)
-- The great themes of the world's religions and the methodological approaches to the academic study of religion and culture.

RLST 110D. Religion, Conflict & Politics. 4 Credits. (3 Lec)
-- This course will focus on issues in which political events and conflict have had their roots in religion or in interpretations of religion.

RLST 201. Islam. 3 Credits. (3 Lec) F
The textual traditions and historical forms of Islam will be studied from literary, historical, archaeological, and/or cultural perspectives.

RLST 202D. Hindu Traditions. 3 Credits. (3 Lec)
-- The sacred texts and the historical forms of religious thought and practice in the traditions of India.

RLST 203D. Buddhist Traditions. 3 Credits. (3 Lec)
-- The sacred texts and images of the religious thought and practices in the traditions of China, Korea, India, Southeast Asia, and/or Japan.

RLST 204H. Intro to the Hebrew Bible. 3 Credits. (3 Lec)
-- The Hebrew Bible (Old Testament) and its interpreters will be studied from literary, historical, archaeological, anthropological, and cultural perspectives.

RLST 205H. Introduction to New Testament. 3 Credits. (3 Lec)
-- The New Testament and its interpreters will be studied from literary, historical, archaeological, anthropological, and cultural perspectives.

RLST 206H. Origins of God. 3 Credits. (3 Lec)
-- The history and roots of and varieties of concepts of the divine in various religious traditions.

RLST 207H. Myth and Belief. 3 Credits. (3 Lec)
-- The study of religion through story and image from their early contexts to their re-imagined forms. We will examine riddles such as myth and metaphor within a demythologized or literal worldview. We will apply and critique theorists of myth and of metaphor to topics such as the monster or the trickster, and to themes such as cosmogony or metamorphosis.

RLST 217H. Religion, Sci & Environment. 3 Credits. (3 Lec)
-- The interdisciplinary course investigates models for interpreting the relationship of religion, science, and nature using cultural, textual, and historical approaches. The purpose of this course is neither to examine nor to critique the conclusions of scientific work; neither is it a course in theology not a testing ground for faith.

RLST 220H. Interpretations of Armcn Religion. 3 Credits. (3 Lec)
-- Religion in America and America as religion: an examination of figures, texts, movements, and material culture in creating America’s religious and cultural landscapes.

RLST 223H. Sacrifice, Rite & Ritual. 3 Credits. (1 Lec)
-- The course explores how nature may be an idea shaped by cultural influences or worldviews. Analyses will include perspectives on myth, scientific theories, technologies, gender, geography, history and politics, film, literary, and visual studies.

RLST 291. Special Topics. 1-4 Credits. (1 Lec; 12 cr max)
Max 12 cr. PREREQUISITE: None required but some may be determined necessary by each offering department. Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

RLST 321. Religion and Gender. 3 Credits. (2 Lec)
PREREQUISITE: Any RLST or PHL course. Investigation of metaphors and myths of gender and world cultures.

RLST 325. Religion and Literature. 3 Credits. (3 Sem)
PREREQUISITE: At least two 200 level courses in any one or combination of Religious Studies, English, Humanities, Modern Languages, or permission of the instructor. This course explores the intersection of religion with literary and other narrative cultures, with a focus on close reading and the interpretation of texts.

RLST 326. Topics in Religion. 3 Credits. (3 Sem)
PREREQUISITE: Any RLST course. Charismatic individuals, whether they found, reform, or depart from existing tradition, are an important feature of religion worldwide. This course examines such persons from different disciplinary perspectives. Topics may include guru culture; religion and colonialism; mystical experience and more.

RLST 330. Religion of Ancient Egypt. 3 Credits. (3 Lec)
PREREQUISITE: Any RLST course. Survey of Egyptian culture, religion, and society from the beginning of the history of a unified kingdom of ancient Egypt in the middle of the third millennium BCE through the Hellenistic conquest of Egypt by Alexander the Great.

RLST 332. Archaeology & Religion. 3 Credits. (3 Lec)
PREREQUISITE: Any RLST course. This course will utilize archaeology and archaeological method and theory as a means to study the history and development of the peoples, places, writings, and religious beliefs of the ancient Near Eastern world.

RLST 370. Philosophy of Religion. 3 Credits. (3 Lec)
PREREQUISITE: Any RLST or PHL course. Analysis of concepts of God, revealed truth, and immortality; the nature of religious emotion and experience, and of religious language; relation of faith to reason; traditional proofs of God’s existence; the problem of evil.

RLST 402. Natural/Unnatural/Supernatural. 3 Credits. (3 Lec)
PREREQUISITE: Any RLST course. This course considers how secular and religious thinkers have defined the supernatural and distinguished it from the natural world, with attention to the contemporary implications of debates about supernaturalism.

RLST 405. Text and Image. 4 Credits. (3 Lec)
PREREQUISITE: Any RLST course. From iconoclasts to bibliophiles, religion has remained deeply entangled in matters of text and image. This course situates religion within the interdisciplinary study of visual, material, and media cultures using theoretical, cultural studies, anthropological, art historical, and/or literary approaches.

RLST 407. Violence & Religion. 3 Credits. (3 Sem)
PREREQUISITE: Any RLST course. This course will examine the religious roots of various social and political categories in today's world which might include, among others, nationalism, fundamentalism, or sexism, and examine the means by which these categories affect contemporary society and events.

RLST 410. What is Religion?. 3 Credits. (3 Lec)
PREREQUISITE: Any RLST course. This course is a cross-cultural investigation of the ideas of personhood, including theories of the individual, the social, the body, and the transpersonal and transtemporal.

RLST 490R. Undergraduate Research. 1-6 Credits. (1 Ind; 12 cr max) F,S,Su Max 12 cr. PREREQUISITE: Any RLST course. Directed undergraduate research. Course will address responsible conduct of research. May be repeated.

RLST 491. Special Topics. 1-4 Credits. (1 Sem; 12 cr max)
Max 12 cr. PREREQUISITE: Course prerequisites as determined for each offering. Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

RLST 492. Independent Study. 1-3 Credits. (1 Ind; 6 cr max)
Max 6 cr. PREREQUISITE: Junior standing, consent of instructor, and approval of department head. Directed research and study on an individual basis.

RLST 494. Seminar. 1-3 Credits. (1-3 Ind; 6 cr max) On Demand Each semester is given over to the detailed study of a major figure or problem in religious studies. Since the figures and problems studied vary from semester to semester, the course may be repeated for credit.

RLST 499RH. Senior Capstone. 3 Credits. (3 Sem)
PREREQUISITE: Consent of instructor. Religious Studies majors will explore significant themes relevant to the academic study of religion, using advanced research techniques, appropriate bibliographic tools, and in-depth analysis of historical, literary, theoretical, and/or visual sources.

RLST 592. Independent Study. 1-3 Credits. (1 Ind; 6 cr max)
Max 6 cr. PREREQUISITE: Graduate standing, consent of instructor, approval of Associate Dean, and Dean of Graduate Studies. Directed research and study on an individual basis.
SFBS - Sustainable Food & Bioenergy

SFBS 146. Introduction to Sustainable Food and Bioenergy Systems. 3 Credits. (3 Lec) S
This course provides an introductory foundation to explore and draw connections between key sustainability issues related to food and bioenergy systems. Interactive lectures, readings, activities, and field trips will provide exposure to a wide range of interdisciplinary topics including agro-ecology, natural resource management, crop production, livestock production, biodiversity, land use, livelihoods, nutrition, food choices, and policy.

SFBS 296. Practicum: Towne's Harvest. 3 Credits. (1 Lec; 2 Lab) Su
PREREQUISITE: SFBS 146 or permission of instructor. Emphasizes hands-on field experience with small-scale market gardening, distribution through community-supported agriculture, and market sales at local farms’ markets. Students will complete one independent project, service-learning at local farms and complete weekly writing assignments.

SFBS 298. Internship. 2-12 Credits. (2-12 Ind; 12 cr max) F,S,Su
PREREQUISITE: Consent of instructor. An individualized assignment with a professional agency to provide a guided field experience.

SFBS 327. Measure Innovation in Food Sys. 3 Credits. (3 Lab) F
PREREQUISITE: SFBS 146, SFBS 298, NUTR 221CS, NUTR 226. Students will learn natural and social science tools to measure innovation in food systems. Training will be provided on experimental design as well as data collection, analysis and dissemination. Research methods will draw from agro-ecology, botany, cultural anthropology and nutrition.

SFBS 346. Sustainable Food and Bioenergy Systems Summer Field Course. 2 Credits. (1 Lec, 1 Ind) Su
PREREQUISITE: SFBS 296 or consent of instructor. This field trip course compares and contrasts large-scale agricultural operations across Montana. Students will gain an appreciation of the choices, opportunities, and challenges facing conventional, diversified, and organic producers. Interdisciplinary and systems level thinking will be practiced.

SFBS 429. Small Business and Entrepreneurship in Food and Health. 3 Credits. (3 Lec) F
PREREQUISITE: ECNS 101, or FCS 138 or FCS 239 and senior standing or permission of instructor. Basic bookkeeping, marketing, and management concepts for owning and operating a successful small business. Students will prepare a modified business plan based on individual interests. Special emphasis on sustainable design and corporate responsibility in food system enterprises.

SFBS 445R. Culinary Marketing: Farm/Table. 3 Credits. (1 Lec, 2 Lab) Su
PREREQUISITE: FCS 371, NUTR 221CS, NUTR 226, NUTR 227, and NUTR 322 or permission of instructor. Emphasizes hands-on food experience, including market garden tendeing and harvesting, distribution by community supported agriculture, food marketing and retail at farmers’ markets, culinary practice with seasonal garden produce and food preservation, educational outreach and culinary demonstrations, and independent research projects.

SFBS 451R. Sustainable Food Systems. 3 Credits. (3 Lec) S
PREREQUISITE: FCS 371, NUTR 221CS and senior standing or permission of instructor. This course examines the connections among the food industry, agriculture, and the environment and considers the sustainability of food choices. Students gain a systems perspective on current nutrition problems such as hunger, obesity, and disordered eating. Students conduct independent research.

SFBS 466. Food System Resilience, Vulnerability and Transformation. 3 Credits. (3 Lec) S
PREREQUISITE: SFBS 146, SFBS 298, NUTR 221C, NUTR 226 In this lecture and literature-review based course, we will examine the impacts of global environmental change, policy, and markets on agro-ecosystems, diets and community health within the framework of systems theory.

SFBS 491. Special Topics. 1-4 Credits. (1-4 Sem; 12 cr max) On Demand
PREREQUISITE: Course prerequisites as determined for each offering. Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

SFBS 498. Internship. 1-12 Credits. (1-12 Ind; 12 cr max) F,S,Su
PREREQUISITE: Consent of instructor. An individualized assignment with a professional agency to provide a guided field experience.

SFBS 499. Senior Thesis/Capstone. 3 Credits. (3 Lec) F
PREREQUISITE: SFBS 146, SFBS 296, SFBS 498 and senior standing. Capstone experience for SFBS majors. Emphasizes systems thinking about food and bioenergy from production to consumption. Integrates SFBS field experience into development of outreach materials, interdisciplinary team project work, and honing of professional skills including oral and written communication, leadership.

SFBS 541. Culinary Marketing: Farm to Table. 3 Credits. (1 Lec, 2 Lab) Su
PREREQUISITE: NUTR 226, NUTR 227, NUTR 322, NUTR 395 or equivalent and graduate standing. Emphasizes hands-on food experience, including market garden tending and harvesting, distribution by community supported agriculture, food marketing and retail at farmers’ markets, culinary practice with seasonal garden produce, food preservation and product development, teaching and culinary demonstrations, and marketing plan development.

SFBS 545. Exploration of Food Biotechnology. 2 Credits. (2 Lec) On Demand
This course will delve into the history, techniques, applications and ethical concerns associated with the rapidly growing areas of biotechnology in food production, food processing and agriculture. All course participants will receive food biotechnology curriculum materials for incorporation into the high school biology classroom.

SFBS 551. Global Food Perspectives. 3 Credits. (3 Lec) F
Explores the making of the American diet by examining the impact of global historical events, cultural trends, economic pressures and political activities. Students think critically about the relationship between health and the food supply, proposing solutions to common food problems.

SFBS 552. State of the Environment: Policy, Management, and Practice. 3 Credits. (3 Lec) F
alternate odd years PREREQUISITE: NUTR 221CS, NUTR 351, and HHD graduate standing; or consent of the instructor. To better understand the state of the United States food environment, this course examines food system policies, how they are measured, and what happens when they are put into practice. Students will explore critical issues in the food environment that impact national health, including policies related to food and nutrition assistance programs, food prices, community characteristics, food service, food safety, land use planning, and food access.

SFBS 575. Prof Paper & Project. 1-3 Credits. (1-3 Ind; 6 cr max) F,S,Su
PREREQUISITE: Graduate standing. A research or professional paper or project dealing with a topic in the field. The topic must have been mutually agreed upon by the student and his or her major advisor and graduate committee.

SFBS 590. Master's Thesis. 1-10 Credits. (1-10 Ind; max unlimited) F,S,Su
PREREQUISITE: Master's standing, Directed graduate research/creative activity, advisor and graduate committee.

SFBS 598. Internship. 2-12 Credits. (2-12 Ind; 12 cr max) F,S,Su
PREREQUISITE: Graduate standing, consent of instructor and approval of department head. An individualized assignment arranged with an agency, business or other organization to provide guided experience in the field.

SOCI - Sociology

SOCI 101IS. Introduction to Sociology. 3 Credits. (3 Lec)
Theoretical and methodological underpinnings of sociology. How theory guides investigation of social life and results in creation of factual knowledge. How sociological questions are studied and results are interpreted.

SOCI 110IS. Honors Sociological Inquiry. 3 Credits. (3 Lec) On Demand
In-depth study of the sociological enterprise: the broad range of theories and research used by sociologists to think about and examine the social world. All major areas of sociology are covered with an emphasis on institutions and systems of stratification.

SOCI 150D. Social Difference. 3 Credits. (3 Lec)
Examination of social differences by focusing on the construction and consequences of a limited set ascribed social characteristics: race, ethnicity, gender, sexual orientation and class. Focus on how these ascribed statuses are central to the sociological study of inequality.

SOCI 201D. Social Problems. 3 Credits. (3 Lec) On Demand
Major social problems such as human deviance, discrimination, crime, mental illness, and economic inequality. These problems will be considered primarily as consequences of cultural premises and values in American society. Competing theoretical explanations.

SOCI 202. Social Statistics. 3 Credits. (3 Lec)
PREREQUISITE: SOC 101IS or equivalent course; Quantitative Core; or consent of instructor. Topics covered include: Levels of measurement; measures of central tendency, dispersion and association; normal curve, statistical inference; logic of quantitative comparison and decision making utilized by social scientists; introduction to data collection techniques.
understanding of their dynamics. Through the theories used to interpret their activities in order to improve our movements are among the most controversial. This course looks at movements.

PREREQUISITE: SOCI 101IS. Of all the means of achieving social change, sociologists have long been interested in social movements. Social movements are groups with shared goals and unified action, persistently working to change or create some feature of their world. This course will explore the dynamics of social movements and how they operate through their interactions with the state and other political institutions.

SOCI 405. Social Movements. 3 Credits. (3 Lec) On Demand
PREREQUISITE: SOCI 101IS. Of all the means of achieving social change, movements are among the most controversial. This course looks at movements through the theories used to interpret their activities in order to improve our understanding of their dynamics.

SOCI 414. Family Violence. 3 Credits. (3 Lec)

SOCI 344. Sociology of Race & Ethnicity. 3 Credits. (3 Lec)
PREREQUISITE: SOCI 101IS. Historical, comparative, and social psychological study of race and ethnic relations in the U.S. and elsewhere. Power, prejudice, and discrimination relating to minority status are emphasized.

SOCI 345. Sociology of Organizations. 3 Credits. (3 Lec)
PREREQUISITE: SOCI 101IS. Rational, natural, and open systems theories of complex organizations. Introduction to organizational structure. Irrational aspects of organizations. Organizational environments and their effects on structure and activity.

SOCI 355. Population and Society. 3 Credits. (3 Lec)

SOCI 357. Occupational/Corporate Crime. 3 Credits. (3 Lec)
PREREQUISITE: SOCI 101IS. A sociological analysis of crimes committed by individuals within the work place and by corporations. Addressed are the extent of the problems, social costs, legal responses, and theoretical perspectives assessing the etiology of such crimes.

SOCI 358. Crime and Inequality. 3 Credits. (3 Lec)
PREREQUISITE: SOCI 101IS. This course examines how crime amid justice play out in the context of a stratified society. Students explore how social organization, inequality and conflict influence and shape the nature and distribution of crime and social control.

SOCI 359. Crime, Justice and Media. 3 Credits. (3 Lec)
PREREQUISITE: SOCI 101IS. Examines interrelationships between mass media, criminal justice system and crime in the US; public policy implications of media portrayals of crime, criminals, police and court system; relationship between media consumption and crime.

SOCI 362. Sociology of Law Enforcement. 3 Credits. (3 Lec)
PREREQUISITE: SOCI 101IS or SOCI 221. An examination of policing in society, with emphasis on the cultural context in which it occurs, its structural characteristics, and social psychological processes.

SOCI 368. Latino Immigration. 3 Credits. (3 Lec)
PREREQUISITE: SOCI 101IS. In this course we explore the forces behind labor flows between Latin America and the U.S. and the parallel reality of immigrant life. Although rooted in immigration theory, we use Latino daily life experience as our primary analytical lens.

SOCI 370. Sociology of Globalization. 3 Credits. (3 Lec)
PREREQUISITE: SOCI 101IS. Examines the global interconnectedness of economic, political and cultural processes. Topics covered include theories and historical analysis of globalization, global culture and consumerism. The human struggles that accompany these changes including gender, family, and immigration.

SOCI 373. Sociology of Indigenous People. 3 Credits. (3 Lec)
PREREQUISITE: SOCI 101IS. A survey of indigenous peoples in global, historical, and comparative perspective, with special emphasis on the development of indigenous rights and identity in the Anglo-derived settler societies of North America and Australasia (although other regions will be considered).

SOCI 374. Sociology of Culture. 3 Credits. (3 Lec) S
PREREQUISITE: SOCI 101IS. Survey of major approaches to the sociology of culture and the use of cultural theory in sociological analysis. Focus on cultural aspects of hegemony, language, artifacts, ideas, identities, and narratives to construct social reality.

SOCI 380. Sociology of Health & Medicine. 3 Credits. (3 Lec)
PREREQUISITE: SOCI 101IS. An in-depth exploration of differing perspectives on health, medicine, practitioners, and healthcare systems with a focus on how gender, race/ethnicity, and social class affect health care systems, policies, practice and individual experiences of health and illness.

SOCI 401. Animals and Society. 3 Credits. (3 Lec) F
PREREQUISITES: SOCI 101IS. This course explores the spaces that animals occupy in human social and cultural worlds and the interactions humans have with them. Central to this course will be an exploration of the ways in which people and animals shape each other’s lives.

SOCI 414. Family Violence. 3 Credits. (3 Lec)
SOCI 423. Sociology of Corrections. 3 Credits. (3 Lec)
PREREQUISITE: SOCI 101S. Examination of the nature and extent of corrections in the United States as well as the purposes, structures, and procedures of penal sanctioning and the institutional systems of correction. Emphasis on historical developments and current trends and issues in corrections.

SOCI 425. Victims and Society. 3 Credits. (3 Lec) F
PREREQUISITES: SOCI 101S or SOCI 221. This course introduces students to the field of victimology, response to victimization in the United States, and crime victim typologies. Special topics include: human trafficking, school violence, child abuse, intimate partner violence, stalking, sexual assault, hate crimes & cyber victimization.

SOCI 427. Sociological Analysis. 3 Credits. (3 Lec) On Demand
PREREQUISITE: SOCI 101S. Application of analytical tools to the analysis of sociological data.

SOCI 434. Sociology of Human Sexuality. 3 Credits. (3 Lec)
PREREQUISITE: SOCI 101S. Investigation of human sexuality from a sociological perspective. Focus on social aspects of human desires experiences, and meanings in historical and cultural context primarily using a social construction of human sexuality perspective.

SOCI 435. Law and Society. 3 Credits. (3 Lec)
PREREQUISITE: SOCI 101S. Analysis of law, legal processes, and legal and quasi-legal institutions from sociological and philosophical perspectives. Some issues that are addressed include the functions of the law in modern society, the issue of the law's power (or impotence) in the everyday, and the law's violence.

SOCI 436. Law and Inequality. 3 Credits. (3 Lec)
PREREQUISITE: SOCI 101S. This course addresses the problem of social inequality by examining the contradictory ways in which the law may be utilized as both an instrument of social change and as a medium to formalize and solidify social inequality.

SOCI 455. Classical Sociological Theory. 3 Credits. (3 Lec)
PREREQUISITE: SOCI 101S. Introduction to major sociological theories with focus on the implication for the development of empirical research. Theory as a set of tools to guide research. The explanations provided by theorists are compared and their contributions to the study of selected social phenomena are discussed.

SOCI 470. Environmental Sociology. 3 Credits. (3 Lec) On Demand

SOCI 485. Political Sociology. 3 Credits. (3 Lec) On Demand
PREREQUISITE: SOCI 101S. Power. Who has it, who doesn't, and why. Political sociology explores the omnipresence of power in society from political power in government to power relationships in our day-to-day lives. Political economy will also be examined.

SOCI 490R. Undergraduate Research. 1-6 Credits. (1-6 Ind; 12 cr max)
PREREQUISITE: SOCI 101S. Directed undergraduate research which may culminate in a research paper, journal article, or undergraduate thesis. Course will address responsible conduct of research. May be repeated.

SOCI 491. Special Topics. 1-4 Credits. (1-4 Lec; 12 cr max) On Demand
PREREQUISITE: SOCI 101S. Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

SOCI 492. Independent Study. 1-3 Credits. (1-3 Ind; 6 cr max) On Demand
PREREQUISITE: SOCI 101S, and at least Junior standing, and approval of Department Head. Directed research and study on an individual basis.

SOCI 494. Seminar/Workshop. 1-3 Credits. (1-3 Sem; 9 cr max) On Demand
PREREQUISITE: SOCI 101S, and as determined for each offering. Topics offered at the upper division level which are not covered in regular courses. Students participate in preparing and presenting discussion material.

SOCI 498. Internship. 2-12 Credits. (2-12 Ind; 12 cr max) On Demand
PREREQUISITE: SOCI 101S, and at least Junior standing, and approval of department head. An individualized assignment arranged with an agency, business, or other organization to provide guided experience in the field. See departmental qualification standards for internships.

SOCI 499. Senior Thesis Capstone. 3 Credits. (3 Sem)
PREREQUISITE: Senior standing, and SOCI 101S, SOCI 202, SOCI 318R, and SOCI 311 or SOCI 455. Senior capstone course. The application of theory and methods in the development of an integrated framework for understanding and explaining issues of current concern. Verbal and written presentation of research paper.

SOCI 592. Independent Study. 1-3 Credits. (1 Ind; 3 cr max) On Demand
PREREQUISITE: Graduate standing, consent of instructor, approval of department head and Dean of Graduate Studies. Directed research and study on an individual basis.

SOCI 594. Seminar. 1 Credit. (1 Sem; 4 cr max) On Demand
PREREQUISITE: Graduate standing or seniors by petition; course prerequisites as determined for each offering. Topics offered at the graduate level which are not covered in regular courses. Students participate in preparing and presenting discussion material.

SPNS - Spanish

SPNS 101. Elementary Spanish I. 3 Credits. (3 Rtc.)
An elementary-level course designed to help students acquire basic proficiency in communicating within culturally significant contexts. An integrated approach to teaching language skills with emphasis on vocabulary acquisition and basic grammatical structures.

SPNS 102D. Elementary Spanish II. 3 Credits. (3 Rtc.)
PREREQUISITE: SPNS 101 or equivalent as determined by CLEP. This course builds upon the foundation established in 101. Emphasis is placed upon oral and written expression. Reading and discussions are designed to increase comprehension of more linguistically complex texts and more conceptually complex cultural issues.

SPNS 196. Experience Latin Amer Today I. 1-2 Credits. (1-2 Ind) F,S,Su
PREREQUISITE: 100-level SPNS course Faculty-led one-to-two-week learning experience (language instruction, service learning, professional development, etc.) in Latin America. It complements faculty's on-campus course.

SPNS 201D. Intermediate Spanish I. 3 Credits. (3 Rct)
PREREQUISITE: SPNS 102D. Or equivalent as determined by CLEP exam. Intensive, methodical review of grammar and syntax combined with the integrated development of proficiency in the four language skills. Expansion of cultural knowledge and functional vocabulary through intermediate-level readings and discussions. Increased emphasis on written communication.

SPNS 202D. Intermediate Spanish II. 3 Credits. (3 Rct)
PREREQUISITE: SPNS 201D. Or equivalent as determined by CLEP exam. Designed to follow the third semester review of grammar and basic skills. Taught through a series of carefully selected readings in Hispanic culture, civilization, and literature which will provide the basis for writing essays and reports and developing advanced language skills.

SPNS 250. Spanish for Healthcare Professionals. 3 Credits. (3 Lec) F,S
PREREQUISITE: SPNS 101 or equivalent. Prepares undergraduates to converse with Spanish-speaking patients and develop cultural competency. Emphasis on conversation/grammar necessary during medical interviews, cultural aspects of Latino health care, interviewing in Spanish. Includes guest speakers, real-world situations, and discussion of current issues.

SPNS 291. Special Topics. 1-3 Credits. (1-3 Lec; 12 cr max) On Demand
PREREQUISITE: None required, but some may be determined necessary by each offering department. Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

SPNS 296. Experience Latin Amer Today II. 1-2 Credits. (1-2 Ind) F,S,Su
PREREQUISITE: 200-level SPNS course Faculty-led one-to-two-week learning experience (language instruction, service learning, professional development, etc.) in Latin America. It complements faculty's on-campus course.

SPNS 313. Don Quijote. 3 Credits. On Demand
Alternate Years, starting 2015 - PREREQUISITE: SPNS 201. Don Quijote is often considered to be the first novel. In this course, students read and discuss the themes and issues that the novel explores and how they relate to modern society. The reading and discussion of the novel will also be used as a means of building vocabulary and increasing students' proficiency in Spanish.

SPNS 320. Spanish Culture & Civilization. 3 Credits. (3 Lec) F
PREREQUISITE: SPNS 202D. This is a history course on Spain that begins in the pre-historical period and ends in the twentieth century. Students learn about the most famous and consequential events. Architecture is taught as the "visible history" from the Arabic palaces and Christian medieval churches and cathedrals through the Renaissance, Baroque, Neoclassic, and ending with Art Nouveau houses. The course is taught 100% in Spanish.
SPNS 323. Spanish: Adv Grammar & Phonetic. 3 Credits. (3 Lec) F
PREREQUISITE: SPNS 202D. In-depth review of problem areas in grammar, complete review of the verb system and a practical study of Spanish sounds. This class is designed to provide prospective teachers and advanced students with an understanding of the function of Spanish grammar. In Spanish.

SPNS 324. Spanish: Adv Conversat & Comp. 3 Credits. (3 Lec) S
PREREQUISITE: SPNS 202D. Development and refinement of advanced oral and writing skills, intensive practice in expository and imaginative composition, review of idiomatic expressions, and vocabulary expansion.

SPNS 329. Early Cultures of Latin America. 3 Credits. (3 Lec) F
Readings, lectures, and discussions in Spanish. This course examines the historical, social, and ideological aspects of Latin American culture from the pre-Columbian period through independence.

SPNS 330. Modern Cultures Latin America. 3 Credits. (3 Lec) F
PREREQUISITE: SPNS 323 or 324. Readings, lectures and discussions in Spanish. This course examines the historical, social, and ideological aspects of modern Latin American culture. Taught in Spanish.

SPNS 332. Contemp Latin Amer Literature. 3 Credits. (3 Lec) S
PREREQUISITE: SPNS 323 or 324. An examination of the major authors, works, and literary movements of the 19th and 20th centuries as Latin American literature has come of age and established its independence from Spanish peninsular influences. Taught in Spanish.

SPNS 333. To Infinity and Beyond: Jorge Luis Borges. 3 Credits. (3 Rct) F, Su
PREREQUISITE: Completion of, or concurrent enrollment in, SPNS 202D. An examination of the work of the Latin American writer and thinker, Jorge Luis Borges. Readings may include essays and poetry, but the emphasis will be on Borges's short stories. While the course will explore the themes of Borges's work, activities and assignments will be geared toward strengthening Intermediate level proficiency and developing Advanced level skills on the ACTFL scale. Taught in Spanish.

SPNS 335IH. Travel in Latin Am Lit & Film. 3 Credits. (3 Rct) Su
PREREQUISITE: SPNS 202D or Junior standing. The course examines travel in Latin American texts and films as exploration and search for individual and national identity and as disruptive displacements caused by political and economic forces and the problems of adapting to a new environment. In English.

SPNS 341. Warriors and Damsels in Spanish Literature. 3 Credits. (3 Lec) F
PREREQUISITE: SPNS 202D. This course explores Spanish literature from its medieval origins through the baroque period. Students read several canonical works in their entirety and learn about the historical, social, and political factors that influenced literary styles. Students learn about Spanish painting from the Middle Ages, the Renaissance, and Baroque in order to gain a better understanding of the tenets that form the foundation of each literary period. The course is taught 100% in Spanish.

SPNS 342. Passion & Politics in Spanish Literature. 3 Credits. (3 Lec) S
PREREQUISITE: SPNS 202D. This course covers canonical texts from the neoclassic period up to the present. Students read a combination of short literary works (poems and short stories) and three novels. Students learn about the tenets of the most influential literary movements and movements that transpire throughout the semester that explore the assigned texts. Spanish painting is taught to help elucidate the characteristics of each literary period. The course is taught 100% in Spanish.

SPNS 350. US Latino Cultures. 3 Credits. (3 Lec) F
PREREQUISITE: SPNS 202D for majors and minors or Junior standing for non-majors. Examines the history and culture of Latino communities in the U.S. It centers on the largest Hispanic populations found in the U.S today: Mexican, Dominican, Puerto Rican, and Cuban. Taught in Spanish.

SPNS 351. US Latino Literature. 3 Credits. (3 Lec) F
PREREQUISITE: SPNS 202D. Examination of the major authors, works, and literary movements of U.S. Latino literature. Taught in English. Spanish majors and minors will read and write in Spanish.

SPNS 352IH. US Latino Text & Cinema. 3 Credits. (3 Lec) S
PREREQUISITE: WRIT 101W and/or consent of instructor. This course will focus on different topics concerning U.S. Latino communities in the United States. Through the reading and viewing of a variety of Latino literature and films, students will learn about themes such as immigration, race, identity, gender, language and politics that characterize the Mexican American, Cuban, Puerto Rican and Dominican communities. In English.

SPNS 361. Latin American Text & Cinema. 3 Credits. (3 Lec) On Demand
PREREQUISITE: SPNS 323 or SPNS 324. This course will focus on different topics of Latin America through the reading and viewing of a variety of literature and movies. These themes may include history, race, gender, politics and literary trends in Latin America. Focus will vary depending on the professor. In Spanish.

SPNS 362. Hispanic Poetry. 3 Credits. (3 Sem) F
COREQUISITE: SPNS 202D. In this course, students read poetry from several Latin American countries and Spain. Students learn how to decipher and analyze poetic devices like metaphor, pathetic fallacy, alliteration, and onomatopoeia. Students write short papers throughout the semester on the assigned poems and also compose their own poetry. One movie is shown in class and students listen to several songs that reinterpret poems. The course is taught 100% in Spanish.

SPNS 363H. Spanish Cinema. 3 Credits. (3 Lec) S
This course explores the history of Spanish cinema and students watch ten movies that are representative of diverse styles and social/political issues, such as surrealism, class struggle under the Franco dictatorship, the postmodern society ushered in during the transition to democracy, the trivialization of violence in the media, the representation of historical events, masculine violence against women, and Spain’s peripheral nations (Galiza, Basque country, and Catalonia). The course is taught 100% in English.

SPNS 371. Latin America in Focus. 3 Credits. (1 Lec, 2 Rct)
On demand PREREQUISITE: SPNS 330 Analyze one topic in depth. Topics address current issues in Latin America (i.e. The New Bolivarian Revolution, Violence in the US-Mexican border) or themes (migration, religion, race, etc.). Topics may vary with instructor and year.

SPNS 396. Experience Lat Am Today III. 1-2 Credits. (1-2 Ind) F, Su
Max 6 cr. PREREQUISITE: The 300-level SPNS course it complements Faculty-led study abroad course integrating experimental learning into existing semester-long SPNS 300-level courses. One (1 cr) or two (2 cr) weeks in Latin America during spring break or right after semester ends. Theme varies with course and instructor.

SPNS 416. Latin America: Culture and Revolution. 3 Credits. (3 Rct) F
PREREQUISITE: SPNS 202D. An intensive study of the cultural materials produced as a result of dictatorships and revolutions in Latin America and Spain including movies, documentaries, songs, literature and art. Will encourage the understanding of the mutual influence between historical events and cultural production in Hispanic countries. Focus will vary depending on the professor. In Spanish.

SPNS 430. Latin Amer Perspectives. 3 Credits. (3 Lec) S
PREREQUISITE: SPNS 323 or SPNS 324. This course approaches historical developments, literature, and constructions of identity in twentieth-century Latin America. Taught in English with Spanish reading/writing option. Focus will vary by professor.

SPNS 445. Hispanic Caribbean: Cuba, Puerto Rico, Dominican Republic. 3 Credits. (3 Rct) On Demand
PREREQUISITES: HSTR 130 and Junior standing Focuses on the cultures and societies of Cuba, Puerto Rico, and the Dominican Republic. Uses cultural material (i.e. novels, films, music, and art) as well as scholarly essays to address the region’s history, politics classes/gender/race dynamics, religion, etc. In English.

SPNS 460. Contemporary Spain & Nations. 3 Credits. (3 Lec) F
PREREQUISITE: SPNS 202D. This course examines core events of twentieth and twenty-first century Spain. The course is divided into four parts: 1) The Second Republic and the Civil War. 2) The Franco dictatorship, the transition to democracy, current movements to denounce the crimes committed by fascism, and the current economic crisis. 3) Spain’s peripheral nations: Basque Country, Catalonia, and Galicia. 4) Three social/political issues with a focus on the present: Immigration, masculine violence against women, and feminism. The course is taught 100% in Spanish.

SPNS 470R. Seminar: Hispanic Literature. 3 Credits. (3 Sem) F
S PREREQUISITE: Senior standing. Undergraduate research. An in-depth examination of important authors, works, or issues in Hispanic studies. In Spanish.

SPNS 490R. Undergraduate Research. 1-6 Credits. (1-6 Ind; 12 cr max) F, Su
Max 12 cr. Directed undergraduate research which may culminate in a research paper, journal article, or undergraduate thesis. Course will address responsible conduct of research. May be repeated.

SPNS 491. Special Topics. 1-3 Credits. (1-3 Lec; 12 cr max) On Demand
PREREQUISITE: Course prerequisites as determined for each offering. Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

SPNS 492. Independent Study. 1-3 Credits. (1-3 Ind; 6 cr max)
PREREQUISITE: Junior standing and consent of instructor. Directed research and study on an individual basis.

SPNS 496. Experience Lat Am Today IV. 1-2 Credits. (1 Ind; 6 cr max) F, Su
Max 6 cr. PREREQUISITE: The 400-level SPNS course it complements Faculty-led study abroad course integrating experiential learning into existing semester-long SPNS 400-level courses. One (1 cr) and two (2 cr) weeks in Latin America during spring break or right after semester ends. Theme varies with course and instructor.
STAT 532. Statistics for Scientists and Engineers. 3 Credits. (3 Lec) F,S
PREREQUISITE: M 172Q. Methods of estimation, data collection, analysis and display of quantitative information, continuous and discrete random variables, families of probability distributions, hypothesis testing, regression, ANOVA.

STAT 401. Applied Methods in Statistics. 3 Credits. (2 Lec, 1 Lab) F,S
PREREQUISITE: Graduate standing and STAT 216Q. This course is intended for graduate students not majoring in mathematical sciences and not ready for STAT 511. Graphical techniques, data collection plans, populations, samples, sampling distributions, analysis of variance for one-way classifications, multiple comparisons, simple linear regression.

STAT 408. Statistical Computing and Graphical Analysis. 1-3 Credits. (1-3 Lec) cr max 3
PREREQUISITE: One of the following: STAT 217Q, STAT 332, or STAT 401. Introduction to statistical packages R or SAS, including data importation, cleaning, graphing, and basic programming. Emphasis on use of graphical displays to explore, understand, and present data, and on organization of code.

STAT 411. Methods for Data Analysis I. 3 Credits. (2 Lec, 1 Lab) F,S
PREREQUISITE: STAT 217Q or STAT 332, or equivalent. Introduction to statistical inference and design, t-tests, non-parametric alternatives, one-way ANOVA, simple linear regression, multiple linear regression, with an emphasis on statistical thinking, appropriate inference, interpretation of results, and writing. Co-convened with STAT 511.

STAT 412. Methods for Data Analysis II. 3 Credits. (2 Lec, 1 Lab) S
PREREQUISITE: STAT 411. Continuation of STAT 411/STAT 511 to cover principles of experimental design, multi-factor ANOVA, repeated measures, logistic regression, Poisson log-linear regression, and introductions to multivariate and time series analyses, with an emphasis on statistical thinking, appropriate inference and interpretation, and writing. Co-convened with STAT 512.

STAT 421. Probability Theory. 3 Credits. (3 Lec) F
PREREQUISITE: M 273Q and M 242 Strongly recommended. Fundamentals of probability; discrete and continuous random variables; expected value; variance; joint, marginal, and conditional distributions; conditional expectations; applications; simulation; central limit theorem; order statistics.

STAT 422. Mathematical Statistics. 3 Credits. (3 Lec) S
PREREQUISITE: STAT 421. Senior capstone course. Introduction to the theory of point estimation, interval estimation, and hypothesis testing.

STAT 425. Biostatistical Data Analysis. 3 Credits. (3 Lec) F
PREREQUISITE: STAT 217Q starting S 2015 then to be offered F even years. PREREQUISITE: STAT 411 Statistical methodology applicable to vital statistics, life tables and survival curves, clinical trials, epidemiologic investigations, and cause-effect studies.

STAT 431. Nonparametric Statistics. 3 Credits. (3 Lec) S
To be offered alternate odd years PREREQUISITE: One of the following: STAT 217Q, STAT 332, STAT 401 or STAT 511. Goodness-of-fit tests, sign tests, randomization and permutation tests, Wilcoxon and Mann-Whitney tests, Kruskal-Wallis and Friedman’s tests, Spearman and Kendall’s measures of association, bootstrap techniques, and other nonparametric test procedures. Emphasis on methods and interpretations rather than theory.

STAT 436. Introduction to Time Series Analysis. 3 Credits. (3 Lec) F
PREREQUISITE: STAT 411/STAT 511 or consent of instructor. An introduction to time series analysis considering time series regression, autoregressive, moving average, and ARIMA models, time series model building, estimation, and forecasting, and basic frequency domain methods. Co-convened with STAT 536.

STAT 457. Introduction to Applied Multivariate Analysis. 3 Credits. (3 Lec) S
PREREQUISITE: STAT 412/STAT 512 or consent of instructor. Classic multivariate methods, including but not limited to principal components analysis, canonical correlation analysis, factor analysis, discrimination and classification methods, cluster analysis, and other topics may depend on instructor.

STAT 510. Application of Statistical Methods to Business. 3 Credits. (3 Lec) S
PREREQUISITE: STAT 411 or MATH 408. Statistical methodology applicable to vital statistics, life tables and survival curves, clinical trials, epidemiologic investigations, and cause-effect studies.

STAT 532. Statistics for Scientists and Engineers. 3 Credits. (3 Lec) F,S
PREREQUISITE: M 172Q. Methods of estimation, data collection, analysis and display of quantitative information, continuous and discrete random variables, families of probability distributions, hypothesis testing, regression, ANOVA.

STAT 401. Applied Methods in Statistics. 3 Credits. (2 Lec, 1 Lab) F,S
PREREQUISITE: Graduate standing and STAT 216Q. This course is intended for graduate students not majoring in mathematical sciences and not ready for STAT 511. Graphical techniques, data collection plans, populations, samples, sampling distributions, analysis of variance for one-way classifications, multiple comparisons, simple linear regression.

STAT 408. Statistical Computing and Graphical Analysis. 1-3 Credits. (1-3 Lec) cr max 3
PREREQUISITE: One of the following: STAT 217Q, STAT 332, or STAT 401. Introduction to statistical packages R or SAS, including data importation, cleaning, graphing, and basic programming. Emphasis on use of graphical displays to explore, understand, and present data, and on organization of code.

STAT 411. Methods for Data Analysis I. 3 Credits. (2 Lec, 1 Lab) F,S
PREREQUISITE: STAT 217Q or STAT 332, or equivalent. Introduction to statistical inference and design, t-tests, non-parametric alternatives, one-way ANOVA, simple linear regression, multiple linear regression, with an emphasis on statistical thinking, appropriate inference and interpretation, and writing. Co-convened with STAT 512.

STAT 412. Methods for Data Analysis II. 3 Credits. (2 Lec, 1 Lab) S
PREREQUISITE: STAT 411. Continuation of STAT 411/STAT 511 to cover principles of experimental design, multi-factor ANOVA, repeated measures, logistic regression, Poisson log-linear regression, and introductions to multivariate and time series analyses, with an emphasis on statistical thinking, appropriate inference and interpretation, and writing. Co-convened with STAT 512.

STAT 421. Probability Theory. 3 Credits. (3 Lec) F
PREREQUISITE: M 273Q and M 242 Strongly recommended. Fundamentals of probability; discrete and continuous random variables; expected value; variance; joint, marginal, and conditional distributions; conditional expectations; applications; simulation; central limit theorem; order statistics.

STAT 422. Mathematical Statistics. 3 Credits. (3 Lec) S
PREREQUISITE: STAT 421. Senior capstone course. Introduction to the theory of point estimation, interval estimation, and hypothesis testing.

STAT 425. Biostatistical Data Analysis. 3 Credits. (3 Lec) F
PREREQUISITE: STAT 217Q starting S 2015 then to be offered F even years. PREREQUISITE: STAT 411 Statistical methodology applicable to vital statistics, life tables and survival curves, clinical trials, epidemiologic investigations, and cause-effect studies.

STAT 431. Nonparametric Statistics. 3 Credits. (3 Lec) S
To be offered alternate odd years PREREQUISITE: One of the following: STAT 217Q, STAT 332, STAT 401 or STAT 511. Goodness-of-fit tests, sign tests, randomization and permutation tests, Wilcoxon and Mann-Whitney tests, Kruskal-Wallis and Friedman’s tests, Spearman and Kendall’s measures of association, bootstrap techniques, and other nonparametric test procedures. Emphasis on methods and interpretations rather than theory.

STAT 436. Introduction to Time Series Analysis. 3 Credits. (3 Lec) F
PREREQUISITE: STAT 411/STAT 511 or consent of instructor. An introduction to time series analysis considering time series regression, autoregressive, moving average, and ARIMA models, time series model building, estimation, and forecasting, and basic frequency domain methods. Co-convened with STAT 536.

STAT 457. Introduction to Applied Multivariate Analysis. 3 Credits. (3 Lec) S
PREREQUISITE: STAT 412/STAT 512 or consent of instructor. Classic multivariate methods, including but not limited to principal components analysis, canonical correlation analysis, factor analysis, discrimination and classification methods, cluster analysis, and other topics may depend on instructor.

STAT 510. Application of Statistical Methods to Business. 3 Credits. (3 Lec) S
PREREQUISITE: STAT 411 or MATH 408. Statistical methodology applicable to vital statistics, life tables and survival curves, clinical trials, epidemiologic investigations, and cause-effect studies.
STAT 446. Sampling. 3 Credits. (3 Lec) F
PREREQUISITE: One of the following: STAT 217Q, STAT 332, or STAT 401. Probability sampling, sources of bias and uncertainty, survey design, methods for the natural sciences, simple random sampling, stratified random sampling, systematic sampling, cluster sampling.

STAT 448. Mixed Effects Models. 3 Credits. (3 Lec) F alternate years offered in odd years. PREREQUISITE: STAT 411/STAT 511 or consent of instructor. In depth analysis of random, fixed and mixed effects models including use of R software and interpretation of results. Emphasis on observations correlated in time (repeated measures) and space, and on random coefficients models (growth curves).

STAT 490R. Undergraduate Research. 1-6 Credits. (1-6 Ind; 12 cr max) F,S,Su PREREQUISITE: Junior standing in statistics and consent of department head. Directed undergraduate research/creative activity which may culminate in a research paper, journal article, or undergraduate thesis. Course will address responsible conduct of research. May be repeated.

STAT 491. Special Topics. 1-4 Credits. (1-4 Ind; 12 cr max) On Demand PREREQUISITE: Course prerequisites as determined for each offering. Course not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

STAT 492. Independent Study. 1-3 Credits. (1-3 Ind; 6 cr max) F,S,Su Max 6 cr. PREREQUISITE: Junior standing, consent of instructor, and approval of department head. Directed research and study on an individual basis.

STAT 494. Seminar. 1 Credit. (1 Sem; 4 cr max) On Demand PREREQUISITE: Junior standing and as determined for each offering. Topics offered at the upper division level which are not covered in regular courses. Students participate in preparing and presenting material.

STAT 498. Internship. 2-12 Credits. (2-12 Ind; 12 cr max) F,S,Su PREREQUISITE: Junior standing, consent of instructor, and approval of department head. An individualized assignment arranged with an agency business, or other organization to provide guided experience in the field.


STAT 505. Linear Models. 3 Credits. (3 Lec) F PREREQUISITE: STAT 412 or STAT 512. Special matrix theory for statistics, multivariate normal distribution, distributions of quadratic forms, estimation and testing for the general linear model, one-way and two-way classification models, contrasts (main effect, simple effect and interaction), multiple comparison techniques.

STAT 506. Advanced Regression Analysis. 3 Credits. (3 Lec) S PREREQUISITE: STAT 505. Applications of linear models using statistical packages; detecting and dealing with violations of assumptions including nonconstant variance, nonnormality, and collinearity; mixed effects models.

STAT 509. Stochastic Processes. 3 Credits. (3 Lec) S alternate years, to be offered even years. PREREQUISITE: STAT 421. Conditional probability theory, discrete and continuous time markov chains including birth and death processes and long run behavior, Poisson processes; queueing systems; system reliability. Cross-listed with M 509.

STAT 510. Statistical Consulting Seminar. 1 Credit. (1 Sem; 6 cr max) F,S PREREQUISITE: Graduate standing in statistics. Seminar discussions of issues and cases in statistical consulting. Supervised practice in consulting with researchers from various disciplines.

STAT 511. Methods of Data Analysis I. 3 Credits. (2 Lec, 1 Lab) F,S PREREQUISITE: Graduate standing and STAT 216Q or STAT 401. This course targets non-statistics graduate students. Introduction to statistical inference and design, t-tools, non-parametric alternatives, one-way ANOVA, simple linear regression and multiple linear regression, with an emphasis on statistical thinking, appropriate inference, interpretation of results and writing. Semester project required. Co-convened with STAT 411.

STAT 512. Methods of Data Analysis II. 3 Credits. (2 Lec, 1 Lab) S PREREQUISITE: STAT 411/STAT 511 (co-convened). Continuation of STAT 411/STAT 511 to cover principles of experimental design, multi-factor ANOVA, repeated measures, logistic regression, Poisson log-linear regression, and introductions to multivariate and time series analyses, with an emphasis on statistical thinking, appropriate inference and interpretation, and writing. A semester project is required. Co-convened with STAT 412.

STAT 520. Topics in Applied Statistics. 3 Credits. (3 Lec) F PREREQUISITE: STAT 422 and consent of instructor. Current topics selected from computational statistics, time series and spatial statistics, decision theory, sampling, linear and mixed models, and multivariate statistics.

STAT 525. Biostatistics. 3 Credits. (3 Lec) F alternate years to be offered even years PREREQUISITE: STAT 411 or STAT 511. Statistical methodology applicable to vital statistics, life tables and survival curves, clinical trials, epidemiologic investigations, and cause-effect studies. Co-convened with STAT 425.

STAT 528. Statistical Quality Control. 3 Credits. (3 Lec) F alternate years, to be offered odd years. PREREQUISITE: STAT 421 or an equivalent transfer course in probability theory. Modeling process quality, traditional SQC tools, control charts for variable and attribute data, CUSUM and WMA charts, process capability analysis, reliability statistics, accelerated testing.

STAT 532. Bayesian Data Analysis. 3 Credits. (3 Lec) F PREREQUISITE: STAT 422 or STAT 502 or M 502 and STAT 506 recommended. Fundamentals of Bayesian inference, methods of Bayesian data analysis, computational methods for posterior simulation, fundamentals of hierarchical modeling.

STAT 534. Spatial Data Analysis. 3 Credits. (3 Lec) S alternate years, to be offered odd years. PREREQUISITE: STAT 412, STAT 512, and STAT 422, or equivalent, or consent of the instructor. Statistical methods of spatial data analysis, stationary and nonstationary random fields, covariance structures, geostatistical models and analysis, spatial point models and analysis, spatial lattice models and analysis.

STAT 536. Time Series Analysis. 3 Credits. (3 Lec) F alternate years, to be offered even years. PREREQUISITE: STAT 411, STAT 511, or consent of the instructor. An introduction to time series analysis considering time series regression, autoregressive, moving average, and ARIMA models, time series model building, estimation, and forecasting, and basic frequency domain methods. Co-convened with STAT 436.

STAT 537. Multivariate Analysis I. 3 Credits. (3 Lec) S alternate years, to be offered even years. PREREQUISITE: STAT 505. Multivariate regression, principal components analysis, exploratory and confirmatory factor analysis, discriminant and classification analysis, cluster analysis, classification and regression trees, basic structural equation modeling, along with bagging and boosting methods.

STAT 538. Multivariate Analysis II. 3 Credits. (3 Lec) F alternate years, to be offered even years. PREREQUISITE: STAT 537. Special topics in multivariate analysis including general latent variable methods, analysis of covariance structures, common principle components, robust and distribution free multivariate analysis.

STAT 539. Generalized Linear Models. 3 Credits. (3 Lec) S alternate years, to be offered odd years. PREREQUISITE: STAT 422 and STAT 411/STAT 511. Analysis of categorical data including logistic regression, log-linear models, analysis of deviance, extramalional variation, quasi-likelihood.

STAT 541. Experimental Design. 3 Credits. (3 Lec) S PREREQUISITE: STAT 411/STAT 511 and M 221 or M 333 or M 441. An introduction to the design and analysis of experiments: topics include analysis of variance methods, matrix forms, multiple comparisons, fixed and random effects, factorial designs, balanced complete and incomplete blocking designs, designs with nested effects, and split plot designs. Co-convened with STAT 441.


STAT 575. Professional Paper and Project. 1-4 Credits. (1-4 Lec; 6 cr max) F,S,Su PREREQUISITE: Graduate standing. A research or professional paper or project dealing with a topic in the field. The topic must have been mutually agreed upon by the student and his or her major advisor and graduate committee.
TE 291. Special Topics. 1-4 Credits. (1 Lec; 12 cr max) On Demand PREREQUISITE: Master’s standing. This course may be used only by students who have completed all of their coursework (and thesis, if on a thesis plan) but who need additional faculty or staff time.

TE 294. Seminar. 1 Credit. (1 Sem; 4 cr max) F,S Max 4 cr. Topics offered at the lower division level which are not covered in regular courses.

TE 300. Alternative Power/Energy Tech. 3 Credits. (2 Lec, 1 Lab) S alternate years, to be offered odd years. LEC 1 LAB 2 PREREQUISITE: TE 101 and TE 207 Through a variety of research and applied learning activities, students will develop an understanding of various power/energy sources while at the same time gaining new perspectives on the feasibility and appropriateness of adopting and implementing a variety of power/energy systems to meet current societal needs.

TE 353. Teaching Practices. 1 Credit. (1 Lab) F COREQUISITE: EDU 497 (Methods: Ag and Tech Ed). Provides additional experiences in planning, teaching and evaluating lessons in Technology Education.

TE 406. Curriculum & Facilities Plan. 3 Credits. (3 Lec) F PREREQUISITE: Acceptance in Teacher Education program; junior standing. COREQUISITE: EDU 497 (Methods: Ag and Tech Ed), or consent of instructor. Determining appropriate development of Technology Education and Agricultural Education programs based on an analysis of student and community needs. Organizing subject matter materials and laboratory resources to promote the development of standard based curricula.

TE 410. Computer Aided and Industrial Machining and Manufacturing. 4 Credits. (2 Lec, 2 Lab) S PREREQUISITE: TE 230. Understanding of computer aided machining and manufacturing. Includes instruction in the use and operation of a complete CAM system including applications on a CNC milling machine. Course content includes machine tool technology practice related to traditional machining techniques.

TE 417. Manufacturing Technology. 3 Credits. (1 Lec, 2 Lab) F PREREQUISITE: TE 207 and TE 250 and junior standing. Capstone course. Study and application of manufacturing concepts common to industry, including the stages of initial planning, prototype construction through the use of modern manufacturing techniques, market research, and analysis.

TE 490R. Undergraduate Research. 1-6 Credits. (1 Lec; 12 cr max) F,S Su Max 12 cr. Directed undergraduate research which may culminate in a research paper, journal article, or undergraduate thesis. Course will address responsible conduct of research. May be repeated.

TE 491. Special Topics. 1-4 Credits. (1 Lec; 12 cr max) On Demand Max 12 cr. PREREQUISITE: Course prerequisites as determined for each offering. Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

TE 492. Independent Study. 1-3 Credits. (1 Lec; 6 cr max) On Demand Max 6 cr. PREREQUISITE: Junior standing, consent of instructor, and approval of department head. Directed research and study on an individual basis.

TE 494. Seminar. 1 Credit. (1 Sem; 4 cr max) On Demand Max 4 cr. PREREQUISITE: Junior standing, consent of instructor, and approval of department head. Directed research and study on an individual basis.

TE 498. Internship. 2-12 Credits. (1 Lab; 12 cr max) F,S,Su Max 12 cr. PREREQUISITE: Junior standing, consent of instructor, and approval of department head. An individualized assignment arranged with an agency, business or other organization to provide guided experience in a technology field.

TE 501. History and Philosophy of Technology Education. 3 Credits. (3 Lec) F,Su A review of national trends and issues in Technology Education and their implications for program development at the local, state and national level.

TE 530. 3D Modeling & Animation. 3 Credits. (1 Lec, 2 Lab) S alternate years, to be offered even years. PREREQUISITE: TE 230 or ME 115, 116, 117 or have consent of instructor This course is designed to provide the learner with experiences that build on previous AutoCAD use and focuses primarily on the creations of 3D solid models.
TE 594. Seminar. 1 Credit. (1 Sem; 4 cr max) On Demand Max 4 cr. PREREQUISITE: Graduate standing or seniors by petition. Course prerequisites as determined for each offering. Topics offered at the graduate level which are not covered in regular courses. Students participate in preparing and presenting discussion material.

THTR - Theatre

THTR 122IA. Acting for Non-Majors. 3 Credits. (3 Lec) F S, Su. On demand An introduction to the creative process engaged by a performer on a stage. Taught in a workshop format in which the individual student engages in exercises designed to convey stories and emotions through the understanding of human behavior as expressed on a stage.

THTR 304. Theatre Production. 4 Credits. (Sem) F PREREQUISITE: FILM 212, FILM 251, and FILM 254. Exploration of the aesthetics and practice of creating a live theatrical performance. Students will work in teams to produce one act plays resulting in a public performance.

THTR 490R. Undergraduate Research. 1-6 Credits. (1-6 Ind; 12 cr max) F,S,Su Max 12 cr. PREREQUISITE: Senior standing in MPVT. Directed undergraduate research which may culminate in a research paper, journal article, or undergraduate thesis. Course will address responsible conduct of research. May be repeated.

THTR 492. Independent Study. 1-3 Credits. (1 Ind; 6 cr max) On Demand May be repeated, Maximum 6 cr. total for FILM, PHOT & THTR 492 combined. PREREQUISITE: Junior standing, consent of instructor and approval of department head. Directed research and study on an individual basis.

THTR 494. Seminar/Workshop. 1-4 Credits. (1-4 Sem; 12 cr max) F,S,Su 1 - 4 cr. SEM Maximum 12 cr. PREREQUISITE: Junior standing or permission of instructor and as determined for each offering. Topics offered at the upper division level that are not covered in regular courses. Students participate in preparing and presenting discussion material.

THTR 498. Career Internship. 2-12 Credits. (2-12 Ind; 12 cr max) F,S,Su 2-12 cr. IND may be repeated, maximum 12 credits total for FILM,PHOT & THTR 498 combined. PREREQUISITE: Consent of School Director. An individualized assignment arranged with an agency, business, or other organization to provide guided experience in the field.

UC - University College

UC 102. Leadership Explorations. 1 Credit. (1 Sem) F One day prior to move-in day, this engaging and experiential leadership course provides first-year students with the opportunity to discuss theory and practice leadership in a small team setting.

UC 202. Leadership Foundations. 3 Credits. (3 Sem) F,S,Su Provides students with the opportunity to develop leadership skills by examining individual and organizational leadership effectiveness through case studies and experiential learning on campus in the community and nationally. Introductory course for students interested in pursuing the MSU Leadership Fellows Certificate.

UC 221. Critical Thinking & Leading. 3 Credits. (Seminar) F,S,Su In this seminar students discover, evaluate and apply Critical Thinking and its relationship to Leadership. Using various techniques, including Socratic Questioning, they develop and practice effective Critical Thinking skills. Participants are challenged to 'think about how they think' i.e. Metacognition.

UC 291. Special Topics. 1-4 Credits. (1-4 Sem; 12 cr max) On Demand PREREQUISITE: None required but some may be determined necessary by each offering department. Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

UC 292. Independent Study. 1-3 Credits. (1-3 Ind; 6 cr max) On Demand PREREQUISITE: Consent of instructor and approval of Director. Directed research and study on an individual basis.

UC 298. Internship. 1-6 Credits. (1-6 Ind; 6 cr max) On Demand Max 6 cr. PREREQUISITE: Consent of instructor and approval of department head. An individualized assignment arranged with an agency, business, or other organization to provide guided experience in the field.

UC 302. Leadership Capstone. 1 Credit. (1 Sem) F,S,Su PREREQUISITE: UC 202. Junior standing, and permission of instructor. Capstone course for students completing the requirements of the MSU Leadership Fellows Certificate. Emphasizes leadership development to empower students to become effective agents of change.

UC 491. Special Topics. 1-4 Credits. (1-4 Lec) -- Special Topics in University College.

UC 498. Internship. 1-6 Credits. (1-6 Int; 6 cr max) On Demand Max 6 cr. PREREQUISITE: Consent of instructor and approval of department head. An individualized assignment arranged with an agency, business, or other organization to provide guided experience in the field.

UH - University Honors

UH 121. Hike and Read. 1 Credit. (1 Rct) F Reading and analysis of a text in the humanities, arts, or sciences. Course held off campus for a weekend.

UH 131. Freshman Research Symposium. 1 Credit. (1 Lec) F Presentations of research by current MSU faculty. Tours of laboratory facilities at MSU.

UH 201US. Texts & CriticaKnowledge. 4 Credits. (4 Sem) F PREREQUISITE: Restricted entrance; admission to the University Honors Program. University Seminar in critical reading/analysis of fundamental texts in the humanities, arts, communication, social studies, science, and history of ideas. Socratic teaching methodology. Particular emphasis on development of analysis and criticism through argument, writing, and oral communication. Academic writing and oral argumentation presentations.

UH 202IH. Texts & CriticaImagination. 4 Credits. (4 Sem) S PREREQUISITE: Restricted entrance; admission to the University Honors Program. Critical reading/analysis of fundamental texts in the humanities, arts, communication, social studies, science, and history of ideas. Socratic teaching methodology. Particular emphasis on development of analysis and criticism through argument, writing, and oral communication. Academic writing and oral argumentation presentations.

UH 204. Great Expeditions. 3 Credits. (3 Sem; max unlimited) On Demand Max credits unlimited. PREREQUISITE: Consent of instructor. Preparation and execution of an expedition paralleling a portion of a historically and/or culturally significant expedition. Students study the original expedition journals, history, social, scientific, artistic, and environmental context as well as plan their own expedition. The expedition occurs over a vacation break and students are required to make a public presentation on the expedition and their specific research project during the subsequent semester.

UH 204D. Great Expeditions. 3 Credits. (3 Sem; max unlimited) PREREQUISITE: Consent of instructor. Preparation and execution of an expedition paralleling a portion of a historically and/or culturally significant expedition. Students study the original expedition journals, history, social, scientific, artistic, and environmental context as well as plan their own expedition. The expedition occurs over a vacation break and students are required to make a public presentation on the expedition and their specific research project during the subsequent semester.

UH 210. Mentoring Gifted Students. 2 Credits. (2 Sem; 4 cr max) F,S,Su Max 4 cr. PREREQUISITE: Admission to the University Honors Program. University Honors Program students mentor gifted children from the Bozeman Public Schools. Students meet together in seminar discussion, plan and implement projects, and evaluate their projects.

UH 291. Special Topics. 1-4 Credits. (1 Sem; 12 cr max) On Demand Max 12 cr. PREREQUISITE: None required but some may be determined necessary by each offering department. Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

UH 292. Independent Study. 1-3 Credits. (1 Ind; 6 cr max) On Demand Max 6 cr. PREREQUISITE: Consent of instructor and approval of Director. Directed research and study on an individual basis.

UH 301US. Texts and CriticaII. 4 Credits. (Sem) F,S,Su PREREQUISITE: Restricted entrance; admission to the University Honors Program. Critical reading/analysis of fundamental texts in the humanities, arts, communication, social studies, science, and history of ideas. Socratic teaching methodology. Particular emphasis on development of analysis and criticism through argument, writing, and oral communication. Academic writing and oral argumentation presentations.

UH 401RA. Honors Research Seminar in the Arts. 2-4 Credits. (2-4 Sem; max unlimited) On Demand Max credits unlimited. PREREQUISITE: UH 201 and UH 202. Advanced Honors seminars are interdisciplinary courses which emphasize class discussion, development of analytic thinking and writing skills, and require independent creativity/research.
**UNIV - University**

UH 402RH. Honors Seminar. 2-4 Credits. (2 Sem; max unlimited) On Demand
Max credits unlimited. PREREQUISITE: UH 201 and UH 202. Advanced Honors seminars are interdisciplinary courses which emphasize class discussion, development of analytic thinking and writing skills, and require independent creativity/research.

UH 403RS. Honors Seminar. 2-4 Credits. (2-4 Sem; max unlimited) On Demand
Max credits unlimited. PREREQUISITE: UH 201 and UH 202. Advanced Honors seminars are interdisciplinary courses which emphasize class discussion, development of analytic thinking and writing skills, and require independent creativity/research.

UH 404RN. Honors Research Seminar in the Natural Sciences. 2-4 Credits. (2-4 Sem; max unlimited) On Demand
Max credits unlimited. PREREQUISITE: UH 201 and UH 202. Advanced Honors seminars are interdisciplinary courses which emphasize class discussion, development of analytic thinking and writing skills, and require independent creativity/research.

UH 450. Advanced Honors Tutorial. 4-6 Credits. (4 Ind; 12 cr max) F.S.
Maximum 12 cr. PREREQUISITE: UH 201 and UH 202. Weekly seminar and tutorial supervision with extensive interdisciplinary reading, analytic writing, and oral argument, leading to comprehensive examinations. May be repeated.

UH 451. Advanced Honors Tutorial. 4-6 Credits. (6 Ind; 12 cr max) F.S.
Maximum 12 cr. PREREQUISITE: UH 450, admission to the University Honors Program, and approval of Director. Weekly seminar and tutorial supervision with extensive interdisciplinary reading, analytic writing, and oral argument, leading to comprehensive examinations. May be repeated.

UH 490R. Undergrad Ruth/Thesis. 1-6 Credits. (1-6 Ind; 12 cr max) F.S.,Su.
Max 12 cr. PREREQUISITE: Admission to the University Honors Program, and approval of Director. Directed undergraduate research/creative activity which may culminate in a research paper, journal article, or undergraduate thesis. Course will address responsible conduct of research. May be repeated.

UH 491. Special Topics. 1-4 Credits. (1 Lec; 12 cr max) On Demand
1 - 4 cr. Maximum 12 cr. PREREQUISITE: Course prerequisites as determined for each offering. Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

UH 492. Independent Study. 1-3 Credits. (1 Ind; 12 cr max) On Demand
Maximum 12 cr. PREREQUISITE: Junior standing, consent of instructor and approval of Director. Directed research and study on an individual basis.

UH 494. Honors Seminar. 2-4 Credits. (2-4 Sem; max unlimited) On Demand
Max credits unlimited. PREREQUISITE: UH 201 and UH 202. Advanced Honors seminars are interdisciplinary courses which emphasize class discussion, development of analytic thinking and writing skills, and encourage independent creativity/research.

UH 494CS. Honors Seminar. 4 Credits. (4 Sem)
PREREQUISITE: UH 201 and UH 202. Advanced Honors seminars are interdisciplinary courses which emphasize class discussion, development of analytic thinking and writing skills, and encourage independent creativity/research.

UH 494D. Honors Seminar. 2-4 Credits. (2-4 Sem; max unlimited) On Demand
PREREQUISITE: UH 201 and UH 202. Advanced Honors seminars are interdisciplinary courses which emphasize class discussion, development of analytic thinking and writing skills, and encourage independent creativity/research.

UH 494A. Honors Seminar. 4 Credits. (Sem; max unlimited) On Demand
Max credits unlimited. PREREQUISITE: UH 201 and UH 202. Advanced Honors seminars are interdisciplinary courses which emphasize class discussion, development of analytic thinking and writing skills, and encourage independent creativity/research.

UH 494H. Honors Seminar. 4 Credits. (Sem; max unlimited) On Demand
Max credits unlimited. PREREQUISITE: UH 201 and UH 202. Advanced Honors seminars are interdisciplinary courses which emphasize class discussion, development of analytic thinking and writing skills, and encourage independent creativity/research.

UH 494N. Honors Seminar. 4 Credits. (Sem; max unlimited) On Demand
Max credits unlimited. PREREQUISITE: UH 201 and UH 202. Advanced Honors seminars are interdisciplinary courses which emphasize class discussion, development of analytic thinking and writing skills, and encourage independent creativity/research.

UH 494S. Honors Seminar. 4 Credits. (Sem; max unlimited) On Demand
Max credits unlimited. PREREQUISITE: UH 201 and UH 202. Advanced Honors seminars are interdisciplinary courses which emphasize class discussion, development of analytic thinking and writing skills, and encourage independent creativity/research.

UH 494RH. Honors Seminar. 4 Credits. (Sem; max unlimited) On Demand
PREREQUISITE: UH 201 and UH 202. Advanced Honors seminars are interdisciplinary courses which emphasize class discussion, development of analytic thinking and writing skills, and encourage independent creativity/research.

UH 494RS. Honors Seminar. 4 Credits. (4 Sem; max unlimited) On Demand
PREREQUISITE: UH 201 and UH 202. Advanced Honors seminars are interdisciplinary courses which emphasize class discussion, development of analytic thinking and writing skills, and encourage independent creativity/research.

UNIV - University

UNIV 125CS. Microbes in the Environment. 3 Credits. (3 Lec) F.S.
During the semester, students will explore contemporary issues related to microorganisms in the environment through a series of lectures and hands-on activities. Topics will include microbes in environmental, industrial, and medical settings. Examples include the beneficial role microbes play in treating waste water and making beer, wine, cheese and other food products as well as problems caused by microbes in medical infections, hot tubs, drinking water, and other industrial systems. Completing this course will advance a student’s awareness and appreciation of scientific thought and critical thinking and will improve communication skills.

US - University Studies

US 101US. First Year Seminar. 3 Credits. (3 Sem) F.S.
PREREQUISITE: First year students (less than 30 credits) only. This multi-disciplinary course, presented in seminar format, draws from the disciplines of psychology, sociology, history, and philosophy and encourages students to explore issues critical to their academic goals and objectives. The course emphasizes verbal communication, critical thinking, intellectual development, and academic choices. Fulfills university seminar requirement of the core curriculum. This course cannot be repeated.

US 102. Career Connections. 1 Credit. (1 Sem) On Demand
Course is designed to assist students in the selection of a major in accordance with their interests and abilities.

US 103. Learning Strategies. 1 Credit. (1 Ret) F.S.
Co-Requisite: US 101US for the specified sections only. In this course, students will “learn how to learn” and develop critical thinking skills to solve problems. Study skills for effective reading, note taking, and test preparation are covered, as well as time management, organization, preventing procrastination, improving motivation, and reducing anxiety. Awareness and effective use of campus resources are also emphasized. The overarching purpose is to help students apply this information to their college coursework and be more effective and engaged students.

US 121US. Humanity, Society & Culture in the Digital Landscape. 3 Credits. (3 Sem) F.S.,Su
PREREQUISITE: Successful completion of at least 12 credits, including WRIT 101W or its equivalent. This multi-disciplinary course, delivered in an online seminar format, draws from psychology, sociology, history, and philosophy and asks students to consider the role of education in their lives and the social responsibilities of educated, engaged individuals living in the digital age. The course emphasizes critical thinking, communication and support of ideas, and intellectual development. US 121US fulfills the university seminar requirement of the core curriculum. This course cannot be repeated.

US 135. Veteran Academic Strategies. 1 Credit. (1 Lec) F.S.
Study skills for student veterans that targets developing and applying the academic strategies necessary for persistence and degree completion. Topics include utilizing campus resources, continuing federal educational benefits, and generalizing skills to new academic situations.

US 140. Intro to Law and Legal Prof. 1 Credit. (1 Lec) F.
Introduction to the study of law and an overview of the legal profession, including civil law, criminal prosecution, defense and the judiciary. Students will evaluate their interest in pursuing a legal education and career in law.

US 191. Special Topics. 1 Credit. (1 Sem) On Demand
PREREQUISITE: Course prerequisites as determined for each offering. Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand.

US 210, Education, World of Work, and You. 3 Credits. (1 Sem) F.S.
Study skills for student veterans that targets developing and applying the academic strategies necessary for persistence and degree completion. Topics include utilizing campus resources, continuing federal educational benefits, and generalizing skills to new academic situations.

US 290R. Undergraduate Research. 1-6 Credits. (1-6 Ind; max unlimited) F.S.
Directed undergraduate research which may culminate in a written work or other creative project. Course will address responsible conduct of research. May be repeated.
US 291. Special Topics. 1-3 Credits. (1 Rcr) On Demand
Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand.

US 292. Independent Study. 1-3 Credits. (1 Ind; 6 cr max) On Demand
PREREQUISITE: Consent of instructor and approval of the Director of University Studies. Directed study on an individual basis.

US 460. Peer Leadership. 3 Credits. (1 Lec; 6 cr max) F,S
Max 6 cr. PREREQUISITE: Accepted Peer Leader Status, Restricted Entry. Provides selected upper division students an opportunity to develop leadership and mentoring skills through the involvement with the US 101US First Year Seminar course. Includes training in group leadership and includes topics such as counseling and communication skills, student development, problem solving, and conflict resolution. Peer leaders work closely with faculty to enhance the academic, cultural, and social experiences of students in the seminar course.

US 490R. Undergraduate Research. 1-6 Credits. (1-6 Ind; 12 cr max) F,S,Su
Max 12 cr. Directed undergraduate research/creative activity which may culminate in a research paper, journal article, or undergraduate thesis. Course will address responsible conduct of research. May be repeated.

US 491. Special Topics. 1-3 Credits. (1-3 Lec; 3 cr max) On Demand
PREREQUISITE: Course prerequisites as determined for each offering. Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand.

US 492. Independent Study. 1-3 Credits. (1 Ind; 6 cr max) On Demand
PREREQUISITE: Junior standing, consent of instructor, and approval of the Director of University Studies. Directed study on an individual basis.

US 494. AdvCat Seminar. 1 Credit. (1 Sem; max unlimited) F,S
PREREQUISITE: Sophomore standing and consent of instructor. As student ambassadors on campus, AdvCats are trained to market the programs and activities at MSU to prospective students and their families.

US 498. Internship. 1-12 Credits. (1-12 Ind; 12 cr max) On Demand
PREREQUISITE: Junior standing, consent of instructor, and approval of the Director of University Studies. An individual assignment arranged with an agency, business, or other organization to provide guided experience in the field.

USP - Undergraduate Scholars Program

USP 191. Special Topics. 1 Credit.

USP 290R. Undergraduate Scholars Program. 1-4 Credits. (1 Lec; max unlimited)
On Demand
PREREQUISITE: 1st or 2nd year student and consent of collaborating faculty member. First and second year students in this course will conduct research in collaboration with a faculty member which may culminate in a research paper, a journal article, or an oral presentation. Course will address responsible conduct of research.

USP 490R. Undergraduate Research. 1-6 Credits. (1 Ind; 12 cr max) F,S,Su
Max 12 cr. Directed undergraduate research/creative activity which may culminate in a research paper, journal article, or undergraduate thesis. Course will address responsible conduct of research. May be repeated.

WGSS - Women's and Gender Studies

WGSS 201H. Intro to Feminist Theories. 3 Credits. (3 Lec) F
Major directions in feminist scholarship. Examination of the various schools of thought which have addressed gender inequities, and review of the strategies of cultural criticism which incorporate gender.

WGSS 301RH. Integrative Seminar in Women’s Studies. 3 Credits. (3 Sem; 9 cr max)
Max 9 cr. The seminar builds on the theoretical issues in women's studies and addresses special topics each year from a variety of disciplines.

WGSS 378. LGBTQ Studies. 3 Credits. (3 Lec) S, even years
PREREQUISITE: Sophomore standing or consent of instructor. Examines issues, questions, and interdisciplinary approaches that characterize the field of lesbian/gay/bisexual/trans/queer (LGBTQ) studies. It explores the formation of LGBTQ politics and cultures in the United States; theories of sexual and gender diversity; and sexuality and sexual identity as key categories for understanding knowledge and the self.

WGSS 454. The Study of Men & Masculinity. 3 Credits. (3 Lec) S
PREREQUISITES: WGSS 201 or PSYX 101 or 230 or 235 or 335 or SOCI 101. This course explores masculine gender role socialization and its impact on individuals/society, with emphasis on men’s development and mental health. Systems of patriarchy, privilege, and oppression and their impact on men, women, and society are also discussed. WGSS/US/.

WGSS 491. Special Topics. 3 Credits. (1 Lec, 2 Sem.) S
PREREQUISITE: Sophomore standing or consent of instructor. Examines issues, questions, and interdisciplinary approaches that characterize the field of lesbian/gay/bisexual/trans/queer (LGBTQ) studies. It explores the formation of LGBTQ politics and cultures in the United States; theories of sexual and gender diversity; and sexuality and sexual identity as key categories for understanding knowledge and the self.

WGSS 492. Independent Study. 1-3 Credits. (1-3 Ind; 6 cr max) On Demand
Max 6 cr. PREREQUISITE: Junior standing, consent of instructor, and approval of the Director of University Studies. Directed study on an individual basis.

WGSS 494. Seminar. 3 Credits. (3 Sem) S
PREREQUISITE: Junior standing and as determined for each offering. Time and applied topics drawing on expert feminist voices from the field. Topics at the upper division level that are not covered in regular courses. Students prepare and present discussion material, read original research, and hear presentations by guest speakers.

WILD - Fish & Wildlife Science & Mgmt

WILD 201. Intro to Fish and Wildlife. 1 Credit. (1 Sem) F
An introduction to the career opportunities and current issues associated with management of fisheries and wildlife. For Fish and Wildlife Majors or those interested in the profession.

WILD 290R. Undergraduate Research. 1-6 Credits. (1 Ind; 6 cr max) F,S
Directed undergraduate research which may culminate in a written work or other creative project. Course will address responsible conduct of research. May be repeated.

WILD 291. Special Topics. 1-4 Credits. (1-4 Ind; 12 cr max) On Demand
PREREQUISITE: None required but some may be determined necessary by each offering department. Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

WILD 292. Independent Study. 1-3 Credits. (1-3 Ind; 6 cr max) On Demand
PREREQUISITE: Consent of instructor and approval of department head. Directed research and study on an individual basis.

WILD 301. Princ of Fish & Wildlife Mgmt. 3 Credits. (3 Lec) S
PREREQUISITE: BIOL 160 and BIOL 170N and junior standing. Overview of history and ecological principles underlying fish and wildlife management. In-depth discussion of current issues.

WILD 325. Wildlife-Livestock Nutrition. 3 Credits. (3 Lec) S
PREREQUISITE: ANSC 100 and NRSM 101 and NRSM 102. Nutrition of free ranging ungulates including deer, elk, antelope, bison, sheep, cattle and feral horses. Topics will include digestive systems, intake, food habits, feeding behavior and management on rangelands.

WILD 355. Wildlife and Livestock Habitat Restoration. 3 Credits. (1 Lec, 2 Lab) F
PREREQUISITE: NRSM 101 or ENSC 110 or WILD 301, and BIOL 230, and NRSM 240 or BIOE 370. Improvement and rehabilitation of rangeland, forest, and desert habitats used by wildlife and free-ranging livestock in the western United States. Topics include methods used to improve wildlife habitat as well as livestock forage. Design criteria for stock ponds, off-site water development, construction of bird/ small mammal gazelles, use of prescribed fire, mechanical, chemical and biological techniques to rehabilitate and improve rangeland, forest, and desert vegetation communities.

WILD 373. Wildlife Techniques. 3 Credits. (1 Lec, 2 Lab) F
PREREQUISITE: BIOL 160 or BIOL 170N and junior standing and minimum 3.0 GPA or consent of instructor. The goal of this class is to introduce students to a suite of techniques routinely used by natural resource professionals for gaining knowledge of the ecology and status of wildlife populations.

WILD 401RN. Fish and Wildlife Capstone. 4 Credits. (2 Lec, 2 Lab) S
PREREQUISITE: Completion of STAT 216Q or BIOL 318, and BIOE 370, and WILD 301, and Fish and Wildlife Ecology and Management option, or consent of instructor. Senior capstone course. Course emphasizes solving problems related to management of fish and wildlife. Students will be introduced to field techniques, analysis approaches, and scientific literature used to answer questions related to conservation and management of terrestrial and aquatic vertebrates.
WILD 420. Range & Wildlife Policy and Planning. 3 Credits. (3 Lec) S
PREREQUISITE: BIO 103 or NRSM 101 or ENSC 110 and Junior Standing.
Course explores primary rangeland and wildlife policy in North America, how
it developed and how it is currently administered. Emphasis will be on the
multidisciplinary application of policy for land resource and wildlife management

WILD 426. Wildlife Habitat Management. 3 Credits. (3 Lec) S
PREREQUISITE: NRSM 240 or BIOE 370 or consent of instructor. Emphasis
is placed on wildlife habitat management in coordination with other land uses (i.e.
agriculture, recreation, and development). Students gain insight into the details
of wildlife habitat management by delving into the historical and current literature on the
subject. Real world issues and solutions based on case study examples are emphasized.

WILD 429. Yellowstone Wildlife Habitat Ecology. 2 Credits. (2 Lec) Su
PREREQUISITES: Junior standing and a Biology course or consent of instructor.
This course will describe the native communities of the internationally prominent
northern Yellowstone winter range for wild ungulates. The ecology of many organisms,
both plant and animal will be studied. Plant identification skills will be incorporated
with an emphasis on the recognition of the Yellowstone northern range's flora and
its importance as wildlife habitat. Ecosystem interrelationships will form the basis
for understanding the ecology of the range and interpreting the consequences of
management alternatives.

WILD 438. Wildlife Habitat Ecology. 3 Credits. (3 Lec) S
PREREQUISITE: NRSM 240 or BIOE 370 or consent of instructor. Principles of
habitat importance and management. Habitat requirements within wildlife population
constrains will be emphasized with consideration of other natural resource desires.
Students will be required to learn the ecological characteristics and gain proficiency in
the identification of 40 important woody plants.

WILD 490R. Undergrad Research. 1-6 Credits. (1 Ind; 12 cr max) F,S,Su
Directed undergraduate research which may culminate in a research paper, journal article,
or undergraduate thesis. Course will address responsible conduct of research.
May be repeated.

WILD 491. Special Topics. 1-3 Credits. (1-3 Lec; 12 cr max) On Demand
PREREQUISITE: Course prerequisites as determined for each offering. Courses not
required in any curriculum for which there is a particular one-time need, or given on a
trial basis to determine acceptability and demand.

WILD 492. Independent Study. 1-3 Credits. (1-3 Ind; 6 cr max) On Demand
PREREQUISITE: Junior standing, consent of instructors, and approval of department
head. Directed research and study on an individual basis.

WILD 494. Seminar. 1 Credit. (1 Sem; 4 cr max) On Demand
PREREQUISITE: Junior standing and as determined for each offering. Topics
offered at the upper division level which are not covered in regular courses. Students
participate in preparing and presenting discussion material.

WILD 498. Internship. 1-4 Credits. (1-4 Ind; 8 cr max) On Demand
PREREQUISITE: Approval of internship program by instructor and the department head.
An individualized assignment arranged with an agency, business, or other organization
that provide guided experience in the field. May be repeated.

WILD 501. Applied Population Ecology. 3 Credits. (2 Lec, 1 Lab) S
PREREQUISITE: BIOE 370 or WILD 301. An in-depth review of the (1) key
topologies of population ecology, (2) the application of theory in contemporary
population management, and (3) managing populations in the face of uncertainty.

WILD 502. Population & Habitat Data. 3 Credits. (2 Lec, 1 Lab) 3 credits.
Lecture, 2 Lab 1 Offered in alternate fall semesters in odd numbered years
PREREQUISITE: Completion of or concurrent enrollment in a five-hundred
level statistics course. Study of the theory and methods of sampling and analyzing
population data for vertebrates. Estimation of population size, survival, and
recruitment using competing models that relate population states and rates to habitat
conditions and other covariates of interest. Computer lab.

WILD 504. Wildlife-Habitat Relationships. 3 Credits. (2 Lec, 1 Lab) Offered
in alternate spring semesters in even numbered years
PREREQUISITE: Completion of a 500-level statistics course. This course will help students develop a
conceptual and practical understanding of wildlife-habitat relationships and the use,
application, and limitations of the analytical tools used to analyze these data. Course
will be a blend of discussion and lecture; students will be responsible for written
assignments based on readings and data sets.

WILD 510. Fisheries Science. 3 Credits. (2 Lec, 1 Lab) Offered in alternate spring semesters in even numbered years
PREREQUISITE: BIOO 415, WILD 301. An in-depth review of fisheries data types and the analysis
and interpretation of those data as it relates to freshwater fisheries research and
management.

WILD 513. Fisheries Habitat Management. 3 Credits. (3 Lec) F
PREREQUISITE: Graduate standing or consent of instructor. Assessment and application of ecological principles and methods used to protect and restore stream, lake and reservoir habitats for management of fishes and other aquatic organisms.

WILD 525. Human Dimensions of Fisheries and Wildlife Management. 3 Credits. (3 Lec) S
PREREQUISITE: Graduate standing. This course provides fisheries and wildlife management graduate students with an understanding of how social, cultural, behavioral, and demographic characteristics of humans affect fisheries and wildlife management.

WILD 548. Research Perspectives. 2 Credits. (2 Lec) S
PREREQUISITE: Graduate standing or consent of instructor. An introduction to the
philosophical underpinnings of resource science and management, with the goal
of helping students to develop their own ideological perspective. A broad array of
disciplinary readings is used to survey philosophical worldviews and explore their
influence on science.

WILD 575. Professional Paper and Project. 1-4 Credits. (1 Ind; 4 cr max) F,S,Su
Max 4 cr. Graduate standing and committee approval and consent of instructor.
A research or professional paper or project dealing with a topic in the field. The
topic must be mutually agreed upon by the student and his or her major advisor and
committee.

WILD 591. Special Topics. 1-3 Credits. (1-3 Ind; 12 cr max) On Demand
PREREQUISITE: Upper division courses and others as determined for each offering.
Courses not required in any curriculum for which there is a particular one time need,
or given on a trial basis to determine acceptability and demand before requesting a
regular course number.

WLDG - Welding Technology

WLDG 103. Welding Fund for Const Trades. 2 Credits. (2 Lab) F
Prerequisites: CSTN 135, CSTN 145, CSTN 161, CSTN 171 Corequisites: CSTN
230, CSTN 260 This course is specifically designed to teach students the basic welding
methods that a carpenter might face (i.e. steel stud). Students will cover basic welding
processes used in the trade applications.

WLDG 104. Technical Mathematics. 3 Credits. (3 Lec) F
This course presents basic mathematical topics as they are applied in a trades program.
Topics covered include: use of measuring tools, measurement systems, dimensional
arithmetic, percent, proportion, applied geometry, and basic trigonometry. This
course is intended for CAS and AAS-degree seeking students and does NOT provide
sufficient Pre-Algebra material as a pre-requisite for subsequent mathematics courses.

WLDG 106. Welding Fabrication Methods. 3 Credits. (3 Lab) F
Prerequisites: WLDG 110, WLDG 111, WLDG 121, WLDG 205 Corequisites:
WLDG 120, WLDG 122 This course provides an introduction to basic fabrication of
structural steel in accordance with industry standards.

WLDG 110. Welding Theory 1. 1 Credit. (1 Lab) F
S COREQUISITE: WLDG 111 This course covers welding safety, oxy-fuel and
shielded metal arc welding (SMAW), definitions covering joining common metals,
joint and weld classifications, welding positions, power source selection, plus manual
and semiautomatic curting principles, and terminology.

WLDG 111. Welding Theory 1 Practical. 3 Credits. (1 Lec, 2 Lab) F
S COREQUISITE: WLDG 110 Oxy-fuel practical work will involve fusion welding,
brazing, and cutting. Shielded metal arc welding (SMAW) practical work will involve
flat and horizontal welding skills using a variety of electrodes.

WLDG 117. Blueprint Reading and Welding Symbols. 2 Credits. (2 Lec) F
This course will introduce blueprints and emphasize reading and interpreting welding
symbols. Topics covered include basic blueprint reading for welders; basic lines, basic views,
title block information, dimensions, structural shapes, auxiliary views, section views,
detail prints, welding symbols and other various blueprint information.

WLDG 120. Welding Theory II. 2 Credits. (2 Lec) S
Prerequisites: WLDG 110, WLDG 111, WLDG 121 Corequisites: WLDG 122 This
course will concentrate on the processes which use inert and/or inert and active gas
mixtures for shielding during welding. Gas metal arc welding (GMAW) or MIG, gas
tungsten arc welding (GTAW) or TIG, and plasma welding and cutting (PAW/PAC)
operations will be thoroughly covered. Process selection and use for welding ferrous
and nonferrous metals will be covered.
The goal of this course is to develop confidence and the ability to write clear and effective paragraphs and in various writing positions, and manipulation techniques will be emphasized.

WLDG 122. Welding Theory III Practical. 3 Credits. (3 Lec) S
Prerequisites: WLDG 110, WLDG 111, WLDG 121 Corequisites: WLDG 120 This course continues skill development from WLDG 121. Practical work involves the application of GMAW and GTAW as it is used in industry today. Use of the various modes of metal transfer, joint styles, welding positions, welding of carbon and stainless steels, and aluminum alloys on various joint styles and in various welding positions, ad manipulation techniques will be emphasized.

WLDG 130. Intro to Structural Welding. 3 Credits. (3 Lec) S
Prerequisites: WLDG 110, WLDG 111, WLDG 121, WLDG 205 Corequisites: WLDG 120, WLDG 122 This course covers Gas Metal Arc Welding (GMAW), Shielded Metal Arc Welding (SMAW), and Flux Cored Arc Welding (FCAW) of structural steel and stresses certification code welding on plate and structural steel in all positions. Course instruction and related information will include gas metal and flux core arc welding equipment and welding variables, shielding gases, troubleshooting equipment and weld defects, welder certification and welding codes.

WLDG 145. Fabrication Basics. 3 Credits. (3 Lec) S
Prerequisites: WLDG 110, WLDG 111, WLDG 121, WLDG 205 Corequisites: WLDG 120, WLDG 122 The introduction to basic fabrication of structural steel in accordance with industry standards.

WLDG 151. Shop Practices. 3 Credits. (3 Lab) F
This is an on-going course during normally scheduled shop hours. It is intended to match spring semester students with live, practical shop experiences involving subject matter previously covered in other courses. Emphasis will be on productivity. Gallatin College Workforce Program.

WLDG 185. Qualification Test Prep. 2 Credits. (2 Lab) S
Prerequisites: WLDG 110, WLDG 111, WLDG 121, WLDG 205 Corequisites: WLDG 120, WLDG 122 This is an advanced course in Gas Metal Arc Welding (GMAW), Shielded Metal Arc Welding (SMAW), and Flux Cored Arc Welding (FCAW) procedures to prepare for industrial certification. This includes welding single vee groove weld but joints with backing strips in the flat, horizontal, vertical, and overhead position following the American Welding Society (AWS) and the American Society of Mechanical Engineers (ASME) code specifications.

WLDG 205. Applied Metallurgy. 2 Credits. (2 Lec) F
This course covers basic metallurgical principles and their relationship to the following processes: welding, machining, forming, heat treating, and finishing of ferrous and nonferrous metals. Includes applied metallurgy lab testing exercises.

WLDG 281. Weld Testing Certification Lab. 2 Credits. (2 Lab) S
PREREQUISITES: Limited to students with at least 3 years welding experience, or previous certification, or consent of instructor. Students will prepare, practice and qualify for plate and pipe, according to AWS D1.1, APT 1104, and ASME Section IX codes and standards. Gallatin College.

WLDG 292. Independent Study. 1-3 Credits. (1-3 Ind) F,S
Maximum credit hours 4. The WLDG 292 student is required to work with the instructor to develop a project plan tied to specific skill goals. In preparation for developing their course plan, students will be asked to identify deficiencies in skills. Such an individualized and reflective approach allows the student to develop skills according to what is most needed to continue to improve as a welder in the lab, and as a student in the classroom.

WRIT 080. Building Basic Writing Skills. 4 Credits. (4 Lec) F,S
Offered by Gallatin College. Building Basic Writing Skills introduces students to critical reading practices by focusing on textual analysis of non-fiction works and to writing for academic purposes by focusing on the development of the paragraph. The course also provides, in the context of writing, a review and reinforcement of principles of English grammar and punctuation associated with successful college-level writing. The goal of this course is to develop confidence and the ability to write clear and effective paragraphs and to read college-level texts.

WRIT 095. Developmental Writing. 4 Credits. (4 Lec) F,S
Offered by Gallatin College. Developmental Writing introduces students to critical reading practices within thematic non-fiction, fosters students’ critical thinking based on textual analysis, and encourages questioning and exploration. Composing paragraphs and short essays provides a review and reinforcement of principles of English grammar and punctuation associated with successful college-level writing. Ability to write clear sentences is assumed.

WRIT 101W. College Writing I. 3 Credits. (3 Lec) F,S,Su
Studies the nature and practice of reading and writing as human interaction, with particular attention to elements of writing process and craft, to present new conceptions of writing as students enter the university writing environment.

WRIT 104. Workplace Communications. 2 Credits. (2 Lec) F
Offered by Gallatin College. This course reviews the basic elements of grammar and language arts skills in business writing. Emphasis is placed on writing business letters, memos, emails, and reports for a variety of business applications as well as giving oral presentations. Letters of application and resumes are also covered.

WRIT 201. College Writing II. 3 Credits. (3 Lec) F,S
PREREQUISITE: WRIT 101W. Studies writing as a practice, process, and tool of inquiry in various academic domains. Bridges general study of writing in WRIT 101 and later discipline-specific study of writing. Emphasizes how to conduct inquiry through writing, and how to learn to write in new situations.

WRIT 205. Intro to Writing Studies. 3 Credits. (3 Sem) F
PREREQUISITE: WRIT 101W or equivalent. Overviews the Writing Option and the field of Writing Studies, its areas and methods of inquiry, and questions and issues of interest to writers as writing researchers and theorists from historical, cultural, social and psychological perspectives.

WRIT 221. Intermediate Tech Writing. 3 Credits. (3 Lec) F,S
PREREQUISITE: WRIT 101W. Focuses on kinds of writing done in technical or business environments: business letters, proposals, formal reports, technical presentations, user manuals, etc. Prepares students for technical writing in a range of disciplines and with attention to the social implications of technology.

WRIT 291. Special Topics. 1-4 Credits. (1-4 Lec; 12 cr max) On Demand
Maximum 12 cr. PREREQUISITE: None required but some may be determined necessary by the department. Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

WRIT 292. Independent Study. 1-3 Credits. (1 Ind; 6 cr max) On Demand
Max 6 cr. PREREQUISITE: Consent of instructor and approval of department head. Directed research and study on an individual basis.

WRIT 326. Advanced Writing. 3 Credits. (3 Lec) F
PREREQUISITE: WRIT 101 or equivalent. Advanced writing study and practice, with attention to topics like research writing and style.

WRIT 371. Digital Rhetorics and Multimodal Writing. 3 Credits. (3 Rct) F or S
PREREQUISITE: Junior standing or consent of instructor. Covers topics concerned with rhetoric and writing in digital environments. Students will study theories, principles, and techniques of writing in blended modes and alternative (usually electronic) genres, e.g., web writing and other digital formats that integrate alphabetic-print, image, and audio texts.

WRIT 372. Science Writing for Popular Non-Fiction. 3 Credits. (3 Rct) F, alternate years
Offered by Gallatin College. Science Writing for Popular Non-Fiction is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

WRIT 373. News and Pub Relations Writing. 3 Credits. (3 Rct) S
PREREQUISITE: WRIT 101 and enrollment in English major or Writing minor, or consent of the instructor. Study of science journalism and nonfiction that reports scientific research to non-specialist audiences. Students will study research, reporting, and narrative writing techniques and consider ethical challenges and industry practices in professional science writing.

WRIT 373. News and Pub Relations Writing. 3 Credits. (3 Rct) S
PREREQUISITE: WRIT 101 and enrollment in English major or Writing minor, or consent of the instructor. Familiarizes students with the professional news and public relations writing environment. In writing breaking and feature news stories and press releases, students will master processes by which written information is disseminated to the public, both through news media and government and corporate public information operations.

WRIT 374. Magazine Editing. 3 Credits. (2 Lab, 1 Rct) S
PREREQUISITE: One WRIT course 300-level or above Magazine Editing and Production creates a studio-driven experience for students to walk through editorial considerations, design, and production of themed periodical publications such as magazines, journals, and websites.
WS 491. Special Topics. 1-12 Credits. (1-12 Lec; 12 cr max) On Demand Max 12 cr. PREREQUISITE: Course prerequisites as determined for each offering. Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.
Faculty

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<td>Department of Health and Human Development</td>
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<td>M.S. in Land Rehabilitation</td>
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<td>Master of Engineering in Bioengineering</td>
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<td>Master of Science Animal and Range Sciences</td>
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<tr>
<td>MB - Microbiology</td>
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<td>MBEH - Microbiology Environmental Hlt</td>
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<tr>
<td>MBSP - Molecular Biosciences Program</td>
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<td>MCH - Machining &amp; Manufacturing Tech</td>
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<td>Military Science - Air Force ROTC</td>
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<td>MOR - Museum of the Rockies</td>
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<td>MSEM - Master of Sci &amp; Engineer Mngmt</td>
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<td>MSL - Military Science Leadership</td>
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<td>MSSE - Master of Science Education</td>
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<td>MSU Leadership Fellows Certificate</td>
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<td>MTA - Media &amp; Theatre Arts</td>
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