COURSE BULLETIN
2015-2016
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# 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>
</tr>
<tr>
<td>University Communications</td>
<td>437 Culbertson Hall</td>
<td>994-4571</td>
</tr>
<tr>
<td>Conference Services</td>
<td>211 Strand Union Building</td>
<td>994-3081</td>
</tr>
<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>
</tr>
<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>

## Additional Contacts

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

**MSU - Billings**

Toll Free: 800-565-6782

- Admissions and Records: 657-2158
- Business Services: 657-2301
- Extended Campus: 896-5890
- Financial Aid: 657-2188
- Graduate Studies and Research: 657-2238
- Registrar: 657-2158

**Great Falls College - MSU**

Toll Free: 800-446-2698

- Admissions: 771-4420
- Business and Finance: 771-4321
- Community and Continuing Education: 771-4303
- Distance Education Coordinator: 771-4444
- Financial Aid: 771-4334
- Registrar: 771-5128

**MSU - Northern (Havre)**

Toll Free: 800-662-6132

- Admissions: 265-3704
- Business Services: 265-3733
- Extended University: 265-3730
- Financial Aid: 265-3787
- Graduate Studies: 265-3738
- Registrar: 265-3703
II. Directory

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, Missoula
William Johnstone, Bozeman
Jeffrey Krauss, Bozeman
Major Robinson, Billings
Martha Sheehy, Billings
Paul Tuss, Anaconda, Chair
Mariah R. Williams, Missoula, Student Regent

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
Rhonda Russell, M.Ed, Director of Admissions
Tony Campeau, M.S., Registrar
Carina Beck, Ed.D, Director of the Office of Student Success Programs
Brenda 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
Nancy Cornwell, Ph.D., Dean
Erica Dungan, M.A., Assistant Dean

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

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

Education, Health and Human Development
Lynda Ransdell, Ph.D., FACSM, CSCS, Dean
Jayne Downey, Ph.D., Associate Dean
Robert Carson, Ph.D., Associate Dean
Suzanne Christopher, Ph.D., Associate Dean

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

Honors
Ilse-Mari Lee, D.M.A., Dean

Letters and Science
Nicol Rae, Ph.D., Dean
Tami Eitle, Ph.D., Associate Dean
Melody Zajdel, Ph.D., Associate Dean

Nursing
Helen Melland, Ph. D., Dean
Gretchen McNeely, D.N.S.C., Associate Dean
Donna Williams, Ph.D., Associate Dean

Graduate School
Karlene A. Hoo, Ph.D., 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
Kate Grimes, J.D., Director
University Studies
Diane Donnelly, M.Ed., Director

Human Resources
Dennis Dela, M.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
Leslie Taylor, J.D.

Library
Kenning Arlitsch, Dean
Brian Rossmann, 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
Tammie Brown, M.S., Director of Residence Life and Family and Graduate Housing
Todd Jutila, Director of University Food Service

Safety and Risk Management
Jeff Shada, M.Ed., 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. 378)
• Accounting - BS option in Business; minor (p. 126)
• Adult & Higher Education - option in MEd; option in EdD (p. 285)
• Aerospace - minor (p. 173)
• Agribusiness Management - concentration (p. 69)
• Agricultural Business - BS; minor (p. 68)
• Agricultural Education - BS; MS (p. 72)
• Agricultural Relations - BS option in Agricultural Education (p. 72)
• Agroecology - BS option in Sustainable Food and Bioenergy Systems (p. 96)
• American Studies - Graduate - MA; PhD (p. 332)
• American Studies - Undergraduate - BA (p. 182)
• Animal & Range Sciences - MS; PhD (p. 269)
• Animal Science - BS; minor (p. 75)
• Animal Systems - BS option in Biotechnology (p. 80)
• Anthropology - BS; minor (p. 185)
• Applied Economics - MS (p. 269)
• Applied Mechanics - PhD option in Engineering (p. 330)
• Architecture - Graduate - M.Arch (p. 282)
• Architecture - Undergraduate - BA option in Environmental Design (p. 109)
• Art - BA; BFA; MFA; teaching option; teaching minor, Art History minor (p. 99)
• Art History - BA option in Art; minor (p. 99)
• Associate of Arts - AA (p. 256)
• Associate of Science - AS (p. 257)
• Aviation - AAS (p. 257)

B
• Bio-Resources Engineering - BS option in Civil Engineering (p. 161)
• Biochemistry - Graduate - MS; PhD (p. 316)
• Biochemistry - Undergraduate - BS option in Chemistry; minor (p. 188)
• Bioengineering - BS (p. 157)
• Biological Sciences - BS; MS; PhD (p. 78)
• Biology - teaching option; teaching minor (p. 200)
• Biomedical Sciences - BS option in Cell Biology and Neuroscience (p. 186)
• Biotechnology - BS (p. 79)
• Bookkeeping - CAS (p. 258)
• Botany - refer to Organismal Biology (p. 203)
• Business - BS (p. 118)
• Business Administration - minor (p. 126)

C
• CNC Machine Welding - CAS (http://catalog.montana.edu/undergraduate/gallatin-college/workforce-programs/CNC-machine-technology)
• Cell Biology and Neuroscience - BS; option in Cell Biology and Neuroscience (p. 186)
• Chemical Engineering - Graduate - MS; PhD option in Engineering (p. 316)
• Chemical Engineering - Undergraduate - BS (p. 158)
• Chemistry - Graduate - MS; PhD (p. 334)
• Chemistry - Undergraduate - BS; professional option; teaching option; teaching minor (p. 188)
• China Studies - minor (p. 231)
• Civil Engineering - Graduate - MS; PhD option in Engineering (p. 324)
• Civil Engineering - Undergraduate - BS (p. 159)
• Clinical Nurse Specialist - Adults with Complex Acute and Chronic Health Problems (p. 356)
• Coaching - minor (p. 143)
• Community Health - BS (p. 143)
• Computer Engineering - Graduate - MS (p. 326)
• Computer Engineering - Undergraduate - BS, minor (p. 168)
• Computer Science - Graduate - MS; PhD (p. 325)
• Computer Science - Undergraduate - BS, minor (p. 165)
• Construction Engineering Technology - BS (p. 163)
• Counseling - MS option in Health & Human Development (p. 311)
• Crop Science - BS option in Plant Sciences (p. 93)
• Curriculum & Instruction EdD - option in EdD (p. 294)
• Curriculum & Instruction MEd - option in MEd (p. 305)

D
• Design Drafting - AAS (p. 259)
• Dietetics - BS option in Food and Nutrition (p. 147)

E
• Early Childhood Education - BS option in Elementary Education (p. 130)
• Early Childhood Education and Child Services - BS (p. 130)
• Earth Sciences - Graduate - MS; PhD (p. 337)
• Earth Sciences - Undergraduate - BS; teaching minor (p. 192)
• Ecology & Environmental Sciences - PhD (p. 278)
• Economics - BS; teaching minor; minor (p. 204)
• Economics (Applied) - MS (p. 269)
• 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. 285)
• Education Specialist - EdS with option in Education Administration (p. 285)
• Educational Leadership - option in MEd; option in EdS; option in EdD (p. 285)
• Electrical & Computer Engineering - PhD option in Engineering (p. 326)
• Electrical Engineering - Graduate - MS (p. 326)
• Electrical Engineering - Undergraduate - BS, minor (p. 170)
• Elementary Education - BS (p. 130)
• Engineering - PhD with options in Applied Mechanics, Chemical Engineering, Civil Engineering, Electrical & Computer Engineering, Environmental Engineering, Industrial Engineering, and Mechanical Engineering (p. 320)
• Engineering Management - MS (p. 374)
• Engineering Management - minor (http://catalog.montana.edu/undergraduate/engineering/mechanical-industrial-engineering/eims-minor)
• English - Graduate - MA (p. 341)
• English - Undergraduate - BA; writing option; literature option; teaching option (p. 205)
• Entomology - Graduate - MS (p. 276)
• Entomology - Undergraduate - minor (p. 82)
• Entrepreneurship & Small Business Management - minor (p. 127)
• Environmental Biology - BS option in Environmental Sciences (p. 87)
• Environmental Design - BA (p. 109)
• Environmental Engineering - MS; PhD option in Engineering (p. 317)
• Environmental Health - BS option in Microbiology (p. 228)
• Environmental Horticulture - BS (p. 82)
• Environmental Horticulture Science - BS option in Environmental Horticulture (p. 83)
• Environmental Sciences - BS (http://catalog.montana.edu/undergraduate/agriculture/environmental-sciences/environmental-sciences)
• Environmental Studies - BA option in Liberal Studies (p. 216)
• Equine Science - BS option in Animal Science (p. 75)
• Exercise Science - BS option in Health & Human Performance (p. 149)
• Family & Consumer Science Education - teaching minor (p. 137)
• Family & Consumer Sciences - Graduate - MS option in Health & Human Development (p. 314)
• Family & Consumer Sciences - Undergraduate - BS teaching or nonteaching options (p. 141)
• Family Financial Planning - MS option in Health & Human Development (p. 314)
• Family Nurse Practitioner - MS option in Nursing (p. 357)
• Farm & Ranch Management - concentration (p. 69)
• Film & Photography - BA options in Film or Photography; minor in Photography (p. 112)
• Finance - BS option in Business (p. 123)
• Financial Engineering - BS; minor (p. 70)
• Fish & Wildlife Biology - PhD (p. 341)
• Fish & Wildlife Management - Graduate - MS (p. 340)
• Fish & Wildlife Management - Undergraduate - BS option in Biological Sciences (p. 202)
• Food & Nutrition - BS (p. 147)
• French - BA option in Modern Languages & Literatures; teaching option; teaching minor; minor (p. 230)
• General Science - BS option in Secondary Education (p. 132)
• Genetics - non-teaching minor (p. 90)
• Geographic Information Science (GIS) - minor (p. 194)
• Geographic Information Science (GIS)/Planning - option (p. 193)
• Geography - BS option in Earth Sciences (p. 194)
• Geology - BS option in Earth Sciences (p. 195)
• Geospatial and Environmental Analysis - BS option in Environmental Sciences (p. 88)
• German - BA option in Modern Languages & Literatures; teaching option; teaching minor; minor (p. 230)
• Global/Multicultural Studies - BA option in Liberal Studies (p. 216)
• Government - teaching minor (p. 138)
• Graphic Design - option in BFA Art (p. 104)
• 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. 285)
• Health Information Coding - CAS (p. 259)
• Health Promotion and Education - MS option in Health & Human Development (p. 311)
• Health and Human Performance - BS option in Exercise Science; Kinesiology Health Enhancement K-12 (Health and Physical Education) - BS (p. 149)
• Hispanic Studies - BA option in Modern Languages and Literatures; minor (p. 230)
• History - Graduate - MA; PhD (p. 342)
• History - Undergraduate - BA; teaching option; teaching minor; minor (p. 208)
• Honors - courses (p. 262)
• Immunology and Infectious Diseases - MS; PhD (p. 271)
• Industrial & Management Engineering - MS (p. 330)
• Industrial Engineering - Graduate - PhD option in Engineering (p. 320)
• Industrial Technology - BS option in Technology Education (p. 139)
• Industrial and Management Systems Engineering - Undergraduate - BS (p. 174)
• International Business - minor (p. 128)
• International Relations - BS option in Political Science (p. 244)
• Japan Studies - BA in option History; minor (p. 230)
• Kinesiology - BS option in Health and Human Performance (p. 149)
• Land Rehabilitation - BS option in Environmental Sciences (p. 88)
• Land Rehabilitation - Graduate - MS (p. 277)
• Land Resources and Environmental Sciences - MS (p. 278)
• Landscape Design - BS option in Horticulture (p. 84)
• Latin American and Latino Studies - minor (p. 235)
• Liberal Studies - BA (p. 216)
• Library Media - BS option in Elementary Education; teaching minor (p. 130)
• Livestock Management and Industries - BS option in Animal Science (p. 76)

M
• Management - BS option in Business (p. 124)
• Marketing - BS option in Business (p. 125)
• Mathematics - Graduate - MS; PhD; Education option (p. 343)
• Mathematics - Undergraduate - BS; applied option; teaching option; teaching minor; minor (p. 221)
• Mechanical Engineering - Graduate - MS; PhD option in Engineering (p. 331)
• Mechanical Engineering - Undergraduate - BS (p. 176)
• Mechanical Engineering Technology - BS (p. 178)
• Mechanics (Applied) - PhD option in Engineering (p. 320)
• Medical Assistant - CAS (p. 261)
• Medical Laboratory Science - BS option in Microbiology (p. 225)
• Microbial Systems - BS option in Biotechnology (p. 81)
• Microbiology - Graduate - MS; PhD (p. 347)
• Microbiology - Undergraduate - BS; MS; PhD (p. 225)
• Military Aerospace Studies-Air Force ROTC - courses (p. 179)
• Military Science-Army ROTC - courses; minor (p. 179)
• Modern Languages & Literatures - BA (p. 230)
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• Music Education - BME (p. 117)
• Music Technology - BA (p. 115)

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R
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S
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• Sustainable Food Systems - BS option in Sustainable Food & Bioenergy Systems (p. 153)
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T
• Technology Education - BS option in Secondary Education (p. 139)
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U
• University Studies - University Seminar, other courses (p. 262)

W
• Water Resources - minor (p. 198)
• Welding Technology - CAS (p. 261)
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• Wildlife Biology - PhD (p. 341)
• Wildlife Habitat Ecology & Management - BS option in Natural Resources and Rangeland Ecology (p. 92)
• Women’s Studies - minor (p. 251)

Z
• Zoology - refer to Organismal Biology (p. 203)
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 more than 15,000 students from associate degrees and certificate programs to doctoral degrees.

MSU is Montana’s premier university with seven academic colleges and more than 150 academic programs.

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. It is among only 108 institutions in the nation, out of more than 4,600, that the Carnegie Foundation for the Advancement of Teaching classifies as having “very high research activity” - the highest level in the classification. This prolific research has led to many significant discoveries that are changing the world. MSU holds more than 250 active technology licenses. In addition, 83 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 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.

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.

Integration Sets MSU Apart

By integrating learning, discovery and engagement, and by working across disciplines, MSU is making great strides to improve the world. Based on the Carnegie Classification™ MSU is the only institution in the nation with a very high undergraduate population that maintains “very high research activity” and has made a significant commitment to community engagement. This means that MSU students have access to cutting-edge research and creative opportunities — and to an engaging educational experience that fully integrates learning, discovery and service.

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://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 2019 Facebook group - 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 (https://www.facebook.com/MontanaStateBobcats) - 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 (www.montana.edu/pfa/pfa_handbook.html), 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.coe.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://misextension.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.montanaphs.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
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
- Teacher Education Accreditation Council (TEAC)

Important Notice to All Students

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

This general catalog is published by Montana State University as a guide for students, faculty and others interested in the institution. Students are expected to be familiar with all University regulations and information set forth in this publication or any amendment to or modifications thereof.

Montana State University reserves the right to change regulations and to add or withdraw courses at any time during the period this publication is in effect. The institution, with the concurrence of the Board of Regents of Higher Education, also reserves the right to add or withdraw degree programs and to change fees at any time. Effective dates of changes will be determined by the proper authorities and shall apply to prospective students and to those who are already enrolled.

Montana State University places full responsibility upon the student for registering for the proper courses and for fulfilling all degree requirements as set forth in this catalog, as amended from time to time. No agent or employee of the University has the authority to warrant graduation, the attainment of any type of license, or attainment of any other career goal.
# Academic Calendar

## Summer 2015

<table>
<thead>
<tr>
<th>Event</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Classes Begin</td>
<td>May 18 (Monday)</td>
</tr>
<tr>
<td>Memorial Day Holiday</td>
<td>May 25</td>
</tr>
<tr>
<td>Second 6-week Session Begins</td>
<td>June 29</td>
</tr>
<tr>
<td>Independence Day Holiday</td>
<td>July 3</td>
</tr>
<tr>
<td>Semester Ends</td>
<td>Aug 7</td>
</tr>
</tbody>
</table>

## Fall 2015

<table>
<thead>
<tr>
<th>Event</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Orientation &amp; Registration</td>
<td>Aug 19-21</td>
</tr>
<tr>
<td>Classes Begin</td>
<td>Aug 24 (Monday)</td>
</tr>
<tr>
<td>Labor Day Holiday</td>
<td>Sept 7</td>
</tr>
<tr>
<td>Veterans' Day Holiday</td>
<td>Nov 11</td>
</tr>
<tr>
<td>Thanksgiving Day Holiday</td>
<td>Nov 25-27 (Wed-Fri)</td>
</tr>
<tr>
<td>Classes End</td>
<td>Dec 4</td>
</tr>
<tr>
<td>Final Exams</td>
<td>Dec 7-11</td>
</tr>
<tr>
<td>Semester Ends</td>
<td>Dec 11</td>
</tr>
<tr>
<td>Commencement</td>
<td>Dec 12 (Saturday)</td>
</tr>
</tbody>
</table>

## Spring 2016

<table>
<thead>
<tr>
<th>Event</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Orientation &amp; Registration</td>
<td>Jan 11-12</td>
</tr>
<tr>
<td>Classes Begin</td>
<td>Jan 13 (Wednesday)</td>
</tr>
<tr>
<td>Martin Luther King Day Holiday</td>
<td>Jan 18</td>
</tr>
<tr>
<td>President’s Day Holiday</td>
<td>Feb 15</td>
</tr>
<tr>
<td>Spring Break</td>
<td>Mar 14-18</td>
</tr>
<tr>
<td>University Day</td>
<td>Mar 25</td>
</tr>
<tr>
<td>Classes End</td>
<td>Apr 29</td>
</tr>
<tr>
<td>Final Exams</td>
<td>May 2-6</td>
</tr>
<tr>
<td>Semester Ends</td>
<td>May 6</td>
</tr>
<tr>
<td>Commencement</td>
<td>May 7 (Saturday)</td>
</tr>
</tbody>
</table>

## Summer 2016

<table>
<thead>
<tr>
<th>Event</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Classes Begin</td>
<td>May 16 Monday</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 (Monday)</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 (Wed-Fri)</td>
</tr>
<tr>
<td>Classes End</td>
<td>Dec 9</td>
</tr>
<tr>
<td>Final Exams</td>
<td>Dec 12-16</td>
</tr>
<tr>
<td>Semester Ends</td>
<td>Dec 16</td>
</tr>
<tr>
<td>Commencement</td>
<td>Dec 17 (Saturday)</td>
</tr>
</tbody>
</table>

* Reviewed and approved by Faculty Senate, ASMSU, Deans’ Council, PEC, Provost, and President
Undergraduate Admissions

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 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, 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 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 tuberculosis screening form. This is done by logging onto the Student Health Services (http://www.montana.edu/health/immunization.php) 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 (drv@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 Orientation Office 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 have been received by the Office of Admissions that are necessary to determine a student’s application status.

- All applications are kept on file at MSU for one full academic year from the original application term (e.g., an application for Fall 2015 may be updated through Fall 2016).
- 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.

- **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.
- **International Undergraduate Application Form** (http://www.montana.edu/international/admissions/docs/)
InternationalApplication.pdf): This undergraduate application should be completed by applicants who are not U.S. citizens or Permanent Residents of the U.S.

- **MSU Transfer Application Form** (http://www.montana.edu/admissions/applications/MSUTransferApplication.pdf): Complete this form if you are transferring from MSU-Billings, MSU-Northern, or Great Falls College MSU.

- **MUS Transmittal Form** (http://www.montana.edu/registrar/documents/pdfs/RequestForTransmittalOfApplicationMaterials.pdf): Complete this form if you are transferring from any of the University of Montana institutions or Montana Community Colleges.

- **Form to Request Information** (https://www.montana.edu/admissions/inforequest): Use this online form to request a mailed catalog, application form, and information about financial aid, housing, and student services.

For assistance with any of the applications, please contact the Office of Admissions; if doing so by mail or email, be sure to include name, address, and phone number. For information on applying to graduate programs, please visit The Graduate School (http://catalog.montana.edu/graduate/policies-procedures)'s website.

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**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 tour, an appointment with a MSU Representative, 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 Admissions Office at 406-994-2452 or toll free 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.

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**Freshman (First-Time Undergraduates)**

Freshmen students are those who have completed high school or its equivalent and have never attended a college or university. 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, for example. Students who complete their secondary education through home schooling or at unaccredited secondary schools may be admitted as long as they have satisfactorily performed on the ACT or the SAT tests.

- **MSU Academic Requirements:**
  - A 2.5 cumulative grade-point average (on a 4.0 scale), OR
  - ACT Enhanced 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 of 18+ or SAT Writing of 440+ or minimum score of 7 on either of the essay sub-sections.

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

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?c=ndsd) 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), rank in class, 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 Scholastic Aptitude Test “SAT” (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 the MSU Testing Service 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: MSUadmissions transcrip t@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 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).

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 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 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, or agency previously attended. Credentials must be sent directly from each institution 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: MSUAdmissiontranscripts@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 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 the 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.

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**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 a transfer student.

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 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 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, or agency previously attended. Credentials must be sent directly from each institution 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 waive 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: MSUAdmissiontranscripts@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 IB Course Equivalencies website (http://www.montana.edu/admissions/ib/ib.pdf).
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 adviser 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: MSUadmissionstranscripts@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, and 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 the MSU Testing Service (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 adviser 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 (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 (CERC). Students should contact the Office of Admissions to receive information on the appeal process.

**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**

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 or may be submitted in lieu of a standardized test score upon completion of the program. A list of alternative options to prove English proficiency (https://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. **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 I20 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 funding, in U.S. dollars, will be available to the student during the academic year. A bank statement is also required.

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 as first-time freshmen or those who have earned 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. 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 Admissions Office 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 a completed immunization record and tuberculosis screening form to the Student Health Service 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/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 may be submitted in lieu of a standardized test score upon completion of the program. A list of alternative 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 120 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 a completed immunization record and tuberculosis screening form to the Student Health Service 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 or thirteen in secondary school are considered freshmen; those who have completed an equivalent of 12 credits or more of post-secondary university-level coursework 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 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/InternationalApplication.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 120 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.

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 attempted 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 the Scholastic Aptitude Test “SAT” (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 maybe made by contacting the MSU Testing Service, +1-406-994-6984.

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.


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 may be submitted in lieu of a standardized test score upon completion of the program. 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 a completed immunization record and tuberculosis screening form to the Student Health Service 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.

Notification of Admission

Applications are reviewed for admission when all required final and official credentials have been received at the Office of International Programs. Successful candidates will be promptly 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://www.msuadmissions.org/application/index.cfm?tid=64) 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 score of a 27 or an SAT score of an 1820. Official ACT/SAT scores should be sent electronically directly to the Office of Admissions from the ACT/SAT 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 are working 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 into the Dual Enrollment Program: Gallatin College application, Registration form and the Student Release form. All three Dual Enrollment forms (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 406-994-3991.

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

3. **ACT/SAT Scores**: ACT/SAT scores may be required for placement or to fulfill pre-requisite requirements for particular courses. Contact the Dual Enrollment Coordinator at MSU-Gallatin College to see if any tests are required for the course at 406-994-3991. Official ACT/SAT scores should be sent electronically to the Office of Admissions from the ACT/SAT 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?&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.

**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)**
(http://www.montana.edu/registrar/CERCandGARC.html)
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 eerie booming of a sage grouse and other amazing sounds.

Bob Miller Pavilion
http://animalrange.montana.edu/facilities/eqespav.htm

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://ag.montana.edu/info/BozemanOperations.htm

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/cob/bracken/brackenhome.htm

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:

• The Executive’s Closet - The Bracken Center collects gently worn business clothing and accessories before the fall recruiting fairs so students look professional for upcoming interviews. Professors assist with tie tying and suit fittings.

• 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 - JJCBE 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://plantsciences.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.

Dietetics Internship
http://www.montana.edu/shd/postbaccalaurate/

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.

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 MSU student and faculty 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 cultural adjustment, immigration regulations, and academic and personal matters; cultural-sharing programs designed to integrate international students with domestic students and the Bozeman community; and instruction in English as a second language through the A.C.E. Language Institute.

OIP assists faculty to engage in the international and global dimensions of their academic discipline. OIP provides information and assistance to members of the faculty who wish to conduct research abroad, participate in a faculty exchange program, or develop international dimensions to their courses. OIP also provides employment-based immigration services to MSU’s academic and administrative units, enables MSU faculty to host international researchers, professors and scholars, and facilitates short-term training programs for international students and professionals. These programs serve to build and maintain long-lasting, cross-cultural relationships.

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

**Jabs Hall**
http://www.montana.edu/us/pdc/projects/allPrjs/JabsHall/

The new home for the Jake Jabs College of Business and Entrepreneurship, Jabs Hall is scheduled to open in fall 2015. The new $18.5 million, 50,830 sq. ft. building emphasizes sustainability and flexibility. Collaboration spaces of various sizes were incorporated throughout the building design including a lab where students from business, arts & architecture, engineering and other disciplines can collaborate with each other and members of the community.

**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/xmlui/ - 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/wwwedu/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/-mle/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/wwwgs/nse.htm

The National Student Exchange (NSE), a consortium of nearly 200 universities, offers students the opportunity to study at another university for up to one year. By bringing together students from different areas of the country, the NSE encourages participants to broaden their academic, social and cultural awareness. Through a simplified admissions process, students are able to enroll at a host institution with the same financial benefits enjoyed by in-state residents. Credits and grades are recorded at Montana State University as part of the student’s permanent transcript.

Nursing Facilities and Equipment
http://www.montana.edu/nursing/

The College of Nursing offers state of the art simulation technology such as a 3G Simulation Mannequin at all campus sites in addition to extensive clinical experience in local hospitals and rural/under-served settings like the Fort Peck Reservation in northeast Montana.

Plant Growth Center
http://ag.montana.edu/plantgrowth/

The Plant Growth Center comprises 60,000 square feet with 29 glasshouse rooms that are light and temperature controlled. The center also houses the only bio-containment facility west of the Mississippi River for quarantining and testing insects and plant pathogens.

Summer Session
http://www.montana.edu/summer/

The MSU Summer Session program provides a variety of classroom, outdoor, and online opportunities for students to advance or complete their educational goals. Offerings include undergraduate core classes, science and mathematics courses designed to meet the academic needs of pre-med students, summer master’s degree programs and outdoor courses in photography and wildlife.

TEAL Classroom
http://www.montana.edu/us/pdc/projects/allPj/ TechEnhancedActiveLearningClassroom/

The Technology Enhanced Active Learning (TEAL) classroom in Gaines Hall enables undergraduate and graduate students from all eight of MSU’s colleges to collaborate on assignments during class hours in a high-tech space equipped with flat screens and data ports for laptop computers. A key feature of TEAL classrooms is the “flipped” structure of the course so students read or view lecture materials outside of class and actively solve problems in class. This innovative new teaching method and incorporation of technology helps students actively engage in their learning.

The Writing Center's Peer Tutoring Program
http://www.montana.edu/writingcenter/

The Writing Center’s Peer Tutoring Program offers undergraduate students the opportunity to build their writing skills. In addition to working directly with student writers from across the university, peer tutors also collaborate with faculty, fellow tutors and Writing Center staff to develop resources for writers, provide course-specific writing support, participate in outreach projects and conduct original research. Tutors do intensive, ongoing training and development, and have the chance to engage in Writing Center scholarship, and travel to regional and national conferences.

Discovery

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.

American Indian Research Opportunities (AIRO)
http://www.montana.edu/wwwai/

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://www.arch.montana.edu/index.php

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://mesifepscor.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/home/index.asp

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 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://ioe.rcg.montana.edu/

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://spacegrant.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/Home.aspx

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.cor.montana.edu/ee/ermaherlee101/ecebot/

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.cor.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)**
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.

**Carnegie Engagement Classification**

Carnegie Engagement Classification recognizes MSU’s commitment to teaching that encourages volunteer service in communities and spreading of knowledge that benefits the public. This designation helps to bridge 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).

**Engagement**

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).

**Activity Classes for Credit**

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**

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**

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**

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**

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**

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**

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
Special Academic Opportunities

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/student/international.htm

- **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://www.montana.edu/hhd/undergrad/foodandnutrition/

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

The Women in Engineering (WIE) program provides female undergraduate and graduate students a supportive, vibrant community in which to learn and thrive, as professionals and individuals. WIE includes faculty and students from all engineering disciplines who share a passion for helping women engineers succeed at MSU and in their careers. Program benefits include scholarships, mentorship and opportunities to collaborate with role models in industry and academia.
## Academic Support and 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.

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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 U of M to see who can collect the most food for their local food bank in conjunction with the Cat/Griz football game.
- **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. Within departmental and campus-wide computing facilities, students have easy access to over 600 computers in collaborative workspaces and labs, equipped with all the software required for studies at MSU. Residence Life and Family & Graduate Housing have connected more than 2700 residence hall rooms and married-student housing units providing round-the-clock educational access to learning environments such as the Desire2Learn Learning Management System used for both online and campus courses.

Because email is a vital element of campus communication, all MSU students receive email accounts free of charge. An email account will remain active for as long as the student is registered at MSU so projects can be carried along from year to year. Students also can make use of Google Apps to collaborate with classmates on projects using word processing and spreadsheet functions.

Computer laboratories in residence halls, academic halls, and the Renne Library offer specialized and industry-standard software packages for technology-specific assignments, including Microsoft Office, Adobe products, AutoCAD, SAS, SPSS, and MCAD, among others.

Numerous classrooms are technology-enhanced with equipment to support instruction and collaborative learning. Two Technology Enhanced Active Learning (TEAL) Classrooms are designed for a new style of teaching that encourages students to learn collaboratively. Collaborative spaces with a flat screen and connections for laptops are also provided in public areas for impromptu study and work sessions. Additionally, technology is used by faculty in traditional classrooms for enhanced learning engagement.

An on-campus service desk for students is open six days per week and provides computer repairs, software installs, troubleshooting and computer services for resident students. Computer repair services for students are available on campus by Dell and Apple certified technicians, with friendly
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 16 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 is an active member of the Big Sky Conference where it has the opportunity to participate in the following Championships: Football, Men’s and Women’s Basketball, Women’s Volleyball, Men’s and Women’s Cross Country, Men’s and Women’s Indoor Track & Field, Men’s and Women’s Outdoor Track and Field, Men’s and Women’s Tennis, and Women’s Golf. Men’s and Women’s Nordic and Alpine Skiing participate in the Rocky Mountain Intercolligate Skiing Association. Bobcat Athletics also sponsors Spirit Squad and has teams in both cheer and dance.

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, Bobcat Football was Big Sky Conference Co-Champions in the sport of Football in 2010 and 2011. Women’s Basketball finished as Big Sky Conference runners-up in 2010 and Men’s Cross Country finished second at the Big Sky Championship in 2011.

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 Artitsch
Library Administration, Renne 124
406-994-3119

Research Assistance
The Research Desk is located in the Renne Library Commons

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://www.lib.montana.edu/instruction/ liaison.php).

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 tech hardware are available for check-out.

The Library maintains the University’s open access institutional repository – ScholarWorks (http://scholarworks.montana.edu/xmlui) – which captures 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, and trout and salmonid fish.

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</th>
<th>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>
</tr>
<tr>
<td>LSCI 316</td>
<td>Bus Info Research Skills</td>
<td>3</td>
</tr>
<tr>
<td>LSCI 490R</td>
<td>Undergraduate Research</td>
<td>1-6</td>
</tr>
<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)

www.montana.edu/asmusu
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/asmsu.

**MSU Office of Sustainability**

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

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](http://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 www.streamlinebus.com (http://www.streamlinebus.com).

**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 406-994-5000 or visit www.streamlinebus.com (http://www.streamlinebus.com).

**ASMSU Day Care Center**

[www.montana.edu/asmsu/daycare.html](http://www.montana.edu/asmsu/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**


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 (%20editor@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](http://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 Sports 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](http://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 Roskie 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.
- **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. 32)
- **The VOICE Center** (p. 33)
- **Counseling and Psychological Services** (p. 33)

**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 Promotion
The student Health Promotion program is a comprehensive set of evidence-based programs, activities and campaigns designed to enhance the academic, social and personal health of MSU students. Health Promotion utilizes a public health approach and works to create a safe, healthy and learning-conducive environment via policy, research, education, marketing and programming that focuses on known health risks among college students. Objectives involve the reduction of harm associated with heavy alcohol, tobacco and drug use, violence, unsafe sexual practices and unhealthy eating. Efforts also involve promoting mental health, protective behaviors and healthy norms within the student population. Health Promotion involves students as paid interns and volunteers, and works collaboratively with other campus and community entities. For more information call 406-994-7337.

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.

Office of the Dean of Students
www.montana.edu/wwwds

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.

Office of Student Success
www.montana.edu/success

Programs
The Office of 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 Office of Student Success offers several programs and services aimed at helping students achieve success 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, free tutoring program (Smartycats Tutoring), and several grand scale campus events such as Legend of the Bobcat 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 is required to take 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 will teach students how they can maximize their academic performance. The Student Success Advisors will help students learn what it takes to be a successful MSU student.
They visit one of these permanent reader locations:

Students can also swipe their CatCards and receive ChampChange any time they are playing intramural sports, and meeting with a SmartyCats tutor.

for service projects sponsored by the Office of Community Involvement, or Student Success Advisor, voting in ASMSU elections, volunteering in workshops that will help them become organized, learn the ins and outs of the university, and connect to other students. These workshops include:

- Student Success Advisors - Student Success Advisors are expert learning strategists who meet one-on-one with students to teach them the tools they can use to improve their academic performance. Topics covered in meetings include:
  - guidance on how to become organized
  - time management
  - how to improve grades
  - how to prioritize and meet deadlines
  - other areas that help keep students on the path to graduation

Students who meet with our Student Success Advisors are more self-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 a number of different ways, but the most often used mechanism is 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 each referred student with their Student Success Advisor who will provide each student 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 get students pointed towards the right resources to address those concerns and achieve greater success at MSU.

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

- Navigating MSU
- The Five Keys to College Success
- Developing Your Study Skills
- Managing Your Time
- Getting the Most Out of Lecture
- Identifying Your Learning Style
- Writing at the University Level
- Reading College Texts
- Effective Test Preparation
- Writing Research Papers
- How to Manage Fear of Tests
- And many more!

ChampChange - ChampChange is a program that rewards all undergraduate students for engaging in events and programs at MSU and in the Bozeman community. Students can earn points by attending special lectures, attending a Residence Hall program, meeting with a Career Coach or Student Success Advisor, voting in ASMSU elections, volunteering for service projects sponsored by the Office of Community Involvement, playing intramural sports, and meeting with a SmartyCats tutor.

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

- Student Athletic Events
- Writing Center
- Fitness Center
- BBCC Writing Center
- Gallatin College Programs
- Math Lab
- SUB Rec Center
- M&IE Help Center
- Physics Help Center
- Library Reference Desk
- Library
- Office of Student Success/Career, Internships & Student Employment Services

Students use acquired ChampChange to bid on great prizes in the fun monthly online auctions, or save their ChampChange until the end of each semester and participate in the Final ChampChange Auction.

ChampChange Final Auction - All undergraduate students can earn ChampChange points throughout each semester and “spend” those points at the Final ChampChange Auction for prizes such as TV’s, laptops, bikes, coffee makers, gaming consoles, cameras, and many other great items. The event is divided into two parts: a silent auction followed by an exciting and fast paced live auction culminating with the grand prize of a $1,000 scholarship tuition gifted by the Office of Financial Aid.

SmartyCats Tutoring - The Office of Student Success offers FREE one-on-one and small-group tutoring to MSU students through the SmartyCats Tutoring Program for numerous courses including Calculus, Statistics, and Anatomy & Physiology. SmartyCats Tutors are an invaluable resource for students who need extra help in passing courses required for their programs and career goals. SmartyCats Tutors help students clarify points from lectures, labs, discussions, and assigned readings. Drop-in tutoring sessions for key courses are also available at convenient campus locations throughout the semester and prior to finals. To learn about the free tutoring program, please visit www.msusmartycats.com.

Return to Learn - Return to Learn is a program designed for students seeking re-admission to MSU after taking a leave of absence. The Student Success Advisors will help these students navigate arranging financial aid, meeting with an academic advisor, registering for classes, finding tutoring, and much more. A Student Success Advisor is assigned to each Return to Learn student and will periodically check in with the student throughout the process, developing a relationship to ensure that returning to MSU is simple and seamless. For more information visit www.montana.edu/success/returntolearn.php.

Legend of the Bobcat - This freshman only event is held every year at the beginning of the fall semester and is designed to welcome first year students and to excite them about their new community and home. The event begins with an engaging performance followed by the Montana Country Fair which is filled with fun games and activities where students can win prizes and mingle with their fellow MSU community members. Freshmen will not want to miss this event.

MSU 101 - For students who know they can and want to do better, MSU 101 offers valuable insights on how to “turn lemons into lemonade.” This workshop is offered several times each semester with the purpose of providing students with the tools they need to succeed at MSU. Faculty and staff members share their tips on how to reach goals – both inside and outside the classroom. Students will learn what is necessary to step back on track and they are encouraged to take an active role in achieving their goals. We believe strongly in the usefulness of the MSU 101 experience, so much so that we will pay students to attend and participate in the event. To find out more, visit www.montana.edu/msu101.

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](http://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. Within the office, we educate and support our students to ensure that they can manage debt and develop sound budgeting skills. As an office we are committed to aiding and educating students to ensure that they understand and develop solid financial habits and empower them to make financially sound decisions. To achieve our goal we offer students opportunities to improve their financial management skills through: one-on-one financial coaching, workshops and events, and informative resources.

**Career, Internship & Student Employment Services**

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

The Career, Internship, & Student Employment Services (CISES), 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, have questions on career options, need job searching, or have graduate school questions should visit the office. To learn more about CISES, visit www.montana.edu/careers or call 406-994-4353. Main services are listed below.

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

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

- Margaret Alderson Etiquette Dinner
- Meet the Employers Networking Event
- Careers in Demand Workshops
- Resume critiques
- Resumes for Federal Jobs
- Discover Your Best Career
- Diversity Coffee
- Veteran’s Social
- What Can I DO with a Major in…?
- What Can I DO with a Career in…?
- Get Savvy with Your Job Search
- Help! I’m Still Undecided! Finding a Career That Matches Your Skills and Interests

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

**MyCatCareers.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.

**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 to fast track students to the possibilities of their future. 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! www.montana.edu/mentor

**Internships** – Utilizing www.MyCatCareers.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 the 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.

**EXCEED** - Career, Internship & Student Employment Services is pleased to offer the EXCEED grant program. The program is specifically designed to encourage MSU Bozeman students to seek out and participate in quality internships, foster career exploration and build upon academic studies. Our goal is to help alleviate some of the financial burden associated with unpaid internships or otherwise valuable internship or experiences where a fee is associated with the program.

By breaking down financial barriers, we are creating pathways to success for our students. The EXCEED program will facilitate internship opportunities that will advance students’ career development through meaningful exposures to their career field of interest.

**On-Campus Interviews** - The office also hosts on-campus interviews for summer opportunities, internship, 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

**Disabled Student Services**

[www.montana.edu/wwwres/disability](http://www.montana.edu/wwwres/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/wwwres/reentry](http://www.montana.edu/wwwres/reentry)

Re-entry Student Services provides resources to re-entry students and MSU Alumni to help them gain financial independence and learn techniques to achieve their life goals. Within the office, we educate and support our students to ensure that they can manage debt and develop sound budgeting skills. As an office we are committed to aiding and educating students to ensure that they understand and develop solid financial habits and empower them to make financially sound decisions. To achieve our goal we offer students opportunities to improve their financial management skills through: one-on-one financial coaching, workshops and events, and informative resources.

**Office of Financial Education**

[www.montana.edu/financialeducation](http://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. Within the office, we educate and support our students to ensure that they can manage debt and develop sound budgeting skills. As an office we are committed to aiding and educating students to ensure that they understand and develop solid financial habits and empower them to make financially sound decisions. To achieve our goal we offer students opportunities to improve their financial management skills through: one-on-one financial coaching, workshops and events, and informative resources.
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, vets@montana.edu or byork@montana.edu.

The Veteran Support Center
www.montana.edu/vwvew/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

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

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 or visit us in Strand Union Building room 368.

Cat Card
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. 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/cpa/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/cpa/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/wwwed/centers/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.

The 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**
www.montana.edu/art

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
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

The Housing Enterprise within the Auxiliary Services Division is made up of smaller departments including Residence Life and Family & Graduate Housing. These two departments work collaboratively with the 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. 21 and older Hall (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, 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 Hannon 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. Academic Theme Floors: 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 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 Headwaters Complex is 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, twin beds, chests of drawers, study desks, waste baskets, chairs, and window coverings. Each room is wired for cable television. 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 Headwaters 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 a 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 here, 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 board and room payments.

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).
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.

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. Roskie 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,
Choosing A Meal Plan

Residence Dining Hall Hours of Operation

<table>
<thead>
<tr>
<th>Residence Dining Hall</th>
<th>Hours of Operation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Miller Dining Hall</td>
<td>Monday - Friday 7am to Midnight</td>
</tr>
<tr>
<td></td>
<td>Saturday - Sunday 7am - 7pm</td>
</tr>
<tr>
<td>Harrison Dining Hall</td>
<td>Sunday - Thursday 7AM to Midnight</td>
</tr>
<tr>
<td></td>
<td>Friday 7am - 7pm</td>
</tr>
<tr>
<td></td>
<td>Saturday 7am - 7pm</td>
</tr>
<tr>
<td>Hannon Dining Hall</td>
<td>Monday - Friday 7am to Midnight</td>
</tr>
<tr>
<td></td>
<td>Saturday - Sunday Closed</td>
</tr>
</tbody>
</table>

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 halls
- 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
- There will be no discount to signing up for a meal plan with CNC Money
- 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 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.

ResNet

www.montana.edu/resnet

MSU ResNet is a campus network that provides both 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 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 as part of your room and board plan.
Expenses

- Estimated Expenses (p. 43)
- Fee Schedule and Other Charges (p. 44)
- Special Fees and Charges (p. 45)
- Special Exemptions (p. 45)
- Refund of Fees (p. 46)
- Financial Aid and Student Employment (p. 46)
- Fee Descriptions (p. 47)

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
2015/2016 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, 2015/2016. 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. At the time of publication, 2015-2016 costs had not yet been determined by the Board of Regents.

Undergraduate Resident Students

<table>
<thead>
<tr>
<th>Category</th>
<th>Semester</th>
<th>Academic Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tuition/Fees</td>
<td>$3,425</td>
<td>$6,850</td>
</tr>
<tr>
<td>Room/Board1</td>
<td>$4,325</td>
<td>$8,650</td>
</tr>
<tr>
<td>Books/Supplies2</td>
<td>$625</td>
<td>$1,250</td>
</tr>
<tr>
<td>Personal/Transportation3</td>
<td>$625</td>
<td>$1,250</td>
</tr>
<tr>
<td>Total</td>
<td>$8,375</td>
<td>$16,750</td>
</tr>
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</table>

Undergraduate Non-Resident Students

<table>
<thead>
<tr>
<th>Category</th>
<th>Semester</th>
<th>Academic Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tuition/Fees</td>
<td>$11,085</td>
<td>$22,170</td>
</tr>
<tr>
<td>Room/Board1</td>
<td>$4,325</td>
<td>$8,650</td>
</tr>
<tr>
<td>Books/Supplies2</td>
<td>$625</td>
<td>$1,250</td>
</tr>
<tr>
<td>Personal/Transportation3</td>
<td>$625</td>
<td>$1,250</td>
</tr>
<tr>
<td>Total</td>
<td>$10,190</td>
<td>$20,380</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 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 $1,675 per semester ($3,350 per year). Personal/miscellaneous expenses will vary depending on individual circumstances.

2015/2016 Gallatin College 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, 2015/2016. 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. At the time of publication, 2015-2016 costs had not yet been determined by the Board of Regents.

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>$1,575</td>
<td>$3,150</td>
</tr>
<tr>
<td>Room/Board1</td>
<td>$4,325</td>
<td>$8,650</td>
</tr>
<tr>
<td>Books/Supplies2</td>
<td>$625</td>
<td>$1,250</td>
</tr>
<tr>
<td>Personal/Transportation3</td>
<td>$625</td>
<td>$1,250</td>
</tr>
<tr>
<td>Total</td>
<td>$6,525</td>
<td>$13,050</td>
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</tbody>
</table>

Undergraduate Non-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>$5,240</td>
<td>$10,480</td>
</tr>
<tr>
<td>Room/Board1</td>
<td>$4,325</td>
<td>$8,650</td>
</tr>
<tr>
<td>Books/Supplies2</td>
<td>$625</td>
<td>$1,250</td>
</tr>
<tr>
<td>Personal/Transportation3</td>
<td>$625</td>
<td>$1,250</td>
</tr>
<tr>
<td>Total</td>
<td>$10,190</td>
<td>$20,380</td>
</tr>
</tbody>
</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.

3 Financial Aid budgets include a personal/transportation/miscellaneous figure of $1,675 per semester ($3,350 per year). Personal/miscellaneous expenses will vary depending on individual circumstances.

**2015/2016 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, 2015-2016. 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 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. At the time of publication, 2015-2016 costs had not yet been determined by the Board of Regents.

### Graduate Resident Students

<table>
<thead>
<tr>
<th>Category</th>
<th>Semester</th>
<th>Academic Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tuition/Fees¹</td>
<td>$2,600</td>
<td>$5,200</td>
</tr>
<tr>
<td>Room/Board²</td>
<td>$4,325</td>
<td>$8,650</td>
</tr>
<tr>
<td>Books/Supplies³</td>
<td>$475</td>
<td>$950</td>
</tr>
<tr>
<td>Personal/Transportation⁴</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>$7,400</td>
<td>$14,800</td>
</tr>
</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 $1,675 per semester ($3,350 per year). Personal/miscellaneous expenses will vary depending on individual circumstances.

### 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>$7,750</td>
<td>$15,500</td>
</tr>
<tr>
<td>Room/Board²</td>
<td>$4,325</td>
<td>$8,650</td>
</tr>
<tr>
<td>Books/Supplies³</td>
<td>$475</td>
<td>$950</td>
</tr>
<tr>
<td>Personal/Transportation⁴</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>$12,550</td>
<td>$25,100</td>
</tr>
</tbody>
</table>

¹ 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.

- **Ski Fee** (does not include transportation, lift fees, or equipment rental): $98.85
- **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
- **Extended Studies, per credit hour (minimum)**
  - Undergraduate: $222.10
  - Graduate: $266.50
- **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

### Fall/Spring Fee Schedules

- **Undergraduate fees**: FY15_Fee_USB.png
- **Gallatin College fees**: FY15_Fee_GC.png
- **Western Undergraduate Exchange fees**: FY15_Fee_WUE.png
- **Graduate fees**: FY15_Fee_GR.png
- **Course fees**: FY14_Course_Fees.pdf
(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
(Architecture, Art, College of Business, Engineering, MTA, Nursing, Math)

| Returned Check Service Charge | $25.00 |
| I.D. Card Fee | $15.00 |
| Duplicate I.D. | $15.00 |
| Vehicle Registration for Students and Staff | $169.00 |
| Varies per lot; minimum annual fee |
| Transcript Fee, charge per copy | $3.00 |
| Intensive English Language Fee (per credit) | $276.15 |
| Foreign Student Administrative Fee, per semester (including summer) | $125.00 |
| Graduation Fee | $30.00 |
| New Student Orientation Fee | |
| Freshman | $65.00 |
| Transfer | $50.00 |
| Graduate | $50.00 |
| In Absentia Registration Fee | $30.00 |
| Challenge Fee (per credit) | $30.00 |
| Distance Learning Fee (per credit) | Varies by course/program |
| Residence Hall Prepayment | $200.00 |
| Student Teaching Fees | Consult the department |

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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.

**Extended University**

Extended University courses are open to regularly enrolled MSU students as well as non-MSU students. Courses of particular interest to MSU students are listed along with their fees on a special page in the Schedule of Classes. Many of these courses are offered during the evening hours to accommodate student schedules. For information contact Extended University at (406)994-6683, email at outreach@montana.edu or online at htc.montana.edu/outreach

**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 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 demonstration 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/dpw.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, 2015 for the academic year beginning in Fall Semester 2015).

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.

**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 and Graduation

- Catalog and Curriculum (p. 48)
- Registration (p. 48)
- Examinations (p. 50)
- Credits and Grades (p. 50)
- Dean’s List and President’s List (p. 52)
- Scholastic Probation and Suspension (p. 52)
- Credits for Degree Completion (p. 53)
- Graduation Requirement for Baccalaureate Degrees (p. 55)
- Graduation Procedures (p. 55)
- Student Records (p. 55)
- Name Change (p. 55)
- Transcript of Record (p. 55)

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 signatures on an Add/Drop form. After the 15th semester day, 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.

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 the instructor. In some instances, the student may wish to petition the instructor for I 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 situations 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 graduate student 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.

A graduate-level course approved by petition may be used either for fulfilling undergraduate or graduate program requirements, but not for both. The student must indicate on the petition form the intended use of the registered/reserved course credits.

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.

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**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 (http://catalog.montana.edu/code-conduct-policies-regulations-reports/common-hour-policy) 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.

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**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 are not properly registered.

### 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 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.

### Passing Grades

<table>
<thead>
<tr>
<th>Grade</th>
<th>Quality of Work</th>
<th>Grade Points for Each Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Excellent</td>
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</tr>
<tr>
<td>A-</td>
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<td>P</td>
<td>Pass</td>
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<td>S</td>
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<td>Withdraw</td>
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<tr>
<td>Au</td>
<td>Audit</td>
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</tr>
<tr>
<td>NR</td>
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### Non-passing Grades

<table>
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<tr>
<th>Grade</th>
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<th>Grade Points for Each Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>F</td>
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</tr>
<tr>
<td>I</td>
<td>Incomplete</td>
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</tbody>
</table>

### Grade-Point Average

The general quality of a student’s work is expressed in terms of a grade point average (GPA). Only credits taken at MSU are used to compute 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.

For repeated courses, only the credits and grades received the last time the course was taken will be used in the calculation of the cumulative grade-point average, and only the credits received the last time the course was taken will be included in the credits counted for graduation. However, all grades received will be listed on the transcript. Repeated courses will be noted on the transcript with an “E” (when the course grade is excluded from GPA calculation). The most recent attempt at the course will be noted with an “I” and included in GPA calculation. Excluding a grade from a previous semester does NOT affect the calculation of academic standing for that semester. Academic standing remains as it was originally earned.

### 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 learning courses only. This grade indicates that, though students have not completed the course, they have made satisfactory progress. These students must re-enroll in the course immediately in order to continue with the course work and complete the course.

Pass/Fail Grading
Undergraduate students may take some of their University elective courses on a pass/fail basis subject to the following restrictions:

1. Students can elect the pass/fail option only for courses that are not specifically required for their academic program. Pass/fail courses may not be applied toward completion of Core requirements. This restriction does not apply to (ACT) activity courses.
2. A student may not register for more than one pass/fail elective course per semester, excluding one-credit (ACT) activity courses.
3. Undergraduate students may take a maximum of twelve credits of pass/fail elective courses. This maximum does not include courses that are offered only on a pass/fail basis.
4. Students register for pass/fail courses in the same manner as for other courses, but they must have written permission from their advisers, college deans, and the instructors of the course. The Registrar has forms for this purpose.
5. The instructor’s requirement to obtain a grade of P in the course must be submitted with the Request for Pass/Fail form.
6. Students may only change a pass/fail registration to a regular registration, or a regular registration to a pass/fail registration, prior to the end of the tenth day of instruction. Students will follow the regular drop-add procedures, except that students changing to a pass/fail registration must also secure the written permission of the instructor and adviser (see 4 above).
7. Prerequisites apply for all courses taken on a pass/fail basis.

Pass/Fail Registration
Undergraduate students may take some of their University elective courses on a pass/fail basis subject to the following restrictions:

1. Students can elect the pass/fail option only for courses that are not specifically required for their academic program. Pass/fail courses may not be applied toward completion of Core requirements. This restriction does not apply to (ACT) activity courses.
2. A student may not register for more than one pass/fail elective course per semester, excluding one-credit (ACT) activity courses.
3. Undergraduate students may take a maximum of twelve credits of pass/fail elective courses. This maximum does not include courses that are offered only on a pass/fail basis.
4. Students register for pass/fail courses in the same manner as for other courses, but they must have written permission from their advisers, college deans, and the instructors of the course. The Registrar has forms for this purpose.
5. The instructor’s requirement to obtain a grade of P in the course must be submitted with the Request for Pass/Fail form.
6. Students may only change a pass/fail registration to a regular registration, or a regular registration to a pass/fail registration, prior to the end of the tenth day of instruction. Students will follow the regular drop-add procedures, except that students changing to a pass/fail registration must also secure the written permission of the instructor and adviser (see 4 above).
7. Prerequisites apply for all courses taken on a pass/fail basis.

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 grades 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 probation, 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).

<table>
<thead>
<tr>
<th>For Reinstatement</th>
<th>Deadline</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fall Semester</td>
<td>August 1</td>
</tr>
<tr>
<td>Spring Semester</td>
<td>January 1</td>
</tr>
<tr>
<td>Summer Session</td>
<td>May 1</td>
</tr>
</tbody>
</table>

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

* These academic actions appear on the student’s transcript

**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 or 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. All courses taken prior to degree
obtaining advanced standing:

Under certain circumstances, if students can demonstrate mastery of course requirements, 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.

Upper-Division Credit Requirement

A minimum of forty-two credits for the first degree and at least nine 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.

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 of 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 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 of 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 completion of the second course. Students who have enrolled in a regular or an extension course and received a grade other than 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>CLEP Code</th>
<th>Course Name</th>
<th>MSCU Course Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>NRSM 101</td>
<td>Nat Resource...</td>
<td>Natural Resource Conservation</td>
</tr>
<tr>
<td>BIOB 170IN</td>
<td>Principles of Biological...</td>
<td>Gen Biology</td>
</tr>
<tr>
<td>BIOB 160</td>
<td>Principles of Biological...</td>
<td>Gen Biology</td>
</tr>
<tr>
<td>ECNS 101IS</td>
<td>Econ Way of Thinking</td>
<td>Intro Microecono</td>
</tr>
<tr>
<td>ECNS 202</td>
<td>Prin of Macroeconomics</td>
<td>Intro Microeco</td>
</tr>
<tr>
<td>EDU 222IS</td>
<td>Educ Psych &amp; Child Development</td>
<td>Sch Age Educ Psych</td>
</tr>
<tr>
<td>LIT 110IH</td>
<td>Intro to Lit</td>
<td>Analysis &amp; Interp of Lit</td>
</tr>
<tr>
<td>HSTR 101IH</td>
<td>Western Civilization</td>
<td>Western Civilization I with essay</td>
</tr>
<tr>
<td>HSTR 102IH</td>
<td>Western Civilization</td>
<td>Western Civilization II with essay</td>
</tr>
<tr>
<td>HSTA 101IH</td>
<td>American History</td>
<td>Am Hist I with essay</td>
</tr>
<tr>
<td>HSTA 102IH</td>
<td>American History</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>Calc with Elem Fncs</td>
<td>Calc with Elem Fncs</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>BIOB 110CS</td>
<td>Introduction to Plant Biology</td>
<td>Plant Science, Resource &amp; Environment</td>
</tr>
<tr>
<td>PSYX 100IS</td>
<td>Intro to Psychology</td>
<td>Intro Psy</td>
</tr>
<tr>
<td>SOCI 101IS</td>
<td>Introduction to Sociology</td>
<td>Intro Soc</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
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 each student to maintain acceptable standards of behavior on campus and in the community and to manifest a serious purpose by maintaining a satisfactory scholastic standing in the courses undertaken. No student who shows persistent unwillingness or inability to comply with these requirements will 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 www2.montana.edu/policy/student_conduct/.

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 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/health/healthpromo/

Personal Property
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.

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


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**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.

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**Family Educational Rights and Privacy Act (FERPA)**

The Family Educational Rights and Privacy Act of 1974 grants certain rights, privileges, and protections related to students’ educational records maintained by the University. Students’ educational records (with the exception of directory information) will not be released to third parties outside of the University, except with the written consent of the student. Students have the right to inspect their own educational records, except for those to which students have expressly waived this right (e.g., Career Services placement files or graduate school recommendations). Students have the right to request amendment of their records, if they are found to be inaccurate, misleading, or otherwise in violation of the students’ privacy or other rights. Such requests should be made as soon as the student becomes aware of the inaccuracy or any other problem.

Any student may file a complaint with the U.S. Department of Education concerning any alleged failure on the part of the University to comply with the requirements of the Family Educational Rights and Privacy Act.
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. Any student who believes he or she may have experienced unlawful discrimination on account of race; sex; color; national origin; religion; age; veteran, parental, or marital status; or physical or mental disability should visit the Affirmative Action Office to discuss his or her concerns and to initiate any formal grievance procedure. In addition, 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 university affirmative action/human resources officer. A copy of the university-approved policy and procedures regarding sexual harassment is available from that officer.

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 can be made through the residence hall judicial system. This is described in detail in the Residence Hall Handbook, which is available from the Residence Life Office. 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. 60)
- Core 2.0 Ways of Knowing Courses (p. 62)
- Core 2.0 Credit Policies (p. 64)
- Core 2.0 Grading Standards (p. 64)
- Approved Core 2.0 Courses (http://www.montana.edu/newcore/approved_courses.html)
- Permitted Substitutions (p. 63)
- Appeals (p. 64)
- Accommodations for Students with Math Learning Disabilities (p. 64)

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 these academic fields, enable them to critically evaluate information in these 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 101W). 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/pls/bzagent/bzsxcore.pw_selsem). 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
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 101 W 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 101 W 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 101 W 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) that 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 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>
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<tr>
<td>BIOB 170IN</td>
<td>Principles of Biological Diversity</td>
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<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>
<td>5</td>
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<tr>
<td>BIOH 211</td>
<td>Human Anatomy and Physiology II</td>
<td>4</td>
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<tr>
<td>BIOM 250</td>
<td>Microbiology for Health Sciences: Infectious Diseases</td>
<td>3</td>
</tr>
<tr>
<td>BIOO 220</td>
<td>General Botany</td>
<td>3</td>
</tr>
<tr>
<td>CHMY 121IN</td>
<td>Introduction of General Chemistry</td>
<td>4</td>
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<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>
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<tr>
<td>CHMY 151</td>
<td>Honors College Chemistry I</td>
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<td>CHMY 153</td>
<td>Honors College Chemistry II</td>
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<tr>
<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 Envrmntl Geology</td>
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<tr>
<td>GEO 211</td>
<td>Earth History and Evolution</td>
<td>3</td>
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</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 advisor 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
Montana State University

Undergraduate Catalog

- College of Agriculture (p. 65)
- College of Arts and Architecture (p. 65)
- Jake Jabs College of Business & Entrepreneurship (p. 65)
- College of Education, Health and Human Development (p. 65)
- College of Engineering (p. 66)
- College of Letters and Science (p. 66)
- College of Nursing (p. 67)
- Gallatin College (p. 67)
- Honors College (p. 67)
- University Programs (p. 67)

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. 68)

- Bachelor of Science in Agricultural Business (p. 68)
  - Agribusiness Management Concentration
  - Farm and Ranch Management Concentration
- Bachelor of Science in Agricultural Education (p. 72)
  - Agricultural Education Broadfield Teaching Option
  - Agricultural Relations Option
- Bachelor of Science in Animal Science (p. 74)
  - Equine Science Option
  - Livestock Management and Industry Option
  - Science Option
- Bachelor of Science in Biotechnology (p. 79)
  - Animal Systems Option
  - Plant Systems Option
  - Microbial Systems Option
- Bachelor of Science in Environmental Horticulture (p. 82)
  - Environmental Horticulture Science Option
  - Landscape Design Option
- Bachelor of Science in Environmental Sciences (p. 85)
  - Environmental Biology Option
  - Geospatial and Environmental Analysis Option
  - Land Rehabilitation Option
  - Soil and Water Sciences Option
- Bachelor of Science in Financial Engineering (p. 70)
- Bachelor of Science in Natural Resources and Rangeland Ecology (p. 91)
  - Rangeland Ecology and Management Option
  - Wildlife Habitat Ecology and Management Option
- Bachelor of Science in Plant Science (p. 93)
  - Crop Science Option
  - Plant Biology Option
- Bachelor of Science in Sustainable Food & Bioenergy Systems (p. 95)
  - Agroecology Option
  - Sustainable Crop Production Option
  - Sustainable Livestock Production Option
  - Non-degree program
  - Pre-veterinary Medicine Program (p. 94)

College of Arts and Architecture (p. 99)

- Bachelor of Arts in Art (p. 99)
  - Art Education K-12 Broadfield Option
  - Art History Option
  - Liberal Arts Studio Option
- Bachelor of Fine Arts in Art (p. 99)
  - Graphic Design Option
  - Studio Arts Option
- Bachelor of Arts in Environmental Design (p. 109)
- Bachelor of Arts in Film and Photography (p. 112)
  - Film Option
  - Photography Option
- Bachelor of Arts in Music (p. 114)
- Bachelor of Music Education (p. 117)
- Bachelor of Arts in Music Technology (p. 115)

Jake Jabs College of Business & Entrepreneurship (p. 118)

- Bachelor of Science in Business (p. 118)
  - Accounting Option
  - Finance Option
  - Management Option
  - Marketing Option

College of Education, Health and Human Development (p. 128)

- Bachelor of Science in Community Health (p. 128)
- Bachelor of Science in Early Childhood Education and Child Services (p. 128)
- Bachelor of Science in Elementary Education K-8 (p. 128)
  - Early Childhood Education Option
  - Mathematics Option
  - Science Education Option
  - Special Education Option
- Bachelor of Science in Family and Consumer Sciences (p. 128)
  - Non-teaching Option
  - Teaching Option
- Bachelor of Science in Food and Nutrition (p. 128)
  - Dietetics Option
  - Nutrition Science Option
- Bachelor of Science in Secondary Education (p. 128)
  - General Science Broadfield Option
  - Social Studies Broadfield Option
  - (Departmental Teaching Options)
- Bachelor of Science in Health Enhancement K-12 (p. 128) (Health and Physical Education)
• Bachelor of Science in Health and Human Performance (p. 128)
  • Exercise Science Option
  • Kinesiology Option
• Bachelor of Science in Sustainable Food & Bioenergy Systems (p. 128)
  • Sustainable Food Systems Option
• Bachelor of Science in Technology Education (p. 128)
  • Industrial Technology Option
  • Technology Education Broadfield Teaching Option

College of Engineering (p. 154)
• Bachelor of Science in Bioengineering (p. 157)
• Bachelor of Science in Chemical Engineering (p. 157)
• Bachelor of Science in Civil Engineering (p. 159)
  • Bio-Resources Engineering Option
• Bachelor of Science in Computer Engineering (p. 167)
• Bachelor of Science in Computer Science (p. 165)
  • Interdisciplinary Option
  • Professional Option
• Bachelor of Science in Construction Engineering Technology (p. 159)
• Bachelor of Science in Electrical Engineering (p. 167)
• Bachelor of Science in Financial Engineering (p. 173)
• Bachelor of Science in Industrial and Management Systems Engineering (p. 173)
• Bachelor of Science in Mechanical Engineering (p. 173)
• Bachelor of Science in Mechanical Engineering Technology (p. 173)
• Non-degree programs
  • Military Aerospace Studies (p. 179) - Air Force ROTC
  • Military Science (p. 180) - Army ROTC

College of Letters and Science (p. 181)
• Bachelor of Arts in American Studies (p. 182)
• Bachelor of Science in Anthropology (p. 185)
• Bachelor of Science in Biological Sciences (p. 199) (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 Neurosciences (p. 186)
  • Biomedical Sciences Option (includes Pre-medicine, Pre-dentistry, Pre-optometry)
• Bachelor of Science in Chemistry and Biochemistry (p. 188)
  • Biochemistry Option
  • Chemistry Option
  • Chemistry Teaching Option
• Bachelor of Science in Earth Sciences (p. 192)
  • 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
  • Quaternary Option
• Bachelor of Science in Mathematics (p. 220)
  • Applied Mathematics Option
  • Mathematics Option
  • Mathematics Teaching Option
  • Statistics Option
• Bachelor of Science in Microbiology (p. 225)
  • 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. 230)
  • 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. 237)
• Bachelor of Science in Physics (p. 239)
  • Physics Professional Option
  • Physics Teaching Option
  • Physics Interdisciplinary Option
• Bachelor of Arts in Political Science (p. 243)
  • International Relations Option
  • International and Policy Option
  • Political Institutions Option
  • Political Theory Option
• Bachelor of Science in Psychology (p. 247)
  • Applied Psychology Option
  • Psychological Science Option
• Bachelor of Arts in Religious Studies (p. 248)
• Bachelor of Science in Sociology (p. 250)
  • General Sociology Option
  • Criminology Option
• Non-degree program
  • Pre-Medical/Pre-Health Professions (p. 246)
**College of Nursing (p. 251)**
- Bachelor of Science in Nursing (p. 251)

**Gallatin College (p. 256)**
- Associate of Applied Science in Aviation (p. 257)
- Associate of Applied Science in Design Drafting Technology (p. 259)
- Associate of Applied Science in Interior Design (p. 260)
- Associate of Arts (p. 256)
- Associate of Science (p. 257)
- Certificate of Applied Science in Bookkeeping (p. 258)
- Certificate of Applied Science in Health Information Coding (p. 259)
- Certificate of Applied Science in Medical Assistant (p. 261)
- Certificate of Applied Science in Welding Technology (p. 261)
- Professional Certificate in Business Management (p. 258)

**Honors College (p. 262)**
- Honors College provides academically motivated students with unique opportunities to undertake interdisciplinary coursework and undergraduate research leading to an Honors baccalaureate degree.

**University Programs (p. 262)**
- 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. 136)
- Biology (p. 136)
- Chemistry (p. 136)
- Earth Science (p. 137)
- Economics (p. 137)
- Family and Consumer Sciences (p. 137)
- French K-12 (p. 138)
- German K-12 (p. 138)
- Government (p. 138)
- History (p. 138)
- Mathematics (p. 139)
- Physics (p. 139)
- Reading K-12 (p. 139)
- Spanish K-12 (p. 139)
- Technology Education (p. 139)

**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. 126)
- Aerospace (p. 173)
- Agricultural Business (p. 72)
- Animal Science (p. 75)
- Anthropology (p. 185)
- Art History (p. 101)
- Astrobiology (p. 189)
- Biochemistry (p. 189)
- Business Administration (p. 126)
- China Studies (http://catalog.montana.edu/undergraduate/letters-science/modern-languages-literatures/china-studies-minor-nonteaching)
- Chemistry (p. 191)
- Coaching (p. 143)
- Computer Engineering (p. 170)
- Computer Science (p. 166)
- Economics (p. 205)
- Electrical Engineering (p. 172)
- English Literature (p. 208)
- English Writing (p. 208)
- Entrepreneurship and Small Business Management (p. 127)
- Entomology (p. 82)
- Environmental Horticulture (p. 83)
- Finance (p. 127)
- Financial Engineering (p. 71)
- French (p. 232)
- Genetics (p. 90)
- Geographic Information Science (GIS) (p. 194)
- German (p. 233)
- Global Studies (p. 23)
- Hispanic Studies (http://catalog.montana.edu/undergraduate/letters-science/modern-languages-literatures/hispanic-studies-minor-nonteaching)
- History (p. 209)
- Human Development (http://catalog.montana.edu/undergraduate/education-health-human-development/human_development_minor)
- Industrial and Management Systems Engineering (http://catalog.montana.edu/undergraduate/engineering/mechanical-industrial-engineering/eims-minor)
- International Business (p. 128)
- Japan Studies (p. 233)
- Land Surveying (p. 165)
- Latin American and Latino Studies (p. 235)
- Materials (p. 176)
- Mathematics (p. 222)
- Mechatronics (p. 179)
- Microbiology (p. 227)
- Military Studies (p. 180)
- Museum Studies (p. 214)
- Music (p. 118)
- Native American Studies (p. 237)
- Natural Resources and Rangeland Ecology (p. 91)
• Philosophy (p. 238)
• Photography (p. 113)
• Physics (p. 241)
• Political Science (p. 243)
• Psychology (p. 248)
• Religious Studies (p. 249)
• Sociology (p. 251)
• Soil Science (p. 90)
• Spanish (p. 235)
• Spatial Analysis/GIS (p. 194)
• Statistics (p. 224)
• Water Resources (p. 198)
• Women’s, Gender and Sexuality Studies (p. 251)

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.

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**College of Agriculture**

**Glenn Duff, Interim 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 science, 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. 68)
- B.S. in Agricultural Education (p. 72)
- B.S. in Animal Science (p. 74)
- Biological Sciences at MSU (p. 78)
- B.S. in Biotechnology (p. 79)
- B.S. in Environmental Horticulture (p. 82)
- B.S. in Environmental Sciences (p. 85)
- B.S. in Financial Engineering (p. 70)
- B.S. in Natural Resources and Rangeland Ecology (p. 91)
- B.S. in Plant Science (p. 93)
- B.S. in Sustainable Food & Rangeland Ecology (p. 95)
- Pre-veterinary Medicine Curriculum (p. 94)

**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. 72)
- Animal Science Minor (p. 75)
- Entomology Minor (p. 82)

The Entomology minor provides focused training in entomology for students majoring in agricultural and natural resource disciplines.

- Natural Resources and Rangeland Ecology Minor (p. 91)
- Soil Science Minor (p. 90)
- Water Resources Minor (p. 198)

The Water Resources Minor is designed to encourage a student from any discipline to explore water resources beyond course work in their major.

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**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. 69)
- Farm and Ranch Management Concentration (p. 69)
- Financial Engineering (p. 70)
- Minor in Agricultural Business (p. 72)
- Minor in Financial Engineering (p. 71)

### Agribusiness Management Concentration

**Freshman Year**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</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>
<tr>
<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>4</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>
<td></td>
</tr>
<tr>
<td>or COM 110US - University Core and Electives</td>
<td>4</td>
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<td><strong>Year Total:</strong></td>
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**Sophomore Year**

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<th>Course</th>
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<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 Managerial 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>
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<tr>
<td>Choose one of the following:</td>
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<tr>
<td>BMGT 205 - Prof Business Communication</td>
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<tr>
<td>WRIT 201 - College Writing II</td>
<td></td>
</tr>
<tr>
<td>WRIT 221 - Intermediate Tech Writing</td>
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<tr>
<td>University Core and Electives</td>
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<td><strong>Year Total:</strong></td>
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**Junior and Senior Year**

<table>
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<tr>
<th>Course</th>
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<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 Micro 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>Choose one of the following:</td>
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<tr>
<td>AGBE 445 - Agribusiness Management**</td>
<td></td>
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<tr>
<td>AGBE 421 - Advanced Ag Marketing**</td>
<td></td>
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<tr>
<td>BMGT 335 - Management and Organization</td>
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<td>BMIS 311 - Management Information Systems</td>
<td></td>
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<tr>
<td>BMKT 325 - Principles of Marketing</td>
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</tr>
<tr>
<td>AGBE 421 - Advanced Ag Marketing</td>
<td>3</td>
</tr>
<tr>
<td>or AGBE 445 - Agribusiness Management</td>
<td></td>
</tr>
<tr>
<td>University Core and Electives</td>
<td>33</td>
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<tr>
<td><strong>Year Total:</strong></td>
<td><strong>60</strong></td>
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<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.

**Electives Must Include**

- Social Sciences (excluding AGBE/ECNS)           | 6       |
- One additional course from Fine Arts, Humanities, or Social Sciences (excluding AGBE/ECNS) | 3       |

**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>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>
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<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>AGED 140US - Leadership Dev For Agriculture</td>
<td>3</td>
</tr>
<tr>
<td>or COMX 111US - Introduction to Public Speaking</td>
<td></td>
</tr>
<tr>
<td>or COM 110US - University Core and Electives</td>
<td>4</td>
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<tr>
<td><strong>Year Total:</strong></td>
<td><strong>30</strong></td>
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</table>

**Sophomore Year**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECNS 204IS - Microeconomics*</td>
<td>3</td>
</tr>
<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 Managerial 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>
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</tr>
<tr>
<td><strong>Year Total:</strong></td>
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**Junior and Senior Year**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
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<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 Micro with Calc</td>
<td>3</td>
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<tr>
<td>ECNS 303 - Intermediate Macro with Calc</td>
<td>3</td>
</tr>
<tr>
<td>M 161Q - Survey of Calculus</td>
<td>3</td>
</tr>
<tr>
<td>M 171Q - Calculus I</td>
<td>3</td>
</tr>
<tr>
<td>AGED 140US - Leadership Dev For Agriculture</td>
<td></td>
</tr>
</tbody>
</table>
Agricultural Business students seeking a second major in Economics must complete 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 and above.

### 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.

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 Code</th>
<th>Course Title</th>
<th>Fall</th>
<th>Spring</th>
</tr>
</thead>
<tbody>
<tr>
<td>M 171Q</td>
<td>Calculus I</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>University Core Electives</td>
<td>6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CSCI 111</td>
<td>Programming with Java I</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>M 172Q</td>
<td>Calculus II</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>PHSX 220</td>
<td>Physics I (w/ calculus)</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>EFIN 101</td>
<td>Introduction to Financial Engineering</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>ECNS 251IS</td>
<td>Honors Economics’</td>
<td>4</td>
<td></td>
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<tr>
<td>WRIT 101W</td>
<td>College Writing I”</td>
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### Sophomore Year

<table>
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<th>Course Title</th>
<th>Fall</th>
<th>Spring</th>
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</thead>
<tbody>
<tr>
<td>CSCI 132</td>
<td>Basic Data Structures and Algorithms</td>
<td>4</td>
<td></td>
</tr>
</tbody>
</table>

Choose one of the following:

### Electives Must Include

Social Sciences (excluding AGBE/ECNS)

One additional course from Fine Arts, Humanities, or Social Sciences (excluding AGBE/ECNS)

### 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 selective courses counting toward departmental graduation requirements must be graded C- or better.

### Financial Engineering

- 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 engineering majors undertake rigorous training in financial economics, engineering mathematics, and actuarial methods:

- Software engineering and modeling
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECNS 345</td>
<td>Econ Org, Fin, &amp; Credit</td>
<td></td>
</tr>
<tr>
<td>EGEN 325</td>
<td>Engineering Economic Analysis</td>
<td></td>
</tr>
<tr>
<td>M 221</td>
<td>Introduction to Linear Algebra</td>
<td>3</td>
</tr>
<tr>
<td>M 273Q</td>
<td>Multivariable Calculus</td>
<td>4</td>
</tr>
<tr>
<td>ECNS 309</td>
<td>Managerial Economics</td>
<td>3</td>
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<tr>
<td>CSCI 232</td>
<td>Data Structures and Algorithms</td>
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<tr>
<td>CHMY 141</td>
<td>College Chemistry I</td>
<td>4</td>
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<tr>
<td>ECNS 301</td>
<td>Intermediate Micro with Calc</td>
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</tr>
<tr>
<td>M 274</td>
<td>Introduction to Differential Equation</td>
<td>4</td>
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</table>

**Year Total:** 14 15

**Junior Year**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>Credits</th>
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</thead>
<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></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></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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</table>

**Year Total:** 15 15

**Senior Year**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technical Electives</td>
<td></td>
<td></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>
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<td></td>
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<tr>
<td>EFIN 499R</td>
<td>Financial Engineering Design</td>
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<tr>
<td>Capstone</td>
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**Year Total:** 15 15

**Total Program Credits:** 125

---

**Technical Electives**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>Credits</th>
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<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>
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</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>ESOF 322</td>
<td>Software Engineering</td>
<td>3</td>
</tr>
<tr>
<td>ESOF 422</td>
<td>Advanced Software Engineering</td>
<td>3</td>
</tr>
<tr>
<td>ESOF 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 Code</th>
<th>Course Name</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 Code</th>
<th>Course Name</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>EGEN 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>
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Choose one of the following:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>Credits</th>
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</thead>
<tbody>
<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>
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</table>

Choose one of the following:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>EIND 457</td>
<td>Regres &amp; Multivar Analysis</td>
<td></td>
</tr>
<tr>
<td>EIND 464</td>
<td>Prin of Operations Research II</td>
<td></td>
</tr>
<tr>
<td>EIND 468</td>
<td>Managerial Forecasting &amp; Decision Analysis</td>
<td></td>
</tr>
</tbody>
</table>

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**Professional Electives**

<table>
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<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>Credits</th>
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<tbody>
<tr>
<td>BFIN 420</td>
<td>Investments I</td>
<td>3</td>
</tr>
<tr>
<td>BFIN 441</td>
<td>Advanced Analysis of Financial Statements</td>
<td>3</td>
</tr>
<tr>
<td>BFIN 452</td>
<td>International Finance</td>
<td>3</td>
</tr>
<tr>
<td>BFIN 458</td>
<td>Commercial Bank Management</td>
<td>3</td>
</tr>
<tr>
<td>BFIN 466</td>
<td>Investments II</td>
<td>3</td>
</tr>
<tr>
<td>ECNS 314</td>
<td>International Economics</td>
<td>3</td>
</tr>
<tr>
<td>ECNS 403R</td>
<td>Intro to Econometrics</td>
<td>3</td>
</tr>
<tr>
<td>ECNS 432R</td>
<td>Benefit-Cost Analysis</td>
<td>3</td>
</tr>
<tr>
<td>EGEN 310R</td>
<td>Multidisciplinary Engineering Design</td>
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</tr>
<tr>
<td>EGEN 492</td>
<td>Independent Study</td>
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<tr>
<td>EIND 425</td>
<td>Technology Entrepreneurhip</td>
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</tr>
<tr>
<td>EIND 434</td>
<td>Project and Engineering Management</td>
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</table>

---

**Montana State University**

71
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

- ECNS 101IS Economic Way of Thinking 3
- ECNS 202 Principles of Macroeconomics 3
- ECNS 204IS Microeconomics 3
- ECNS 301 Intermediate Micro with Calc 3
- AGBE 321 Economics of Ag Marketing 3
- AGBE 341 Farm and Ranch Management 3
- AGBE 345 Ag Finance and Credit Analysis 3

Plus six upper division AGBE/ECNS elective credits (no seminars, 490's or 492's) 6

Supporting Requirements

- ACTG 201 Principles of Financial Acct 3
- M 161Q Survey of Calculus 4
- or M 171Q Calculus I 4
- STAT 216Q Introduction to Statistics 3

3 credits of 200+ (ACTG, BFIN, BGEN, BMGT, BMIS, BMKT) 3

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 courses 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.

Relations Option

The relations option is designed specifically to prepare students for entry-level employment in the Extension Service, agricultural communications and leadership positions, federal or state agencies, community education, or the public agriculture sector. This option provides broad-based education that includes animal science, plant science, agricultural economics, education, communications, and leadership development. Students can select their program of study to emphasize communications, leadership, or extension and community education. All students will also enhance their degree with a “Leadership Fellow” certificate integrated into the program of study. An approved internship in a local Extension office or with an agricultural agency is required.

Undergraduate Programs

- Agricultural Education Teaching Option (p. 74)
- Agricultural Education Relations Option (p. 72)

Graduate Programs

- M.S. in Agricultural Education (p. 360)

Agricultural Education Relations Option

<table>
<thead>
<tr>
<th>Freshman Year</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fall</td>
<td>Spring</td>
</tr>
<tr>
<td>WRIT 101W - College Writing I</td>
<td>3</td>
</tr>
<tr>
<td>ECNS 101IS - Economic Way of Thinking</td>
<td>3</td>
</tr>
<tr>
<td>NRSM 101 - Natural Resource Conservation</td>
<td>3</td>
</tr>
<tr>
<td>NRSM 102 - Montana Range Plants</td>
<td>1</td>
</tr>
<tr>
<td>CHMY 121IN - Introduction to General Chemistry</td>
<td>4</td>
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<tr>
<td>AGSC 101 - Introduction to Agricultural and Environmental Resources (1)</td>
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</tr>
</tbody>
</table>

Take the following from appropriate track: 0-1

Leadership Track:

- UC 102 - Leadership Explorations (1)
- AGED 140US - Leadership Dev For Agriculture 3
- M 145Q - Math for the Liberal Arts 3
- AGED 105 - Microcomputers in Agricultural 3
- BIOB 160 - Principles of Living Systems 4
- ANSC 100 - Introduction to Animal Science 3

Year Total: 15-16 16

Sophomore Year | Credits |
<table>
<thead>
<tr>
<th></th>
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<tbody>
<tr>
<td>Fall</td>
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<tr>
<td>BMGT 205 - Prof Business Communication</td>
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<tr>
<td>FCS 101IS - Indiv and Fam Dev: Lifespan (3)</td>
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</tr>
<tr>
<td>ENSC 2451N - Soils</td>
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<tr>
<td>Ag Elective (Lower Level)</td>
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Take the following from appropriate track: 3

Leadership Track:

- H Core (3)

Communications Track:

- FILM 100IH - Intro to Film & Photography (3)

Extension Track:
<table>
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<tbody>
<tr>
<td>BIOB 110CS - Introduction to Plant Biology</td>
<td>3</td>
</tr>
<tr>
<td>UC 202 - Leadership Foundations</td>
<td>3</td>
</tr>
<tr>
<td>AGBE 210IS - Economics of Ag Business</td>
<td>3</td>
</tr>
<tr>
<td>AGED 294 - Seminar</td>
<td>3</td>
</tr>
<tr>
<td>Take the following from appropriate track: Leadership Track:</td>
<td>3-6</td>
</tr>
<tr>
<td>SOCI 101IS - Introduction to Sociology</td>
<td></td>
</tr>
<tr>
<td>ECNS 202 - Principles of Macroeconomics</td>
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<td>PHOT 154IA - Exploring Digital Photography</td>
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<td>ECNS 202 - Principles of Macroeconomics</td>
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<td>ECNS 204IS - Microeconomics</td>
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<tr>
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<td>BINFO 262IN - Introduction to Entomology</td>
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<td>WRIT 373 - News and Pub Relations Writing (3)</td>
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<td>AGED 315 - Electrical and Power Systems Operation (3)</td>
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<tr>
<td>AGBE 337 - Agricultural Law</td>
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<td>AGED 482 - Non-Formal Teaching Methods in Agriculture</td>
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<td>BMKT 343 - Integrated Marketing Communication (3)</td>
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**Ag Electives (Lower Level)**

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<td>ANSC 205</td>
<td>Intro to Meat Evaluation</td>
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<td>ANSC 222</td>
<td>Livestock in Sustain Systems</td>
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<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>SFBS 146</td>
<td>Introduction to Sustainable Food and Bioenergy Systems</td>
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**Ag Electives (Upper Level)**

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<td>AGED 315</td>
<td>Electrical and Power Systems Operation</td>
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<td>AGED 333</td>
<td>Construction Technology</td>
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<td>AGSC 341</td>
<td>Field Crop Prod</td>
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<td>AGSC 342</td>
<td>Forages</td>
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<td>ANSC 316</td>
<td>Meat Science</td>
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<td>ANSC 321</td>
<td>Physiology of Animal Reproduction</td>
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<td>ANSC 337</td>
<td>Disease of Domestic Livestock</td>
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<td>NRSM 421</td>
<td>Holistic Thought/Mgmt</td>
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<td>WILD 325</td>
<td>Wildlife-Livestock Nutrition</td>
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**Communications Electives**

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<td>BMKT 290</td>
<td>Advertising</td>
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<tr>
<td>CS 204</td>
<td>Multimedia Dev Methods</td>
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<tr>
<td>WRIT 326</td>
<td>Advanced Composition</td>
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<tr>
<td>WRIT 371</td>
<td>Digital Rhetorics and Multimodal Writing</td>
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<tr>
<td>WRIT 372</td>
<td>Science Writing for Popular Non-Fiction</td>
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</table>
WRIT 374 Magazine Editing 3
WRIT 429 Professional Writing 3

**Leadership Electives**
AGSC 465R Health, Agriculture, Poverty 4
BGEN 242D Intro to Int'l Business 3
BMGT 366 Supervisory Management Skills 3
BMGT 406 Negotiation/Dispute Resolution 3
BMKT 337 Consumer Behavior 3
BMKT 343 Integrated Marketing Communication 3
BMKT 436 Sales and Sales Management 3
SOCI 345 Sociology of Organizations 3
WRIT 373 News and Pub Relations Writing 3

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

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<tr>
<th>Freshman Year</th>
<th>Credits</th>
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<tbody>
<tr>
<td>AGED 140US - Leadership Dev For Agriculture</td>
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<td>CHMY 121IN - Introduction to General Chemistry</td>
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<td>M 145Q - Math for the Liberal Arts</td>
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<tr>
<td>NRSM 101 - Natural Resource Conservation</td>
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<tr>
<td>NRSM 102 - Montana Range Plants</td>
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<td>WRIT 101W - College Writing I</td>
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<td>AGED 105 - Microcomputers in Agricultural</td>
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<tr>
<td>ANSC 100 - Introduction to Animal Science</td>
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<tr>
<td>BIOB 110CS - Introduction to Plant Biology</td>
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<td>ECNS 101IS - Economic Way of Thinking</td>
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<td>EDU 202 - Early Field Experience</td>
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<td>FCS 101IS - Indiv and Fam Dev: Lifespan</td>
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<th>Sophomore Year</th>
<th>Credits</th>
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<tr>
<td>BIOB 160 - Principles of Living Systems</td>
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<td>EDU 223IS - Educ Psych and Adolescent Dev</td>
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<td>ENSC 245IN - Soils</td>
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<td>TE 207 - Materials and Processes</td>
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<td>University Core</td>
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<tr>
<td>AGBE 210IS - Economics of Ag Business</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>GPHY 262 - Spatial Sci Tech &amp; Application</td>
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<td>HORT 245 - Plant Propagation</td>
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<tr>
<td>WRIT 221 - Intermediate Tech Writing</td>
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<th>Junior Year</th>
<th>Credits</th>
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<tbody>
<tr>
<td>AGED 312R - Communicating Agriculture</td>
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AGED 315 - Electrical and Power Systems Operation 3
or AGTE 355 - Power Systems Operational Control 3
BIOB 318 - Biometry 3
EDU 211D - Multicultural Education 3
WLDG 110 - Welding Theory I 1
WLDG 111 - Welding Theory I Practical 3
AGED 253 - Ag Ed in Pub Schools 3
AGED 301 - Rural Electrification 3
AGED 494 - Seminar 3
ANSC 316 - Meat Science 4
University Core 3
EDU 382 - Assessmt, Curric, Instructn 3

**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. 75)
- Livestock Management & Industry Option (p. 76)
- Science Option (p. 77)

Undergraduate Minors
- Animal Science Minor (Non-Teaching) (p. 75)
- Genetics Minor (Non-Teaching) (p. 90)

Graduate Programs
- M.S. in Animal and Range Sciences (p. 270)
- M.S. in Land Rehabilitation (interdisciplinary) (p. 277)
- Ph.D. in Animal and Range Sciences (p. 271)

Animal Science Minor (Non-Teaching)

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<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>ANSC 222</td>
<td>Livestock in Sustain Systems</td>
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<tr>
<td>CHMY 123</td>
<td>Introduction of Organic Chemistry and Biochemistry</td>
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<tr>
<td>ANSC 265</td>
<td>Anatomy and Physiology of Domestic Animals - Lecture</td>
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<td>ANSC 266</td>
<td>Anatomy and Physiology of Domestic Animals - Lab</td>
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<td>ANSC 320</td>
<td>Animal Nutrition</td>
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<td>ANSC 321</td>
<td>Physiology of Animal Reproduction</td>
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<td>ANSC 322</td>
<td>Principles of Animal Breeding and Genetics</td>
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Choose one of the following:

- ANSC 205 Intro to Meat Evaluation
- ANSC 215 Calving Management
- ANSC 232 Livestock Management - Sheep I
- EQUIS 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:

- ANSC 316 Meat Science
- EQUIS 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

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<td>Montana Range Plants</td>
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<td>CHMY 121N -</td>
<td>Introduction to General Chemistry</td>
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<td>or CHMY 141 -</td>
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<td>BIOB 160 -</td>
<td>Principles of Living Systems</td>
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<td>ECNS 101S -</td>
<td>Economic Way of Thinking</td>
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<td>Applied Courses</td>
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Sophomore Year

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<td>or STAT 216Q -</td>
<td>Introduction to Statistics</td>
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<td>EQUIS 206 -</td>
<td>Equine Ethology: Understanding</td>
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<td>Horse Behavior</td>
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<td>NRSM 240 -</td>
<td>Natural Resource Ecology</td>
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<td>Applied Courses</td>
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Junior Year

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<td>Livestock in Sustain Systems</td>
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<tr>
<td>ANSC 265 -</td>
<td>Anatomy and Physiology of Domestic Animals - Lecture</td>
<td>3</td>
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<tr>
<td>ANSC 266 -</td>
<td>Anatomy and Physiology of Domestic Animals - Lab</td>
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<tr>
<td>NRSM 236 -</td>
<td>Small Pasture Management</td>
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<tr>
<td>NRBM 236 -</td>
<td>Introduction of Organic Chemistry and Biochemistry</td>
<td>4</td>
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<td>BMGT 205 -</td>
<td>Prof Business Communication</td>
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<tr>
<td>or WRIT 221 -</td>
<td>Intermediate Tech Writing</td>
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Graduate Programs

- M.S. in Animal and Range Sciences (p. 270)
- M.S. in Land Rehabilitation (interdisciplinary) (p. 277)
- Ph.D. in Animal and Range Sciences (p. 271)
Management & Industry Electives
Select 9 credits
- AGSC 341 Field Crop Prod
- AGSC 342 Forages
- ANSC 232 Livestock Management - Sheep I
- ANSC 234 Livestock Management - Beef I
- ANSC 418 Topics in Beef Nutrition
- or EQUS 423 Equine Nutrition
- ANSC 432R Sheep Management
- ANSC 434R Beef Cattle Management
- BIOM 405 Host-Associated Microbiomes
- ENSC 245IN Soils
- EQUH 430 Horse Management
- NRSM 353 Grazing Ecology and Management
- NRSM 453 Habitat Inventory and Analysis
- NRSM 455 Riparian Ecology & Management

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
- NRSM 101 - Natural Resource Conservation
- NRSM 102 - Montana Range Plants
- CHMY 121IN - Introduction to General Chemistry
- University Core and Electives
- ANSC 100 - Introduction to Animal Science
- CHMY 123 - Introduction of Organic Chemistry and Biochemistry
- BIOB 160 - Principles of Living Systems
- ENSC 245IN - Soils
- ECNS 101IS - Economic Way of Thinking

Year Total: 14

Sophomore Year
- ANSC 320 - Animal Nutrition
- ANSC 321 - Physiology of Animal Reproduction
- NRSM 240 - Natural Resource Ecology
- STAT 216Q - Introduction to Statistics
- University Core and Elective
- Econ & Business Elective
- Practicum Electives
- ANSC 222 - Livestock in Sustain Systems
- ANSC 265 - Anatomy and Physiology of Domestic Animals - Lecture
- ANSC 266 - Anatomy and Physiology of Domestic Animals - Lab
- BMGT 205 - Prof Business Communication or WRIT 221 - Intermediate Tech Writing
- University Core and Electives

Year Total: 15-16

Junior Year
- ANSC 347 - Equine Form to Function
- Econ and Business Elective
- Year Total: 16
**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>
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<tr>
<td>or ANSC 308</td>
<td>Livestock Evaluation</td>
<td></td>
</tr>
<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>EQU S 233</td>
<td>Horse Science and Mgt Lab</td>
<td>2</td>
</tr>
<tr>
<td>NRSM 235</td>
<td>Range and Pasture Monitoring</td>
<td>1</td>
</tr>
</tbody>
</table>

**Livestock Management Electives**

Select 6 credits

<table>
<thead>
<tr>
<th>Course Code</th>
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<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>
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<tr>
<td>EQU S 430</td>
<td>Horse Management</td>
<td>4</td>
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**Econ & Business Electives**

Select 9 credits

<table>
<thead>
<tr>
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<th>Course Name</th>
<th>Credits</th>
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</thead>
<tbody>
<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 220</td>
<td>Survey of Accounting</td>
<td>3</td>
</tr>
<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 421</td>
<td>Advanced Ag Marketing</td>
<td>3</td>
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<tr>
<td>AGBE 353</td>
<td>Cooperative Business Principles and Practices</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>
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<tr>
<td>BGEN 242D</td>
<td>Intro to Int’l Business</td>
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<tr>
<td>BGEN 361</td>
<td>Principles of Business Law</td>
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<tr>
<td>BMGT 335</td>
<td>Management and Organization</td>
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<td>BMKT 337</td>
<td>Consumer Behavior</td>
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<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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<tbody>
<tr>
<td>AGSC 341</td>
<td>Field Crop Prod</td>
<td>3</td>
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<tr>
<td>AGSC 342</td>
<td>Forages</td>
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<td>ANSC 410</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>
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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>EQU S 327</td>
<td>Equine Lameness</td>
<td>3</td>
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<tr>
<td>EQU S 423</td>
<td>Equine Nutrition</td>
<td>2</td>
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<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>
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<tr>
<td>NRSM 453</td>
<td>Habitat Inventory and Analysis</td>
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<tr>
<td>NRSM 455</td>
<td>Riparian Ecology &amp; Management</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. University core requirements must be completed.

**Science Option**

**Freshman Year**

<table>
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<tr>
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<tr>
<td>NRSM 101</td>
<td>Natural Resource Conservation</td>
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<td>NRSM 102</td>
<td>Montana Range Plants</td>
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<tr>
<td>BIOB 170IN</td>
<td>Principles of Biological Diversity</td>
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<tr>
<td>CHMY 141</td>
<td>College Chemistry I</td>
<td>4</td>
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<td>University Core and Electives</td>
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<tr>
<td>ANSC 100</td>
<td>Introduction to Animal Science</td>
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<tr>
<td>BIOB 160</td>
<td>Principles of Living Systems</td>
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<td>CHMY 143</td>
<td>College Chemistry II</td>
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**Sophomore Year**

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<tr>
<td>NRSM 240</td>
<td>Natural Resource Ecology</td>
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<td>ECNS 1011S</td>
<td>Economic Way of Thinking</td>
<td>3</td>
</tr>
<tr>
<td>M 161Q</td>
<td>Survey of Calculus</td>
<td>4</td>
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<tr>
<td>BIOB 318</td>
<td>Biometry</td>
<td>3</td>
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<tr>
<td>or STAT 216Q</td>
<td>Introduction to Statistics</td>
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<td>University Core and Electives</td>
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<td>ANSC 222</td>
<td>Livestock in Sustain Systems</td>
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<tr>
<td>ANSC 265</td>
<td>Anatomy and Physiology of Domestic Animals - Lecture</td>
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<td>ANSC 266</td>
<td>Anatomy and Physiology of Domestic Animals - Lab</td>
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<tr>
<td>CHMY 211</td>
<td>Elements of Organic Chemistry</td>
<td>5</td>
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<tr>
<td>BMGT 205</td>
<td>Prof Business Communication</td>
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<tr>
<td>or WRIT 221</td>
<td>Intermediate Tech Writing</td>
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<tr>
<td>BIOB 109CS</td>
<td>Introduction to Biotechnology</td>
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**Total Program Credits:** 120
Junior 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>ANSC 320 - Animal Nutrition</td>
<td>4</td>
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<td>ANSC 321 - Physiology of Animal Reproduction</td>
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<tr>
<td>BCH 380 - Biochemistry</td>
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<tr>
<td>Restricted Electives</td>
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<tr>
<td>ANSC 322 - Principles of Animal Breeding and Genetics</td>
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<tr>
<td>University Core and Electives</td>
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Senior Year

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
<th>Fall</th>
<th>Spring</th>
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<tbody>
<tr>
<td>University Core and Electives</td>
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<tr>
<td>Livestock Management Electives</td>
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<tr>
<td>ANSC 498 - Internship</td>
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<tr>
<td>or ANSC 490R - Undergraduate Research</td>
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<td>Year Total:</td>
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Total Program Credits: 120

Livestock Management Electives

Take two

<table>
<thead>
<tr>
<th>Course</th>
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<tbody>
<tr>
<td>ANSC 316 - Meat Science</td>
<td>4</td>
</tr>
<tr>
<td>ANSC 432R - Sheep Management</td>
<td>3</td>
</tr>
<tr>
<td>ANSC 434R - Beef Cattle Management</td>
<td>4</td>
</tr>
<tr>
<td>EQUIS 430 - Horse Management</td>
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</table>

Restricted Electives

Select 12 credits

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ANSC 337 - Disease of Domestic Livestock</td>
<td>3</td>
</tr>
<tr>
<td>ANSC 410 - Veterinary Entomology and Parasitology</td>
<td>3</td>
</tr>
<tr>
<td>ANSC 421 - Assisted Reproduction Technologies w/ Lab</td>
<td>4</td>
</tr>
<tr>
<td>BIOB 375 - General Genetics</td>
<td>3</td>
</tr>
<tr>
<td>BIOH 323 - Human Development Biology</td>
<td>4</td>
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<tr>
<td>BIOH 454 - Microanatomy (Histology)</td>
<td>4</td>
</tr>
<tr>
<td>BIOM 360 - General Microbiology</td>
<td>5</td>
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<tr>
<td>BIOM 405 - Host-Associated Microbiomes</td>
<td>4</td>
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<tr>
<td>BIOO 310 - Comparative Vertebrate Anatomy</td>
<td>4</td>
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<tr>
<td>BIOO 412 - Animal Physiology</td>
<td>3</td>
</tr>
<tr>
<td>PHSX 205 - College Physics I</td>
<td>4</td>
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<tr>
<td>PHSX 207 - College Physics II</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.

Biological Sciences

Animal Science (p. 74) - 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.

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.

Biology 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

Environmental Horticulture Science: the science and art of growing and maintaining plants for food and the enjoyment and improvement of the human environment. Its application through research has led to improved varieties of plants to benefit our daily lives.

Landscape design: prepares students to solve aesthetic and functional landscape problems.
Environmental Sciences - Land Resources and Environmental Sciences Department; College of Agriculture

Environmental Sciences Major: This major 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.

Environmental Biology Option: 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.

Geospatial and Environmental Analysis Option: This program is for students interested in land resources and their management at landscape scales.

Land Rehabilitation Option: This course of study provides training in site re-vegetation, soil remediation, riparian zone restoration, stream channel restoration, investigation of impacted geologic resources, restoration ecology, and remediation of sites contaminated by industrial activities.

Soil and Water Sciences Option: provides students with fundamental training in biological, chemical, and physical sciences and advanced training in soil and water sciences.

Microbiology - Microbiology Department; College of Letters and Science

Environmental Health: provides a program for attaining a broad understanding of the physical, chemical, and biological factors in our environment, and their interactions that relate to health.

Medical Laboratory Science: designed to prepare students for careers in Clinical Laboratory Science.

Microbiology: In this option, students obtain a thorough education in the fields of medical, ecological, physiological and environmental microbiology, immunology, virology, and molecular biology.

Natural Resources and Rangeland Ecology - Animal and Range Sciences Department; College of Agriculture

Rangeland Ecology and Management: provides training in soils, vegetation, water, riparian areas, and livestock production on rangelands.

Wildlife Habitat Ecology and Management: the science and art of managing wildland habitats for wildlife.

Plant Sciences - Plant Sciences and Plant Pathology Department; College of Agriculture

Crop Science: The challenge for crop scientists is to implement crop and soil management schemes that maintain and/or increase production, but at the same time conserve our soil and water resources and preserve the delicate balance in the agroecosystem.

Plant Biology: Plant biology provides a broad education in the plant sciences.

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. 79)
- Animal Systems Option (p. 80)
- Microbial Systems Option (p. 81)
- Plant Systems Option (p. 81)

All Biotechnology Options

Freshman Year  Credits
WRIT 101W - College Writing I 3
BIOB 105CS - Introduction to Biotechnology 3
BIOB 170IN - Principles of Biological Diversity 4
CHMY 141 - College Chemistry I 4
Select one of the following: 3
BIOB 318 - Biometry
STAT 216Q - Introduction to Statistics
M 161Q - Survey of Calculus

M 165Q - Calculus for Technology I 4
BIOB 160 - Principles of Living Systems or BIOB 260 - Cellular and Molecular Biology 4
CHMY 143 - College Chemistry II 4
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  Credits
BIOB 375 - General Genetics 3
CHMY 321 - Organic Chemistry I or CHMY 211 - Elements of Organic Chemistry 4
BIOM 360 - General Microbiology 5
CHMY 323 - Organic Chemistry II 4
ECNS 101IS - Economic Way of Thinking 3
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.
Animal Systems Option

All Biotechnology Options have the same Freshman and Sophomore year requirements.

** If a student takes CHMY 321 Organic Chemistry I, the student must take CHMY 323 Organic Chemistry II.

** If one of these is used as a departmental requirement, then it cannot count as elective credits.

---

### Freshman Year

<table>
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<tbody>
<tr>
<td>WRIT 101W - College Writing I</td>
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<tr>
<td>BIOC 105CS - Introduction to Biotechnology</td>
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<tr>
<td>BIOC 170IN - Principles of Biological Diversity</td>
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<tr>
<td>CHMY 141 - College Chemistry I</td>
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<tr>
<td>Select one of the following:</td>
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<tr>
<td>BIOC 318 - Biometry*</td>
<td>3</td>
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<tr>
<td>STAT 216Q - Introduction to Statistics*</td>
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<tr>
<td>M 165Q - Calculus for Technology I*</td>
<td>3</td>
</tr>
<tr>
<td>BIOC 160 - Principles of Living Systems</td>
<td>4</td>
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<tr>
<td>or BIOC 260 - Cellular and Molecular Biology</td>
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<td>CHMY 143 - College Chemistry II</td>
<td>3-4</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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** M 166Q - Calculus for Technology II**

University Core and Electives: 11

Year Total: 39-40

### Sophomore Year

<table>
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<tr>
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<td>BIOC 375 - General Genetics</td>
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<td>CHMY 321 - Organic Chemistry I</td>
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<tr>
<td>or CHMY 211 - Elements of Organic Chemistry</td>
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<tr>
<td>BIOM 360 - General Microbiology</td>
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<td>CHMY 323 - Organic Chemistry II*</td>
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<td>ECNS 101IS - Economic Way of Thinking</td>
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University Core and Electives: 8-12

Year Total: 27-31

** Total Program Credits: 66-71

---

** If a student takes BIOC 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

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<td>BCH 380 - Biochemistry</td>
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<td>BIOC 412 - Hybridomas</td>
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<td>BIOC 415 - Adv Immunology Methods</td>
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<tr>
<td>BIOC 413 - Flow Cytometry</td>
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<td>BIOC 414 - Advanced Microscopy</td>
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<td>University Core and Electives</td>
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<td>BIOM 400 - Medical Microbiology</td>
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<td>BIOC 477 - Genome Science and Gene Expression</td>
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<td>Choose one of the following:</td>
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### Senior Year

<table>
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<tbody>
<tr>
<td>PHSX 205 - College Physics I</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>IMID 498R - Biotech Internship</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>University Core and Electives</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>PHSX 207 - College Physics II</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>BIOC 424 - Ethical Practice of Science</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>IMID 499 - Biotechnology Capstone</td>
<td>2</td>
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</tr>
<tr>
<td>University Core and Electives</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Year Total:</td>
<td>15</td>
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</tr>
</tbody>
</table>

** Total Program Credits: 60

---

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>BIOC 425 - Adv Cell &amp; Molecular Biology</td>
<td>3</td>
</tr>
<tr>
<td>BIOC 410 - Immunology</td>
<td>3</td>
</tr>
<tr>
<td>BIOC 201 - Hum Anatomy &amp; Physiology I **</td>
<td>5</td>
</tr>
<tr>
<td>BIOC 211 - Hum Anatomy &amp; Physiology II **</td>
<td>4</td>
</tr>
<tr>
<td>BIOC 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>Credits</th>
<th>WRIT 101W - College Writing I</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>BIOB 105CS - Introduction to Biotechnology</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>BIOB 170IN - Principles of Biological Diversity</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>CHMY 141 - College Chemistry I</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Select one of the following:</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>BIOB 318 - Biometry*</td>
<td></td>
</tr>
<tr>
<td></td>
<td>STAT 216Q - Introduction to Statistics*</td>
<td></td>
</tr>
<tr>
<td></td>
<td>M 165Q - Calculus for Technology I*</td>
<td></td>
</tr>
<tr>
<td></td>
<td>BIOB 160 - Principles of Living Systems</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>or BIOB 260 - Cellular and Molecular Biology</td>
<td></td>
</tr>
<tr>
<td></td>
<td>CHMY 143 - College Chemistry II</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Select one of the following:</td>
<td>3-4</td>
</tr>
<tr>
<td></td>
<td>M 161Q - Survey of Calculus*</td>
<td></td>
</tr>
<tr>
<td></td>
<td>M 166Q - Calculus for Technology II*</td>
<td></td>
</tr>
<tr>
<td>University Core and Electives</td>
<td>11</td>
<td></td>
</tr>
<tr>
<td>Year Total:</td>
<td>39-40</td>
<td></td>
</tr>
</tbody>
</table>

### Sophomore Year

| Credits | BIOB 375 - General Genetics | 3 |
|---------| CHMY 321 - Organic Chemistry I | 4 |
|         | or CHMY 211 - Elements of Organic Chemistry | |
|         | BIOM 360 - General Microbiology | 5 |
|         | CHMY 323 - Organic Chemistry II** | 4 |
|         | ECNS 101IS - Economic Way of Thinking | 3 |
| 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.

### Senior Year

| Credits | BIOM 450 - Microbial Physiology | 3 |
|---------| BIOM 494 - Seminar/Workshop | 1 |
|         | BIOM 490R - Undergraduate Research | 3 |
|         | University Core and Electives | 8 |
|         | BIOM 430 - Applied and Environmental Microbiology | |
|         | BIOM 452 - Soil & Environmental Microbiology | 3 |
|         | or BIOM 415 - Microbial Diversity, Ecology, and Evolution | |
|         | BIOM 410 - Microbial Genetics | 3 |
|         | BIOM 494 - Seminar/Workshop | 1 |
|         | University Core and Electives | 4 |
| Year Total: | 15 | 15 |
| **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
- BIOH 405 - Hematology
- & BIOH 406 - and Hematology Laboratory
- BCH 441 - Biochemistry of Macromolecules
- BCH 444R - Biochemistry & Molecular Biology Methods
- EENV 447 - Hazardous Waste Management
- ENSC 245IN - Soils
- ENSC 272CS - Water Resources
- ENSC 353 - Environmental Biogeochemistry
- EBI 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 and above.

**Plant Systems Option**

### Freshman Year

| Credits | WRIT 101W - College Writing I | 3 |
|---------| BIOB 105CS - Introduction to Biotechnology | 3 |
|         | BIOB 170IN - Principles of Biological Diversity | 4 |
|         | CHMY 141 - College Chemistry I | 4 |
|         | Select one of the following: | 3 |
|         | BIOB 318 - Biometry* | |
|         | STAT 216Q - Introduction to Statistics* | |
|         | M 165Q - Calculus for Technology I* | |
|         | BIOB 160 - Principles of Living Systems | 4 |
|         | or BIOB 260 - Cellular and Molecular Biology | |
|         | CHMY 143 - College Chemistry II | 4 |
|         | 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 |

**Total Program Credits:** 66-71

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* This credit is required for graduation.
** If a student takes CHMY 321 Organic Chemistry I, the student must take CHMY 323 Organic Chemistry II.

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**Microbial Systems Option**

### Junior Year

| Credits | BCH 380 - Biochemistry | 5 |
|---------| PHSX 205 - College Physics I | 4 |
|         | BIOB 410 - Immunology | 3 |
|         | University Core and Electives | 3 |
|         | BCH 442 - Metabolic Regulation | 3 |
|         | PHSX 207 - College Physics II | 4 |
|         | University Core and Electives | 8 |
| Year Total: | 15 | 15 |

---

**Plant Systems Option**

### Senior Year

| Credits | BIOM 450 - Microbial Physiology | 3 |
|---------| BIOM 494 - Seminar/Workshop | 1 |
|         | BIOM 490R - Undergraduate Research | 3 |
|         | University Core and Electives | 8 |
|         | BIOM 430 - Applied and Environmental Microbiology | |
|         | BIOM 452 - Soil & Environmental Microbiology | 3 |
|         | or BIOM 415 - Microbial Diversity, Ecology, and Evolution | |
|         | BIOM 410 - Microbial Genetics | 3 |
|         | BIOM 494 - Seminar/Workshop | 1 |
|         | University Core and Electives | 4 |
| Year Total: | 15 | 15 |

**Total Program Credits:** 60

---

* 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.
# 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

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOO 262IN</td>
<td>Introduction to Entomology</td>
<td>3</td>
</tr>
<tr>
<td>AGSC 401</td>
<td>Integrated Pest Management</td>
<td>3</td>
</tr>
<tr>
<td>BIOO 465</td>
<td>Insect Identification</td>
<td>4</td>
</tr>
<tr>
<td>BIOB 490R</td>
<td>Undergraduate Research</td>
<td>1-3</td>
</tr>
<tr>
<td>ANSC 490R</td>
<td>Undergraduate Research</td>
<td></td>
</tr>
<tr>
<td>ENSC 490R</td>
<td>Undergraduate Research</td>
<td></td>
</tr>
</tbody>
</table>

## Restricted Elective Courses

Choose three of the following: 12-13 credits

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>AGSC 341</td>
<td>Field Crop Prod</td>
<td>3</td>
</tr>
<tr>
<td>ANSC 410</td>
<td>Veterinary Entomology and Parasitology</td>
<td>3</td>
</tr>
<tr>
<td>BCH 380</td>
<td>Biochemistry</td>
<td>5</td>
</tr>
<tr>
<td>BIOB 318</td>
<td>Biometry</td>
<td>3</td>
</tr>
<tr>
<td>or STAT 216Q</td>
<td>Introduction to Statistics</td>
<td></td>
</tr>
<tr>
<td>BIOB 375</td>
<td>General Genetics</td>
<td>3</td>
</tr>
<tr>
<td>BIOB 420</td>
<td>Evolution</td>
<td>3</td>
</tr>
<tr>
<td>BIOE 370</td>
<td>General Ecology (equiv to 270)</td>
<td>3</td>
</tr>
<tr>
<td>or NRSM 240</td>
<td>Natural Resource Ecology</td>
<td></td>
</tr>
<tr>
<td>BIOE 422</td>
<td>Insect Ecology</td>
<td>3</td>
</tr>
<tr>
<td>BIOE 428</td>
<td>Freshwater Ecology</td>
<td>3</td>
</tr>
<tr>
<td>BIOM 250</td>
<td>Microbiology for Health Sciences: Infectious</td>
<td>3</td>
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<tr>
<td>Diseases</td>
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<td></td>
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<tr>
<td>BIOM 421</td>
<td>Concepts of Plant Pathology</td>
<td>3</td>
</tr>
<tr>
<td>BIOO 412</td>
<td>Animal Physiology</td>
<td>3</td>
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<tr>
<td>ENSC 407</td>
<td>Environmental Risk Assessment</td>
<td>3</td>
</tr>
<tr>
<td>WILD 301</td>
<td>Princ of Fish &amp; Wildlife Mgmt</td>
<td>3</td>
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</tbody>
</table>

## Total Credits

21-24 credits

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# 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. 78) 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 areas 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. 83)
- Landscape Design Option (p. 84)

**Undergraduate Minors**
- Environmental Horticulture Minor (Non-Teaching) (p. 83)

### Environmental Horticulture Minor (Non-Teaching)

**Required Courses**
- **HORT 105** Miracle Growing 3
- **BIOB 170IN** Principles of Biological Diversity 4
- **CHMY 121IN** Introduction to General Chemistry 4
- **HORT 231** Woody Ornamentals 3

**Elective courses**
Select four of the following: 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**

### Environmental Horticulture Science Option

**Freshman Year**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>AGSC 101 - Introduction to Agricultural and Environmental Resources</td>
<td>1</td>
</tr>
<tr>
<td>BIOB 170IN - Principles of Biological Diversity</td>
<td>4</td>
</tr>
<tr>
<td>BIOB 160 - Principles of Living Systems</td>
<td>4</td>
</tr>
<tr>
<td>BIOB 110CS - Introduction to Plant Biology</td>
<td>3</td>
</tr>
<tr>
<td>HORT 105 - Miracle Growing</td>
<td>3</td>
</tr>
<tr>
<td>CHMY 121IN - Introduction to General Chemistry</td>
<td>4</td>
</tr>
<tr>
<td>M 145Q - Math for the Liberal Arts</td>
<td>3</td>
</tr>
<tr>
<td>WRIT 101W - College Writing I</td>
<td>3</td>
</tr>
<tr>
<td>University Core and Electives</td>
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</tr>
<tr>
<td><strong>Year Total:</strong></td>
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</tr>
</tbody>
</table>

**Sophomore Year**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHMY 123 - Introduction to Organic Chemistry and Biochemistry</td>
<td>4</td>
</tr>
<tr>
<td>BIOO 262IN - Introduction to Entomology</td>
<td>3</td>
</tr>
<tr>
<td>ENSC 245IN - Soils</td>
<td>3</td>
</tr>
<tr>
<td>HORT 231 - Woody Ornamentals</td>
<td>3</td>
</tr>
<tr>
<td>HORT 232 - Herbaceous Ornamentals</td>
<td>3</td>
</tr>
<tr>
<td>HORT 245 - Plant Propagation</td>
<td>3</td>
</tr>
<tr>
<td>BIOO 220 - General Botany</td>
<td>3</td>
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<tr>
<td>Select two of the following:</td>
<td>3-4</td>
</tr>
<tr>
<td>AGED 105 - Microcomputers in Agricultural Technology</td>
<td>3</td>
</tr>
<tr>
<td>AGED 482 - Non-Formal Teaching Methods in Agriculture</td>
<td>3</td>
</tr>
<tr>
<td>BMGT 205 - Prof Business Communication</td>
<td>3</td>
</tr>
<tr>
<td>BMIS 211 - Intro to Bus Decision Support</td>
<td>3</td>
</tr>
<tr>
<td>WRIT 201 - College Writing II</td>
<td>3</td>
</tr>
<tr>
<td>WRIT 221 - Intermediate Tech Writing</td>
<td>3</td>
</tr>
<tr>
<td>SPNS 101 - Elementary Spanish I</td>
<td>3</td>
</tr>
<tr>
<td><strong>Year Total:</strong></td>
<td><strong>30</strong></td>
</tr>
</tbody>
</table>

**University Core and Electives**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>AGED 312R - Communicating Agriculture</td>
<td>4</td>
</tr>
<tr>
<td>AGED 482 - Non-Formal Teaching Methods in Agriculture</td>
<td>4</td>
</tr>
<tr>
<td><strong>Total Credits:</strong></td>
<td><strong>32</strong></td>
</tr>
</tbody>
</table>

**Junior Year**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>HORT 310 - Turfgrass Management</td>
<td>3</td>
</tr>
<tr>
<td>AGSC 491 - Plant Nutrition and Soil Fertility Management</td>
<td>3</td>
</tr>
<tr>
<td>BIOB 377 - Practical Genetics</td>
<td>3</td>
</tr>
<tr>
<td>HORT 343 - Comm Plant Production</td>
<td>3</td>
</tr>
<tr>
<td>Select one of the following:</td>
<td>3</td>
</tr>
<tr>
<td>BIOO 318 - Biometry</td>
<td>3</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.

### Landscape Design Option

#### Freshman Year

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ARCH 151RA - Design Fundamentals I</td>
<td>4</td>
</tr>
<tr>
<td>BIOB 170IN - Principles of Biological Diversity</td>
<td>4</td>
</tr>
<tr>
<td>CHMY 121IN - Introduction to General Chemistry</td>
<td>4</td>
</tr>
<tr>
<td>M 145Q - Math for the Liberal Arts</td>
<td>3</td>
</tr>
<tr>
<td>BIOB 110CS - Introduction to Plant Biology</td>
<td>3</td>
</tr>
<tr>
<td>HORT 131 - Landscape Dsgn/Hist/Theory</td>
<td>3</td>
</tr>
<tr>
<td>HORT 105 - Miracle Growing</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>7</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>ENSC 245IN - Soils</td>
<td>3</td>
</tr>
<tr>
<td>HORT 231 - Woody Oramentals</td>
<td>3</td>
</tr>
<tr>
<td>HORT 232 - Herbaceous Oramentals</td>
<td>3</td>
</tr>
<tr>
<td>HORT 225 - Landscape Graphics I</td>
<td>3</td>
</tr>
<tr>
<td>HORT 226 - Landscape Graphics II</td>
<td>3</td>
</tr>
<tr>
<td>DDSN 101 - CAD 1-A</td>
<td>2</td>
</tr>
<tr>
<td>Select two of the following:</td>
<td>6</td>
</tr>
</tbody>
</table>

#### Junior Year

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ARGED 312R - Communicating Agriculture</td>
<td></td>
</tr>
<tr>
<td>BMGT 205 - Prof Business Communication</td>
<td></td>
</tr>
<tr>
<td>BMIS 211 - Intro to Bus Decision Support</td>
<td></td>
</tr>
<tr>
<td>SPNS 101 - Elementary Spanish I</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 &amp; Electives</td>
<td>7</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>
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<tbody>
<tr>
<td>MART 145RA - Web Design</td>
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</tr>
<tr>
<td>HORT 331 - Planting Design</td>
<td>3</td>
</tr>
<tr>
<td>HORT 310 - Turfgrass Management</td>
<td>3</td>
</tr>
<tr>
<td>HORT 335 - Site Development</td>
<td>4</td>
</tr>
<tr>
<td>HORT 336 - Landscape Construction</td>
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<tr>
<td>ACTG 201 - Principles of Financial Acct (Choose two of the following:)</td>
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<tr>
<td>ACTG 202 - Principles of Managerial Acct (Choose two of the following:)</td>
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<tr>
<td>BMGT 335 - Management and Organization (Choose two of the following:)</td>
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<tr>
<td>BMKT 325 - Principles of Marketing</td>
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<tr>
<td>ECIV 308 - Construction Practice</td>
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<td>BMGT 448 - Entrepreneurship</td>
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#### Credits

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### Notes

- Select one of the following:
  - ACTG 201 - Principles of Financial Acct
  - BMGT 335 - Management and Organization
  - BMKT 325 - Principles of Marketing
- University Core and Electives: 12 credits
- **Year Total:** 30 credits

---

### Freshman Year

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<td>BIOB 170IN - Principles of Biological Diversity</td>
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<td>CHMY 121IN - Introduction to General Chemistry</td>
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<td>M 145Q - Math for the Liberal Arts</td>
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<td>BIOB 110CS - Introduction to Plant Biology</td>
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<td>HORT 105 - Miracle Growing</td>
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<td>HORT 231 - Woody Oramentals</td>
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<td>HORT 232 - Herbaceous Oramentals</td>
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<td>HORT 225 - Landscape Graphics I</td>
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<td>HORT 226 - Landscape Graphics II</td>
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<td>DDSN 101 - CAD 1-A</td>
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<td>BMGT 205 - Prof Business Communication</td>
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<td>BMIS 211 - Intro to Bus Decision Support</td>
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<td>SPNS 101 - Elementary Spanish I</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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### Senior Year

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<td>HORT 331 - Planting Design</td>
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<td>HORT 310 - Turfgrass Management</td>
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<td>HORT 335 - Site Development</td>
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<td>HORT 336 - Landscape Construction</td>
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<tr>
<td>ACTG 201 - Principles of Financial Acct (Choose two of the following:)</td>
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<tr>
<td>ACTG 202 - Principles of Managerial Acct (Choose two of the following:)</td>
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<td>BMKT 325 - Principles of Marketing</td>
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### Credits

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<tbody>
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### Notes

- Select three of the following:
  - BIOM 421 - Concepts of Plant Pathology
  - BMKT 325 - Principles of Marketing
  - BIOM 423 - Mycology
  - BIOM 424 - Ecology of Fungi
  - AGED 315 - Electrical and Power Systems Operation
- **Year Total:** 30 credits
### 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 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,

- 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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<table>
<thead>
<tr>
<th>Course Code</th>
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<tbody>
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<td>ARTH 427</td>
<td>Baroque Art in Northern Europe</td>
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<tr>
<td>ARTH 430</td>
<td>19th Century Art</td>
</tr>
<tr>
<td>ARTH 432</td>
<td>Art in the Age of Revolution</td>
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<tr>
<td>ARTH 435</td>
<td>Art in the United States</td>
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<tr>
<td>ARTH 438</td>
<td>Beginnings of Modern Art</td>
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<td>ARTH 440</td>
<td>20th Century Art</td>
</tr>
<tr>
<td>ARCH 321A</td>
<td>World Architecture I</td>
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<tr>
<td>ARCH 323A</td>
<td>World Architecture II</td>
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<td>ARCH 424</td>
<td>Contemporary Architectural History and Theory</td>
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<td>ARCH 425</td>
<td>West Architectural History</td>
</tr>
<tr>
<td>ARCH 426</td>
<td>History of Identity of Contemporary Places</td>
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<td>ARCH 427</td>
<td>Non-Western Architectural History</td>
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<td>BIOL 404</td>
<td>Plant, Water, &amp; Land Ecology</td>
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<tr>
<td>BIOL 408</td>
<td>Rocky Mountain Vegetation (Planning)</td>
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<td>BIOL 416</td>
<td>Alpine Ecology (Planning)</td>
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<td>BIOL 421</td>
<td>Yellowstone Wildlife Ecology (Planning)</td>
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<td>Freshwater Ecology</td>
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<td>ENSC 272</td>
<td>Water Resources (Planning)</td>
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<td>ENSC 444</td>
<td>Watershed Hydrology (Planning)</td>
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<td>Stream Restoration Ecology</td>
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<td>Natural Resource Conservation</td>
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<td>NRSM 240</td>
<td>Natural Resource Ecology (Planning)</td>
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<td>NRSM 330</td>
<td>Fire Ecology and Mgmt (Planning)</td>
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<td>NRSM 350</td>
<td>Veg of Western Wildlands</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 (Planning)</td>
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<td>WILD 438</td>
<td>Wildlife Habitat Ecology (Planning)</td>
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<td>GPHY 121D</td>
<td>Human Geography (GIS/GPS)</td>
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<td>Urban Geography</td>
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<td>GPHY 325</td>
<td>Cultural Geography (GIS/GPS)</td>
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<td>Geographical Planning</td>
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<td>GPHY 411</td>
<td>Biogeography</td>
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<td>GPHY 445</td>
<td>Adv. Regional Geography (GIS/GPS)</td>
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<td>GPHY 284</td>
<td>Intro to GIS Science &amp; Cartog</td>
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<td>GPHY 357</td>
<td>GPS Fund/App in Mapping</td>
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<td>GPHY 384</td>
<td>Adv GIS and Spatial Analysis</td>
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<td>AGED 333</td>
<td>Construction Technology (Plant, Water, &amp; Land Ecology)</td>
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<td>ARCH 241</td>
<td>Building Construction I (Plant, Water, &amp; Land Ecology)</td>
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<td>SRVY 230</td>
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**Department Internship:**
- HORT 498 - Internship

### Total Program Credits

<table>
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<tr>
<td><strong>Total Program Credits</strong></td>
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</table>
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 of 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 coursework 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, fluvial 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 reclamation 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 (http://catalog.montana.edu/undergraduate/agriculture/environmental-sciences/environmental-sciences)
- Environmental Biology Option (p. 87)
- Geospatial & Environmental Analysis Option (p. 88)
- Land Rehabilitation Option (p. 88)
- Soil & Water Science Option (p. 89)

**Undergraduate Minors**

- Soil Science Minor (Non-Teaching) (p. 90)
- Entomology Minor (Non-Teaching) (p. 82)
- Water Resources Minor (Non-Teaching) (p. 198)

**Environmental Biology Option**

**Freshman Year**

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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>CHMY 141</td>
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**Sophomore Year**

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<td>ENSC 260</td>
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<td>STAT 216Q</td>
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<td>PHSX 205</td>
<td>College Physics I</td>
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**Junior Year**

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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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<tr>
<td>ENSC 353</td>
<td>Environmental Biogeochemistry</td>
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<td>Choose one of the following:</td>
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<td>BIOE 370 - 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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<td>BIOE 455</td>
<td>Plant Ecology</td>
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</tr>
<tr>
<td>BIOM 452</td>
<td>Soil &amp; Environmnl Microbiology</td>
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<td>ENSC 444</td>
<td>Watershed Hydrology</td>
<td>3</td>
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<td>ENSC 464</td>
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<td>NRSM 430</td>
<td>Natural Resource Law</td>
<td>3</td>
</tr>
<tr>
<td>PSCI 362</td>
<td>Natural Resource Policy</td>
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<tr>
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<td>Total Program Credits:</td>
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</table>

**Restricted Electives**

Choose 18-20 credits from the following

- AGSC 401 Integrated Pest Management 3
- BIOB 375 General Genetics 3
- BIOB 420 Evolution 3
- BIOE 375 Ecological Responses to Climate Change 3
- BIOE 405 Behavioral and Evolutionary Ecology 3
- BIOE 408 Rocky Mountain Vegetation 2
- BIOE 428 Freshwater Ecology 3
- BIOM 410 Microbial Genetics 3
- BIOM 423 Mycology (even years) 3
- BIOM 430 Applied and Environmental Microbiology 4
- BIOM 450 Microbial Physiology 3
- BIOM 455R Research Mthds in Microbiology 4
- BIOO 412 Animal Physiology 3
- BIOO 415 Ichthyology 3
- BIOO 433 Plant Physiology 3
- BIOO 470 Ornithology 3
- BIOO 475 Mammalogy 3
- ECNS 332 Econ of Natural Resources 3
- ENSC 407 Environmental Risk Assessment (odd years) 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 461 Restoration Ecology 3
- GPHY 426 Remote Sensing 3
- NRSM 421 Holistic Thought/Mgmt 4
- NRSM 453 Habitat Inventory and Analysis 3
- WILD 301 Princ of Fish & Wildlife Mgmt 3
- WILD 438 Wildlife Habitat Ecology 3

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.
## Geospatial and Environmental Analysis Option

### Freshman Year

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
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<tbody>
<tr>
<td>ENSC 110 - Lnd Res Environ Sciences</td>
<td>3</td>
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<tr>
<td>BIOB 170IN - Principles of Biological Diversity</td>
<td>4</td>
</tr>
<tr>
<td>BIOB 160 - Principles of Living Systems</td>
<td>4</td>
</tr>
<tr>
<td>CHMY 141 - College Chemistry I</td>
<td>4</td>
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<tr>
<td>CHMY 143 - College Chemistry II</td>
<td>4</td>
</tr>
<tr>
<td>M 161Q - Survey of Calculus (or higher)</td>
<td>4</td>
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<tr>
<td>WRIT 101W - College Writing I</td>
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<td>University Seminar (US) Core</td>
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### Sophomore Year

<table>
<thead>
<tr>
<th>Course</th>
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<tbody>
<tr>
<td>ERTH 101IN - Earth System Sciences</td>
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<tr>
<td>ENSC 245IN - Soils</td>
<td>3</td>
</tr>
<tr>
<td>ENSC 260 - Evolution for Env Scientists</td>
<td>3</td>
</tr>
<tr>
<td>GPHY 284 - Intro to GIS Science &amp; Cartog</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>
<td>3</td>
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<tr>
<td>STAT 217Q - Intermediate Statistical Concepts</td>
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<tr>
<td>WRIT 201 - College Writing II</td>
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### Junior Year

<table>
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<tbody>
<tr>
<td>ENSC 353 - Environmental Biogeochemistry</td>
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<td>Choose one of the following:</td>
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<tr>
<td>NRSM 240 - Natural Resource Ecology</td>
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<td>BIOE 370 - General Ecology (equiv to 270)</td>
<td></td>
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<tr>
<td>GPHY 357 - GPS Fund/App in Mapping</td>
<td>3</td>
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<tr>
<td>GPHY 384 - Adv GIS and Spatial Analysis</td>
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### Senior Year

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>ENSC 444 - Watershed Hydrology</td>
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<tr>
<td>ENSC 454 - Landscape Pedology</td>
<td>3</td>
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<tr>
<td>Choose one of the following:</td>
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<tr>
<td>ENSC 464 - Computational Techniques Environmental Science</td>
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<tr>
<td>ENSC 465 - Environmental Biophysics</td>
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</tr>
<tr>
<td>GPHY 426 - Remote Sensing</td>
<td>3</td>
</tr>
<tr>
<td>GPHY 484R - Applied GIS &amp; Spatial Analysis</td>
<td>3</td>
</tr>
<tr>
<td>Choose one of the following:</td>
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<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>ENSC 499R - LRES Capstone</td>
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<tr>
<td><strong>Year Total:</strong></td>
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**Total Program Credits:** 120

### Restricted Electives

<table>
<thead>
<tr>
<th>Course</th>
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<tbody>
<tr>
<td>AGSC 401 Integrated Pest Management</td>
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<tr>
<td>AGSC 428 Sustainable Cropping Systems</td>
<td>3</td>
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</table>

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 for your 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.

## Land Rehabilitation Option

### Freshman Year

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>ENSC 110 - Lnd Res Environ Sciences</td>
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</tr>
<tr>
<td>BIOB 170IN - Principles of Biological Diversity</td>
<td>4</td>
</tr>
<tr>
<td>BIOB 160 - Principles of Living Systems</td>
<td>4</td>
</tr>
<tr>
<td>CHMY 141 - College Chemistry I</td>
<td>4</td>
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<tr>
<td>CHMY 143 - College Chemistry II</td>
<td>4</td>
</tr>
<tr>
<td>M 161Q - Survey of Calculus (or higher)</td>
<td>4</td>
</tr>
<tr>
<td>WRIT 101W - College Writing I</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>
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<tbody>
<tr>
<td>BIOO 230 - Identification of Seed Plants</td>
<td>4</td>
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<tr>
<td>ENSC 245IN - Soils</td>
<td>3</td>
</tr>
<tr>
<td>ENSC 260 - Evolution for Env Scientists</td>
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<td><strong>Year Total:</strong></td>
<td><strong>9</strong></td>
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</table>
Take one of the following:  

- GPHY 262 - Spatial Sci Tech & Application  
- GPHY 284 - Intro to GIS Science & Cartog  
- PHSX 205 - College Physics I  
- STAT 216Q - Introduction to Statistics (or higher)  
- WRIT 201 - College Writing II  
- University Core and Electives  

Year Total: 30

### Junior Year

<table>
<thead>
<tr>
<th>Course</th>
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<tr>
<td>ENSC 353 - Environmental Biogeochemistry</td>
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<tr>
<td>BIOM 452 - Soil &amp; Environmental Microbiology</td>
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<td>ENSC 443 - Weed Ecology and Management</td>
<td>3</td>
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<tr>
<td>ENSC 454 - Landscape Pedology</td>
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<td>Take one of the following:</td>
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<td>BIOE 370 - General Ecology (equiv to 270)</td>
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<td>NRSM 240 - Natural Resource Ecology</td>
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Year Total: 30

### Senior Year

<table>
<thead>
<tr>
<th>Course</th>
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<tbody>
<tr>
<td>ENSC 410R - Biodiversity Methods</td>
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<td>ENSC 444 - Watershed Hydrology</td>
<td>3</td>
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<td>ENSC 448 - Stream Restoration Ecology</td>
<td>3</td>
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<td>ENSC 460 - Soil Remediation</td>
<td>3</td>
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<tr>
<td>ENSC 461 - Restoration Ecology</td>
<td>3</td>
</tr>
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<td>Take one of the following:</td>
<td>1-3</td>
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<tr>
<td>ENSC 464 - Computational Techniques Environmental Science</td>
<td></td>
</tr>
<tr>
<td>ENSC 465 - Environmental Biophysics</td>
<td></td>
</tr>
<tr>
<td>Take one of the following:</td>
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<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>ENSC 499R - LRES Capstone</td>
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Year Total: 28-32

### Total Program Credits:

120

### Soil and Water Sciences Option

#### Freshman Year

<table>
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<tr>
<th>Course</th>
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<tbody>
<tr>
<td>ENSC 110 - Lnd Res Environ Sciences</td>
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<tr>
<td>BIOB 170IN - Principles of Biological Diversity</td>
<td>4</td>
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<tr>
<td>BIOB 160 - Principles of Living Systems</td>
<td>4</td>
</tr>
<tr>
<td>CHMY 141 - College Chemistry I</td>
<td>4</td>
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<td>CHMY 143 - College Chemistry II</td>
<td>4</td>
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<tr>
<td>ERTH 101IN - Earth System Sciences</td>
<td>4</td>
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<td>WRIT 101W - College Writing I</td>
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<td>University Seminar (US) Core</td>
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Year Total: 29

#### Sophomore Year

<table>
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<tr>
<td>ENSC 245IN - Soils</td>
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<td>Choose one of the following two semester Math Sequences:</td>
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<td>M 165Q - Calculus for Technology I</td>
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<td>M 166Q - Calculus for Technology II</td>
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<tr>
<td>OR</td>
<td></td>
</tr>
<tr>
<td>M 171Q - Calculus I</td>
<td></td>
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<tr>
<td>M 172Q - Calculus II</td>
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<td>CHMY 211 - Elements of Organic Chemistry</td>
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<td>ENSC 260 - Evolution for Env Scientists</td>
<td>3</td>
</tr>
<tr>
<td>STAT 216Q - Introduction to Statistics (or higher)</td>
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<tr>
<td>GEO 208IN - Earth Materials</td>
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<tr>
<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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<tr>
<td>GPHY 284 - Intro to GIS Science &amp; Cartog</td>
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<tr>
<td>WRIT 201 - College Writing II</td>
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Year Total: 29-31

#### Junior Year

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<th>Course</th>
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<tr>
<td>ENSC 410R - Biodiversity Methods</td>
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<tr>
<td>ENSC 444 - Watershed Hydrology</td>
<td>3</td>
</tr>
<tr>
<td>ENSC 448 - Stream Restoration Ecology</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 - Ecosystem Biogeochem</td>
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Year Total: 29-31

#### Senior Year

<table>
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<tr>
<th>Course</th>
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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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<td>BIOE 370 - General Ecology (equiv to 270)</td>
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<tr>
<td>PHSX 205 - College Physics I</td>
<td>4</td>
</tr>
<tr>
<td>ENSC 353 - Environmental Biogeochemistry</td>
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<td>ERTH 307 - Principles of Geomorphology</td>
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<td>Take one of the following:</td>
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<tr>
<td>BIOE 452 - Soil &amp; Environmental Microbiology</td>
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<td>ENSC 460 - Soil Remediation</td>
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Year Total: 30

#### Total Program Credits:

120

### Restricted Electives

Choose 20 Credits from the following:

- AGSC 454 - Agroecology 3
- BIOE 375 - Ecological Responses to Climate Change 3
- BIOE 428 - Freshwater Ecology 3
- BIOE 455 - Plant Ecology 3
- BIOO 433 - Plant Physiology 3
- BIOO 435 - Plant Systematics 3
- ENSC 407 - Environmental Risk Assessment 3
- ENSC 445 - Watershed Analysis 3
- ENSC 468 - Ecosystem Biogeochem 3
- GPHY 357 - GPS Fund/App in Mapping 3
- GPHY 384 - Adv GIS and Spatial Analysis 3
- GPHY 484R - Applied GIS & Spatial Analysis 3
- NRSM 421 - Holistic Thought/Mgmt 4
- NRSM 453 - Habitat Inventory and Analysis 3
- WILD 301 - Princ of Fish & Wildlife Mgmt 3

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)

- **ENSC 461** - Restoration Ecology  
- **BIOE 455** - Plant Ecology  

Take one of the following:  
- **NRSM 430** - Natural Resource Law  
- **PSCI 362** - Natural Resource Policy  

Take one of the following:  
- **ENSC 464** - Computational Techniques Environmental Science  
  AND  
- **ENSC 445** - Watershed Analysis  
  OR  
- **ENSC 465** - Environmental Biophysics  

Choose one of:  
- **ENSC 499R** - LRES Capstone  

**University Core and Electives**  
- **5-6**  

Year Total:  
- **26-28**  

Total Program Credits:  
- **120**  

**Restricted Electives**  
Choose 6-9 credits from the following:  
- **AGSC 454** - Agrostology  
- **BIOE 375** - Ecological Responses to Climate Change  
- **BIOE 428** - Freshwater Ecology (if not taken above)  
- **BIOE 455** - Plant Ecology  
- **BIOM 415** - Microbial Diversity, Ecology, and Evolution  
- **BIOM 452** - Soil & Environmental Microbiology  
- **CHMY 311** - Fundamental Analytical Chem  
- **EENV 441** - Natural Treatment Systems  
- **ENSC 407** - Environmental Risk Assessment  
- **ENSC 410R** - Biodiversity Methods  
- **ENSC 443** - Weed Ecology and Management  
- **ENSC 445** - Watershed Analysis  
- **ENSC 448** - Stream Restoration Ecology (if not taken above)  
- **ENSC 460** - Soil Remediation  
- **ENSC 461** - Restoration Ecology (if not taken above)  
- **ERTH 432R** - Surface Water Resources  
- **GEO 309** - Sedimentation and Stratigraphy  
- **GPHY 357** - GPS Fund/App in Mapping  
- **GPHY 384** - Adv GIS and Spatial Analysis  
- **GPHY 426** - Remote Sensing  
- **GPHY 429R** - Applied Remote Sensing  
- **GPHY 484R** - Applied GIS & Spatial Analysis  
- **NRSM 421** - Holistic Thought/Mgmt  
- **NRSM 455** - Riparian Ecology & Management  
- **STAT 411** - Methods for Data Analysis I  

Because some of the 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 for 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.

### 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** or **BIOB 260** - Principles of Living Systems  
- **BIOB 375** or **BIOH 320** - General Genetics  
- **BIOB 480** or **BIOB 484** - Conservation Genetics  
- **STAT 216Q** or **BIOB 318** - Introduction to Statistics  

#### Elective Courses

Choose 15 credits from the following:  
- **AGSC 441** - Plant Breeding & Genetics  
- **ANSC 322** - Principles of Animal Breeding and Genetics  
- **BCH 444R** - Biochemistry & Molecular Biology Methods  
- **BIOB 420** - Evolution  
- **BIOB 428** - Molecular Evolution  
- **BIOB 430** - Plant Biotechnology  
- **BIOB 476R** - Gene Construction  
- **BIOB 480** - Conservation Genetics  
- **BIOB 484** - Population Genetics (if not taken as a requirement)  
- **BIOH 422** - Genes and Cancer  

Because some of the 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 for 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.
**Wildlife Habitat Ecology and Management Option**

This option includes classes in wildlife habitat ecology, habitat restoration, 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. 91)
- **Wildlife Habitat Ecology and Management Option** (p. 92)
- **Natural Resources and Rangeland Ecology Minor (Non-Teaching)** (p. 91)

### Natural Resources and Rangeland Ecology Minor (Non-Teaching)

**NRSM 101** - Natural Resource Conservation  
3 credits

**NRSM 102** - Montana Range Plants  
1 credit

**BIOO 230** - Identification of Seed Plants  
4 credits

**NRSM 350** - Veg of Western Wildlands  
3 credits

**NRSM 351** - Biomes of Western Wildlands  
2 credits

**AGSC 454** - Agrostology  
3 credits  

or **BIOO 435** - Plant Systematics  

**NRSM 240** - Natural Resource Ecology  
3 credits

**NRSM 353** - Grazing Ecology and Management  
3 credits

**NRSM 453** - Habitat Inventory and Analysis  
3 credits

Take two of the following:  
6 credits

- **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 credits

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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<th>Spring</th>
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<tbody>
<tr>
<td>NRSM 101</td>
<td>Natural Resource Conservation</td>
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<td></td>
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<tr>
<td>NRSM 102</td>
<td>Montana Range Plants</td>
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<tr>
<td>BIOB 170N</td>
<td>Principles of Biological Diversity</td>
<td>4</td>
<td></td>
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<tr>
<td>CHMY 121N</td>
<td>Introduction to General Chemistry</td>
<td>4</td>
<td></td>
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<td>ECNS 101IS</td>
<td>Economic Way of Thinking</td>
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<tr>
<td>ANSC 100</td>
<td>Introduction to Animal Science</td>
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<td>BIOB 160</td>
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**Sophomore Year**

<table>
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<tr>
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<th>Course Title</th>
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<th>Fall</th>
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<tbody>
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<td>NRSM 235</td>
<td>Range and Pasture Monitoring</td>
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### Department of Animal and Range Sciences

[http://animalrange.montana.edu/](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.

**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

**Notes:** 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. 78) at MSU.

### Total Credits

<table>
<thead>
<tr>
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<td>Gene Expression Lab: From Genes to Proteins to Cells</td>
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<td>BIOM 410</td>
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<td>BIOM 415</td>
<td>Microbial Diversity, Ecology, and Evolution</td>
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<td>BIOM 450</td>
<td>Microbial Physiology</td>
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<td>BIOM 455R</td>
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<td>ANSC 222</td>
<td>Livestock in Sustain Systems</td>
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<td>CHMY 123</td>
<td>Introduction of Organic Chemistry and Biochemistry</td>
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<td>BIOO 230</td>
<td>Identification of Seed Plants</td>
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<td>Fire Ecology and Mgmt</td>
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<td>GPHY 284</td>
<td>Intro to GIS Science &amp; Cartog or GPHY 262</td>
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<td>NRSM 350</td>
<td>- Veg of Western Wildlands</td>
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<td>- Biomes of Western Wildlands</td>
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<td>NRSM 353</td>
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<tr>
<td>NRSM 453</td>
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<td>BJOE 370</td>
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<td>NRSM 455</td>
<td>Riparian Ecology &amp; Management</td>
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<td>WILD 420</td>
<td>Range &amp; Wildlife Policy and Planning</td>
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<td>WILD 438</td>
<td>- Wildlife Habitat Ecology</td>
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Total Program Credits: 120

**Wildlife Habitat Ecology and Management Option**

**Freshman Year**

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<td>NRSM 102</td>
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**Sophomore Year**

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<tr>
<td>BMGT 205</td>
<td>Prof Business Communication</td>
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<td>WRIT 201</td>
<td>College Writing II</td>
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<td>WRIT 221</td>
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<td>Livestock in Sustain Systems</td>
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<td>CHMY 123</td>
<td>- Introduction of Organic Chemistry and Biochemistry</td>
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<td>BJOE 230</td>
<td>Identification of Seed Plants</td>
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**Junior Year**

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<td>NRSM 330</td>
<td>Fire Ecology and Mgmt</td>
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<td>WILD 355</td>
<td>Wildlife and Livestock Habitat Restoration</td>
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<td>GPHY 284</td>
<td>Intro to GIS Science &amp; Cartog or GPHY 262</td>
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<td>AGSC 454</td>
<td>Agrostology</td>
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<td>NRSM 350</td>
<td>- Veg of Western Wildlands</td>
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<td>- Biomes of Western Wildlands</td>
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**Restricted Electives (Select six credits)**

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<td>AGBE 210IS</td>
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<td>ANSC 232</td>
<td>Livestock Management - Sheep I</td>
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<td>ANSC 234</td>
<td>Livestock Management - Beef I</td>
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<td>ANSC 320</td>
<td>Animal Nutrition</td>
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<td>ANSC 337</td>
<td>Disease of Domestic Livestock</td>
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<td>ANSC 410</td>
<td>Veterinary Entomology and Parasitology</td>
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<td>ANSC 432R</td>
<td>Sheep Management</td>
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<td>ANSC 434R</td>
<td>Beef Cattle Management</td>
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<td>ERTH 101IN</td>
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<td>NRSM 421</td>
<td>Holistic Thought/Mgmt</td>
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<td>Weed Ecology and Management</td>
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<td>ENSC 444</td>
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**Year Total:**

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</table>
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. 78) at MSU.

Department of Plant Sciences and Plant Pathology
http://plantsciences.montana.edu/

Plant Science involves a thorough background in the liberal arts and a comprehensive understanding of the scientific principles underlying plant sciences. Plant systems are the fundamental basis for life on earth and are also a major contributor to the economy. Modern plant science encompasses many areas, impacting such diverse interests as agriculture, biotechnology, and recreational land management.

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.

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. 93)
- Plant Biology Option (p. 94)

Undergraduate Minor

- Genetics Minor (Non-Teaching) (p. 90)

Graduate Programs

- Plant Sciences and Plant Pathology (p. 278)

Crop Science Option

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<td>BIOC 160 - Principles of Living Systems</td>
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<td>BIOC 110CS - Introduction to Plant Biology</td>
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<td>CHMY 121IN - Introduction to General Chemistry</td>
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<td>CHMY 123 - Introduction of Organic Chemistry and Biochemistry</td>
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<td>BIOC 262IN - Introduction to Entomology</td>
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<td>ENSC 245IN - Soils</td>
<td>3</td>
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<td>BICO 220 - General Botany</td>
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AGSC 342 - Forages 3
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  BMGT 205 - Prof Business Communication
  WRIT 201 - College Writing II
  WRIT 221 - Intermediate Tech Writing
Select one of the following: 3
  BIOM 318 - Biometry
  STAT 216Q - Introduction to Statistics
University Core and Electives 6
Year Total: 30

Junior Year

Credits
AGSC 341 - Field Crop Prod 3
AGSC 491 - Plant Nutrition and Soil Fertility Management 3
ENSC 443 - Weed Ecology and Management 3
BIOM 421 - Concepts of Plant Pathology 3
Select one of the following: 3
  BIOM 375 - General Genetics
  BIOM 377 - Practical Genetics
Select two of the following: 6
  ACTG 220 - Survey of Accounting
  AGBE 210IS - Economics of Ag Business
  AGBE 321 - Economics of Ag Marketing
  AGBE 341 - Farm and Ranch Management
  AGED 353 - Cooperative Business Principles and Practices
  ECNS 204IS - Microeconomics
  BMKT 241 - Sales
  BMKT 325 - Principles of Marketing
  BMGT 335 - Management and Organization
  BGEN 242D - Intro to Int'l Business
University Core and Electives 9
Year Total: 30

Senior Year

Credits
AGSC 428 - Sustainable Cropping Systems 3
BIOO 433 - Plant Physiology 3
Select one of the following: 3
  BIOB 430 - Plant Biotechnology
  AGSC 441 - Plant Breeding & Genetics
Select two of the following: 6
  BIOE 370 - General Ecology (equiv to 270)
  AGSC 401 - Integrated Pest Management
  ENSC 454 - Landscape Pedology
  AGSC 450 - Plant Disease Control
  HORT 337 - Vegetable Production
  GPHY 357 - GPS Fund/App in Mapping
University Core and Electives 15
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.

Plant Biology Option

Freshman Year

Credits
BIOB 170IN - Principles of Biological Diversity 4
BIOB 160 - Principles of Living Systems 4
CHMY 141 - College Chemistry I 4
CHMY 143 - College Chemistry II 4
Select one of the following: 3
  COMX 111US - Introduction to Public Speaking (formerly COM 110US)
CLA 101US - Knowledge and Community
WRIT 101W - College Writing I 3
M 161Q - Survey of Calculus 4
University Core and Electives 4
Year Total: 30

Sophomore Year

Credits
BIOO 220 - General Botany 3
CHMY 211 - Elements of Organic Chemistry 5
PHSX 205 - College Physics I 4
PHSX 207 - College Physics II 4
Select one of the following: 3
  BIOM 318 - Biometry
  STAT 216Q - Introduction to Statistics
University Core and Electives 11
Year Total: 30

Junior Year

Credits
BIOB 375 - General Genetics 3
BCH 380 - Biochemistry 5
University Core and Electives 19
Year Total: 30

Senior Year

Credits
BIOB 420 - Evolution 3
BIOO 433 - Plant Physiology 3
University Core and Electives 24
Year Total: 30
Total Program Credits: 120

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.

**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 questions about qualifying for admission to a veterinary medicine program, please contact your academic advisor(s).

1. Chemistry *  
   - CHMY 141 College Chemistry I  
   - CHMY 143 College Chemistry II  
   - CHMY 211 Elements of Organic Chemistry  
   - BCH 380 Biochemistry  
   
   For students without a strong background in chemistry, consider taking CHMY 121IN as a preparatory course before taking CHMY 141. This is not usually done, but it is an option. CHMY 121IN is not required for the pre-veterinary curriculum and does not count as an elective. Some undergraduate degree curricula may require CHMY 321 and CHMY 323 or equivalent; these will substitute for CHMY 211 for all vet schools.  
   
   *Includes appropriate labs.

2. Biology  
   - BIOB 160 Principles of Living Systems  
   - or BIOB 260 Cellular and Molecular Biology  
   - BIOB 170IN Principles of Biological Diversity  
   - BIOB 375 General Genetics  
   - or ANSC 322 Principles of Animal Breeding and Genetics  

3. Mathematics  
   - M 161Q Survey of Calculus  
   
   The math requirement changes frequently, but all science degrees require M 161Q.

4. Statistics  
   - STAT 216Q Introduction to Statistics  

5. Physics  
   - PHSX 205 College Physics I  

6. English

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**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 Food Systems Option**

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 in culinary fundamentals and management, organic gardening, and independent research projects. Internships are designed to provide 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 sustainability 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 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. 96)
- Sustainable Foods Systems Option (p. 97)
- Sustainable Crop Production Option (p. 97)
- Sustainable Livestock Production Option (p. 98)

Agroecology Option

<table>
<thead>
<tr>
<th>Land Resources and Environmental Sciences</th>
<th>Freshman Year</th>
<th>Credits</th>
</tr>
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<tbody>
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<td>ENSC 110 - Land Res Environ Sciences</td>
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<tr>
<td>SFBS 146 - Introduction to Sustainable Food and Bioenergy Systems</td>
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<tr>
<td>BIOB 170IN - Principles of Biological Diversity</td>
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<tr>
<td>BIOB 110CS - Introduction to Plant Biology</td>
<td>3</td>
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<tr>
<td>CHMY 141 - College Chemistry I</td>
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<tr>
<td>M 121Q - College Algebra</td>
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<td>ECNS 101S - Economic Way of Thinking</td>
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<td>WRIT 101W - College Writing I</td>
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<th>Sophomore Year</th>
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<tr>
<td>BIOB 160 - Principles of Living Systems</td>
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<tr>
<td>CHMY 143 - College Chemistry II</td>
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<td>Choose one of the following:</td>
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<td>BCH 104RN - The Biochemistry of Health for Non-Science Majors</td>
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<tr>
<td>CHMY 123 - Introduction of Organic Chemistry and Biochemistry</td>
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<td>CHMY 211 - Elements of Organic Chemistry</td>
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<tr>
<td>ECHM 205CS - Energy and Sustainability</td>
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<tr>
<td>ENSC 245IN - Soils</td>
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</tr>
<tr>
<td>GPHY 284 - Intro to GIS Science &amp; Cartog</td>
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<tr>
<td>NUTR 221CS - Basic Human Nutrition</td>
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<tr>
<td>NUTR 226 - Food Fundamentals</td>
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<td>Choose one of the following:</td>
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<td>SFBS 298 - Internship</td>
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<tr>
<td>SFBS 296 - Practicum: Towne’s Harvest</td>
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<td>Year Total:</td>
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<table>
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<th>Junior Year</th>
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<td>BIOB 318 - Biometry</td>
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<tr>
<td>STAT 216Q - Introduction to Statistics</td>
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<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>ENSC 353 - Environmental Biogeochemistry</td>
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<tr>
<td>NUTR 351 - Nutrition and Society</td>
<td>3</td>
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</table>
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 & Environmental 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:

AGSC 341  Field Crop Prod  3
AGSC 342  Forages  3
BIOB 375  General Genetics  3
BIOE 370  General Ecology (equiv to 270)  3
BIOE 375  Ecological Responses to Climate Change  3
BIOM 360  General Microbiology  5
ENSC 410R  Biodiversity Methods  3
GPHY 384  Adv GIS and Spatial Analysis  3
GPHY 484R  Applied GIS & Spatial Analysis  3
HORT 337  Vegetable Production  3
HORT 345  Market Gardening  3
NASX 415  Native Food Systems  3
PSCI 406  The Political Economy of Energy  3
PSCI 436  Politics of Food & Hunger  3
SFBS 346  Sustainable Food and Bioenergy Systems  2
SFBS 445R  Culinary Marketing: Farm/Table  3
SFBS 451R  Sustainable Food Systems  3

Plant Sciences and Plant Pathology

Freshman Year  Credits

SFBS 146 - Introduction to Sustainable Food and Bioenergy Systems  3
BIOB 170IN - Principles of Biological Diversity  4
ECNS 101IS - Economic Way of Thinking  3
BIOB 110CS - Introduction to Plant Biology  3
ENSC 110 - Lnd Res Environ Sciences  3

ENSC 245IN - Soils  3
Select one of the following:  4
  CHMY 121IN - Introduction to General Chemistry
  CHMY 141 - College Chemistry I
Select one of the following:  3
  M 121Q - College Algebra
  M 145Q - Math for the Liberal Arts
University Core and Electives  4
Year Total:  30

Sophomore Year  Credits

NUTR 221CS - Basic Human Nutrition  3
AGSC 341 - Field Crop Prod  3
BIOM 103IN - Unseen Universe: Microbes  3
ECHM 205CS - Energy and Sustainability  3
Select one of the following:  3
  SFBS 296 - Practicum: Towne’s Harvest
  SFBS 298 - Internship
Select one of the following:  3
  NASX 232D - MT Indian Cult, Hist, Cur Issu
  PSCI 230D - Introduction to International Relations
Select one of the following:  3
  BIO 318 - Biometry
  STAT 216Q - Introduction to Statistics
Select one of the following:  3
  AGBE 210IS - Economics of Ag Business
  ECNS 204IS - Microeconomics
  ANSC 222 - Livestock in Sustain Systems
University Core and Electives  6
Year Total:  30

Junior Year  Credits

SFBS 327 - Measure Innovation in Food Sys  3
BIOE 370 - General Ecology (equiv to 270)  3
FCS 239 - Contemporary Consumer Issues  3
NUTR 351 - Nutrition and Society  3
AGSC 428 - Sustainable Cropping Systems  3
Select three of the following:  9-10
  AGBE 315 - Ag in a Global Context
  BIOB 377 - Practical Genetics
  HORT 337 - Vegetable Production
  HORT 345 - Market Gardening
  NRSM 421 - Holistic Thought/Mgmt
  NUTR 322 - Food Service System Management
  NUTR 395 - Pract: Quant Foods Prod & Mgmt
  SFBS 346 - Sustainable Food and Bioenergy Systems
  Summer Field Course
University Core and Electives  5-6
Year Total:  30

Senior Year  Credits

AGSC 491 - Plant Nutrition and Soil Fertility Management  3
SFBS 466 - Food System Resilience, Vulnerability and Transformation  3
SFBS 498 - Internship  2-12
SFBS 499 - Senior Thesis/Capstone  3
Select one of the following:  3
Sustainable Livestock Production Option

Animal and Range Sciences

Freshman Year
- ANSC 100 - Introduction to Animal Science 3
- NRSM 101 - Natural Resource Conservation 3
- NRSM 102 - Montana Range Plants 1
- SFBS 146 - Introduction to Sustainable Food and Bioenergy Systems 3
- BIOB 160 - Principles of Living Systems 4
- CHMY 121IN - Introduction to General Chemistry 4
- ENSC 110 - Lnd Res Environ Sciences 3
- BIOB 116CS - Introduction to Plant Biology 3
- WRIT 101W - College Writing I 3
- COMX 111US - Introduction to Public Speaking (formerly COM 110US) 3
  or AGED 140US - Leadership Dev For Agriculture

Year Total: 30

Sophomore Year
- ANSC 222 - Livestock in Sustain Systems 3
- CHMY 123 - Introduction of Organic Chemistry and Biochemistry 4
- NUTR 221CS - Basic Human Nutrition 3
- ENSC 245IN - Soils 3
- ANSC 265 - Anatomy and Physiology of Domestic Animals - Lecture 3
- ANSC 266 - Anatomy and Physiology of Domestic Animals - Lab 1

Choose one of the following: 1-2
- ANSC 205 - Intro to Meat Evaluation
- ANSC 232 - Livestock Management - Sheep I
- ANSC 234 - Livestock Management - Beef I

Year Total: 30

Junior Year
- ANSC 210IS - Economics of Ag Business 3
- ANSC 316 - Meat Science 4
- ECHM 205CS - Energy and Sustainability 3

Choose two of the following: 6-8
- ANSC 320 - Animal Nutrition
- ANSC 321 - Physiology of Animal Reproduction
- ANSC 322 - Principles of Animal Breeding and Genetics
- ANSC 337 - Disease of Domestic Livestock
- ECNS 202 - Principles of Macroeconomics
  or ECNS 204HS - Microeconomics

Choose one of the following: 3
- AGBE 321 - Economics of Ag Marketing
- AGBE 337 - Agricultural Law
- AGBE 345 - Ag Finance and Credit Analysis
- AGED 353 - Cooperative Business Principles and Practices
- BGEN 361 - Principles of Business Law
- BMGT 335 - Management and Organization
- BMKT 325 - Principles of Marketing

Year Total: 31

Senior Year
- ANSC 416R - Meat Processing 3
- ANSC 498 - Internship 3
- ANSC 432R - Sheep Management
  or ANSC 434R - Beef Cattle Management
- NUTR 351 - Nutrition and Society 3
- SFBS 445R - Culinary Marketing: Farm/Table
  or SFBS 451R - Sustainable Food Systems
- SFBS 499 - Senior Thesis/Capstone 3

Choose one of the following: 2-3
- AGSC 401 - Integrated Pest Management
- ANSC 410 - Veterinary Entomology and Parasitology
- BIOE 375 - Ecological Responses to Climate Change
- ENSC 353 - Environmental Biogeochemistry
- ENSC 443 - Weed Ecology and Management

Choose one of the following: 3-4
- NASX 415 - Native Food Systems
- NRSM 421 - Holistic Thought/Mgmt
- SFBS 436 - Politics of Food & Hunger

Year Total: 32-42

Total Program Credits: 122-132
College of Arts and Architecture

Nancy Cornwell, Dean

Undergraduate Programs Available:

- B.A. and B.F.A. in Art (p. 99)
- B.A. in Environmental Design (p. 109)
- B.A. in Film and Photography (p. 112)
- B.A. in Music (p. 114)
- B.A. in Music Technology (p. 115)
- Bachelor of Music Education (p. 117)

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 theatre 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-Yoblonsky 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 Spring 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-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 will 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.

Undergraduate Programs Available:

- Bachelor of Music Education (p. 117)
- B.A. in Environmental Design (p. 109)
- B.A. in Film and Photography (p. 112)
- B.A. in Music (p. 114)
- B.A. in Music Technology (p. 115)
- Bachelor of Music Education (p. 117)
Internship Program
It is possible for students to earn academic credit while working outside of the University, employed by businesses, individual artists, craftspersons, 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. 104)
- Studio Arts Option - B.F.A (p. 107)
- Art Education K-12 Broadfield Option - B.A. (p. 100)
- Art History Option - B.A. (p. 102)
- Liberal Arts Studio Option - B.A (p. 105)

Undergraduate Minors

- Art History Minor (Non-teaching) (p. 101)
- Art Education K-12 Minor (p. 101)

Graduate Programs

- M.F.A. in Art (p. 284)
- M.A. in Art History (p. 283)

Undergraduate Programs

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<tr>
<th>Credits</th>
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<td>Freshman Year</td>
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<tr>
<td>ARTZ 106RA</td>
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<tr>
<td>ARTH 200IA - Art of World Civilization I</td>
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<td>FCS 101IS - Indiv and Fam Dev: Lifespan</td>
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<td>University Core and Electives</td>
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<td>ARTZ 105RA - Visual Language - Drawing</td>
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<tr>
<td>ARTZ 108RA</td>
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<tr>
<td>ARTH 201IA - Art of World Civilization II</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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Sophomore Year

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<td>ARTZ 221 - Painting I</td>
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Montana State University

Year Total: 18 14
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.

**Art Education K-12 Minor**

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<th>Course Code</th>
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<td>Visual Language - Drawing</td>
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<td>ARTH 200IA</td>
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**Art History Minor (Non-Teaching)**

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<tr>
<td><strong>Group I - Ancient Medieval</strong></td>
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<tr>
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<td>Survey of Ancient Art</td>
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## Art History Option - B.A.

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### Group III - Modern & Contemporary

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<tr>
<td>ARTH 438</td>
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<td>ARTH 440</td>
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<td>Contemporary Art</td>
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<td>Art in the United States</td>
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<tr>
<td>ARTH 461</td>
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### Group IV - Non-Western, Diversity, Theory

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<td>ARTH 360</td>
<td>History of Asian Art and Architecture</td>
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<td>ARTH 323</td>
<td>History of Printmaking</td>
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<tr>
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### Total Credits

| Credits | 27 |

## Freshman Year

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## Sophomore Year

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<td>ARTH 422</td>
<td>Early Renaissance to 15th Century Art</td>
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<tr>
<td>ARTH 424</td>
<td>High Renaissance and Mannerism</td>
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<tr>
<td>ARTH 430</td>
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<tr>
<td>ARTH 432</td>
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### Foreign Language

| Credits | 4 |

### Humanities Elective Requirement

| Credits | 3 |

### University Core and Electives

| Credits | 5 |

## Junior Year

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### Art History (Group IV)

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<td>ARTH 310</td>
<td>Ancient Art Mesoamerica</td>
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<tr>
<td>ARTH 323</td>
<td>History of Printmaking</td>
</tr>
<tr>
<td>ARTH 360</td>
<td>History of Asian Art and Architecture</td>
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### Art History Electives (art rubric)

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<td>Survey of Ancient Art</td>
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<td>Roman, Etruscan, Greek</td>
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### Year Total:

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## University Core and Electives

| Credits | 2 |

## Art History (Group II)

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<td>ARTH 422</td>
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<tr>
<td>ARTH 432</td>
<td>Art in the Age of Revolution</td>
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### Humanities Elective Requirement

| Credits | 3 |

### Foreign Language

| Credits | 4 |

### University Core and Electives

| Credits | 5 |

## Year Total:

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<td>Art and Social Activism</td>
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<td>ARTH 491</td>
<td>Special Topics</td>
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<td>Foreign Language</td>
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**Senior Year**

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Art History Electives (ART rubric or other)

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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.

### Graphic Design Option - B.F.A.

#### Freshman Year

<table>
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<td>ARTH 200IA - Art of World Civilization I</td>
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<td>ARTZ 108RA -</td>
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<td>PHOT 113RA - Understanding Photography</td>
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**Year Total:** 15 15

#### Sophomore Year

<table>
<thead>
<tr>
<th>Course</th>
<th>Fall</th>
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<th>Spring</th>
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<tbody>
<tr>
<td>GDSN 223 - Design Principles</td>
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<tr>
<td>Art Studio Beginning (must include one 2D and one 3D)</td>
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**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 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
- ARTH 432 - Art in the Age of Revolution
- ARTH 438 - Beginnings of Modern Art

#### Junior Year

<table>
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<tr>
<th>Course</th>
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<tbody>
<tr>
<td>GDSN 224 - Form and Content</td>
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<tr>
<td>Portfolio Review is required for all students before admittance to 300 level design courses.</td>
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</table>

**Year Total:** 15 15

#### 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

**Advanced Studio Elective**

**Choose one of the following:** 5

- 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 492 - Independent Study
- GDSN 498 - Internship

**University Core and Electives**
- Semester in Italy (optional) (15)

**Advanced Graphic Design studio electives**
- Choose two of the following:
  - 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**
- 5

**Year Total:**
- 15

### Senior Year

**Credits**
- Fall
- Spring

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<thead>
<tr>
<th>Course</th>
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<tr>
<td>GDSN 369 - History of Graphic Design</td>
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<td>GDSN 465 - Professional Studio</td>
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<td>Take one of the following:</td>
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<tr>
<td>ARTZ 322 - Intermediate Painting</td>
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<tr>
<td>ARTZ 323 - Intermediate Ceramics</td>
<td></td>
<td></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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<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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<td>ARTZ 379 - Alternative Print Media</td>
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<td>ARTZ 411 - Guided Research - Drawing</td>
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<tr>
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<tr>
<td>ARTZ 431 - Guided Research - Ceramics</td>
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<td>ARTZ 453 - Guided Research - Sculpture</td>
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<td>ARTZ 461 - Guided Research-Metalsmithing</td>
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</table>

**Year Total:**
- 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.

#### Freshman Year

<table>
<thead>
<tr>
<th>Course</th>
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<tr>
<td>ARTZ 105RA - Visual Language - Drawing</td>
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<td>ARTZ 106RA -</td>
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<td>ARTH 200IA - Art of World Civilization I</td>
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<tr>
<td>ARTZ 108RA -</td>
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<tr>
<td>ARTH 201IA - Art of World Civilization II</td>
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**Year Total:**
- 16

### Sophomore Year

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<td>ARTZ 211RA - Drawing I</td>
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<td>ARTZ 221 - Painting I</td>
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<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>ARTZ 271 - Printmaking I</td>
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<td>GDSN 223 - Design Principles</td>
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<td>Take one of the following:</td>
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<td>ARTH 302 - Survey of Ancient Art</td>
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<td>ARTH 310 - Ancient Art Mesoamerica</td>
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<td>ARTH 312 - History of Decorative Arts</td>
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<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>ARTH 375 - Roman, Etruscan, Greek</td>
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<td>ARTH 400 - Art and Architecture of Egypt</td>
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<td>ARTH 402 - Greek Art and Architecture</td>
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<td>ARTH 406 - Roman Art and Architecture</td>
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<td>ARTH 410 - Medieval Art</td>
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<td>ARTH 421 - Late Gothic Painting</td>
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<td>ARTH 422 - Early Renaissance to 15th Century Art</td>
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<td>ARTH 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>ARTH 427 - Baroque Art in Northern Europe</td>
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<td>ARTH 430 - 19th Century Art</td>
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<td>ARTH 432 - Art in the Age of Revolution</td>
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<td>ARTH 438 - Beginnings of Modern Art</td>
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<td>ARTH 440 - 20th Century Art</td>
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<td>ARTH 451 - Contemporary Art</td>
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<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 491 - Special Topics</td>
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### Total Program Credits
- **120**

### Montana State University

**University Core and Electives**
- 2

**Advanced Studio**
- Choose one from the list above.
- 5

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<thead>
<tr>
<th>Course</th>
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<tr>
<td>GDSN 499 - Senior Portfolio</td>
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**University Core and Electives**
- 5

**Year Total:**
- 15

**Total Program Credits:**
- **120**

**PHOT 113RA - Understanding Photography**
- 3
Liberal Arts Studio Option - B.A.

Choose two of the following: 8

ARTZ 221 - Painting I
ARTZ 231RA - Ceramics I
ARTZ 251 - Sculpture I
ARTZ 261 - Metals I
ARTZ 271 - Printmaking I
GDSN 223 - Design Principles

University Core and Electives 4

Year Total: 15 15

Junior Year

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
ARTZ 271 - Printmaking I
GDSN 223 - Design Principles

Choose one of the following: 5

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

University Core and Electives 6

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
GDSN 223 - Design Principles

Choose one of the following: 3

ARTH 302 - Survey of Ancient Art
ARTH 310 - Ancient Art Mesoamerica
ARTH 312 - History of Decorative Arts
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
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 491 - Special Topics

University Core and Electives 8

Year Total: 15 15

Senior Year

Semester in Italy Option (Fall and Spring, 15 credits)

ARTZ 400 - Careers in Art 1

Choose two of the following: 5

ARTZ 312 - Intermediate Drawing (Choose one of the following:)
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

University Core and Electives 9

Choose two of the following: 5

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

University Core and Electives 10

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.
## Studio Arts Option - B.F.A.

### Freshman Year

<table>
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<th>Course</th>
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<tr>
<td>ARTH 200IA - Art of World Civilization I</td>
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<td>ARTZ 109 - Visual Language: Comprehensive Foundations</td>
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<tr>
<td>ARTZ 105RA - Visual Language - Drawing</td>
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<tr>
<td>ARTZ 110 - Visual Language: Ideation and Creativity</td>
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<td>ARTH 201IA - Art of World Civilization II</td>
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<td><strong>Year Total:</strong></td>
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### Sophomore Year

- Art Studio Beginning (must include one 2D & one 3D)
  - Choose of one 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
    - ARTZ 421 - Guided Research: 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
    - ARTH 451 - Contemporary Art
    - ARTH 460 - Contemporary Art & Ecology
    - ARTH 461 - Art and Social Activism
    - ARTH 495 - Field Study
  - University Core and Electives                                         | 8    |         |        |

**Year Total:** 15

### Junior Year

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<thead>
<tr>
<th>Course</th>
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<tr>
<td>PHOT 113RA - Understanding Photography</td>
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<tr>
<td>Art Studio Beginning (must include one 2D &amp; one 3D)</td>
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<td>Choose two of the following:</td>
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<tr>
<td>ARTZ 211RA - Drawing I</td>
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<td>ARTZ 271 - Printmaking I</td>
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</table>

- 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.

**Year Total:** 15
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
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

University Core and Electives 2
Semester in Italy Option (15)

Art Studio Beginning (must include one 2D & 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

Major Medium
Choose one of the following: 5
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

Advanced Studio Elective
Choose one of the following: 5
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

Art History Elective
Choose one of the following: 3
ARTH 302 - Survey of Ancient Art
ARTH 310 - Ancient Art Mexico
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
Environmental Design

School of Architecture

The School of Architecture offers a four year Bachelor of Arts in Environmental Design undergraduate program which, when combined with our three-semester graduate program, leads to a fully accredited Master of Architecture degree. The Master of Architecture degree is a first-professional degree.

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 US 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 six-year, three-year, or two-year term of accreditation, depending on the extent of its conformance with established educational standards.

Doctor of Architecture and Master of Architecture 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.

Montana State University, College of Arts and Architecture, School of Architecture offers the following NAAB-accredited degree program:

**Master of Architecture**

*Pre-professional degree + 42 graduate credits*

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.

The School of Architecture 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 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 321IA 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 defer 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 notebook 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 Title</th>
<th>Fall Credits</th>
<th>Spring Credits</th>
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<tr>
<td>ARCH 121IA</td>
<td>Introduction to Design</td>
<td>3</td>
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</tr>
<tr>
<td>ARCH 151RA</td>
<td>Design Fundamentals I</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>M 151Q</td>
<td>Precalculus</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>or M 171Q</td>
<td>Calculus I</td>
<td></td>
<td></td>
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<tr>
<td>University Core</td>
<td></td>
<td>3</td>
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</tr>
<tr>
<td>ARCH 152</td>
<td>Design Fundamentals II</td>
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**Sophomore Year**

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>ARCH 241</td>
<td>Building Construction I</td>
<td>3</td>
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<tr>
<td>ARCH 253</td>
<td>Architectural Design I</td>
<td>5</td>
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</tr>
<tr>
<td>ARCH 261</td>
<td>Architectural Graphics I</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>ARCH 322IA</td>
<td>World Architecture I</td>
<td>3</td>
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</tr>
<tr>
<td>University Core</td>
<td></td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>ARCH 262</td>
<td>Arch Graphics II</td>
<td>3</td>
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<tr>
<td>ARCH 254</td>
<td>Architectural Design II</td>
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</tr>
<tr>
<td>ARCH 323IA</td>
<td>World Architecture II</td>
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<td>University Core</td>
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Year Total: 17 Fall 14 Spring

**Junior Year**

<table>
<thead>
<tr>
<th>Course Code</th>
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<tbody>
<tr>
<td>ARCH 331</td>
<td>Environmental Controls I</td>
<td>4</td>
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<tr>
<td>ARCH 363</td>
<td>Architectural Graphics III</td>
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<tr>
<td>ARCH 345</td>
<td>Arch Structures II</td>
<td>4</td>
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</tr>
<tr>
<td>ARCH 355</td>
<td>Architectural Design III</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>ARCH 332</td>
<td>Environmental Controls II</td>
<td>4</td>
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</tr>
<tr>
<td>ARCH 340</td>
<td>Building Construction II</td>
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<tr>
<td>ARCH 344</td>
<td>Arch Structures III</td>
<td>4</td>
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<tr>
<td>ARCH 356</td>
<td>Arch Design IV</td>
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Year Total: 16 Fall 17 Spring

**Senior Year**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
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<th>Spring Credits</th>
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<tbody>
<tr>
<td>Non-Architecture Electives</td>
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<tr>
<td>University Core</td>
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<td>3</td>
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<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>5-12</td>
<td>5-12</td>
<td></td>
</tr>
<tr>
<td>ARCH 414</td>
<td>Architectural Study Abroad &amp; ARCH 428 - Foreign Study History</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ARCH 450</td>
<td>Community Design Center</td>
<td></td>
<td></td>
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<tr>
<td>ARCH 458</td>
<td>Arch Design VI</td>
<td></td>
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</tr>
<tr>
<td>ARCH 498</td>
<td>Internship</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ARCH 413</td>
<td>Professional Practice</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>ARCH 457</td>
<td>Architectural Design V</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>ARCH 452</td>
<td>Research Methods in Arch</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Non-Architecture Electives</td>
<td>6</td>
<td>6</td>
<td></td>
</tr>
</tbody>
</table>

Year Total: 14-21 Fall 17 Spring

**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 exhibition 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 Cheyenne 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. 374) 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. 280)

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**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. 112)
- Photography Option (p. 113)

**Undergraduate Minor**

- Photography Minor (Non-Teaching) (p. 113)

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**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:

| THTR 304 | Theatre Production | 4 |
| MUST 380 | Interdisciplinary Proj I: Film | 3 |
| MUST 382 | Interdisciplinary Projects II | 3 |

**Foundation Courses (typically taken in freshman year)**

| FILM 100H | Intro to Film & Photography | 3 |
| FILM 112 | Aesthetics of Film Prodctn I | 3 |
| FILM 101H | Understanding Film and Media | 3 |
| PHOT 113RA | Understanding 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 Minor Curriculum

Foundation Courses

<table>
<thead>
<tr>
<th>Course</th>
<th>Description</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>FILM 100H</td>
<td>Intro to Film &amp; Photography</td>
<td>3</td>
</tr>
<tr>
<td>PHOT 113RA</td>
<td>Understanding Photography</td>
<td>3</td>
</tr>
<tr>
<td>PHOT 213</td>
<td>Intermediate Photography</td>
<td>3</td>
</tr>
</tbody>
</table>

Photography Minor Requirements

<table>
<thead>
<tr>
<th>Course</th>
<th>Description</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHOT 255</td>
<td>Intro to Color Photography</td>
<td>3</td>
</tr>
<tr>
<td>PHOT 258</td>
<td>View Camera</td>
<td>4</td>
</tr>
<tr>
<td>PHOT 303</td>
<td>Early History of Photography</td>
<td>3</td>
</tr>
</tbody>
</table>

Photography Minor Requirements

Choose two of the following:

- FILM 381 Studies in Film
- FILM 449 Film and Documentary Theory
- FILM 481 Advanced Studies in Film
- FILM 494 Seminar/Workshop

Total Credits: 1-4

Other film-related studies course(s) approved by advisor

Choose two of the following:

- FILM 371 Non-Fiction Film Production
- FILM 372 Fiction Film Production
- THTHR 304 Theatre Production
- FILM 499 Senior Production

SFP Electives (at least 4 other SFP courses*) 12

Non-SFP Electives (at least 3 courses**) 9

Total Credits 56

* SFP Electives are any courses offered in the School of Film & Photography including THTHR 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 THTHR 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 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)

<table>
<thead>
<tr>
<th>Course</th>
<th>Description</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>FILM 100H</td>
<td>Intro to Film &amp; Photography</td>
<td>3</td>
</tr>
<tr>
<td>FILM 112</td>
<td>Aesthetics of Film Production I</td>
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<tr>
<td>PHOT 113RA</td>
<td>Understanding Photography</td>
<td>3</td>
</tr>
</tbody>
</table>
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):  
  FILM 101H  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  
other photography-related studies course(s) approved by advisor  
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  
  PHOT 374  Experimental Photography  
other photography-related production course(s) approved by advisor  
PHOT 499 -Senior Thesis/Capstone (fall or spring; may be taken twice)
SFP Electives (at least 4 courses*; photo majors are strongly encouraged to fulfill 2 SFP electives with Photography Production courses)
Non-SFP Electives Not Including Core Requirement (at least 3 courses**)

Total Credits  57

* SFP Electives are any courses offered in the School of Film & Photography 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 will count 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 that are not serving to fulfill university CORE requirements. This requirement is intended to encourage Film and Photography students to develop other areas of knowledge outside of film and photography. Completion of a minor outside of the School of Film and Photography automatically fulfills this requirement.

Photography Students are strongly recommended to take at least one of ARTZ 106RA, ARTZ 108RA, or ARTZ 105RA Visual Language - Drawing, and ARTH 200IA Art of World Civilization I or ARTH 201IA Art of World Civilization II. The ARTH courses will count as Photography Studies electives.

A minimum of 120 credits is required for graduation, 42 of these credits must be in courses numbered 300 and above. The Photography major requirements fulfill a minimum of 16 upper division credits.

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**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 life-long 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.

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 pre-tests, prior to enrollment.

**Undergraduate Curricula in Music**

- Bachelor of Arts in Music (p. 114)
- Bachelor of Music Education (p. 117)
- Bachelor of Arts in Music Technology (p. 115)
- Music Minor (Non-Teaching) (p. 118)

**Graduate Curricula**

A selection of courses in music education, music theory, and music history are offered at the graduate level. A Master of Education in Curriculum and Instruction is available with a Professional Educator Option, especially designed for K-12 music teachers. The degree is offered through the Department of Education.

Master’s Program Information (p. 305)

**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 must audition and be accepted to Applied Music study in order to complete the Music Major. 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. A recital, or an appearance in 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 Department’s band, choral, and orchestral ensembles. Acceptable ensembles are listed in the music major handbook.

Students in the BA music major or those seeking a music minor must achieve the grade of "C" or better in all required music courses. 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 in sequential 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/MUED) 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 Foundation Courses may be taken a maximum of two times in order to meet the "C" or better requirement of the B.A. 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

For music elective credits below, a maximum of 2 credits of ensembles can be applied for all 8 music elective credits, NO Applied Lessons

<table>
<thead>
<tr>
<th>Freshman Year</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>MUSI 100 -</td>
<td>0</td>
</tr>
<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>
<td>1</td>
</tr>
<tr>
<td>MUSI 195 - Applied Music I</td>
<td>1</td>
</tr>
<tr>
<td>MUSI 195 - Applied Music I</td>
<td>1</td>
</tr>
<tr>
<td>Ensemble</td>
<td>2</td>
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<tr>
<td>University Core and Electives</td>
<td>16</td>
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<tr>
<td>Year Total:</td>
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</table>

<table>
<thead>
<tr>
<th>Sophomore Year</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>MUSI 100 -</td>
<td>0</td>
</tr>
<tr>
<td>MUSI 240 - Aural Perception III</td>
<td>1</td>
</tr>
<tr>
<td>MUSI 241 - Aural Perception IV</td>
<td>1</td>
</tr>
<tr>
<td>MUSI 205 - Music Theory III</td>
<td>3</td>
</tr>
<tr>
<td>MUSI 206 - Music Theory IV</td>
<td>3</td>
</tr>
<tr>
<td>Choose two of the following:</td>
<td>2</td>
</tr>
<tr>
<td>MUSI 230 - Interim Keyboard: Repertoire</td>
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</tr>
<tr>
<td>MUSI 231 - Interim Keyboard: Accompanying</td>
<td></td>
</tr>
<tr>
<td>MUSI 232 - Interim Keyboard: Opn Sce Rdng</td>
<td></td>
</tr>
<tr>
<td>MUSI 233 - Interim Keyboard Skill: Jazz</td>
<td></td>
</tr>
<tr>
<td>MUSI 295 - Applied Music I</td>
<td>1</td>
</tr>
<tr>
<td>MUSI 295 - Applied Music II</td>
<td>1</td>
</tr>
<tr>
<td>MUSI 307IA - World Music</td>
<td>3</td>
</tr>
<tr>
<td>Ensemble</td>
<td>2</td>
</tr>
<tr>
<td>University Core and Electives</td>
<td>13</td>
</tr>
</tbody>
</table>

| Year Total: | 30 |

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 of composition or digital audio technology and related media.

Students with limited musical experience may be required to complete MUSI 1201A Musicianship 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.

All students will be placed, by audition, at the appropriate level of Applied Music (instrumental or vocal performance study). It is required that students audition with the appropriate applied instrumental or vocal faculty prior to, or at the latest, during their first semester of study in the Music Technology program. 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 to reach the MUSI 195 level. 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 evaluation 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.

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 who have not completed or are not currently enrolled in MUST 115 Introduction to Digital Music are exempt from this requirement.

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 Director and the Coordinator of Music Technology.

The following Foundation Courses may be taken a maximum of two times in order to meet the "C" or better requirement of the B.A. in 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 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 Music School 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.

**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>
<td>1</td>
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<tr>
<td>MUSI 105 - Music Theory I</td>
<td>3</td>
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<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>
<td>1</td>
</tr>
<tr>
<td>MUSI 195 - Applied Music I</td>
<td>1</td>
</tr>
<tr>
<td>or MUSI 160 - Beginning Guitar</td>
<td></td>
</tr>
<tr>
<td>MUSI 195 - Applied Music I</td>
<td>1</td>
</tr>
<tr>
<td>or MUSI 161 - Intermediate Guitar II</td>
<td>1</td>
</tr>
<tr>
<td>MUST 115 - Introduction to Digital Music</td>
<td>3</td>
</tr>
<tr>
<td>MUST 125 - MIDI and Electro-Acoustic Comp</td>
<td>3</td>
</tr>
<tr>
<td>University Core and Electives</td>
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</tr>
<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>MUSI 295 - Applied Music II</td>
<td>1</td>
</tr>
<tr>
<td>or MUSI 260 - Intermediate Guitar</td>
<td></td>
</tr>
<tr>
<td>MUSI 195 - Applied Music I (If Not Previously Completed)</td>
<td>(1)</td>
</tr>
<tr>
<td>Ensemble</td>
<td>1</td>
</tr>
<tr>
<td>MUST 220 - Recording I</td>
<td>3</td>
</tr>
<tr>
<td>EELE 217 - The Science of Sound</td>
<td>2</td>
</tr>
<tr>
<td>or MUSI 485 - Acoustic Composition</td>
<td></td>
</tr>
<tr>
<td>FILM 259 - Multimedia Audio Prod</td>
<td>3</td>
</tr>
<tr>
<td>University Core and Electives</td>
<td>18</td>
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<tr>
<td>MUSI 301 - Music History I</td>
<td>3</td>
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<tr>
<td>or MUSI 302 - Music History II</td>
<td></td>
</tr>
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<td><strong>Year Total:</strong></td>
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</table>

**Junior Year**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>MUSI 195 - Applied Music I (If Not Previously Completed)</td>
<td>(1)</td>
</tr>
<tr>
<td>MUSI 295 - Applied Music II (If Not Previously Completed)</td>
<td>(1)</td>
</tr>
<tr>
<td>Ensemble</td>
<td>1</td>
</tr>
<tr>
<td>MUSI 3071A - World Music</td>
<td>3</td>
</tr>
<tr>
<td>MUST 384 - Film Scoring</td>
<td>3</td>
</tr>
<tr>
<td>MUST 341 - Sound Design and Synthesis</td>
<td>3</td>
</tr>
<tr>
<td>MUST 382 - Interdisciplinary Projects II</td>
<td>3</td>
</tr>
<tr>
<td>or CAA 490R/290R - Collaborative Rch/Creative</td>
<td></td>
</tr>
<tr>
<td>EELE 217 - The Science of Sound</td>
<td>2</td>
</tr>
<tr>
<td>or MUSI 485 - Acoustic Composition</td>
<td></td>
</tr>
<tr>
<td>MUST 305 - Orchestration for New Media</td>
<td>3</td>
</tr>
<tr>
<td>MUSI 303 - Music History of 20th Century</td>
<td>3</td>
</tr>
<tr>
<td>University Core and Electives</td>
<td>8</td>
</tr>
<tr>
<td><strong>Year Total:</strong></td>
<td><strong>29</strong></td>
</tr>
</tbody>
</table>
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

### 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/wwweduc/grad/ci/index.shtml#tab=1 for more information.

Bachelor of Music Education (BME) degree students must enroll in Applied Music each semester of residency. All students will be placed, by audition, at the appropriate level of applied study. 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.

### Credits

<table>
<thead>
<tr>
<th>Senior Year</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>MUST 498 - Internship (or Music Technology Elective)</td>
<td>6</td>
</tr>
<tr>
<td>Computer Engineering, Electrical Engineering, Computer Science, Physics, or Business</td>
<td>3</td>
</tr>
<tr>
<td>Fine Arts, Social Sciences, or Humanities (non-Music)</td>
<td>3</td>
</tr>
<tr>
<td>Upper Division Electives</td>
<td>6</td>
</tr>
<tr>
<td>Electives</td>
<td>6</td>
</tr>
<tr>
<td>MUST 499R - Senior Recital/Capstone Pjt</td>
<td>3</td>
</tr>
<tr>
<td>MUST 380 - Interdisciplinary Proj I: Film</td>
<td>3</td>
</tr>
<tr>
<td>Year Total:</td>
<td>30</td>
</tr>
</tbody>
</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 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

**Freshman Year**

<table>
<thead>
<tr>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>MUSI 100</td>
</tr>
<tr>
<td>MUSI 105 - Music Theory I</td>
</tr>
<tr>
<td>MUSI 140 - Aural Perception I</td>
</tr>
<tr>
<td>MUSI 135 - Keyboard Skills I</td>
</tr>
<tr>
<td>MUSI 106 - Music Theory II</td>
</tr>
<tr>
<td>MUSI 141 - Aural Perception II</td>
</tr>
<tr>
<td>MUSI 136 - Keyboard Skills II</td>
</tr>
<tr>
<td>MUSE 134 - Techniques: Percussion</td>
</tr>
<tr>
<td>MUSE 123 - Techniques: Voice</td>
</tr>
<tr>
<td>MUSI 195 - Applied Music I</td>
</tr>
<tr>
<td>MUSI 195 - Applied Music I</td>
</tr>
<tr>
<td>Ensemble</td>
</tr>
<tr>
<td>University Core</td>
</tr>
<tr>
<td>Year Total</td>
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</table>

**Sophomore Year**

<table>
<thead>
<tr>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>MUSI 100</td>
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<tr>
<td>MUSI 205 - Music Theory III</td>
</tr>
<tr>
<td>MUSI 240 - Aural Perception III</td>
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<tr>
<td>MUSI 231 - Intern Keyboard: Accompanying</td>
</tr>
<tr>
<td>MUSI 206 - Music Theory IV</td>
</tr>
<tr>
<td>MUSI 241 - Aural Perception IV</td>
</tr>
<tr>
<td>MUSI 232 - Intern Keyboard: Opn Scre Rdng</td>
</tr>
<tr>
<td>MUSE 130 - Techniques: Flute &amp; Clarinet</td>
</tr>
<tr>
<td>MUSE 132 - Techniques: Brass</td>
</tr>
<tr>
<td>MUSE 220 - Intro to Comp App Music Ed</td>
</tr>
<tr>
<td>MUSE 239 - Beginning Conducting</td>
</tr>
<tr>
<td>MUSI 301 - Music History I</td>
</tr>
<tr>
<td>EDU 222IS - Educ Psych &amp; Child Development or EDU 223IS - Educ Psych and Adolescent Dev</td>
</tr>
<tr>
<td>EDU 211D - Multicultural Education</td>
</tr>
</tbody>
</table>
### Music Minor (non-Teaching)

A Music Minor (Non-Teaching) is offered for those non-majors across the university whose involvement with the School of Music forms a substantial portion of their undergraduate study.

Students must audition and be accepted into Applied Music study in order to complete the Music Minor (Non-Teaching). A minimum of 4 credits of Applied Music must be taken over a period of four semesters.

Students seeking a music minor must achieve the grade of "C" or better in all required music courses. Further, a grade of "C-" or better is required in all courses that will be counted toward the 9 upper-division credits required in all minors.

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.

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<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 140 - Aural Perception I</td>
<td>1</td>
</tr>
<tr>
<td>MUSI 141 - Aural Perception II</td>
<td>1</td>
</tr>
<tr>
<td>MUSI 195 - Applied Music I</td>
<td>1</td>
</tr>
<tr>
<td>Choose one of the following:</td>
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</tr>
<tr>
<td>MUSI 101IA - Enjoyment of Music</td>
<td></td>
</tr>
<tr>
<td>MUSI 211IA - Masterworks in Music</td>
<td></td>
</tr>
<tr>
<td>MUSI 295 - Applied Music II</td>
<td></td>
</tr>
<tr>
<td>MUSI 307IA - World Music</td>
<td>3</td>
</tr>
<tr>
<td>Music Ensembles</td>
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<tr>
<td>Music Electives</td>
<td>6</td>
</tr>
<tr>
<td><strong>Total Credits</strong></td>
<td><strong>26</strong></td>
</tr>
</tbody>
</table>

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### Jake Jabs College of Business & Entrepreneurship

**Administration**

Kregg Aytes, Ph.D., Dean
Harry Benham, Ph.D., Interim Associate Dean for Administration and Finance
Susan Dana, J.D., Associate Dean for Academic Affairs and Director, The Bracken Center for Excellence in Undergraduate Business Education

**General Information**

- The Gary K. Bracken Center for Excellence in Undergraduate Business Education (p. 119)
- The Jake Jabs Center for Entrepreneurship and the Alderson Program in Entrepreneurship (p. 120)
- Degree Programs (p. 120)
  - Bachelor of Science in Business (p. 120)
  - Master of Professional Accountancy (p. 121)
- Academic Policies (p. 121)
  - Formal Admission to the Jake Jabs College of Business & Entrepreneurship (JJCBE) (p. 121)
  - Advising and Student Services (p. 121)
  - Acceptance of Transfer Credits and Residency Requirements (p. 121)
- Pre-Professional Requirements for the Master of Business Administration (MBA) (p. 122)
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 opening 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 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 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 Reid 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 teamwork 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. 126) 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 work with students and faculty members to support the growth of small businesses in Montana. The Center also offers the Entrepreneur-in-Residence program, which brings in experienced entrepreneurs to interact with students and offer insights into business.

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 entrepreneurship-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 RC&D, 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. 122), Finance (p. 123), Management (p. 124) and Marketing (p. 125); 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. 60), which is required of all MSU students, is described within 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:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>BGEN 194US</td>
<td>Seminar: Business &amp; Entrepreneurship Fundamentals</td>
<td>3</td>
</tr>
<tr>
<td>BMGT 205</td>
<td>Prof Business Communication</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 (ACCT students take ACTG 202 &amp; 223; FIN students take ACTG 223; MGMT &amp; MKTG students take ACTG 202.)</td>
<td>3</td>
</tr>
<tr>
<td>or ACTG 225</td>
<td>Principles of Accounting II</td>
<td></td>
</tr>
<tr>
<td>M 161Q</td>
<td>Survey of Calculus</td>
<td>4</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>STAT 216Q</td>
<td>Introduction to Statistics</td>
<td>3</td>
</tr>
<tr>
<td>STAT 217Q</td>
<td>Intermediate Statistical Concepts</td>
<td>3</td>
</tr>
<tr>
<td>or BMGT 240IS</td>
<td>Business Research Methods</td>
<td></td>
</tr>
</tbody>
</table>

* 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:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credit Hours</th>
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</thead>
<tbody>
<tr>
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</tbody>
</table>

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:
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. 122), Finance (p. 123), Management (p. 124) or Marketing (p. 125). 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. 378) 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-
- Score of at least 3 on the ACT WorkKeys Written Exam
- 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/Summer Term: On or before May 1st
- Admission for Spring Term: On or before December 1st

Applications are available in the JJCBE Student Services Office located in 338 Reid Hall, 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 JJCBE policy that any upper-division required business or business option course(s) in which a student earns an unsatisfactory grade (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 JJCBE Office of Student Services at business@montana.edu to discuss his/her possible remedies.

Advising and Student Services
The JJCBE’s Office of Student Services coordinates new and transfer student orientation, continuing student registration, formal admission to the JJCBE, 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 JJCBE. 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 JJCBE must meet the JJCBE residency requirement. Students are required to complete at least the following 28 credits in residence at MSU:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BMGT 335</td>
<td>Management and Organization</td>
<td>3</td>
</tr>
<tr>
<td>BGEN 302</td>
<td>Career Perspectives</td>
<td>1</td>
</tr>
<tr>
<td>or BGEN 303</td>
<td>Professional Coaching Clinic</td>
<td></td>
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<tr>
<td>BMIS 311</td>
<td>Management Information Systems</td>
<td>3</td>
</tr>
<tr>
<td>BMGT 322</td>
<td>Operations Management</td>
<td>3</td>
</tr>
<tr>
<td>BMKT 325</td>
<td>Principles of Marketing</td>
<td>3</td>
</tr>
<tr>
<td>BFIN 322</td>
<td>Business Finance</td>
<td>3</td>
</tr>
<tr>
<td>BGEN 361</td>
<td>Principles of Business Law</td>
<td>3</td>
</tr>
<tr>
<td>BGEN 499</td>
<td>Senior Thesis/Capstone: Strategy Seminar</td>
<td>4</td>
</tr>
</tbody>
</table>
Minimum of 12 credits/4 courses of upper-division required option courses
Plus a minimum of 12 credits/4 courses of upper-division required
BGEN, BFIN, 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 JJCBE’s Office of Student Services at business@montana.edu.

It is JJCBE 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 JJCBE 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 JJCBE 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.

- **ACTG 201** Principles of Financial Acct 3
- **ACTG 202** Principles of Managerial Accounting 3
- **BMGT 205** Prof Business Communication 3
- **BMIS 211** Intro to Bus Decision Support 3
- **BMGT 335** Management and Organization 3
- **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
- **ECNS 202** Principles of Macroeconomics 3
- **ECNS 204IS** Microeconomics 3
- **M 161Q** Survey of Calculus 4
- **STAT 216Q** Introduction to Statistics 3
- **STAT 217Q** Intermediate Statistical Concepts 3
- **or BMGT 240IS** Business Research Methods 3

### Undergraduate Programs

- Accounting (p. 122)
- Finance (p. 123)
- Management (p. 124)
- Marketing (p. 125)
- Business Minors & Certificates (p. 126)

### Graduate Degrees

- Master of Professional Accountancy (MPAc) (p. 378)

### 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

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
<th>Fall</th>
<th>Spring</th>
</tr>
</thead>
<tbody>
<tr>
<td>BGEN 194US - Seminar: Business &amp; Entrepreneurship Fundamentals’</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-business/non-economics and general electives, and University Core</td>
<td>12</td>
<td></td>
<td></td>
</tr>
<tr>
<td>M 161Q - Survey of Calculus</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ECNS 202 - Principles of Macroeconomics</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-business/non-economics and general electives, and University Core</td>
<td>8</td>
<td></td>
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<tr>
<td>Year Total:</td>
<td>15</td>
<td>15</td>
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</table>

#### Sophomore Year

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
<th>Fall</th>
<th>Spring</th>
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</thead>
<tbody>
<tr>
<td>ACTG 201 - Principles of Financial Acct</td>
<td>3</td>
<td></td>
<td></td>
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<tr>
<td>BMIS 211 - Intro to Bus Decision Support</td>
<td>3</td>
<td></td>
<td></td>
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<tr>
<td>ECNS 204IS - Microeconomics</td>
<td>3</td>
<td></td>
<td></td>
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<tr>
<td>STAT 216Q - Introduction to Statistics</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-business/non-economics and general electives, and University Core</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ACTG 202 - Principles of Managerial Acct</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ACTG 223 - Principles of Accounting II</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BMGT 205 - Prof Business Communication</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Choose one of the following:</td>
<td>3</td>
<td></td>
<td></td>
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<tr>
<td>STAT 217Q - Intermediate Statistical Concepts</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>BMGT 240IS - Business Research Methods</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Non-business/non-economics and general electives, and University Core</td>
<td>3</td>
<td></td>
<td></td>
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<tr>
<td>Year Total:</td>
<td>15</td>
<td>15</td>
<td></td>
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</tbody>
</table>

#### Junior Year

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
<th>Fall</th>
<th>Spring</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACTG 327 - Inter Fin Acct &amp; Reporting I</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ACTG 321R - Acct Information Systems I</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BMGT 335 - Management and Organization</td>
<td>3</td>
<td></td>
<td></td>
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<tr>
<td>BGEN 302 - Career Perspectives</td>
<td>1</td>
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<tr>
<td>or BGEN 303 - Professional Coaching Clinic</td>
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<tr>
<td>BMIS 311 - Management Information Systems</td>
<td>3</td>
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</tbody>
</table>
Non-business/non-economics and general electives, and University Core  
ACTG 328 - Inter Fin Acct & Reporting II 3  
BFIN 322 - Business Finance 3  
BMGT 322 - Operations Management 3  
BMKT 325 - Principles of Marketing 3  
BGEN 361 - Principles of Business Law 3  
Year Total: 15  
Senior Year  
ACTG 401 - Principles of Federal Taxation - Individuals 3  
ACTG 410 - Cost Management Accounting I 3  
Choose one of the following Accounting electives: 3  
ACTG 420 - Cost Management Accounting II  
ACTG 421 - Acct Information Systems II  
ACTG 441 - Financial Statement Analysis  
ACTG 498 - Internship (must be taken for at least 3 credits; counts as one Accounting elective)  
Non-business/non-economics and general electives, and University Core 6  
BGEN 499 - Senior Thesis/Capstone: Strategy Seminar 4  
ACTG 411 - Auditing I 3  
ACTG 415 - Government and Nonprofit Accounting I 3  
Non-business/non-economics and general electives, and University Core 5  
Year Total: 15  
Total Program Credits 120  

* Students transferring into the Jake Jabs College of Business & Entrepreneurship (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.  

All business majors must be formally admitted to the Jake Jabs College of Business & Entrepreneurship (JJCBE) in order to enroll in all upper-division (300-400 level) option courses (ACTG, BFIN, BMGT, BMKT, BGEN, BMIS) and BGEN 499 Senior Thesis/Capstone: Strategy Seminar.  

A minimum of 120 credits is required for graduation; 42 of these credits must be in courses numbered 300 and above; 54 credits must be non-business/non-economics rubrics (although ECNS 101IS, ECNS 202, ECNS 204IS, BMGT 240IS may be included); University Core credit requirements must be satisfied.  

Any students transferring to the JJCBE must meet the JJCBE residency requirement (p. 121).  

Finance Option

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>Fall</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BGEN 194US - Seminar: Business &amp; Entrepreneurship Fundamentals’</td>
<td>3</td>
</tr>
<tr>
<td>ECNS 202 - Principles of Macroeconomics</td>
<td>3</td>
</tr>
<tr>
<td>M 161Q - Survey of Calculus</td>
<td>4</td>
</tr>
<tr>
<td>Year Total:</td>
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</tbody>
</table>

Sophomore Year

<table>
<thead>
<tr>
<th>Fall</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACTG 201 - Principles of Financial Acct</td>
<td>3</td>
</tr>
<tr>
<td>BMIS 211 - Intro to Bus Decision Support</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>
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<tr>
<td>ACTG 223 - Principles of Accounting II</td>
<td>3</td>
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<tr>
<td>BMGT 205 - Prof Business Communication</td>
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</tr>
<tr>
<td>ECNS 204IS - Microeconomics</td>
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</tr>
<tr>
<td>STAT 217Q - Intermediate Statistical Concepts or BMGT 240IS - Business Research Methods</td>
<td>3</td>
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<td>Non-business/non-economics and general electives, and University Core</td>
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Junior Year

<table>
<thead>
<tr>
<th>Fall</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BMGT 335 - Management and Organization</td>
<td>3</td>
</tr>
<tr>
<td>BMIS 311 - Management Information Systems</td>
<td>3</td>
</tr>
<tr>
<td>BFIN 322 - Business Finance</td>
<td>3</td>
</tr>
<tr>
<td>ECNS 301 - Intermediate Micro with Calc</td>
<td>3</td>
</tr>
<tr>
<td>Non-business/non-economics and general electives, and University Core</td>
<td>3</td>
</tr>
<tr>
<td>BGEN 302 - Career Perspectives or BGEN 303 - Professional Coaching Clinic</td>
<td>1</td>
</tr>
<tr>
<td>BMGT 322 - Operations Management</td>
<td>3</td>
</tr>
<tr>
<td>BMKT 325 - Principles of Marketing</td>
<td>3</td>
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<tr>
<td>BGEN 361 - Principles of Business Law</td>
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<tr>
<td>BFIN 352 -</td>
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<td>Non-business/non-economics and general electives, and University Core</td>
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<td>Year Total:</td>
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</table>

Senior Year

<table>
<thead>
<tr>
<th>Fall</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BFIN 441 - Advanced Analysis of Financial Statements</td>
<td>3</td>
</tr>
<tr>
<td>BFIN 420 - Investments I</td>
<td>3</td>
</tr>
<tr>
<td>BFIN 457R -</td>
<td>3</td>
</tr>
</tbody>
</table>
Non-business/non-economics and general electives, and University Core  6  
BGEN 499 - Senior Thesis/Capstone: Strategy Seminar  4  
Choose three of the following:  9  
  BFIN 421 - Real Estate and Investment Analysis  
  BFIN 452 - International Finance  
  BFIN 456 - Fin Mgmt for the Entrepreneur  
  BFIN 458 - Commercial Bank Management (On Demand)  
  BFIN 466 - Investments II  
  BFIN 490R - Undergrad Research (May be taken more than once, but counts as one Finance elective)  
  BFIN 498 - Internship (Must be taken for at least 3 credits, but counts as one Finance elective)  
Students may replace one of the above Finance electives with one of the following:  
  ACTG 327 - Inter Fin Acct & Reporting I  
  ACTG 328 - Inter Fin Acct & Reporting II  
  BMGT 405 - Supply Chain Analytics  
  ECNS 403 - Intermediate Macro with Calc  
  ECNS 406 - Industrial Organization  
  STAT 411 - Methods for Data Analysis I  
  STAT 412 - Methods for Data Analysis II  
*Students must meet pre-requisite requirements of individual courses.  
Non-business/non-economics and general electives, and University Core  2  
Year Total:  15  

Total Program Credits:  120  

- Students transferring into the Jake Jabs College of Business & Entrepreneurship (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.  

All business majors must be formally admitted to the Jake Jabs College of Business & Entrepreneurship (JJCBE) in order to enroll in all upper-division (300-400 level) option courses (ACTG, BFIN, BMGT, BMKT, BGEN, BMIS) and BGEN 499 Senior Thesis/Capstone: Strategy Seminar.  

A minimum of 120 credits is required for graduation; 42 of these credits must be in courses numbered 300 and above; 54 credits must be non-business/non-economics rubrics (although ECNS 101IS, ECNS 202, ECNS 204IS, BMGT 240IS may be included); University Core credit requirements must be satisfied.  

Any students transferring to the JJCBE must meet the JJCBE residency requirement (p. 121).  

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>Credits</th>
<th>Fall</th>
<th>Spring</th>
</tr>
</thead>
<tbody>
<tr>
<td>BGEN 194US - Seminar: Business &amp; Entrepreneurship Fundamentals</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Non-business/non-economics and general electives, and University Core</td>
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<td></td>
</tr>
<tr>
<td>M 161Q - Survey of Calculus</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>ECNS 202 - Principles of Macroeconomics</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Non-business/non-economics and general electives, and University Core</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>Year Total:</td>
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Sophomore Year  

<table>
<thead>
<tr>
<th>Credits</th>
<th>Fall</th>
<th>Spring</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACTG 201 - Principles of Financial Acct</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>BMGT 205 - Prof Business Communication</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>STAT 216Q - Introduction to Statistics</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Non-business/non-economics and general electives, and University Core</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>ACTG 202 - Principles of Managerial Acct</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>BMIS 211 - Intro to Bus Decision Support</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>ECNS 204IS - Microeconomics</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>STAT 217Q - Intermediate Statistical Concepts or BMGT 240IS - Business Research Methods</td>
<td>3</td>
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<tr>
<td>Non-business/non-economics and general electives, and University Core</td>
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<td>Year Total:</td>
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Junior Year  

<table>
<thead>
<tr>
<th>Credits</th>
<th>Fall</th>
<th>Spring</th>
</tr>
</thead>
<tbody>
<tr>
<td>BMGT 335 - Management and Organization</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>BMIS 311 - Management Information Systems</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>
<td></td>
</tr>
<tr>
<td>Non-business/non-economics and general electives, and University Core</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>BGEN 302 - Career Perspectives or BGEN 303 - Professional Coaching Clinic</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>BMGT 322 - Operations Management</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>BFIN 322 - Business Finance</td>
<td>3</td>
<td></td>
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<tr>
<td>BMGT 366 - Supervisory Management Skills</td>
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<td></td>
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<tr>
<td>BMGT 329 - Human Resource Management</td>
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</table>

Senior Year  

<table>
<thead>
<tr>
<th>Credits</th>
<th>Fall</th>
<th>Spring</th>
</tr>
</thead>
<tbody>
<tr>
<td>BMGT 466 - Middle Management Skills</td>
<td>3</td>
<td></td>
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<tr>
<td>BMGT 475R - Management Experience</td>
<td>3</td>
<td></td>
</tr>
</tbody>
</table>
Choose two of the following management electives: 6

BMGT 405 - Supply Chain Analytics
BMGT 406 - Negotiation/Dispute Resolution
BMGT 410 - Sustainable Business Practices
BMGT 420 - Leadership and Motivation
BMGT 433 - Managing Quality and Productivity
BMGT 448 - Entrepreneurship
BMGT 458 - Adv Entrepreneurship Sem
BMGT 460 - Practical Management Perspectives
BMGT 461 - Small Business Management
BMGT 464 - International Management
BMGT 465 - International Practicum
BMGT 466 - Entrepreneurial Experience
BMGT 468 - Contemporary Issues in Business Ethics
BMGT 469 - Community Entrepreneurship & Nonprofit Management
BGEN 472 - Legal and Social Framework of Business Regulation
BMGT 498 - Internship (Must be taken for at least 3 credits, but counts as one Management elective)
BMIS 314 - Business Web Site Design

Advisor Approved Electives** 3

BGEN 499 - Senior Thesis/Capstone: Strategy Seminar
Advisor Approved Electives** 6
Non-business/non-economics and general electives, and University Core 5

Year Total: 15 15

Total Program Credits: 120

* Students transferring into the Jake Jabs College of Business & Entrepreneurship (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.

** 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.

All business majors must be formally admitted to the Jake Jabs College of Business & Entrepreneurship (JJCBE) in order to enroll in all upper-division (300-400 level) option courses (ACTG, BFIN, BMGT, BMKT, BGEN, BMIS) and BGEN 499 Senior Thesis/Capstone: Strategy Seminar.

A minimum of 120 credits is required for graduation; 42 of these credits must be in courses numbered 300 and above; 54 credits must be non-business/non-economics rubrics (although ECNS 101IS, ECNS 202, ECNS 204IS, BMGT 240IS may be included); University Core credit requirements must be satisfied.

Any students transferring to the JJCBE must meet the JJCBE residency requirement (p. 121).

---

**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**

**Freshman Year**

<table>
<thead>
<tr>
<th>Credits</th>
<th>Fall</th>
<th>Spring</th>
</tr>
</thead>
<tbody>
<tr>
<td>BGEN 194US - Seminar: Business &amp; Entrepreneurship Fundamentals*</td>
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<tr>
<td>Non-business/non-economics and general electives, and University Core</td>
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<td></td>
</tr>
<tr>
<td>ECNS 202 - Principles of Macroeconomics</td>
<td>3</td>
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<td>8</td>
<td></td>
</tr>
<tr>
<td>ACTG 201 - Principles of Financial Acct</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>BMIS 211 - Intro to Bus Decision Support</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>ACTG 202 - Principles of Managerial Acct</td>
<td>3</td>
<td></td>
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<tr>
<td>BMIS 211 - Intro to Bus Decision Support</td>
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</tr>
<tr>
<td>BMIS 311 - Management Information Systems</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>BMKT 325 - Principles of Marketing</td>
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<tr>
<td>Non-business/non-economics and general electives, and University Core</td>
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<td>Year Total:</td>
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**Sophomore Year**

<table>
<thead>
<tr>
<th>Credits</th>
<th>Fall</th>
<th>Spring</th>
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</thead>
<tbody>
<tr>
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<td>BMIS 211 - Intro to Bus Decision Support</td>
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<td></td>
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<tr>
<td>ECNS 204IS - Microeconomics</td>
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<td></td>
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<tr>
<td>Non-business/non-economics and general electives, and University Core</td>
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</tr>
<tr>
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<td></td>
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<tr>
<td>BMIS 311 - Management Information Systems</td>
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<td></td>
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<tr>
<td>BMKT 325 - Principles of Marketing</td>
<td>3</td>
<td></td>
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<td>Year Total:</td>
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**Junior Year**

<table>
<thead>
<tr>
<th>Credits</th>
<th>Fall</th>
<th>Spring</th>
</tr>
</thead>
<tbody>
<tr>
<td>BMGT 335 - Management and Organization</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>BGEN 302 - Career Perspectives or BGEN 303 - Professional Coaching Clinic</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>BMIS 311 - Management Information Systems</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>BMKT 325 - Principles of Marketing</td>
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<tr>
<td>Non-business/non-economics and general electives, and University Core</td>
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<td></td>
</tr>
<tr>
<td>Year Total:</td>
<td>15</td>
<td>15</td>
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</tbody>
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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. 126) (not available to business students in the Accounting option)
- Business Administration (p. 126) (not available to business-major students)
- Entrepreneurship and Small Business Management (p. 127)
- Finance (p. 127) (not available to business students in the Finance option)
- International Business (p. 128)

Certificates:


**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>
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<tbody>
<tr>
<td>BMGT 405 - Supply Chain Analytics</td>
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<tr>
<td>Non-business/non-economics and general electives, and University Core</td>
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</tr>
<tr>
<td>BGEN 499 - Senior Thesis/Capstone: Strategy Seminar</td>
<td>4</td>
</tr>
<tr>
<td>BMKT 499 - Senior Capstone: Marketing Management</td>
<td>3</td>
</tr>
<tr>
<td>Approved Restricted Elective**</td>
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</tr>
<tr>
<td>Non-business/non-economics and general electives, and University Core</td>
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<tr>
<td>Year Total:</td>
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<tr>
<td></td>
<td>15</td>
</tr>
<tr>
<td><strong>Total Program Credits:</strong></td>
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</tr>
</tbody>
</table>

* Students transferring into the Jake Jabs College of Business & Entrepreneurship (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.

** Advisor Approved Elective: One course (3 credits), in addition to University Core, of any relevant upper-division course that are pre-approved by the student’s faculty advisor.

All business majors must be formally admitted to the Jake Jabs College of Business & Entrepreneurship (JJCBE) in order to enroll in all upper-division (300-400 level) option courses (ACTG, BFIN, BMGT, BMKT, BGEN, BMIS) and BGEN 499 Senior Thesis/Capstone: Strategy Seminar.

A minimum of 120 credits is required for graduation; 42 of these credits must be in courses numbered 300 and above; 54 credits must be non-business/non-economics rubrics (although ECNS 101IS, ECNS 202, ECNS 204IS, BMGT 240IS may be included); University Core credit requirements must be satisfied.

Any students transferring to the JJCBE must meet the JJCBE residency requirement (p. 121).

**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.

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BMIS 211 - Intro to Bus Decision Support</td>
<td>3</td>
</tr>
<tr>
<td>ACTG 201 - Principles of Financial Acct</td>
<td>3</td>
</tr>
<tr>
<td>ACTG 223 - Principles of Accounting II</td>
<td>3</td>
</tr>
<tr>
<td>ACTG 327 - Inter Fin Acct &amp; Reporting I</td>
<td>3</td>
</tr>
<tr>
<td>ACTG 321R - Acct Information Systems I</td>
<td>3</td>
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<tr>
<td>Choose three of the following:</td>
<td>9</td>
</tr>
<tr>
<td>ACTG 328 - Inter Fin Acct &amp; Reporting II</td>
<td></td>
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<tr>
<td>ACTG 401 - Principles of Federal Taxation-Individuals</td>
<td></td>
</tr>
<tr>
<td>ACTG 410 - Cost Management Accounting I</td>
<td></td>
</tr>
<tr>
<td>ACTG 411 - Auditing I *</td>
<td></td>
</tr>
<tr>
<td>ACTG 415 - Government and Nonprofit Accounting I *</td>
<td></td>
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<tr>
<td>ACTG 420 - Cost Management Accounting II</td>
<td></td>
</tr>
<tr>
<td>ACTG 421 - Acct Information Systems I</td>
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<tr>
<td>ACTG 441 - Financial Statement Analysis</td>
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<tr>
<td>BFIN 322 - Business Finance</td>
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<tr>
<td>Elective Courses</td>
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</tr>
<tr>
<td><strong>Total Credits:</strong></td>
<td>24</td>
</tr>
</tbody>
</table>

* ACTG 328 is a prerequisite for these courses.

Four of the five upper-division courses must be taken in residence at MSU-Bozeman.
Montana State University

ACTG 201  Principles of Financial Acct  3
ACTG 202  Principles of Managerial Acct  3
BMGT 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  30

Three of the four upper-division courses must be taken in residence at MSU-Bozeman.

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.

BMGT 205  Prof Business Communication  3
BMKT 325  Principles of Marketing  3
BGEN 361  Principles of Business Law  3
BMGT 448  Entrepreneurship  3
BMGT 463  Entrepreneurial Experience  3
Take one of the following accounting courses:  3
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:  3
BMGT 335  Management and Organization
EIND 300  Engineering Management & Ethics
Take one of the following finance courses:  3
BFIN 322  Business Finance
EGEN 325  Engineering Economic Analysis
AGBE 345  Ag Finance and Credit Analysis
Take two of the following electives:  6
ACTG/BFIN  441  Financial Statement Analysis
BFIN 456  Fin Mgmt for the Entrepreneur

Total Credits  30

* JJCBE Management option students must take at least one course outside of BMGT.

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:

BMIS 211  Intro to Bus Decision Support  3
ACTG 201  Principles of Financial Acct  3
ACTG 202  Principles of Managerial Acct  3
or ACTG 223  Principles of Accounting II
STAT 216Q  Introduction to Statistics  3
BFIN 322  Business Finance  3
BFIN 352  3
Choose at least two of the following:  6
ACTG/BFIN  441  Financial Statement Analysis
BFIN 420  Investments I
BFIN 421  Real Estate and Investment Analysis
BFIN 452  International Finance
BFIN 456  Fin Mgmt for the Entrepreneur
BFIN 457R  
BFIN 458  Commercial Bank Management
BFIN 466  Investments II
BFIN 498  Internship (An internship must be taken for at least 3 credits, but counts as one elective.)

Students may replace one of the above Finance electives with one of the following:

ACTG 327  Inter Fin Acct & Reporting I
ACTG 328  Inter Fin Acct & Reporting II
ECNS 303  Intermediate Macro with Calc
ECNS 403R Intro to Econometrics
ECNS 406  Industrial Organization
STAT 411  Methods for Data Analysis I
STAT 412  Methods for Data Analysis II

**Total Credits**  24

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

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>
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<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 (Reid 457), or in the Office of Student Services (Reid 338).

** 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 (Reid 457), or in the Office of Student Services (Reid 338).

**Undergraduate Programs Available**

**Department of Education (p. 129)**

- B.S. in Elementary Education K-8 (p. 130)
- B.S. in Secondary Education (p. 132)
- B.S. in Technology Education (p. 139)
- Teacher Education Program (p. 134)
- Teaching Minors (p. 136)

**Department of Health and Human Development (p. 141)**

- B.S. in Community Health (p. 143)
- B.S. in Early Childhood Education and Child Services (p. 144)
- B.S. in Family and Consumer Sciences (p. 147)
- B.S. in Food and Nutrition (p. 147)
- B.S. in Health and Human Performance (p. 149)
- B.S. in Health Enhancement (Health and Physical Education) K-12 (p. 148)
- B.S. in Sustainable Food & Bioenergy Systems (p. 151)
- Coaching Minor (Non-Teaching) (p. 143)
- Human Development Minor (Non-Teaching) (http://catalog.montana.edu/undergraduate/education-health-human-development/health-human-development/)

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.
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.

The college cooperates with other agencies in Montana in the improvement of educational programs and services through its Center for Community-School Development and Field Services, Child Development Center, Human Development Clinic, and other public service centers and activities.

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 Teacher Education Accreditation Council, as are the master’s level programs for the preparation of elementary school principals, high school principals, and guidance counselors, and the doctoral program in education administration. All education programs are approved by the Montana Board of Public Education. Mental health, marriage and family, and school counseling programs are approved 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.

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. 287)

Link to the Department of Education Overview (p. 285)

**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 Programming within the Department of Education (p. 287)

### Coursework Required for Elementary Education K-8

See Teacher Education Program (p. 134) 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 153Q</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>
<tr>
<td></td>
<td>Choose one of the following:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>HSTA 101IH American History I</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>HSTA 102IH American History II</td>
<td></td>
</tr>
<tr>
<td></td>
<td>HSSTR 101IH Western Civilization I</td>
<td></td>
</tr>
<tr>
<td></td>
<td>HSSTR 102IH Western Civilization II</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>3</td>
</tr>
<tr>
<td>GPHY 141D</td>
<td>Geography of World Regions</td>
<td>3</td>
</tr>
<tr>
<td>SOCII 101IS</td>
<td>Introduction to Sociology</td>
<td>3</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></td>
<td>3</td>
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</tbody>
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Life Science choose one of the following:

<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>3</td>
</tr>
<tr>
<td>ERTH 212RN</td>
<td>Yellowstone: Scientific Lab</td>
<td>3</td>
</tr>
<tr>
<td>GEO 103CS</td>
<td>Intro to Envirmt Geology</td>
<td>3</td>
</tr>
<tr>
<td>GEO 105IN</td>
<td>Oceanography</td>
<td>3</td>
</tr>
<tr>
<td>GEO 111IN</td>
<td>Dinosaurs</td>
<td>3</td>
</tr>
<tr>
<td>GEO 140IN</td>
<td>Planetary Geoscience</td>
<td>3</td>
</tr>
<tr>
<td>Physical Science choose one of the following:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CHMY 102CS</td>
<td>Applying Chemistry to Society</td>
<td>3</td>
</tr>
<tr>
<td>PHSX 103IN</td>
<td>The Physics of How Things Work</td>
<td>3</td>
</tr>
<tr>
<td>PHSX 201IN</td>
<td>Physics by Inquiry</td>
<td>3</td>
</tr>
<tr>
<td>NASX 105D</td>
<td>Intro Native Amer Studies</td>
<td>3</td>
</tr>
<tr>
<td>or NASX 205D</td>
<td>Native Americans Contemp Soc</td>
<td>3</td>
</tr>
<tr>
<td>or NASX 232D</td>
<td>MT Indian Cult, Hist, Cur Issu</td>
<td>3</td>
</tr>
<tr>
<td>PSCI 210IS</td>
<td>Introduction to American Government</td>
<td>3</td>
</tr>
<tr>
<td>EDU 330</td>
<td>Emergent Literacy</td>
<td>3</td>
</tr>
<tr>
<td>EDU 331</td>
<td>Lit and Literacy for Children</td>
<td>3</td>
</tr>
<tr>
<td>EDU 370</td>
<td>Integrating Tech into Educ</td>
<td>3</td>
</tr>
<tr>
<td>EDU 382</td>
<td>Assessmnt, Curric, Instructn</td>
<td>3</td>
</tr>
<tr>
<td>EDU 397</td>
<td>Methods (K-8 Health Enhancement)</td>
<td>3</td>
</tr>
<tr>
<td>ESPD 306</td>
<td>Exceptional Learners</td>
<td>3</td>
</tr>
<tr>
<td>Electives</td>
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</tr>
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</table>

**K-8 Teaching Methods - Developing Instructional Materials**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>EDU 342</td>
<td>Managing the Learning Envr</td>
<td>3</td>
</tr>
<tr>
<td>EDU 395</td>
<td>Practicum (I)</td>
<td>3</td>
</tr>
<tr>
<td>EDU 397</td>
<td>Methods (K-8 Language Arts Methods)</td>
<td>3</td>
</tr>
<tr>
<td>EDU 397</td>
<td>Methods (K-8 Creative Arts Methods)</td>
<td>3</td>
</tr>
<tr>
<td>EDU 397R</td>
<td>Methods-K-8 Social Studies</td>
<td>3</td>
</tr>
<tr>
<td>EDU 397</td>
<td>Methods (K-8 Math Methods)</td>
<td>3</td>
</tr>
<tr>
<td>EDU 397</td>
<td>Methods (K-8 Science Methods)</td>
<td>3</td>
</tr>
<tr>
<td>EDU 395</td>
<td>Practicum (II)</td>
<td>3</td>
</tr>
<tr>
<td>EDU 438</td>
<td>Ltrcy Asmnt, Diagnos and Instr</td>
<td>3</td>
</tr>
<tr>
<td>EDU 495</td>
<td>Student Teaching</td>
<td>12</td>
</tr>
<tr>
<td>Total Credits</td>
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<td>120</td>
</tr>
</tbody>
</table>

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**

<table>
<thead>
<tr>
<th>Freshman Year</th>
<th>Credits</th>
</tr>
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<tbody>
<tr>
<td>WRIT 101W - College Writing I</td>
<td>3</td>
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<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>EDU 222IS - Educ Psych &amp; Child Development</td>
<td>3</td>
</tr>
<tr>
<td>BIOB 100IN - Organism Function</td>
<td>3</td>
</tr>
<tr>
<td>or BIOM 103IN - Unseen Universe: Microbes</td>
<td></td>
</tr>
<tr>
<td>NASX 105D - Intro Native Amer Studies</td>
<td>3</td>
</tr>
<tr>
<td>EDU 204IA - Arts &amp; Lifelong Learning</td>
<td>3</td>
</tr>
<tr>
<td>Choose one of the following:</td>
<td></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>
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<tr>
<td>M 135Q - Geometry &amp; Measure K-8 Teachers</td>
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<tr>
<td>Elective</td>
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<td>Year Total:</td>
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<thead>
<tr>
<th>Sophomore Year</th>
<th>Credits</th>
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<tbody>
<tr>
<td>HSTA 101IH - American History I</td>
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</tr>
<tr>
<td>TE 250CS - Technology and Society</td>
<td>3</td>
</tr>
<tr>
<td>PHSX 201IN - Physics by Inquiry</td>
<td>3</td>
</tr>
<tr>
<td>or CHMY 102CS - Applying Chemistry to Society</td>
<td></td>
</tr>
<tr>
<td>or PHSX 103IN - The Physics of How Things Work</td>
<td></td>
</tr>
<tr>
<td>M 234 - Higher Math for K-8 Teachers</td>
<td>3</td>
</tr>
<tr>
<td>EDU 211D - Multicultural Education</td>
<td>3</td>
</tr>
<tr>
<td>EDU 331 - Lit and Literacy for Children</td>
<td>3</td>
</tr>
<tr>
<td>PSCI 210IS - Introduction to American Government</td>
<td>3</td>
</tr>
<tr>
<td>ERTH 101IN - Earth System Sciences</td>
<td>4</td>
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<tr>
<td>EDU 370 - Integrating Tech into Educ</td>
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<td>Elective</td>
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<table>
<thead>
<tr>
<th>Junior Year</th>
<th>Credits</th>
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<tbody>
<tr>
<td>EDU 382 - Assessmt, Curric, Instructn</td>
<td>3</td>
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<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</td>
<td>3</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 342 - Managing the Learning Envir</td>
<td>3</td>
</tr>
<tr>
<td>EDU 395 - Practicum (I)</td>
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<td>Year Total:</td>
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<table>
<thead>
<tr>
<th>Senior Year</th>
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<tbody>
<tr>
<td>EDU 397 - Methods (K-8 Math Methods)</td>
<td>3</td>
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<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 - Lanct Asmnt, Diagnos and Instr</td>
<td>3</td>
</tr>
<tr>
<td>~ Student Teaching Semester~</td>
<td></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:

- EDEC 160 - Early Childhood through Adolescent Development | 3
- EDEC 271 - Paraprofessional Experience in Early Childhood | 1
- EDEC 350 - Play and Learning in Early Childhood | 3
- EDEC 385 - Integrated Curriculum Early Childhood Education | 4
- EDSP 458 - Assessment and Intervention | 4

| 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.

**Mathematics Option**

All mathematics education option students must meet the requirements of the Elementary Education K-8 curriculum, with these additions:

- EDU 497R - Methods: 5-8 Mathematics | 3
- STAT 216Q - Introduction to Statistics | 3
- M 420 - Geometry, Measurement, and Data in the Middle Grades | 3
- M 424 - Algebraic Thinking and Number Sense in the Middle Grades | |

<table>
<thead>
<tr>
<th>Recommended Mathematics Elective: (cannot double count in any credits)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Choose two of the following:</td>
<td>6</td>
</tr>
<tr>
<td>M 149Q - Secrets of the Infinite</td>
<td></td>
</tr>
<tr>
<td>M 147Q - Language of Mathematics</td>
<td></td>
</tr>
<tr>
<td>M 151Q - Precalculus</td>
<td></td>
</tr>
<tr>
<td>M 161Q - Survey of Calculus</td>
<td></td>
</tr>
<tr>
<td>M 171Q - Calculus I</td>
<td></td>
</tr>
<tr>
<td>M 420 - Geometry, Measurement, and Data in the Middle Grades</td>
<td></td>
</tr>
<tr>
<td>M 424 - Algebraic Thinking and Number Sense in the Middle Grades</td>
<td></td>
</tr>
<tr>
<td>STAT 217Q - Intermediate Statistical Concepts</td>
<td></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 options may be subject to change. Please consult with an advisor for the most up-to-date information.**
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:

- BIOB 160 Principles of Living Systems
- BIOE 103CS Environmental Science and Society
- BIOB 170IN Principles of Biological Diversity
- BIOM 103IN Unseen Universe: Microbes

Choose one lab course and one additional course from the following:

- ERTH 101IN Earth System Sciences
- ERTH 212RN Yellowstone: Scientific Lab
- GEO 103CS Intro to Envrmntl Geology
- ASTR 110IN Introduction to Astronomy: Mysteries of the Sky

Choose one Chemistry and one Physics lab course and one additional course from the following:

- CHMY 121IN Introduction of General Chemistry
- CHMY 141 College Chemistry I
- PHSX 103IN The Physics of How Things Work
- PHSX 201IN Physics by Inquiry
- PHSX 205 College Physics I
- PHSX 207 College Physics II

Total Credits

Students choosing this option voluntarily select a program that requires additional coursework beyond the 120 credits required for a standard four-year degree.

Special Education Option

All special education option students must meet the requirements of the Elementary Education K-8, K-12, or 5-12 curriculum with these additions:

EDU 438 Ltrcy Asmnt, Diagnos and Instr 3
EDSP 307 Exceptional Learners Lab 1
EDSP 458 Assessment and Intervention 4
Take three approved Special Education Course offerings from 9
MSU-Billings

Total Credits 17

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. 265)).

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. 134) website for entrance requirements.

- FCS 101IS Indiv and Fam Dev: Lifespan 3
- or EDEC 160 Early Childhood through Adolescent Development
- EDU 202 Early Field Experience 1
- EDU 223IS Educ Psych and Adolescent Dev 3
- or EDU 222IS Educ Psych & Child Development
- EDU 211D Multicultural Education 3
- EDU 370 Integrating Tech into Educ 2
- EDSP 306 Exceptional Learners 3
- EDU 382 Assessmnt, Curric, Instructn 3
- EDU 395 Practicum (5-12 Or K-12) 3
- EDU 4XX--Teaching methods in minor 3
- EDU 4YY--Teaching methods in major 3
- EDU 495 Student Teaching (Or K-12) 12
- EDU 408 Professional Issues: K-12 2

Total Credits 41

Note: A student must be admitted into the Teacher Education Program before enrolling in a methods class.

Secondary level endorsement will cover grades kindergarten through twelve or five through twelve for all applicants graduating from approved programs. Practicum and student teaching experiences are coordinated through the Office of Field Placement & Licensure. Details regarding these placements are found on the following link: http://www.montana.edu/wwedu/undergrad/clinical_exp_place_req.shtml

Sequencing Your Required Education Courses

The faculty in the Department of Education recommends that any student completing a secondary education program adhere to the following sequence. If a student falls behind in this time-line, all subsequent courses could be moved back in time as well.

Note: While we recommend this sequence, there will be some variance, especially between courses taken by the end of the junior year and first-semester senior year.

Freshman Year

1st Semester
- FCS 101IS Indiv and Fam Dev: Lifespan 3
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. 134) 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. 134) page for entrance requirements.

Program Sequence

Freshman Year

- EDU 101US - Teaching and Learning 3
- FCS 101IS - Indiv and Fam Dev: Lifespan 3
- or EDEC 160 - Early Childhood through Adolescent Development 3
- EDU 223IS - Educ Psych and Adolescent Dev 3
- EDU 202 - Early Field Experience 1
- CHMY 141 - College Chemistry I 4
- PHSX 205 - College Physics I 4
- Elective 3
- Year Total: 32

Sophomore Year

- EDU 370 - Integrating Tech into Educ 2
- CHMY 143 - College Chemistry II 4
- IA/RA CORE 3
- BIOB 160 - Principles of Living Systems 4
- EDU 211D - Multicultural Education 3
- PHSX 207 - College Physics II 4
- ERTH 101IN - Earth System Sciences 4
- BIBO 412 - Animal Physiology 3
- or BIBO 433 - Plant Physiology 3
- BIBO 370 - General Ecology (equiv to 270) 3
- Elective 3
- Year Total: 33

Junior Year

- EDU 382 - Assessmt, Curric, Instructn 3
- BIBO 375 - General Genetics 3
- CHMY 211 - Elements of Organic Chemistry 5
- Electives 0-2
- HSTR 101IH - Western Civilization I 4
- Earth Science Elective 4
- BIBO 103IN - Unseen Universe: Microbes 3-5
- or BIBO 360 - General Microbiology 3
- ERTH 303 - Weather and Climate of GEO 211 - Earth History and Evolution 3
- BIBO 420 - Evolution 3
- EDSP 306 - Exceptional Learners 3
- Year Total: 31-35

Total Credits 41
### 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. 134) page for entrance requirements.

#### Program Sequence

##### Freshman Year

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>EDU 101US - Teaching and Learning</td>
<td>3</td>
</tr>
<tr>
<td>WRIT 101W - College Writing I</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 through Adolescent Development</td>
<td></td>
</tr>
<tr>
<td>HSTR 101IH - Western Civilization I</td>
<td>4</td>
</tr>
<tr>
<td>M 145Q - Math for the Liberal Arts (Or other Q core)</td>
<td>3</td>
</tr>
<tr>
<td>HSTR 102IH - Western Civilization II</td>
<td>4</td>
</tr>
<tr>
<td>GPHY 141D - Geography of World Regions</td>
<td>3</td>
</tr>
<tr>
<td>or GPHY 121D - Human Geography</td>
<td></td>
</tr>
<tr>
<td>or 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>or PSYX 100IS - Intro to Psychology</td>
<td></td>
</tr>
<tr>
<td>PSCI 210IS - Introduction to American Government</td>
<td>3</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>CS Core</td>
<td>3</td>
</tr>
<tr>
<td>EDU 202 - Early Field Experience</td>
<td>1</td>
</tr>
</tbody>
</table>

| Year Total:                                 | 33      |

<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 217IH - 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>
</tbody>
</table>

| Year Total:                                 | 31      |

| 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.

#### 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>PSCI elective (upper division 300-400)**</td>
<td>9</td>
</tr>
<tr>
<td>IN/RN Core</td>
<td>3</td>
</tr>
<tr>
<td>NASX 405 - Gndr Iss In Native Amer Studies</td>
<td>3</td>
</tr>
<tr>
<td>or NASX 304 - Native American Belief &amp; Phil</td>
<td></td>
</tr>
<tr>
<td>or NASX 340 - Native American Literature</td>
<td></td>
</tr>
<tr>
<td>or NASX 430 - American Indian Education</td>
<td></td>
</tr>
<tr>
<td>HSTA/HSTR elective (upper division 300-400)</td>
<td>12</td>
</tr>
<tr>
<td>EDSP 306 - Exceptional Learners</td>
<td>3</td>
</tr>
</tbody>
</table>

| Year Total:                                 | 33      |

<table>
<thead>
<tr>
<th>Senior Year</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>HSTA/HSTR elective (upper division 300-400)**</td>
<td>3</td>
</tr>
<tr>
<td>Social Science (upper division 300-400)**</td>
<td>3</td>
</tr>
<tr>
<td>PSCI elective (upper division 300-400)**</td>
<td>3</td>
</tr>
<tr>
<td>Elective</td>
<td>1</td>
</tr>
<tr>
<td>EDU 407 - Methods (5-12 Social Studies)</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>
</tbody>
</table>

| 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/educ/advising/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
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
4. proof of liability insurance

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
4. proof of liability insurance

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
4. proof of liability insurance

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 and arrangements will be 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. 53) 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. 136)
- Biology (p. 136)
- Chemistry (p. 136)
- Earth Science (p. 137)
- Economics (p. 137)
- Family and Consumer Sciences (p. 137)
- French K-12 (p. 138)
- German K-12 (p. 138)
- Government (p. 138)
- History (p. 138)
- Mathematics (p. 139)
- Physics (p. 139)
- Reading K-12 (p. 139)
- Spanish K-12 (p. 139)
- Technology Education (p. 139)

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</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ARTZ 106RA</td>
<td>Visual Language - Drawing</td>
<td>3</td>
</tr>
<tr>
<td>ARTZ 108RA</td>
<td>Art of World Civilization I</td>
<td>4</td>
</tr>
<tr>
<td>ARTZ 201IA</td>
<td>Art of World Civilization II</td>
<td>4</td>
</tr>
<tr>
<td>Choose one of the following:</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>ARTZ 211RA</td>
<td>Drawing I</td>
<td></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>
</tbody>
</table>

Choose one of the following:

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOM 103IN</td>
<td>Unseen Universe: Microbes</td>
<td>3-5</td>
</tr>
<tr>
<td>BIOM 360</td>
<td>General Microbiology</td>
<td>3</td>
</tr>
</tbody>
</table>

Total Credits 31-33

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</th>
<th>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>3</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>2</td>
<td></td>
</tr>
<tr>
<td>BIOE 408</td>
<td>Rocky Mountain Vegetation</td>
<td></td>
</tr>
<tr>
<td>BIOE 416</td>
<td>Alpine Ecology</td>
<td></td>
</tr>
<tr>
<td>Choose one of the following:</td>
<td>3-5</td>
<td></td>
</tr>
<tr>
<td>BIOM 103IN</td>
<td>Unseen Universe: Microbes</td>
<td></td>
</tr>
<tr>
<td>BIOM 360</td>
<td>General Microbiology</td>
<td></td>
</tr>
<tr>
<td>Choose one of the following:</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>BIOB 412</td>
<td>Hybridomas</td>
<td></td>
</tr>
<tr>
<td>BIOO 433</td>
<td>Plant Physiology</td>
<td></td>
</tr>
<tr>
<td>Biology Electives (except BIOB 100IN)</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>EDU 497</td>
<td>Methods (5-12 Art)</td>
<td>3</td>
</tr>
</tbody>
</table>

Total Credits 34

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.

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BCH 380</td>
<td>Biochemistry</td>
<td>5</td>
</tr>
<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>CHMY 211</td>
<td>Elements of Organic Chemistry</td>
<td>5</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>Choose one of the following:</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>CHMY 311</td>
<td>Fundamental Analytical Chem</td>
<td></td>
</tr>
<tr>
<td>CHMY 401</td>
<td>Advanced Inorganic Chemistry</td>
<td></td>
</tr>
<tr>
<td>EDU 497</td>
<td>Methods (5-12 Science)</td>
<td>3</td>
</tr>
</tbody>
</table>

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.

<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 (Must take a minimum of 3 credits of ERTH 102CS)</td>
<td>1</td>
</tr>
<tr>
<td>ERTH 307</td>
<td>Principles of Geomorphology</td>
<td>4</td>
</tr>
<tr>
<td>ERTH 303</td>
<td>Weather and Climate</td>
<td>3</td>
</tr>
<tr>
<td>GEO 302</td>
<td>Mineralogy and Optical Mineral</td>
<td>4</td>
</tr>
<tr>
<td>GEO 211</td>
<td>Earth History and Evolution</td>
<td>3</td>
</tr>
<tr>
<td>GEO 312</td>
<td>Dinosaur Paleontology</td>
<td>3</td>
</tr>
<tr>
<td>GEO 310</td>
<td>Invertebrate Paleontology</td>
<td>3</td>
</tr>
<tr>
<td>EDU 497</td>
<td>Methods (5-12 Science)</td>
<td>3</td>
</tr>
</tbody>
</table>

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.

<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>ECNS 311</td>
<td>Intermediate Microeconomics with Economies Education Applications</td>
<td>3</td>
</tr>
<tr>
<td>ECNS 313</td>
<td>Money and Banking</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>One additional ECNS course at the 300 or 400 levels (no seminars, 492’s, or 490’s)</td>
<td>3</td>
</tr>
<tr>
<td>Approved Math course</td>
<td></td>
<td>3-4</td>
</tr>
<tr>
<td>EDU 497</td>
<td>Methods (5-12 Social Studies)</td>
<td>3</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>FCS 101IS</td>
<td>Indiv and Fam Dev: Lifespan</td>
<td></td>
</tr>
<tr>
<td>EDEC 160</td>
<td>Early Childhood through Adolescent Development</td>
<td></td>
</tr>
<tr>
<td>&amp; FCS 261</td>
<td>and Adult Development and Aging</td>
<td></td>
</tr>
<tr>
<td>EDU 497</td>
<td>Methods (5-12 Family &amp; Cons Sci)</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 263</td>
<td>Relationships and Fam Systems</td>
<td>3</td>
</tr>
<tr>
<td>FCS 219</td>
<td>Apparel Construction</td>
<td>3</td>
</tr>
<tr>
<td>FCS 337</td>
<td>Personal and Family Finance I</td>
<td>3</td>
</tr>
<tr>
<td>FCS 450</td>
<td>Curric Dev in FCS Education</td>
<td>3</td>
</tr>
<tr>
<td>NUTR 221CS</td>
<td>Basic Human Nutrition</td>
<td>3</td>
</tr>
<tr>
<td>FCS 218</td>
<td>Design, Fashion, and Textiles</td>
<td>3</td>
</tr>
<tr>
<td>NUTR 226</td>
<td>Food Fundamentals</td>
<td>3</td>
</tr>
<tr>
<td>NUTR 227</td>
<td>Food Fundamentals Lab</td>
<td>2</td>
</tr>
</tbody>
</table>

Total Credits 32-35

Faculty

Nontenure-Track Instructor

Anacker, Melody
Burroughs, Carol Staben
Franklin, Kathryn
Kaiser, D. Coleen

Nontenure-Track Teaching Professor

Gamble, Janet
Hartman, Kimberly

Nontenure-Track Instructor; Director, Human Development Clinic

Klafriere, Ronald

Nontenure-Track Instructor; Director Montana Dietetic Internship

Lafriere, Ronald

Nontenure-Track Instructor

McGahan, Milica
Morrison, Wendy Bianchini

Nontenure-Track Instructor; Director Montana Dietetic Internship

Rizzuto, Jamie

Taylor, Johnathan

Nontenure-Track Instructor; Director Montana Dietetic Internship

Wanago, Nicole Chinadle

Adjunct Assistant Professors

Blank, Cheryl
Donahoe, Patrick
Wilson, Robert

Assistant Professors

Ahmed, Selena
Byker, Carmen
Colton, Nancy
Koltz, Rebecca
Assistant Professor
Park, Jaebum
Assistant Professor
Simonds, Vanessa
Assistant Professor
Tarabochia, Dawn
Assistant Professor
Vaterlaus, J. Mitchell
Assistant Professor
Warthen, Cristen
Assistant Professor

Associate Professors
Harmon, Alison
Associate Professor
Haynes, Deborah
Associate Professor and Associate Dean of Student Affairs
Hunts, Holly
Associate Professor
Osborne, Sandra
Associate Professor
Owens, Lynn
Associate Professor
Rink, Elizabeth
Associate Professor
Seifert, John
Associate Professor

Professors
Bailey, Sandra
Department Head and Professor
Heil, Daniel
Professor
Miles, Mary
Professor
Nelson, Mark
Professor
Paul, Lynn
Professor
Stewart, C. Craig
Professor

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

<table>
<thead>
<tr>
<th>Course</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>Year Total:</td>
<td>6</td>
</tr>
</tbody>
</table>

Sophomore Year

<table>
<thead>
<tr>
<th>Course</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 496 - Methods: K-12 Modern Languages</td>
<td>4</td>
</tr>
<tr>
<td>Year Total:</td>
<td>10</td>
</tr>
</tbody>
</table>

Junior and Senior Year

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Take 12 additional upper division FRCH credits.</td>
<td>12</td>
</tr>
<tr>
<td>Year Total:</td>
<td>12</td>
</tr>
</tbody>
</table>

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</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>GRMN 101 - Elementary German I</td>
<td>3</td>
</tr>
<tr>
<td>GRMN 102D - Elementary German II</td>
<td>3</td>
</tr>
<tr>
<td>GRMN 201D - Intermediate German I</td>
<td>3</td>
</tr>
<tr>
<td>GRMN 202D - Intermediate German II</td>
<td>3</td>
</tr>
<tr>
<td>GRMN 301 - Oral and Written Expression I</td>
<td>3</td>
</tr>
<tr>
<td>GRMN 302 - Oral and Written Expression II</td>
<td>3</td>
</tr>
<tr>
<td>EDU 496 - Methods: K-12 Modern Languages</td>
<td>4</td>
</tr>
<tr>
<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>6</td>
</tr>
</tbody>
</table>

Total Credits: 28

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</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>PSCI 2101S - Introduction to American Government</td>
<td>3</td>
</tr>
<tr>
<td>PSCI 230D - Introduction to International Relations</td>
<td>3</td>
</tr>
<tr>
<td>PSCI 2141S - Principles of Political Science</td>
<td>3</td>
</tr>
<tr>
<td>Choose two of the following (American Institution or Advisor approved courses):</td>
<td>6</td>
</tr>
<tr>
<td>PSCI 346 - American Presidency</td>
<td></td>
</tr>
<tr>
<td>PSCI 306 - Legislative Process</td>
<td></td>
</tr>
<tr>
<td>PSCI 341 - Political Parties and Elections</td>
<td></td>
</tr>
<tr>
<td>PSCI 471 - American Constitutional Law</td>
<td></td>
</tr>
<tr>
<td>PSCI 302 - Media &amp; Politics</td>
<td></td>
</tr>
<tr>
<td>Choose two of the following (Political Processes and International/Political Theory or Advisor approved course):</td>
<td>6</td>
</tr>
<tr>
<td>PSCI 436 - Politics of Food &amp; Hunger</td>
<td></td>
</tr>
<tr>
<td>PSCI 356 - Classical Political Thought</td>
<td></td>
</tr>
<tr>
<td>PSCI 439 - International Human Rights</td>
<td></td>
</tr>
<tr>
<td>PSCI 354 - Contemporary Issues in Political Theory</td>
<td></td>
</tr>
<tr>
<td>EDU 497 - Methods (5-12 Social Studies)</td>
<td>3</td>
</tr>
</tbody>
</table>

Total Credits: 24

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</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>HSTR 101IH - Western Civilization I</td>
<td>4</td>
</tr>
<tr>
<td>HSTR 102IH - Western Civilization II</td>
<td>4</td>
</tr>
<tr>
<td>HSTA 101IH - American History I</td>
<td>4</td>
</tr>
</tbody>
</table>

Total Credits: 28
### 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</th>
<th>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>
</tbody>
</table>

**Total Credits:** 30

### 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</th>
<th>Title</th>
<th>Credits</th>
</tr>
</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></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>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></td>
</tr>
<tr>
<td>PHSX 224</td>
<td>Physics III</td>
<td></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>
</tbody>
</table>

Choose one of the following:

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHSX 320</td>
<td>Classical Mechanics</td>
<td>3</td>
</tr>
<tr>
<td>PHSX 423</td>
<td>Electricity and Magnetism I</td>
<td></td>
</tr>
<tr>
<td>Physics elective (200 level or above)</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Approved elective in Biology, Chemistry, or Earth Science</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>EDU 497</td>
<td>Methods (5-12 Science)</td>
<td>3</td>
</tr>
</tbody>
</table>

**Total Credits:** 31-32

### Technology Education 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>TE 207</td>
<td>Materials and Processes</td>
<td>4</td>
</tr>
<tr>
<td>AGED 333</td>
<td>Construction Technology or ARCH 241</td>
<td>3</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>DDSN 114</td>
<td>Introduction to CAD</td>
<td>3</td>
</tr>
<tr>
<td>TE 330</td>
<td>Alternative Power/Enrgy Tech</td>
<td>3</td>
</tr>
<tr>
<td>TE 331</td>
<td>Electronic Communication Technology</td>
<td>4</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>
</tbody>
</table>

**Total Credits:** 28

### 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.

### Technology Education Broadfield Teaching Option

<table>
<thead>
<tr>
<th>Program Sequence</th>
<th>Freshman Year</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHMY 121IN - Introduction to General Chemistry</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>COM 110US - or EDU 101US - Teaching and Learning</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>EDU 202 - Early Field Experience</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>WRIT 101W - College Writing I</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>FCS 101IS - Indiv and Fam Dev: Lifespan or EDEC 160 - Early Childhood through Adolescent Development</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>TE 101 - Intro to Technology Ed</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>ELE 101 - Intro Electrical Fundamentals</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>DDSN 114 - Introduction to CAD</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>University Core and Electives</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td>Year Total:</td>
<td>30</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Sophomore Year</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>TE 207 - Materials and Processes</td>
<td>4</td>
</tr>
<tr>
<td>or EDU 223IS - Educ Psych and Adolescent Dev</td>
<td>3</td>
</tr>
<tr>
<td>or EDU 222IS - Educ Psych &amp; Child Development</td>
<td>3</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>Year Total:</td>
<td>30</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Junior Year</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>AGED 333 - Construction Technology or ARCH 241 - Building Construction I</td>
<td>3</td>
</tr>
<tr>
<td>TE 330 - Alternative Power/Enrgy Tech</td>
<td>3</td>
</tr>
<tr>
<td>EDU 382 - Assessmnt, Curric, Instructn</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>Year Total:</td>
<td>30</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Senior Year</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>TE 353 - Teaching Practices</td>
<td>1</td>
</tr>
<tr>
<td>TE 406 - Curriculm &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>12</td>
</tr>
<tr>
<td>EDU 495 - Student Teaching</td>
<td>2</td>
</tr>
<tr>
<td>Total Program Credits:</td>
<td>120</td>
</tr>
</tbody>
</table>

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.

### Industrial Technology Option

<table>
<thead>
<tr>
<th>Freshman Year</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>M 151Q - Precalculus</td>
<td>4</td>
</tr>
<tr>
<td>COM 110US - 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>ELE 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>Year Total:</td>
<td>30</td>
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</table>

<table>
<thead>
<tr>
<th>Sophomore Year</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>or STAT 216Q - Introduction to Statistics</td>
<td>3</td>
</tr>
<tr>
<td>TE 207 - Materials and Processes or M 165Q - Calculus for Technology I</td>
<td>3</td>
</tr>
<tr>
<td>EDU 250CS - Technology and Society</td>
<td>3</td>
</tr>
<tr>
<td>University Core and Electives</td>
<td>11</td>
</tr>
<tr>
<td>Year Total:</td>
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</tr>
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</table>

<table>
<thead>
<tr>
<th>Junior Year</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>AGED 333 - Construction Technology or ARCH 241 - Building Construction I</td>
<td>3</td>
</tr>
<tr>
<td>PHSX 205 - College Physics I</td>
<td>4</td>
</tr>
<tr>
<td>TE 330 - Alternative Power/Enrgy 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>Year Total:</td>
<td>30</td>
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</table>

<table>
<thead>
<tr>
<th>Senior Year</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>Year Total:</td>
<td>20-30</td>
</tr>
</tbody>
</table>

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.
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/nutrition science, exercise science/kinesiology, early childhood education and child services, and family and consumer sciences. 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 masters degrees with options in counseling, including marriage and family counseling, mental health counseling, and school counseling; family and consumer sciences, including early childhood education; family financial planning; exercise and nutrition sciences; and food, family and community health. See the graduate catalog for additional information on graduate Health and Human Development programs.

In addition to the career options, the department offers recreational activity courses in billiards, bowling, skiing, and snowboarding. Physical activity courses are offered as a service to the general student population with no prerequisite. 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.

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 Teaching (5-12) or Non-Teaching options; a B.S. in Food and Nutrition with options in Dietetics, 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); Family and Consumer Sciences (including early childhood education); Family Financial Planning; Exercise and Nutrition Sciences (including exercise physiology and nutrition in sport and coaching sciences); and Food, Family and Community Health (including sustainable food systems and family and community health).

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 and in Human Development. 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 section of this catalog.

Degree Requirements

Bachelor of Science degrees in Community Health, Early Childhood Education and Child Services, Family and Consumer Sciences (Non-Teaching), 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.

The Master of Science 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 Food, Family and Community Health Sciences. A minimum of 36 credits is required for the Family Financial Planning program. 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/acccredited-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 three-course series 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 and the restricted electives 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 and the restricted electives will be eligible to apply for the CFLE (http://www.ncf.org/cle-certification) granted by the National Council on Family Relations (http://www.ncf.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 employees 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) (MHSA) 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**
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-baccalaurate supervised professional experience or internship. Upon its completion, the student may sit for the RD 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 RD status enables a person to become licensed in Montana as a Licensed Nutritionist by the Board of Medical Examiners (http://bsd.dli.mt.gov/license/bsd_boards/med_board/board_page.asp).

**Academic Advisors**
The Health and Human Development academic advising office, staffed with academic advisors to serve the needs of students, is located in 121 Marga Hosaecus Fitness Center. Students are expected to meet with an advisor each semester to discuss their plan of study, select courses, and register for courses. 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 hhdadvising@montana.edu.

**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. 143)
- Early Childhood Education and Child Services Major (p. 144)
- Family and Consumer Sciences Major (p. 147)
- Family and Consumer Sciences Major - Teaching Option (p. 146)
- Family and Consumer Sciences Major - Non-Teaching Option (p. 145)
- Food and Nutrition Major (p. 147)
- Food and Nutrition Major with Dietetics Option (p. 147)
- Food and Nutrition Major with Nutrition Science Option (p. 148)
- Health Enhancement K-12 (Health and Physical Education Teaching) Major (p. 148)
- Health and Human Performance Major with Options in Exercise Science or Kinesiology (p. 149)
- Sustainable Food Systems Option (p. 151)

**Undergraduate Minor**
- Coaching Minor (Non-Teaching) (p. 143)

**Graduate Programs**
M.S. in Health & Human Development with options in:
- Counseling (p. 311)
- Exercise and Nutrition Sciences (p. 313)
- Family & Consumer Sciences (p. 314)
- Family Financial Planning (http://eu.montana.edu/online/degrees/ffp)
- Food, Family and Community Health Sciences (p. 314)

M.Ed. in School Counseling (p. 311)
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 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 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 Classes

<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: 3-4

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
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<tbody>
<tr>
<td>KIN 105</td>
<td>End of Exercise Science</td>
</tr>
<tr>
<td>KIN 320</td>
<td>Exercise Physiology</td>
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</table>

Choose one of the following: 3

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
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<tbody>
<tr>
<td>CHTH 435</td>
<td>Human Response To Stress</td>
</tr>
<tr>
<td>NUTR 411</td>
<td>Nutrition for Sports/Exercise</td>
</tr>
<tr>
<td>KIN 410</td>
<td>Adv Strength Training and Cond</td>
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</table>

### Elective Classes **

Choose three of the following: 3-4

<table>
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<th>Title</th>
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</thead>
<tbody>
<tr>
<td>COA 256</td>
<td>Coaching Track and Field</td>
</tr>
<tr>
<td>COA 316</td>
<td>Football Coaching Theory</td>
</tr>
<tr>
<td>COA 317</td>
<td>Basketball Coaching Theory</td>
</tr>
<tr>
<td>COA 318</td>
<td>Soccer Coaching Theory</td>
</tr>
<tr>
<td>COA 319</td>
<td>Volleyball Coaching Theory</td>
</tr>
</tbody>
</table>

** Total Credits: 28-30

* 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</th>
<th>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></td>
<td>3</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>
<td>11</td>
<td></td>
</tr>
</tbody>
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Year Total: 30

### Sophomore Year

<table>
<thead>
<tr>
<th>Course</th>
<th>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>CHTH 205</td>
<td>Drugs and Society</td>
<td>3</td>
</tr>
<tr>
<td>CHTH 210</td>
<td>Foundations in Community Health</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>
</tbody>
</table>
Supporting Courses (21-35 credits)
Select supporting courses from the list below. Select courses that will best complement your professional goals in community health. Courses may be counted only once on your program of study. Check prerequisites to all courses.

**Junior Year**
- **Credits**
- CHTH 317 - Health Behavior Theories 3
- CHTH 435 - Human Response To Stress 3
- FCS 359 - Theor Skills for Helping Relat 3
- FCS 371 - Research Methods in HHD 3
- FCS 465R - Family Law & Public Policy 3
- HTH 455 - The Ethic of Care 3
- Supporting Courses 12
- Year Total: 30

**Senior Year**
- **Credits**
- CHTH 428 - Health Disparities 3
- CHTH 440 - Principles Of Epidemiology 3
- CHTH 445 - Program Planning for CH 3
- CHTH 4XX - Program Eval for CH Pract 3
- CHTH 498 - Internship 6
- HADM 445 - Managing Hlthcare Orgnztns 3
- Supporting Courses 9
- Year Total: 30

**Total Program Credits**: 120

**Certifications**
Graduates of the program may pursue certification as a Community Health Education Specialist (CHES). Please see a Community Health faculty member for additional information.

**Early Childhood Education and Child Services Major**
The early childhood education and child services (ECE&CS) major emphasizes the dual focus of education and services within the context of families, educational and child service settings, communities, and society. Course work and field experience focuses on early childhood education, child development, developmentally appropriate practices, early intervention with children with special needs, assessment and intervention, advocacy, and program administration. Additionally, the ECE&CS program provides a distance education program to Montana Tribal Colleges and respective HeadStart Programs through the Early Childhood Education Distance Partnership Program. Graduates of the ECE&CS program are highly qualified for teaching, administration, and advocacy careers in a wide variety of settings including early childhood education, child care-related programs and businesses, early intervention with children with special needs and preschool special education settings, child services and child-focused 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, occupational therapy, speech-language pathology, 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**
- **Credits**
- EDEC 160 - Early Childhood through Adolescent Development 3
The family and consumer sciences non-teaching option emphasizes the family as a dynamic social unit and examines diverse families in contemporary society. 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 development across the lifespan, changing family structures, intergenerational relations. Additionally, human response to stress and crisis, family policies and laws, family finance and economics, work and family issues, and human service delivery and decision-making are included.

The family and consumer sciences non-teaching option provides a strong background for students seeking careers in human services, family life education, family policy, and financial counseling. However, graduate training will be necessary for students wishing to enter the counseling/therapy fields. The curriculum prepares students to work in a wide range of organizations and settings, state or federal agencies, nonprofit settings, and for admission to graduate programs in family science, family resource management, human development, social work, law, and other related behavioral and social science disciplines. Also, graduates of the program may be involved in family-owned business and work in occupations requiring knowledge of family finance including financial counseling.

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 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>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, Clls, and Fam Diver</td>
<td>3</td>
</tr>
<tr>
<td>FCS 465R</td>
<td>Family Law &amp; Public Policy</td>
<td>3</td>
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<tr>
<td>NUTR 221CS</td>
<td>Basic Human Nutrition</td>
<td>3</td>
</tr>
<tr>
<td>Take the following:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FCS 338</td>
<td>Personal and Family Finance II</td>
<td>3-6</td>
</tr>
<tr>
<td>&amp; FCS 339</td>
<td>and Family Financial Counseling</td>
<td></td>
</tr>
<tr>
<td>or FCS 359</td>
<td>Theor Skills for Helping Relat</td>
<td></td>
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</table>

| Total Credits | 39-42 |

**Freshman Year**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</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>
<td>3</td>
</tr>
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<td>WRIT 101W</td>
<td>College Writing I</td>
<td>3</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>CTHTH 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>
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<tr>
<td>University Core and Electives</td>
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<tr>
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</table>
### Family & Consumer Sciences Major - Teaching Option

Family and consumer sciences students learn to work through credit and non-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 is in synch with 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.

| Both teaching and non-teaching options take the following core classes: |
| --- | --- |
| FCS 101IS | Indiv and Fam Dev: Lifespan |
| FCS 138 | Srvy of Fam Fin and Cons Issue |
| FCS 239 | Contemporary Consumer Issues |

<table>
<thead>
<tr>
<th>Junior Year</th>
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<tbody>
<tr>
<td>CTHH 435 - Human Response To Stress</td>
<td>3</td>
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<tr>
<td>FCS 337 - Personal and Family Finance I</td>
<td>3</td>
</tr>
<tr>
<td>FCS 371 - Research Methods in HHD</td>
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<td>FCS 460 - Parenting</td>
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<td>Choose one of the following:</td>
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<tr>
<td>FCS 338 - Personal and Family Finance II &amp; FCS 339 - Family Financial Counseling or FCS 359 - Theor Skills for Helping Relat</td>
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<tr>
<td>FCS 437 - Managing Work and Family</td>
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<tr>
<td>FCS 454 - Professional Issues-Senior Sem</td>
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<td>FCS 455R - Program Plan and Admin in FCS</td>
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<tr>
<td>FCS 457 - Family Life Education</td>
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<tr>
<td>FCS 464 - Gndr, Rce, Clss, and Fam Diver</td>
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<td>FCS 465R - Family Law &amp; Public Policy</td>
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| Total Program Credits | 120 |

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<tr>
<td>CTHH 205 - Drugs and Society</td>
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<td>FCS 101IS - Indiv and Fam Dev: Lifespan</td>
<td>3</td>
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<tr>
<td>FCS 138 - Srvy of Fam Fin and Cons Issue</td>
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<tr>
<td>Choose one of the following:</td>
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<tr>
<td>EDEC 160 - Early Childhood through Adolescent Development or FCS 261 - Adult Development and Aging</td>
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<td>M 1xx--&quot;C&quot; or better in any 100-level or above M course</td>
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<tr>
<td>EDU 202 - Early Field Experience</td>
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<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 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 457 - Family Life Education</td>
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<tr>
<td>FCS 460 - Parenting</td>
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<td>Choose one of the following:</td>
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<tr>
<td>FCS 464 - Gndr, Rce, Clss, and Fam Diver or FCS 465R</td>
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<tr>
<td>Family Law &amp; Public Policy</td>
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<tr>
<td>NUTR 221CS - Basic Human Nutrition</td>
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<tbody>
<tr>
<td>EDSP 306 - Exceptional Learners</td>
<td>3</td>
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<tr>
<td>EDSP 307 - Exceptional Learners Lab</td>
<td>1</td>
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<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>
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<tr>
<td>FCS 371 - Research Methods in HHD</td>
<td>3</td>
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<tr>
<td>FCS 437 - Managing Work and Family</td>
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<td>FCS 460 - Parenting</td>
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<tr>
<td>Year Total</td>
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</table>
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 a common core of foundation courses in content areas based upon American Association of Family and Consumer Sciences (AAFCFS) standards. In addition, students take restricted supporting courses in the program.

Non-Teaching Option (p. 145)
Teaching Option (p. 146)

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. 147) is designed for students wishing to become a registered dietitian. 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. 148) 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. 147)
Nutrition Science Option (p. 148)

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 and 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.
### 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 Code</th>
<th>Course Title</th>
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</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>M 161Q</td>
<td>Survey of Calculus</td>
<td>4</td>
</tr>
<tr>
<td>PSYX 100IS</td>
<td>Intro to Psychology</td>
<td>4</td>
</tr>
<tr>
<td>STAT 216Q</td>
<td>Introduction to Statistics</td>
<td>3</td>
</tr>
<tr>
<td>WRIT 101W</td>
<td>College Writing I</td>
<td>3</td>
</tr>
<tr>
<td>Choose one of the following:</td>
<td></td>
<td></td>
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<tr>
<td>COMX 111US</td>
<td>- Introduction to Public Speaking (formerly COM 110US)</td>
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<tr>
<td>US 101US</td>
<td>First Year Seminar</td>
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</table>
| University Core and Electives | | 5

**Year Total:** 30

### Sophomore Year

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<tbody>
<tr>
<td>BIOB 260</td>
<td>Cellular and Molecular Biology</td>
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</tr>
<tr>
<td>BIOH 201</td>
<td>Hum Anatomy &amp; Physiology I</td>
<td>5</td>
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<tr>
<td>CHMY 321</td>
<td>Organic Chemistry I</td>
<td>4</td>
</tr>
<tr>
<td>CHMY 323</td>
<td>Organic Chemistry II</td>
<td>4</td>
</tr>
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<td>NUTR 221CS</td>
<td>Basic Human Nutrition</td>
<td>3</td>
</tr>
<tr>
<td>NUTR 395</td>
<td>Pract: Quant Foods Prod &amp; Mgmt</td>
<td>3</td>
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<tr>
<td>NUTR 401</td>
<td>Nutrition Assessment/Counsel</td>
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**Year Total:** 30

### Junior Year

<table>
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<tbody>
<tr>
<td>CHTH 317</td>
<td>Health Behavior Theories</td>
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<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 426</td>
<td>Medical Nutrition Therapy II</td>
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<tr>
<td>NUTR 494</td>
<td>Seminar</td>
<td>1</td>
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<tr>
<td>NUTR 499</td>
<td>Capstone for Dietetics</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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**Year Total:** 11

**Total Program Credits:** 120

See the Food and Nutrition major website at [http://www.montana.edu/hhd/](http://www.montana.edu/hhd/) for a suggested list of electives.

### 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/](http://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:

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.

**Freshman Year**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>COA 205</td>
<td>- Introduction to Coaching</td>
<td>3</td>
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<tr>
<td>DANC 150</td>
<td>- Social Dance</td>
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<tr>
<td>COMX 111US</td>
<td>- Introduction to Public Speaking (formerly COM 110US)</td>
<td>3</td>
</tr>
<tr>
<td>FCS 101IS</td>
<td>- Indiv and Fam Dev: Lifespan</td>
<td>3</td>
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<tr>
<td>HEE 195</td>
<td>- Paraprofessional Experience I</td>
<td>1</td>
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<tr>
<td>HEE 306</td>
<td>- Methods of Cond Act</td>
<td>3</td>
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<tr>
<td>KIN 105</td>
<td>- Fnd of Exercise Science</td>
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<td>LSCI 121</td>
<td>- Library Research Skills</td>
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<td>M 145Q</td>
<td>- Math for the Liberal Arts</td>
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<td>WRIT 101W</td>
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**Sophomore Year**

<table>
<thead>
<tr>
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<th>Course Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>CHTH 205</td>
<td>- Drugs and Society</td>
<td>3</td>
</tr>
<tr>
<td>COA 316</td>
<td>- Football Coaching Theory</td>
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<tr>
<td>EDU 211D</td>
<td>- Multicultural Education</td>
<td>3</td>
</tr>
<tr>
<td>EDU 223S</td>
<td>- Educ Psych and Adolescent Dev</td>
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<tr>
<td>EDU 370</td>
<td>- Integrating Tech into Educ</td>
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<tr>
<td>HEE 305</td>
<td>- Methods of Teaching Mvmt Expl</td>
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<tr>
<td>HTH 220</td>
<td>- Human Mvmt Expl</td>
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<tr>
<td>KIN 221</td>
<td>- Hlth Anatomy &amp; Physiology</td>
<td>3</td>
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**Junior Year**

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<tr>
<td>COA 256</td>
<td>- Coaching Track and Field</td>
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</tr>
<tr>
<td>COA 319</td>
<td>- Volleyball Coaching Theory</td>
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<tr>
<td>EDU 382</td>
<td>- Assessmt, Curric, Instructn</td>
<td>3</td>
</tr>
<tr>
<td>EDU 397</td>
<td>- Methods</td>
<td>3</td>
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<tr>
<td>EDU 497</td>
<td>- Methods</td>
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<td>FCS 371</td>
<td>- Research Methods in HHD</td>
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<tr>
<td>HEE 310</td>
<td>- Methods of Adapted HE</td>
<td>3</td>
</tr>
<tr>
<td>KIN 322</td>
<td>- Kinesiology</td>
<td>4</td>
</tr>
<tr>
<td>University Core and Electives</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td><strong>Year Total:</strong></td>
<td><strong>31</strong></td>
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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>COA 317</td>
<td>- Basketball Coaching Theory</td>
<td>1</td>
</tr>
<tr>
<td>COA 318</td>
<td>- Soccer Coaching Theory</td>
<td>1</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>6</td>
</tr>
<tr>
<td>EDU 495</td>
<td>- Student Teaching</td>
<td>6</td>
</tr>
<tr>
<td>HEE 430</td>
<td>- Instrc Design in HE</td>
<td>3</td>
</tr>
<tr>
<td>HTH 455</td>
<td>- The Ethic of Care</td>
<td>3</td>
</tr>
<tr>
<td>KIN 320</td>
<td>- Exercise Physiology</td>
<td>4</td>
</tr>
<tr>
<td>KIN 440R</td>
<td>- Sport Psychology</td>
<td>3</td>
</tr>
<tr>
<td>University Core and Electives</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td><strong>Year Total:</strong></td>
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</table>

**Total Program Credits: 128**

**Electives (select 7-11 credits from the following courses)**

<table>
<thead>
<tr>
<th>Course Code</th>
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<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHTH 435</td>
<td>- Human Response To Stress</td>
<td>3</td>
</tr>
<tr>
<td>COA 395</td>
<td>- Practicum:Coaching Application (may be repeated)</td>
<td>1</td>
</tr>
<tr>
<td>COA 405</td>
<td>- Advanced Concepts in Coaching</td>
<td>3</td>
</tr>
<tr>
<td>KIN 270</td>
<td>- Exercise Prog for Older Adults</td>
<td>3</td>
</tr>
<tr>
<td>KIN 410</td>
<td>- Adv Strength Training and Cond</td>
<td>3</td>
</tr>
<tr>
<td>KIN 415</td>
<td>- Adv Exercise Test and Prescrip</td>
<td>4</td>
</tr>
<tr>
<td>NUTR 411</td>
<td>- Nutrition for Sports/Exercise</td>
<td>3</td>
</tr>
<tr>
<td>Free electives - Select 6 credits from any University Course</td>
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<td></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.

**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 rehabilitative 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; KIN 490R; 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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</thead>
<tbody>
<tr>
<td>BIOB 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>
<td>4</td>
</tr>
<tr>
<td>University Core and Electives</td>
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<tr>
<td>Year Total:</td>
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**Sophomore Year**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOH 201 - Hum Anatomy &amp; Physiology I</td>
<td>5</td>
</tr>
<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>
<tr>
<td>PHSX 205 - College Physics I &amp; PHSX 207 - College Physics II</td>
<td>8</td>
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<tr>
<td>PHSX 220 - Physics I (w/ calculus) &amp; PHSX 222 - Physics II (w/ calculus)</td>
<td>8</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>University Core and Electives</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>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>Year Total:</td>
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**Senior Year**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>Choose one of the following:</td>
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<tr>
<td>KIN 415 - Adv Exercise Test and Prescrip</td>
<td>2-6</td>
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<tr>
<td>KIN 490R - Undergraduate Research</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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<td>Year Total:</td>
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<tr>
<td>Total Program Credits:</td>
<td>120</td>
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</tbody>
</table>

**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 490R, Undergraduate Research; 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>
</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>
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</tr>
<tr>
<td>BIOL 201 - Hum Anatomy &amp; Physiology I</td>
<td>10-12</td>
</tr>
<tr>
<td>KIN 221 - Hlth Anatomy &amp; Physiology</td>
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**Sophomore Year**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
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</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>
<td>3</td>
</tr>
<tr>
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<tr>
<td>Year Total:</td>
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**Junior Year**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<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>
<td>University Core and Approved Electives</td>
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**Senior Year**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Choose two of the following:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>6</td>
</tr>
</tbody>
</table>
consulting firms that solve problems associated with agroecosystems or science, biochemistry, and policy and planning courses that enable them to cropping systems, pest management, applied ecology, soil and water may select from an array of upper division courses in natural ecosystems, technologies like remote sensing and geographic information systems and environmental science principles. Students will also learn how new this knowledge in courses that demonstrate the application of ecology and managed ecosystems. Furthermore, the curriculum will build on environments. In the Agroecology curriculum, students will develop a and microorganisms), and the physical and chemical characteristics of environments. 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, soil and water science, biochemistry, and policy and planning courses 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, 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.
**Agroecology Option**

**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. 152)
- Sustainable Food Systems Option (p. 153)
- Sustainable Crop Production Option (p. 152)
- Sustainable Livestock Production Option (p. 98)

**Agroecology Option**

**Land Resources and Environmental Sciences**

<table>
<thead>
<tr>
<th>Freshman Year</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENSC 110 - Lnd Res Environ Sciences</td>
<td>3</td>
</tr>
<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>
</tr>
<tr>
<td>CHMY 141 - College Chemistry I</td>
<td>4</td>
</tr>
<tr>
<td>Take one of the following</td>
<td>3</td>
</tr>
<tr>
<td>ECNS 101IS - Economic Way of Thinking</td>
<td>3</td>
</tr>
<tr>
<td>M 121Q - College Algebra</td>
<td></td>
</tr>
<tr>
<td>M 145Q - Math for the Liberal Arts</td>
<td></td>
</tr>
<tr>
<td>WRIT 101W - College Writing I</td>
<td>3</td>
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<tr>
<td>University Core and Electives</td>
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<tr>
<td>Year Total:</td>
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</table>

**Sophomore Year**

<table>
<thead>
<tr>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOB 160 - Principles of Living Systems</td>
</tr>
<tr>
<td>CHMY 143 - College Chemistry II</td>
</tr>
<tr>
<td>Choose one of the following:</td>
</tr>
<tr>
<td>BCH 104RN - The Biochemistry of Health for Non-Science Majors</td>
</tr>
<tr>
<td>CHMY 123 - Introduction of Organic Chemistry and Biochemistry</td>
</tr>
<tr>
<td>CHMY 211 - Elements of Organic Chemistry</td>
</tr>
<tr>
<td>ANSC 222 - Livestock in Sustain Systems</td>
</tr>
<tr>
<td>ECHM 205CS - Energy and Sustainability</td>
</tr>
<tr>
<td>ENSC 245IN - Soils</td>
</tr>
<tr>
<td>NUTR 221CS - Basic Human Nutrition</td>
</tr>
<tr>
<td>Take one of the following</td>
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</tbody>
</table>

**Sustainable Crop Production Option**

**Plant Sciences and Plant Pathology**

<table>
<thead>
<tr>
<th>Freshman Year</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>SFBS 146 - Introduction to Sustainable Food and Bioenergy Systems</td>
<td>3</td>
</tr>
<tr>
<td>BIOM 170IN - Principles of Biological Diversity</td>
<td>4</td>
</tr>
<tr>
<td>ECNS 101IS - Economic Way of Thinking</td>
<td>3</td>
</tr>
<tr>
<td>BIOB 110CS - Introduction to Plant Biology</td>
<td>3</td>
</tr>
<tr>
<td>ENSC 110 - Lnd Res Environ Sciences</td>
<td>3</td>
</tr>
<tr>
<td>ENSC 245IN - Soils</td>
<td>3</td>
</tr>
<tr>
<td>Select one of the following:</td>
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</tr>
<tr>
<td>CHMY 121IN - Introduction of General Chemistry</td>
<td></td>
</tr>
<tr>
<td>CHMY 141 - College Chemistry I</td>
<td>3</td>
</tr>
<tr>
<td>Select one of the following:</td>
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</tr>
<tr>
<td>M 121Q - College Algebra</td>
<td></td>
</tr>
<tr>
<td>M 145Q - Math for the Liberal Arts</td>
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</tr>
<tr>
<td>University Core and Electives</td>
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**Sophomore Year**

<table>
<thead>
<tr>
<th>Credits</th>
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<tbody>
<tr>
<td>NUTR 221CS - Basic Human Nutrition</td>
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<td>Course Code</td>
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</tr>
<tr>
<td>AGSC 341</td>
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<td>BIOM 103IN</td>
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<td>HORT 105</td>
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<td>SFBS 296</td>
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<tr>
<td>SFBS 298</td>
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<tr>
<td>NASX 232D</td>
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<tr>
<td>PSCI 230D</td>
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<tr>
<td>SFBS 491</td>
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<td>University Core and Electives</td>
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<tr>
<td>Total Program Credits</td>
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**Freshman Year**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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</thead>
<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</td>
<td>4</td>
</tr>
<tr>
<td>ECNS 101IS</td>
<td>Economic Way of Thinking</td>
<td>3</td>
</tr>
<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 Systems</td>
<td>3</td>
</tr>
<tr>
<td>SFBS 296</td>
<td>Practicum: Towne’s Harvest</td>
<td>3</td>
</tr>
<tr>
<td>SFBS 298</td>
<td>Internship</td>
<td>3</td>
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<td>5-6</td>
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**Sophomore 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>SFBS 498</td>
<td>Internship</td>
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</tr>
<tr>
<td>SFBS 499</td>
<td>Senior Thesis/Capstone</td>
<td>3</td>
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<tr>
<td>SFBS 451R</td>
<td>Sustainable Food Systems</td>
<td>3</td>
</tr>
<tr>
<td>SFBS 445R</td>
<td>Culinary Marketing: Farm/Table</td>
<td>3</td>
</tr>
<tr>
<td>SFBS 429</td>
<td>Small Business and Entrepreneurship in Food and Health</td>
<td>3</td>
</tr>
<tr>
<td>BMGT 469</td>
<td>Community Entrepreneurship &amp; Nonprofit Management</td>
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<td>or BMGT 469 - Community Entrepreneurship &amp; Nonprofit Management</td>
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**Total Program Credits:** 120

**Directed Electives (choose 18 credits)**

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<td>AGED 353</td>
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<td>Non-Formal Teaching Methods in Agriculture</td>
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<td>BIOE 375</td>
<td>Ecological Responses to Climate Change</td>
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<tr>
<td>or BMGT 469</td>
<td>Community Entrepreneurship &amp; Nonprofit Management</td>
</tr>
</tbody>
</table>

The College of Engineering provides administrative structure and support to the following academic departments and baccalaureate degree programs:

- **Department of Chemical & Biological Engineering (p. 157)**
  - BS Bioengineering
  - BS Chemical Engineering

- **Department of Civil Engineering (p. 159)**
  - BS Civil Engineering
  - Bio-Resources Engineering Option
  - Civil Engineering Option
  - BS Construction Engineering Technology

- **Department of Computer Science (p. 165)**
  - BS Computer Science

- **Department of Electrical & Computer Engineering (p. 167)**
  - BS Computer Engineering
  - BS Electrical Engineering

- **Department of Mechanical & Industrial Engineering (p. 173)**
  - BS Financial Engineering
  - BS Industrial Engineering
  - BS Mechanical Engineering
  - BS Mechanical Engineering Technology

The College of Engineering offers several minors:

- Aerospace (p. 173)
- Computer Science (p. 166)
- Computer Engineering (p. 170)
- Electrical Engineering (p. 172)
- Engineering Management (http://catalog.montana.edu/undergraduate/engineering/mechanical-industrial-engineering/ems-minor)
- Financial Engineering (p. 71)
- Materials (p. 176)
- Mechatronics (p. 179)
- Military Studies: Air Force ROTC (p. 179) and Army ROTC (p. 180)

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:

- Accreditation (p. 155)
- College of Engineering Program Fee (p. 155)
- Total Credit Requirements (p. 156)
- General Education Core (p. 156)
- Electives (p. 156)
- Capstone Design Projects with Student Teams (p. 156)
- Cooperative Education/Internship (p. 156)
- Engineering Minority Program (EMPower) (p. 156)
• 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 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 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 Accreditation Board for Engineering and Technology, 111 Market Place, Suite 1050, Baltimore, MD 21202-4012 - telephone (410) 347-7700:

• Chemical Engineering
• Civil Engineering
• Computer Engineering
• Electrical Engineering
• Industrial Engineering
• Mechanical Engineering

Because the Bioengineering degree is new it has not yet gone through an accreditation review process. The program will seek accreditation in the near future.

The following engineering technology programs are accredited by the Technology Accreditation Commission of Accreditation Board for Engineering and Technology, 111 Market Place, Suite 1050, Baltimore, MD 21202-4012 - telephone (410) 347-7700:

• Construction Engineering Technology
• Mechanical Engineering Technology

The Computer Science program is accredited by the Computing Accreditation Commission of the Accreditation Board for Engineering and Technology, 111 Market Place, Suite 1050, Baltimore, MD 21202-4012 - telephone (410) 347-7700.

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:

- $87.65 per semester for Freshmen (flat rate).
- $125.35 per semester for Sophomores through graduate level (flat rate).
- $49.75 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. The College of Engineering has targeted the enhancement of Native American education as a top priority over the next 5 years. 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, 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, graduate 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

- Bioengineering (p. 157)
- Chemical Engineering (p. 158)

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. 316)
- M.S. in Environmental Engineering (p. 317)
- Master of Engineering In Chemical Engineering (p. 319)
- Master of Engineering in Bioengineering (p. 320)
- Ph.D. in Engineering (p. 320)
- Ph.D. in Materials Science (p. 376)

Bioengineering

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

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<td>Univ Core Electives (IA, IH, IS or D)</td>
<td>3</td>
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<tr>
<td>M 171Q - Calculus I</td>
<td>4</td>
</tr>
<tr>
<td>US or W Core course</td>
<td>3</td>
</tr>
<tr>
<td>US or W Core course</td>
<td>3</td>
</tr>
<tr>
<td>EGEN 102 - Intro to Engineer Comp Apps</td>
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<tr>
<td>Univ Core Electives (IA, IH, IS or D)</td>
<td>3</td>
</tr>
<tr>
<td>CHMY 143 - College Chemistry II</td>
<td>4</td>
</tr>
<tr>
<td>M 172Q - Calculus II</td>
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<tr>
<td>Year Total:</td>
<td>16</td>
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<td>16</td>
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</table>

Sophomore Year

<table>
<thead>
<tr>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fall</td>
</tr>
<tr>
<td>M 273Q - Multivariable Calculus</td>
</tr>
<tr>
<td>PHSX 220 - Physics I (w/ calculus)</td>
</tr>
<tr>
<td>ECHM 201 - Elementary Principles of Chemical and Biological Engineering</td>
</tr>
<tr>
<td>CHMY 211 - Elements of Organic Chemistry</td>
</tr>
<tr>
<td>EBIO 216 - Elem Princ of Bioengineering</td>
</tr>
</tbody>
</table>
### 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 Code</th>
<th>Course Name</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>ECHM 100</td>
<td>Intro to Chemical Engr or EBIO 100 - Intro to Biological Engr</td>
<td>2</td>
</tr>
<tr>
<td>M 171Q</td>
<td>Calculus I</td>
<td>4</td>
</tr>
<tr>
<td>Univ Core Electives (IA, IH, IS or D)</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>US or W Core course</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>CHMY 141</td>
<td>College Chemistry I</td>
<td>4</td>
</tr>
<tr>
<td>M 172Q</td>
<td>Calculus II</td>
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#### Sophomore Year

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
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<tbody>
<tr>
<td>CHMY 211</td>
<td>Elements of Organic Chemistry</td>
<td>5</td>
</tr>
<tr>
<td>M 273Q</td>
<td>Multivariable Calculus</td>
<td>4</td>
</tr>
<tr>
<td>ECHM 201</td>
<td>Elementary Principles of Chemical and Biological Engineering</td>
<td>3</td>
</tr>
<tr>
<td>PHSX 220</td>
<td>Physics I (w/ calculus)</td>
<td>4</td>
</tr>
<tr>
<td>ECHM 321</td>
<td>Chemical Engineering Fluid Mechanics Operations</td>
<td>3</td>
</tr>
<tr>
<td>ECHM 307</td>
<td>Chem Engin Thermodynamics I</td>
<td>3</td>
</tr>
<tr>
<td>ECHM 411R</td>
<td>Chemical Engineering Design I</td>
<td>3</td>
</tr>
<tr>
<td>ECHM 442</td>
<td>Chem Engin Laboratory I</td>
<td>3</td>
</tr>
</tbody>
</table>

### 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.

### Total Program Credits

- **Total Program Credits:** 128

A minimum of 128 credits is required for graduation; 42 of which must be in courses numbered 300 and above.

### ECHM 321 - Chemical Engineering Fluid Mechanics Operations

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
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</tr>
</thead>
<tbody>
<tr>
<td>M 274 - Introduction to Differential Equation</td>
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<tr>
<td>BIOM 360 - General Microbiology</td>
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### ECHM 322 - Chemical Engineering Heat Transfer Operations

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
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<tbody>
<tr>
<td>M 274 - Introduction to Differential Equation</td>
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### ECHM 323 - Chemical Engineering Mass Transfer Operations

<table>
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<th>Course Name</th>
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<tbody>
<tr>
<td>ECHM 442</td>
<td>Chem Engin Laboratory I</td>
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### ECHM 411R - Chemical Engineering Design I

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECHM 411R</td>
<td>Chemical Engineering Design I</td>
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</table>

### ECHM 442 - Chem Engin Laboratory I

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECHM 442</td>
<td>Chem Engin Laboratory I</td>
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</table>

### ECHM 443 - Chem Engin Laboratory II

<table>
<thead>
<tr>
<th>Course Code</th>
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</thead>
<tbody>
<tr>
<td>ECHM 443</td>
<td>Chem Engin Laboratory II</td>
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### ECHM 451 - Chemical Engineering Process

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>ECHM 451</td>
<td>Chemical Engineering Process</td>
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</table>

### ECHM 452 - Chemical Engineering Design II

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>ECHM 452</td>
<td>Chemical Engineering Design II</td>
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### CHMY 373 - Physical Chemistry - Kinetics and Thermodynamics

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
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</thead>
<tbody>
<tr>
<td>CHMY 373</td>
<td>Physical Chemistry - Kinetics and Thermodynamics</td>
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### Technical Electives

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<th>Course Name</th>
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<tbody>
<tr>
<td>ECHM 448</td>
<td>Fundamentals of Engineer Exam</td>
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</tr>
<tr>
<td>ECHM 443</td>
<td>Chem Engin Laboratory II</td>
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</table>

### Year Total: 17

### Total Program Credits: 128

- **Total Program Credits:** 128
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:

• enter the surveying profession and become licensed to practice surveying;
• begin careers in the construction industry; or
• 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
Technology all students can expect to be able to:

Upon graduating with a Bachelor of Science in Construction Engineering, graduates to enter and advance to leadership positions in the construction field. The Construction Engineering Technology Bachelor of Science Program is a technically rigorous and production-oriented program that prepares students to build upon the basic Civil Engineering curriculum with courses that focus on soil, water, and environmental concerns. Bio-Resources Engineering students may take upper level professional electives in chosen areas of Civil Engineering, Mechanical Engineering, Chemical Engineering, Mathematics, Biology, or select courses offered in the College of Agriculture. Professional employment opportunities for Bio-Resources Engineering graduates are with private industries dealing with land reclamation, soil and water remediation, hydraulic and hydrologic design, environmental impact and assessment, and natural resource management. State and federal agencies have also been frequent employers of engineers with Bio-Resources backgrounds.

The Civil Engineering Department also offers both a minor and a non-degree certificate 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;
- engage in the life-long learning necessary to advance professionally in the construction field;
- contribute to society and the construction industry 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:

- enter the surveying profession and become licensed to practice surveying; or
- earn a Professional Master of Science & Engineering Management degree in the Construction Engineering Management Track (p. 374) (this is an online program offered through the Extended University at MSU) or other graduate degrees.

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. 162)
- Bio-Resources Engineering Option (p. 161)
- Construction Engineering Technology (p. 163)
- Land Surveying Minor (p. 165)
- Land Surveying Non-Degree Certificate (p. 165)

Graduate Programs

- M.S. in Civil Engineering (p. 325)
- M.S. in Environmental Engineering (p. 317)
- M.S. in Land Rehabilitation (p. 277)
- Professional Master of Engineering and Management (PMSEM) (p. 374)
- Ph.D. in Engineering (p. 320)

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.

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 Engineering Option

<table>
<thead>
<tr>
<th>Freshman Year</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHMY 141 - College Chemistry I*</td>
<td>4</td>
</tr>
<tr>
<td>M 171Q - Calculus I*</td>
<td>4</td>
</tr>
</tbody>
</table>

| University Core | 3 |
| WRIT 101W - College Writing I* | 3 |
| ECIV 202 - Applied Analysis | 1 |
| CHMY 143 - College Chemistry II* | 4 |
| DDSN 101 - CAD 1-A | 2 |
| M 172Q - Calculus II* | 4 |
| PHSX 220 - Physics I (w/ calculus)* | 4 |
| University Seminar - Choose one of the following: | |
| 3-4 |

| CLS 101US - Knowledge and Community |
| COM 110US - |
| HONR 201US - Texts and Critics: Knowledge |
| US 101US - First Year Seminar |

Year Total: 15 18-19

Sophomore Year

<table>
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<th>Credits</th>
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<tr>
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<td>Choose one of the following:</td>
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<tr>
<td>BMGT 205 - Prof Business Communication</td>
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<tr>
<td>WRIT 201 - College Writing II</td>
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<tr>
<td>WRIT 221 - Intermediate Tech Writing</td>
</tr>
<tr>
<td>HONR 202H - Texts and Critics: Imagination</td>
</tr>
<tr>
<td>BIOB 160 - Principles of Living Systems</td>
</tr>
<tr>
<td>SRVY 230 - Intro to Srvg for Engineers</td>
</tr>
<tr>
<td>EGEN 201 - Engineering Mechanics--Statics*</td>
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<tr>
<td>M 273Q - Multivariable Calculus*</td>
</tr>
<tr>
<td>EGEN 202 - Engineering Mech--Dynamics**</td>
</tr>
<tr>
<td>EGEN 205 - Mechanics of Mtls (equiv 305)**</td>
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<tr>
<td>EGEN 350 - Applied Engr Data Analysis**</td>
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<tr>
<td>or STAT 332 - Statistics for Scientists and Engineers</td>
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<td>University Core</td>
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Year Total: 17-18 15-16

Junior Year

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<td>Choose one of the following:</td>
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<tr>
<td>BIOB 170IN - Principles of Biological Diversity</td>
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<tr>
<td>ENSC 245IN - Soils</td>
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<tr>
<td>ENSC 272CS - Water Resources</td>
</tr>
<tr>
<td>NRSM 240 - Natural Resource Ecology</td>
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<tr>
<td>GPHY 284 - Intro to GIS Science &amp; Cartog</td>
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<tr>
<td>PHSX 222 - Physics II (w/ calculus)</td>
</tr>
<tr>
<td>BIOM 360 - General Microbiology</td>
</tr>
<tr>
<td>ECIV 312 - Structures I**</td>
</tr>
<tr>
<td>ECIV 320 - Geotechnical Engineering**</td>
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<tr>
<td>ECIV 331 - Engineering Hydrology**</td>
</tr>
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<td>EENV 340 - Princ of Envir Engineering**</td>
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<tr>
<td>EGEN 335 - Fluid Mechanics**</td>
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<td>ECIV 308 - Construction Practice**</td>
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<td>ECIV 332 - Engineering Hydraulics*</td>
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<tr>
<td>EGEN 310R - Multidisciplinary Engineering Design *</td>
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<td>EGEN 324 - Applied Thermodynamics</td>
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**Civil Engineering**

**Freshman Year**

<table>
<thead>
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<th>Course Title</th>
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<th>Spring Credits</th>
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<tbody>
<tr>
<td>CHMY 141</td>
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<tr>
<td>M 171Q</td>
<td>Calculus I</td>
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<td>EGEN 115</td>
<td>Engineering Graphics</td>
<td>1</td>
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<tr>
<td>WRIT 101W</td>
<td>College Writing I</td>
<td>3</td>
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<tr>
<td>University Seminar - Choose one of the following:</td>
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<tr>
<td>CLS 101US</td>
<td>Knowledge and Community</td>
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<td>COMX 111US</td>
<td>Introduction to Public Speaking (formerly COM 110US)</td>
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<tr>
<td>HONR 201US</td>
<td>Texts and Critics: Knowledge</td>
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<tr>
<td>US 101US</td>
<td>First Year Seminar</td>
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<tr>
<td>CHMY 143</td>
<td>College Chemistry II</td>
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<td>M 172Q</td>
<td>Calculus II</td>
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<td>PHSX 220</td>
<td>Physics I (w/ calculus)</td>
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<td>University Core</td>
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<tr>
<td>DDSN 101</td>
<td>CAD 1-A</td>
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<tr>
<td>Year Total:</td>
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<td>15-16</td>
<td>17</td>
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**Sophomore Year**

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<th>Course Title</th>
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<th>Spring Credits</th>
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<tr>
<td>BMGT 205</td>
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<td>WRIT 221</td>
<td>Intermediate Tech Writing</td>
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<tr>
<td>HONR 2021H</td>
<td>Texts and Critics: Imagination</td>
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<tr>
<td>SRVY 230</td>
<td>Intro to Srvg for Engineers</td>
<td>3</td>
<td></td>
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<tr>
<td>EGEN 201</td>
<td>Engineering Mechanics--Statics</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>PHSX 222</td>
<td>Physics II (w/ calculus)</td>
<td>4</td>
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<tr>
<td>ECIV 202</td>
<td>Applied Analysis</td>
<td>1</td>
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<tr>
<td>EGEN 202</td>
<td>Engineering Mech--Dynamics</td>
<td>3</td>
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<tr>
<td>EGEN 205</td>
<td>Mechanics of Mtls (equiv 305)</td>
<td>3</td>
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<tr>
<td>EGEN 350</td>
<td>Applied Engr Data Analysis</td>
<td>2-3</td>
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<tr>
<td>M 274</td>
<td>Introduction to Differential Equation</td>
<td>4</td>
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**Professional Elective Courses**

**Water Resources Engineering Group**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>ECIV 431</td>
<td>Open Channel Hydraulics</td>
<td>3</td>
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<tr>
<td>ECIV 435</td>
<td>Closed-Conduit Hydraulics</td>
<td>3</td>
</tr>
<tr>
<td>EENV 434</td>
<td>Groundwater Supply/Remediation</td>
<td>3</td>
</tr>
<tr>
<td>EGEN 435</td>
<td>Fluid Dynamics</td>
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**Environmental Engineering Group**

<table>
<thead>
<tr>
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<th>Course Title</th>
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<tbody>
<tr>
<td>EENV 440</td>
<td>Water Chemistry for Envr Engr</td>
<td>3</td>
</tr>
<tr>
<td>EENV 443</td>
<td>Air Pollution Control</td>
<td>3</td>
</tr>
<tr>
<td>EENV 445</td>
<td>Hazardous Waste Treatment</td>
<td>3</td>
</tr>
<tr>
<td>EENV 447</td>
<td>Hazardous Waste Management</td>
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**Supporting Topics Group**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
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<tbody>
<tr>
<td>BIOE 370</td>
<td>General Ecology (equiv to 270)</td>
<td>3</td>
</tr>
<tr>
<td>EENV 441</td>
<td>Natural Treatment Systems</td>
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<tr>
<td>ECIV 401</td>
<td>Civil Eng Practice and Ethics</td>
<td>1</td>
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<tr>
<td>ECIV 489R</td>
<td>Civil Engineering Design I</td>
<td>2</td>
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<tr>
<td>University Core and Prof. Electives</td>
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</tr>
<tr>
<td>EENV 432</td>
<td>Advanced Engineering Hydrology</td>
<td>3</td>
</tr>
<tr>
<td>ECIV 499R</td>
<td>Capstone: Civil Eng Design II</td>
<td>2</td>
</tr>
<tr>
<td>EGEN 488</td>
<td>Fundamentals of Engineer Exam</td>
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<tr>
<td>University Core and Prof. Electives</td>
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**Year Total:**

<table>
<thead>
<tr>
<th>Credits</th>
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<tbody>
<tr>
<td>128</td>
</tr>
</tbody>
</table>

* Key courses
** Advanced courses
Choose one of the following:  
- BIOB 160 - Principles of Living Systems  
- BIOM 103IN - Unseen Universe: Microbes  
- ENSC 245IN - Soils  
- ERTH 101IN - Earth System Sciences  
- GPHY 284 - Intro to GIS Science & Cartog

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 Title</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>ECIV 307 - Construction Estimating and Bidding</td>
<td>3</td>
</tr>
<tr>
<td>ECIV 309 - Building Information Modeling in Construction</td>
<td>3</td>
</tr>
<tr>
<td>ECIV 404 - Heavy Const Equip and Methods</td>
<td>3</td>
</tr>
<tr>
<td>ECIV 405 - Construction Project Planning and Scheduling</td>
<td>3</td>
</tr>
<tr>
<td>ECIV 414 - Steel Design</td>
<td>3</td>
</tr>
<tr>
<td>ECIV 415 - Design of Masonry Structures</td>
<td>3</td>
</tr>
<tr>
<td>ECIV 416 - Design of Wood and Timber Structures</td>
<td>3</td>
</tr>
<tr>
<td>ECIV 484 - Reinforced Concrete Design</td>
<td>3</td>
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<tr>
<td>ECIV 420 - Earth and Foundation Engr</td>
<td>3</td>
</tr>
<tr>
<td>ECIV 425 - Geotechnical Structures</td>
<td>3</td>
</tr>
<tr>
<td>ECIV 431 - Open Channel Hydraulics</td>
<td>3</td>
</tr>
<tr>
<td>ECIV 435 - Closed-Conduit Hydraulics</td>
<td>3</td>
</tr>
<tr>
<td>ECIV 451 - Highway Pavements</td>
<td>3</td>
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<tr>
<td>ECIV 452 - Traffic Engineering and ITS</td>
<td>3</td>
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<tr>
<td>ECIV 454 - Transportation Planning</td>
<td>3</td>
</tr>
<tr>
<td>ECIV 455 - Survey Data Collection &amp; Analysis</td>
<td>3</td>
</tr>
<tr>
<td>ECIV 456 - Highway Geometric Design</td>
<td>3</td>
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<tr>
<td>ECIV 490R - Undergraduate Research</td>
<td>1-4</td>
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<tr>
<td>ECIV 492 - Independent Study</td>
<td>1-3</td>
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<tr>
<td>ECIV 498 - Internship</td>
<td>2</td>
</tr>
<tr>
<td>EENV 432 - Advanced Engineering Hydrology</td>
<td>3</td>
</tr>
<tr>
<td>EENV 434 - Groundwater Supply/Remediation</td>
<td>3</td>
</tr>
<tr>
<td>EENV 440 - Water Chemistry for Envr Engr</td>
<td>3</td>
</tr>
<tr>
<td>EENV 441 - Natural Treatment Systems</td>
<td>3</td>
</tr>
<tr>
<td>EENV 443 - Air Pollution Control</td>
<td>3</td>
</tr>
<tr>
<td>EENV 445 - Hazardous Waste Treatment</td>
<td>3</td>
</tr>
<tr>
<td>EENV 447 - Hazardous Waste Management</td>
<td>3</td>
</tr>
<tr>
<td>EGEN 415 - Advanced Mechanics of Solids</td>
<td>3</td>
</tr>
<tr>
<td>EGEN 435 - Fluid Dynamics</td>
<td>3</td>
</tr>
<tr>
<td>SRVY 355 - Surveying Calculations</td>
<td>3</td>
</tr>
<tr>
<td>SRVY 361 - Intro Legal Princ in Surveying</td>
<td>3</td>
</tr>
<tr>
<td>SRVY 362 - Public Land Survey System</td>
<td>3</td>
</tr>
<tr>
<td>SRVY 375 - Analytic Photogrammetry and Remote Sensing</td>
<td>2</td>
</tr>
<tr>
<td>SRVY 474 - Project Design in Surveying</td>
<td>3</td>
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</table>

### Construction Engineering Technology

#### Freshman Year

<table>
<thead>
<tr>
<th>Course Title</th>
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<tbody>
<tr>
<td>CHMY 121IN - Introduction to General Chemistry</td>
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<tr>
<td>Course Code</td>
<td>Course Title</td>
</tr>
<tr>
<td>-------------</td>
<td>--------------------------------------------------------</td>
</tr>
<tr>
<td>EGEN 115</td>
<td>Engineering Graphics</td>
</tr>
<tr>
<td>M 151Q</td>
<td>Precalculus</td>
</tr>
<tr>
<td>ECNS 101S</td>
<td>Economic Way of Thinking</td>
</tr>
<tr>
<td>University Seminar</td>
<td>Choose one of the following:</td>
</tr>
<tr>
<td>CLS 101US</td>
<td>Knowledge and Community</td>
</tr>
<tr>
<td>COM 110US</td>
<td></td>
</tr>
<tr>
<td>UH 201US</td>
<td>Texts &amp; Critics: Knowledge</td>
</tr>
<tr>
<td>HONR 201US</td>
<td>Texts and Critics: Knowledge</td>
</tr>
<tr>
<td>ECNS 202</td>
<td>Principles of Macroeconomics</td>
</tr>
<tr>
<td>DDSN 101</td>
<td>CAD 1-A</td>
</tr>
<tr>
<td>M 165Q</td>
<td>Calculus for Technology I</td>
</tr>
<tr>
<td>PHSX 205</td>
<td>College Physics I</td>
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<tr>
<td>University Core</td>
<td>3</td>
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<tr>
<td>WRIT 101W</td>
<td>College Writing I</td>
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</table>

Year Total: 15-16

**Sophomore Year**

<table>
<thead>
<tr>
<th>Course Code</th>
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<tbody>
<tr>
<td>ARCH 241</td>
<td>Building Construction I</td>
<td>3</td>
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<tr>
<td>SRVY 230</td>
<td>Intro to Srvyg for Engineers</td>
<td>3</td>
</tr>
<tr>
<td>EGEN 203</td>
<td>Applied Mechanics</td>
<td>3</td>
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<tr>
<td>M 166Q</td>
<td>Calculus for Technology II</td>
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<tr>
<td>PHSX 207</td>
<td>College Physics II</td>
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<tr>
<td>Choose one of the following:</td>
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<tr>
<td>BMGT 205</td>
<td>Prof Business Communication</td>
<td></td>
</tr>
<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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<td>HONR 202IH</td>
<td>Texts and Critics: Imagination</td>
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<tr>
<td>ETCC 204</td>
<td>Appld Analysis for Const Tech</td>
<td>1</td>
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<tr>
<td>SRVY 273</td>
<td>Route Surveying</td>
<td>3</td>
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<tr>
<td>EMAT 251</td>
<td>Materials Structures and Prop</td>
<td>3</td>
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<tr>
<td>EGEN 208</td>
<td>Applied Strength of Materials</td>
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<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: 16-18</td>
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**Junior Year**

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<tr>
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<tbody>
<tr>
<td>ETCC 302</td>
<td>Soils and Foundations</td>
<td>4</td>
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<tr>
<td>ECIV 308</td>
<td>Construction Practice</td>
<td>3</td>
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<tr>
<td>EGEN 325</td>
<td>Engineering Economic Analysis</td>
<td>3</td>
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<tr>
<td>STAT 216Q</td>
<td>Introduction to Statistics</td>
<td>3</td>
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<tr>
<td>Choose one of the following:</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>
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<tr>
<td>EIND 373</td>
<td>Production Inventory Cost Analysis</td>
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<td>ECIV 307</td>
<td>Construction Estimating and Bidding</td>
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<td>ETCC 310</td>
<td>Concrete Technology</td>
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<tr>
<td>EGEN 310R</td>
<td>Multidisciplinary Engineering Design</td>
<td>3</td>
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<td>EGEN 331</td>
<td>Applied Mechanics of Fluids</td>
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**Senior Year**

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<th>Course Title</th>
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<tbody>
<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>
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<tr>
<td>ECIV 405</td>
<td>Construction Project Planning and Scheduling</td>
<td>3</td>
</tr>
<tr>
<td>EELE 354</td>
<td>Electric Power Applications</td>
<td>3</td>
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<tr>
<td>ETME 425</td>
<td>Building Systems</td>
<td>3</td>
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<tr>
<td>ETCC 499R</td>
<td>Capstone: Const Engin Tech</td>
<td>3</td>
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<tr>
<td>ETCC 412</td>
<td>Structural Elements</td>
<td>3</td>
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<tr>
<td>Year Total: 15-16</td>
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</table>

**Total Program Credits:** 128

* Key courses
** Advanced courses

Additional requirements: At least 7 credits of technical-professional elections 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>
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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>
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<td>BFIN 322</td>
<td>Business Finance</td>
<td>3</td>
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<td>BFIN 420</td>
<td>Investments I</td>
<td>3</td>
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<td>BMGT 322</td>
<td>Operations Management</td>
<td>3</td>
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<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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<td>BMGT 410</td>
<td>Sustainable Business Practices</td>
<td>3</td>
</tr>
<tr>
<td>BMGT 464</td>
<td>International Management</td>
<td>3</td>
</tr>
<tr>
<td>BMKT 325</td>
<td>Principles of Marketing</td>
<td>3</td>
</tr>
<tr>
<td>ECIV 350</td>
<td>Transportation Engineering</td>
<td>3</td>
</tr>
<tr>
<td>ECIV 492</td>
<td>Independent Study</td>
<td>1-3</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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<tr>
<td>EIND 313</td>
<td>Work Design and Analysis</td>
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<tr>
<td>EIND 425</td>
<td>Technology Entrepreneurship</td>
<td>3</td>
</tr>
<tr>
<td>EIND 434</td>
<td>Project and Engineering Management</td>
<td>3</td>
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<tr>
<td>ETCC 490R</td>
<td>Undergraduate Research</td>
<td>1-4</td>
</tr>
<tr>
<td>ETCC 492</td>
<td>Independent Study</td>
<td>1-3</td>
</tr>
<tr>
<td>ETCC 498</td>
<td>Internship</td>
<td>1-2</td>
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<tr>
<td>SRVY 355</td>
<td>Surveying Calculations</td>
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<tr>
<td>SRVY 361</td>
<td>Intro Legal Prin in Surveying</td>
<td>3</td>
</tr>
</tbody>
</table>
SRVY 362 Public Land Survey System 3
SRVY 375 Analytic Photogrammetry and Remote Sensing 2
SRVY 474 Project Design in Surveying 3

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.

Students must complete all of the following courses

SRVY 230 Intro to Srvyg for Engineers 3
SRVY 273 Route Surveying 3
or ECIV 350 Transportation Engineering
SRVY 355 Surveying Calculations 3
SRVY 361 Intro Legal Princ in Surveying 3
SRVY 362 Public Land Survey System 3
SRVY 375 Analytic Photogrammetry and Remote Sensing 2
SRVY 474 Project Design in Surveying 3

In addition students must complete any three (9 credits) of the following list of 3-credit courses:

AGBE 337 Agricultural Law
DDSN 245 Civil Drafting
ECIV 456 Highway Geometric Design
GPHY 284 Intro to GIS Science & Cartog
GPHY 357 GPS Fund/App in Mapping
GPHY 384 Adv GIS and Spatial Analysis
GPHY 426 Remote Sensing
GPHY 457 Adv GPS Mapping for GIS
GPHY 484R Applied GIS & Spatial Analysis

Total Credits 29

* 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

A Bachelor of Science (B.S.) degree is required to be eligible for this certificate.

Twenty-nine (29) total semester credits are required for completion of the certificate. This includes twenty (20) credits of required courses and nine (9) credits of approved elective courses.

Completion of the Land Surveying Non-Degree Certificate provides eligibility to qualify to take the Fundamentals of Surveying (FS) Exam required by the Montana Board of Professional Engineers and Professional Land Surveyors and administered by NCEES (National Council of Examiners for Engineering and Surveying).

Students interested in pursuing the Land Surveying Non-Degree Certificate will be asked to declare their interest prior to the start of any 300-level surveying course. The declaration can be made by emailing reneeh@ce.montana.edu. At the beginning of the last semester of course work, students will complete an application to receive certification of completion of the Land Surveying Non-Degree Certificate. The Land Surveying Non-Degree Certificate will be noted on the students’ academic transcript and may also be listed on their resume. Requirements for the Land Surveying Non-Degree Certificate are the same as the requirements for the Land Surveying Minor (p. 165).

SRVY 230 Intro to Srvyg for Engineers 3
SRVY 273 Route Surveying 3
or ECIV 350 Transportation Engineering
SRVY 355 Surveying Calculations 3
SRVY 361 Intro Legal Princ in Surveying 3
SRVY 362 Public Land Survey System 3
SRVY 375 Analytic Photogrammetry and Remote Sensing 2
SRVY 474 Project Design in Surveying 3

In addition students must complete any three (9 credits) of the following list of 3-credit courses:

AGBE 337 Agricultural Law
DDSN 245 Civil Drafting
ECIV 456 Highway Geometric Design
GPHY 284 Intro to GIS Science & Cartog
GPHY 357 GPS Fund/App in Mapping
GPHY 384 Adv GIS and Spatial Analysis
GPHY 426 Remote Sensing
GPHY 457 Adv GPS Mapping for GIS
GPHY 484R Applied GIS & Spatial Analysis

Total Credits 29

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, 111 Market Place, Suite 1050, Baltimore, MD 21202-4012 - telephone: 410-347-7700.

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. 167)
- Interdisciplinary Option (p. 166)

Undergraduate Minors

- Computer Science Minor (Non-Teaching) (p. 166)

Graduate Programs

- M.S. in Computer Science (p. 326)
- Ph.D. in Computer Science (p. 326)

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

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.

Computer Science Minor (Non-Teaching)

Because computational skills are vital in today’s world, the department offers a flexible minor that allows a student to customize much of the coursework to add value to his or her major. The minor strengthens a student’s opportunity for employment or for admission to graduate school.

CSCI 111 Programming with Java I 4
CSCI 132 Basic Data Structures and Algorithms 4
CSCI 232 Data Structures and Algorithms 4
Upper Division Computer Science Credits 9
Additional Computer Science Credits at any level 6
Total Credits 27

Interdisciplinary Option

Freshman Year

<table>
<thead>
<tr>
<th>Course</th>
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<tbody>
<tr>
<td>CSCI 111 - Programming with Java I</td>
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<td>WRIT 101W - College Writing I</td>
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<td>CSCI 132 - Basic Data Structures and Algorithms</td>
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<tr>
<td>M 172Q - Calculus II</td>
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Sophomore Year

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<td>CSCI 246 - Discrete Structures</td>
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Junior Year

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<td>ESOF 322 - Software Engineering</td>
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<td>CSCI 305 - Concepts/Programming Languages</td>
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Senior Year

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Professional Option

Freshman Year

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<tr>
<td>CSCI 111 - Programming with Java I</td>
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<tr>
<td>M 172Q - Calculus II</td>
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Year Total: 14

Sophomore Year

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<td>CSCI 246 - Discrete Structures</td>
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<td>CSCI 215CS - Social &amp; Ethical Issues in CS</td>
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Year Total: 15

Junior Year

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<td>ESOF 322 - Software Engineering</td>
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<td>CSCI 338 - Computer Science Theory</td>
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Year Total: 15

Senior Year

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<td>Science or Math Electives</td>
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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. For more detailed requirements, please consult the Interdisciplinary Option Graduation Worksheet, located at cs.montana.edu/forms.html.

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, 111 Market Place, Suite 1050, Baltimore, MD 21202-4012 - telephone: (410) 347-7700.

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 EEE 292 or EEE 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. 168)
- Electrical Engineering (p. 170)

**Graduate Programs**

- M.S. in Electrical Engineering (p. 326)
- M.Eng in Electrical Engineering (p. 326)
- Ph.D. in Engineering, Electrical & Computer Engineering option (p. 326)

**Computer Engineering**

The Electrical and Computer Engineering Department offers an accredited program for the Bachelor of Science Degree in Computer Engineering (BSCpE). The Computer Engineering program is accredited by the Engineering Accreditation Commission of ABET, 111 Market Place, Suite 1050, Baltimore, MD 21202-4012 - telephone: (410) 347-7700.

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.

- The Computer Engineering program for the Bachelor of Science Degree in Computer Engineering (BSCpE) is accredited by the Engineering Accreditation Commission of ABET, 111 Market Place, Suite 1050, Baltimore, MD 21202-4012 - telephone: (410) 347-7700.

- 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.

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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.

n. An ability to program microcontroller/microcomputer systems using assembly and high-level languages.

p. An ability to design digital systems using modern design tools.

q. 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. 169)
- Computer Engineering Minor (Non-Teaching) (p. 170)

**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. 326) of the catalog for more information.

**B.S. in Computer Engineering**

### Freshman Year

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**Junior Year**

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<td>EGEN 310R - Multidisciplinary Engineering Design</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>EELE 465 - Microcontroller Applications</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>EELE 367 - Logic Design</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Choose one of the following:</td>
<td>3-4</td>
<td></td>
</tr>
<tr>
<td>EELE 321 - Intro To Feedback Controls</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ELE 477 - Digital Signal Processing</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CSCI 232 - Data Structures and Algorithms</td>
<td></td>
<td></td>
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<tr>
<td>Year Total:</td>
<td>17</td>
<td>15</td>
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</table>

**Senior Year**

<table>
<thead>
<tr>
<th>Credits</th>
<th>Fall</th>
<th>Spring</th>
</tr>
</thead>
<tbody>
<tr>
<td>University Core Elective</td>
<td>3</td>
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</tr>
<tr>
<td>EELE 488R - Electric Engineering Design I</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>EELE 475 - Hardw/Softw Eng Embedded Sys</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>EELE 334 - Electromagnetic Theory I</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Two EELE/CSCI Electives</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>University Core Elective</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>EELE 489R - Electrical Engr Design II</td>
<td>3</td>
<td></td>
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<tr>
<td>EELE 487 - Prof, Ethics &amp; Engr Practices</td>
<td>1</td>
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<tr>
<td>EGEN 488 - Fundamentals of Engineer Exam</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>EELE 466 - Comp Computer Architecture</td>
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<td></td>
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<td>Two EELE/CSCI Electives</td>
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</tr>
<tr>
<td>Year Total:</td>
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<td>17</td>
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</table>

**Total Program Credits**: 126

* 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>
<th>Spring</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACTG 201 - Principles of Financial Acct</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>ACTG 202 - Principles of Managerial Acct</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>ASTR 371 - Solar System Astronomy</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>ASTR 373 - Stars, Galaxies, and the Universe</td>
<td>4</td>
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<tr>
<td>BCH 380 - Biochemistry</td>
<td>5</td>
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<tr>
<td>BIOB 105CS - Introduction to Biotechnology</td>
<td>3</td>
<td></td>
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<tr>
<td>BIOB 160 - Principles of Living Systems</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>BIOB 170IN - Principles of Biological Diversity</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>BIOB 260 - Cellular and Molecular Biology</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>BIOH 185 - Integrated Physiology I</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>BIOM 103IN - Unseen Universe: Microbes</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>BMKT 325 - Principles of Marketing</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>CHMY 141 - College Chemistry I</td>
<td>4</td>
<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.*
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 from a specified list of upper-division EE courses. This minor is a useful complement to majors in science or engineering for those seeking 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.

### Computer Engineering Minor (Non-Teaching Minor)

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>CHMY 143</td>
<td>College Chemistry II</td>
<td>4</td>
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<tr>
<td>CHMY 211</td>
<td>Elements of Organic Chemistry</td>
<td>5</td>
</tr>
<tr>
<td>CHMY 321</td>
<td>Organic Chemistry I</td>
<td>4</td>
</tr>
<tr>
<td>CHMY 322</td>
<td>Organic Chemistry II</td>
<td>4</td>
</tr>
<tr>
<td>CS 204</td>
<td>Multimedia Dev Methods</td>
<td>3</td>
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<tr>
<td>CSCI 232</td>
<td>Data Structures and Algorithms</td>
<td>4</td>
</tr>
<tr>
<td>CSCI 300 &amp; 400 level courses (no more than 1 cr CSCI 494)</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>ECNS 309</td>
<td>Managerial Economics</td>
<td>3</td>
</tr>
<tr>
<td>EEE 300 &amp; 400 level courses, excluding EEE 354</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>EGEN 201</td>
<td>Engineering Mechanics--Statics</td>
<td>3</td>
</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 325</td>
<td>Engineering Economic Analysis</td>
<td>3</td>
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<tr>
<td>EGEN 335</td>
<td>Fluid Mechanics</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>EIND 373</td>
<td>Production Inventory Cost Analysis</td>
<td>3</td>
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<td>EIND 425</td>
<td>Technology Entrepreneurship</td>
<td>3</td>
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<td>EIND 434</td>
<td>Project and Engineering Management</td>
<td>3</td>
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<tr>
<td>EIND 454</td>
<td>Engr Probability and Stats II</td>
<td>3</td>
</tr>
<tr>
<td>EMEC 300 &amp; 400 level courses</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>ERTH 101IN</td>
<td>Earth System Sciences</td>
<td>4</td>
</tr>
<tr>
<td>ESOF 322</td>
<td>Software Engineering</td>
<td>3</td>
</tr>
<tr>
<td>ESOF 422</td>
<td>Advanced Software Engineering</td>
<td>3</td>
</tr>
<tr>
<td>GPHY 121D</td>
<td>Human Geography</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>
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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>
</tr>
<tr>
<td>M 300 &amp; 400 level courses, excluding M 330</td>
<td>3</td>
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</tr>
<tr>
<td>PHSX 224</td>
<td>Physics III</td>
<td>4</td>
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<tr>
<td>PHSX 300 &amp; 400 level courses (no more than 1 cr PHSX 494), excluding PHSX 305 and 499</td>
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</tr>
<tr>
<td>WRIT 221</td>
<td>Intermediate Tech Writing</td>
<td>3</td>
</tr>
<tr>
<td>WRIT 429</td>
<td>Professional Writing</td>
<td>3</td>
</tr>
</tbody>
</table>

Total Credits: **30**

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 Electrical Engineering program is accredited by the Engineering Accreditation Commission of ABET, 111 Market Place, Suite 1050, Baltimore, MD 21202-4012 - telephone: (410) 347-7700.

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.

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. 171)
- Electrical Engineering Minor (Non-Teaching) (p. 172)
- Optics Minor (Non-Teaching) (p. 172)

**Graduate Programs**
Please refer to the ECE graduate programs section (p. 326) of the catalog.

**B.S. in Electrical Engineering**

**Freshman Year**

<table>
<thead>
<tr>
<th>Credits</th>
<th>Fall</th>
<th>Spring</th>
</tr>
</thead>
<tbody>
<tr>
<td>COM 110US - or CLS 101US - Knowledge and Community</td>
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<td></td>
</tr>
<tr>
<td>EELE 101 - Intro Electrical Fundamentals</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>M 171Q - Calculus I</td>
<td>4</td>
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<tr>
<td>PHSX 220 - Physics I (w/ calculus)</td>
<td>4</td>
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</tr>
<tr>
<td>WRIT 101W - College Writing I</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>M 172Q - Calculus II</td>
<td>4</td>
<td></td>
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<tr>
<td>PHSX 222 - Physics II (w/ calculus)</td>
<td>4</td>
<td></td>
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<tr>
<td>CSCI 112 - Programming with C I</td>
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**Sophomore Year**

<table>
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<tr>
<th>Credits</th>
<th>Fall</th>
<th>Spring</th>
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<tbody>
<tr>
<td>M 274 - Introduction to Differential Equation</td>
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<tr>
<td>PHSX 224 - Physics III</td>
<td>4</td>
<td></td>
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<tr>
<td>EELE 201 - Circuits I for Engineering</td>
<td>4</td>
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<tr>
<td>EELE 261 - Intro To Logic Circuits</td>
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<td>University Core Elective*</td>
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<table>
<thead>
<tr>
<th>Credits</th>
<th>University Core Elective*</th>
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</thead>
<tbody>
<tr>
<td>2</td>
<td>EGEN 350 - Applied Engr Data Analysis</td>
</tr>
<tr>
<td>4</td>
<td>M 273Q - Multivariable Calculus</td>
</tr>
<tr>
<td>4</td>
<td>CHMY 141 - College Chemistry I</td>
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<tr>
<td>4</td>
<td>EELE 203 - Circuits II for Engineering</td>
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<tr>
<td><strong>Year Total:</strong></td>
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**Junior Year**

<table>
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<th>Spring</th>
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<tbody>
<tr>
<td>University Core Elective*</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>EELE 308 - Signals and Systems Analysis</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>EELE 317 - Electronics</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>EELE 334 - Electromagnetic Theory I</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><strong>Year Total:</strong></td>
<td><strong>17</strong></td>
<td><strong>16-17</strong></td>
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</table>

**Senior Year**

<table>
<thead>
<tr>
<th>Credits</th>
<th>Fall</th>
<th>Spring</th>
</tr>
</thead>
<tbody>
<tr>
<td>EELE 488R - Electric Engineering Design</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>EGEN 310R - Multidisciplinary Engineering Design</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>EGEN 310R - Multidisciplinary Engineering Design</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>EELE 321 - Intro To Feedback Controls</td>
<td>7-8</td>
<td></td>
</tr>
<tr>
<td>EELE 355 - Energy Conversion Devices</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>EELE 445 - Telecommunication Systems</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>EE Professional Elective*</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td><strong>Year Total:</strong></td>
<td><strong>17</strong></td>
<td><strong>16-17</strong></td>
</tr>
</tbody>
</table>

**Total Program Credits:** 125

Elective requirements include 12 credits of humanities, social science, diversity, and arts classes as part of University Core requirements, 18 credits of professional electives with a minimum of 9 credits in Electrical Engineering and a minimum of 6 credits outside of Electrical Engineering all from the professional electives list below. There must be a minimum of 4 credits at the 300 level or above in the student’s professional electives package.

**Professional Electives**

<table>
<thead>
<tr>
<th>Credits</th>
<th>Professional Electives</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>ACTG 201 - Principles of Financial Acct</td>
</tr>
<tr>
<td>3</td>
<td>ACTG 202 - Principles of Managerial Acct</td>
</tr>
<tr>
<td>4</td>
<td>ASTR 371 - Solar System Astronomy</td>
</tr>
<tr>
<td>4</td>
<td>ASTR 373 - Stars, Galaxies, and the Universe</td>
</tr>
<tr>
<td>5</td>
<td>BCH 380 - Biochemistry</td>
</tr>
<tr>
<td>3</td>
<td>BIOB 105CS - Introduction to Biotechnology</td>
</tr>
</tbody>
</table>
BIOL 160 Principles of Living Systems 4
BIOL 170IN Principles of Biological Diversity 4
BIOL 260 Cellular and Molecular Biology 4
BIOL 185 Integrated Physiology I 4
BIOH 201 Hum Anatomy & Physiology I 5
BIOH 211 Hum Anatomy & Physiology II 4
BIOM 103IN Unseen Universe: Microbes 3
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 3
ECNS 309 Managerial Economics 3
ELE 300 & 400 level courses, excluding ELE 354 3
ELE 201 Engineering Mechanics--Statics 3
ELE 202 Engineering Mech--Dynamics 3
ELE 205 Mechanics of Mtls (equiv 305) 3
ELE 325 Engineering Economic Analysis 3
ELE 335 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 and Engineering Management 3
EIND 454 Engr Probability and Stats II 3
EMEC 300 & 400 level courses 3
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 3
PHSX 300 & 400 level courses (no more than 1 cr PHSX 494), and excluding PHSX 305 and 499 3
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 128 credits required for the CpE degree alone.

Required core courses for the minor (21 cr.):

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>EELE 101</td>
<td>Intro Electrical Fundamentals</td>
<td>3</td>
</tr>
<tr>
<td>EELE 201</td>
<td>Circuits I for Engineering</td>
<td>4</td>
</tr>
<tr>
<td>EELE 203</td>
<td>Circuits II for Engineering</td>
<td>4</td>
</tr>
<tr>
<td>EELE 308</td>
<td>Signals and Systems Analysis</td>
<td>3</td>
</tr>
<tr>
<td>EELE 317</td>
<td>Electronics</td>
<td>4</td>
</tr>
<tr>
<td>EELE 334</td>
<td>Electromagnetic Theory I</td>
<td>3</td>
</tr>
</tbody>
</table>

Choose at least nine credits from the following: 9

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>EELE 321</td>
<td>Intro To Feedback Controls</td>
<td></td>
</tr>
<tr>
<td>EELE 355</td>
<td>Energy Conversion Devices</td>
<td></td>
</tr>
<tr>
<td>EELE 409</td>
<td>EE Material Science</td>
<td></td>
</tr>
<tr>
<td>EELE 411</td>
<td>Advanced Analog Electronics</td>
<td></td>
</tr>
<tr>
<td>EELE 414</td>
<td>Intro to VLSI Design</td>
<td></td>
</tr>
<tr>
<td>EELE 422</td>
<td>Intro to Modern Control</td>
<td></td>
</tr>
<tr>
<td>EELE 432</td>
<td>Applied Electromagnetics</td>
<td></td>
</tr>
<tr>
<td>EELE 445</td>
<td>Telecommunication Systems</td>
<td></td>
</tr>
<tr>
<td>EELE 447</td>
<td>Mobile Wireless Communications</td>
<td></td>
</tr>
<tr>
<td>EELE 477</td>
<td>Digital Signal Processing</td>
<td></td>
</tr>
<tr>
<td>EELE 482</td>
<td>Electro-Optical Systems</td>
<td></td>
</tr>
<tr>
<td>EELE 484</td>
<td>Laser Engineering</td>
<td></td>
</tr>
</tbody>
</table>

**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 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.

Required core courses for minor (12 credits):

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>EELE 334</td>
<td>Electromagnetic Theory I</td>
<td>3</td>
</tr>
<tr>
<td>or PHSX 423</td>
<td>Electricity and Magnetism I</td>
<td></td>
</tr>
<tr>
<td>EELE 432</td>
<td>Applied Electromagnetics</td>
<td>3</td>
</tr>
<tr>
<td>or PHSX 425</td>
<td>Electricity and Magnetism II</td>
<td></td>
</tr>
<tr>
<td>EELE 482</td>
<td>Electro-Optical Systems</td>
<td>3</td>
</tr>
<tr>
<td>PHSX 427</td>
<td>Advanced Optics</td>
<td>3</td>
</tr>
<tr>
<td>or PHSX 437</td>
<td>Laser Applications</td>
<td></td>
</tr>
</tbody>
</table>

Optics electives (choose at least 9 credits): 9
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 online catalog in the Curriculum, Enrollment, and Graduation (p. 50) 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&IE 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. 70)
• Industrial and Management Systems Engineering (p. 174)
• Mechanical Engineering (p. 176)
• Mechanical Engineering Technology (p. 178)

Undergraduate Minors
• Aerospace Minor (p. 173)
• Financial Engineering Minor (p. 71)
• Engineering Management Minor (http://catalog.montana.edu/undergraduate/engineering/mechanical-industrial-engineering/eims-minor)
• Materials Minor (p. 176)
• Mechatronics Minor (p. 179)

Graduate Programs
• M.S. in Industrial and Management Engineering (p. 330)
• M.S. in Mechanical Engineering (p. 331)
• Ph.D. in Engineering -- Industrial Engineering and Mechanical Engineering options (p. 320)

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 the minimum background of specific topics applicable to aerospace.
These are Materials and Structures (needed for development of aerospace systems; structures, hardware, sensors, system packages, etc.). Thermo/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</th>
<th>Credit Sub-Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>M 171Q Calculus I</td>
<td>4</td>
</tr>
<tr>
<td>M 172Q Calculus II</td>
<td>4</td>
</tr>
<tr>
<td>PHSX 220 Physics I</td>
<td>4</td>
</tr>
<tr>
<td>PHSX 222 Physics II</td>
<td>4</td>
</tr>
<tr>
<td>EMEC 368 Introduction to Aerospace</td>
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</tr>
<tr>
<td>Credit Sub-Total</td>
<td>19</td>
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</tbody>
</table>

Aerospace Minor Courses

Materials and Structures

Choose one from the following:

<table>
<thead>
<tr>
<th>Course</th>
<th>Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>EMAT 350 Engineering Materials</td>
<td>3-4</td>
</tr>
<tr>
<td>EMEC 463 Composite Materials</td>
<td></td>
</tr>
<tr>
<td>EMEC 405 Finite Element Analysis</td>
<td></td>
</tr>
<tr>
<td>EMEC 444 Mech Behavior of Materials</td>
<td></td>
</tr>
<tr>
<td>EMEC 447 Aircraft Structures</td>
<td></td>
</tr>
<tr>
<td>PHSX 442 Novel Mat for Physics/Engineer</td>
<td></td>
</tr>
</tbody>
</table>

Thermo/Fluids

Choose one from the following:

<table>
<thead>
<tr>
<th>Course</th>
<th>Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECHM 424 Transport Analysis</td>
<td>3-4</td>
</tr>
<tr>
<td>EGEN 324 Applied Thermodynamics</td>
<td></td>
</tr>
<tr>
<td>EGEN 335 Fluid Mechanics</td>
<td></td>
</tr>
<tr>
<td>EGEN 435 Fluid Dynamics</td>
<td></td>
</tr>
<tr>
<td>EMEC 326 Fundamentals of Heat Transfer</td>
<td></td>
</tr>
<tr>
<td>ETME 422 Principles of HVAC I</td>
<td></td>
</tr>
<tr>
<td>ETME 430 Fluid Power Systems Design</td>
<td></td>
</tr>
</tbody>
</table>

Focused Topics

Choose one from the following:

<table>
<thead>
<tr>
<th>Course</th>
<th>Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>EEELE 308 Signals and Systems Analysis</td>
<td>3-4</td>
</tr>
<tr>
<td>EEELE 321 Intro To Feedback Controls</td>
<td></td>
</tr>
<tr>
<td>EEELE 422 Intro to Modern Control</td>
<td></td>
</tr>
<tr>
<td>EEELE 465 Microcontroller Applications</td>
<td></td>
</tr>
<tr>
<td>EEELE 482 Electro-Optical Systems</td>
<td></td>
</tr>
<tr>
<td>EGEN 310R Multidisciplinary Engineering Design</td>
<td></td>
</tr>
<tr>
<td>EIND 422 Introduction to Simulation</td>
<td></td>
</tr>
<tr>
<td>EMEC 403 CAE IV--Design Integration</td>
<td></td>
</tr>
<tr>
<td>EMEC 467 Micro-Electromechanical Systems</td>
<td></td>
</tr>
</tbody>
</table>

Elective for their major degree requirements.

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 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.

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.
IMSE Cognate Elective\(^2\) & 3 &  \\
EIND 499R - Indus Engin Design Capstone & 3  \\
EIND 477 - Quality Assurance & 3  \\
EGEN 488 - Fundamentals of Engineer Exam & 0  \\
University Core Electives & 3  \\
IMSE Cognate Elective\(^2\) & 6  \\
Total Program Credits: & 128  \\
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.  \\
2 & See IMSE Cognate Policy (http://www.coe.montana.edu/mie/students/advising_forms.spring14/IE\%20Cognate\%20Policy\_2012-11-27.pdf) for details.  \\
3 & Engineering Core Elective: Choose EELE 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 |  \\
|-------------------------------|---|
| 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: 18

| Course | Title |  \\
|--------|-------|---|
| 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 Code</th>
<th>Course Title</th>
<th>Fall Credits</th>
<th>Spring Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>COM 111US</td>
<td>Introduction to Public Speaking</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>or CLS 101US</td>
<td>Knowledge and Community</td>
<td></td>
<td></td>
</tr>
<tr>
<td>M 171Q</td>
<td>Calculus I</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>EMEC 100</td>
<td>Introduction to Mechanical</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>EMEC 103</td>
<td>CAE I-Engineering Graphics</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Communications</td>
<td></td>
<td></td>
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<tr>
<td>University Core Electives</td>
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<td>6</td>
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<tr>
<td>CHMY 141</td>
<td>College Chemistry I</td>
<td>4</td>
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<td>WRIT 101W</td>
<td>College Writing I</td>
<td>3</td>
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<td>M 172Q</td>
<td>Calculus II</td>
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<td>PHSX 220</td>
<td>Physics I (w/ calculus)</td>
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<td>University Core Electives</td>
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<td>Year Total:</td>
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<td>18</td>
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**Sophomore Year**

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<th>Course Title</th>
<th>Fall Credits</th>
<th>Spring Credits</th>
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</thead>
<tbody>
<tr>
<td>EGEN 201</td>
<td>Engineering Mechanics--Statics</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>EMEC 205</td>
<td>CAE II-Mechanical Engineering</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Computations</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EMEC 250</td>
<td>Mechanical Engineering Materials</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>EMAT 252</td>
<td>Materials Struct and Prop Lab</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>M 273Q</td>
<td>Multivariable Calculus</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>PHSX 222</td>
<td>Physics II (w/ calculus)</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>EGEN 202</td>
<td>Engineering Mech--Dynamics</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>EGEN 205</td>
<td>Mechanics of Mtls (equiv 305)</td>
<td>3</td>
<td></td>
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<tr>
<td>M 274</td>
<td>Introduction to Differential Equation</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>ETME 215</td>
<td>Manufacturing Processes</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>ETME 217</td>
<td>Manufacturing Process Laboratory</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>EMEC 250</td>
<td>Mechanical Engineering Materials</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>EGEN 350</td>
<td>Applied Engr Data Analysis</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>EMEC 321</td>
<td>Thermodynamics II</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>EMEC 326</td>
<td>Fundamentals of Heat Transfer</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>EMEC 342</td>
<td>Mech Component Design</td>
<td>3</td>
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</tr>
<tr>
<td>EMEC 360</td>
<td>Measurement &amp; Instrumentation</td>
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<td></td>
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<tr>
<td>EMEC 361</td>
<td>Measurement &amp; Instrument Lab</td>
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<td></td>
</tr>
<tr>
<td>EGEN 310R</td>
<td>Multidisciplinary Engineering</td>
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<td></td>
</tr>
<tr>
<td>Year Total:</td>
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<td>18</td>
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**Junior Year**

<table>
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<th>Course Title</th>
<th>Fall Credits</th>
<th>Spring Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>EGEN 335</td>
<td>Fluid Mechanics</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>EMEC 305</td>
<td>CAE III-- Systems Analysis</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>EMEC 320</td>
<td>Thermodynamics I</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>EMEC 341</td>
<td>Adv Mechanics of Materials</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>EGEN 350</td>
<td>Applied Engr Data Analysis</td>
<td>2</td>
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<td>EMEC 321</td>
<td>Thermodynamics II</td>
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<td>EMEC 326</td>
<td>Fundamentals of Heat Transfer</td>
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</tr>
<tr>
<td>EMEC 342</td>
<td>Mech Component Design</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>EMEC 360</td>
<td>Measurement &amp; Instrumentation</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>EMEC 361</td>
<td>Measurement &amp; Instrument Lab</td>
<td>1</td>
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</tr>
<tr>
<td>EGEN 310R</td>
<td>Multidisciplinary Engineering</td>
<td>3</td>
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**Senior Year**

<table>
<thead>
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<th>Course Code</th>
<th>Course Title</th>
<th>Fall Credits</th>
<th>Spring Credits</th>
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</thead>
<tbody>
<tr>
<td>EMEC 489R</td>
<td>Mech Eng Design Capstone I</td>
<td>2</td>
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</tr>
<tr>
<td>EMEC 425</td>
<td>Advanced Thermal Systems</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>EMEC 445</td>
<td>Mechanical Vibrations</td>
<td>3</td>
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<tr>
<td>Professional Electives</td>
<td></td>
<td>6</td>
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<tr>
<td>EMEC 499R</td>
<td>Mech Eng Design Capstone II</td>
<td>3</td>
<td></td>
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<tr>
<td>EGEN 488</td>
<td>Fundamentals of Engineer Exam</td>
<td>0</td>
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<tr>
<td>Professional Electives</td>
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<td>6</td>
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<tr>
<td>EMEC 403</td>
<td>CAE IV--Design Integration</td>
<td>3</td>
<td></td>
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<tr>
<td>EMEC 405</td>
<td>Finite Element Analysis</td>
<td>1</td>
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<tr>
<td>University Core Electives</td>
<td></td>
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<tr>
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<td></td>
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</tr>
</tbody>
</table>

**Total Program Credits:** 128

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 useful 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, 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 Code</th>
<th>Course Title</th>
<th>Fall</th>
<th>Spring</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHMY 121N</td>
<td>Introduction to General Chemistry</td>
<td>4</td>
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<tr>
<td>WRIT 101W</td>
<td>College Writing I</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>M 165Q</td>
<td>Calculus for Technology I</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>ETME 100</td>
<td>Introduction to Mechanical Engineering Technology</td>
<td>1</td>
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</tr>
<tr>
<td>University Core Electives</td>
<td>6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>COMX 111US</td>
<td>Introduction to Public Speaking (formerly COM 110US)</td>
<td>3</td>
<td></td>
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<tr>
<td>or CLS 101US</td>
<td>Knowledge and Community or US 101US - First Year Seminar</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>M 166Q</td>
<td>Calculus for Technology II</td>
<td>3</td>
<td></td>
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<tr>
<td>EMEC 103</td>
<td>CAE I-Engineering Graphics Communications</td>
<td>2</td>
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</tr>
<tr>
<td>PHSX 205</td>
<td>College Physics I</td>
<td>4</td>
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</tr>
<tr>
<td>University Core Electives</td>
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<tr>
<td>Year Total:</td>
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**Sophomore Year**

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<th>Spring</th>
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<tbody>
<tr>
<td>Business Elective’</td>
<td>3</td>
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<td></td>
</tr>
<tr>
<td>EMEC 250</td>
<td>Mechanical Engineering Materials</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>EMAT 252</td>
<td>Materials Struct and Prop Lab</td>
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<tr>
<td>EGEN 203</td>
<td>Applied Mechanics</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>ETME 202</td>
<td>Mechanical Engineering Technology Computer Applications</td>
<td>1</td>
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</tr>
<tr>
<td>PHSX 207</td>
<td>College Physics II</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>EGEN 208</td>
<td>Applied Strength of Materials</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>ETME 215</td>
<td>Manufacturing Processes</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>ETME 216</td>
<td>Manufacturing Process Laboratory - Mechanical Engineering Technology</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>EGEN 324</td>
<td>Applied Thermodynamics</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>ETME 203</td>
<td>Mechanical Design Graphics</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>EELE 250</td>
<td>Circuits, Devices and Motors</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Year Total:</td>
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<td>17</td>
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**Junior Year**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Fall</th>
<th>Spring</th>
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<tbody>
<tr>
<td>EGEN 331</td>
<td>Applied Mechanics of Fluids</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>EGEN 310R</td>
<td>Multidisciplinary Engineering Design</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>EGEN 350</td>
<td>Applied Engr Data Analysis</td>
<td>2</td>
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<tr>
<td>ETME 310</td>
<td>Machining and Industrial Safety</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>ETME 340</td>
<td>Mechanisms</td>
<td>4</td>
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</tr>
</tbody>
</table>
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).

### Mechatronics Minor (non-teaching)

The College of Engineering offers a non-teaching minor in Mechatronics. Students must receive a grade of "C-" or better in all required courses for the Mechatronics minor.

### 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 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. 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>
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</thead>
<tbody>
<tr>
<td>MAS 110 - Foundations of The Air Force I</td>
<td>1</td>
<td></td>
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<tr>
<td>MAS 115 - Leadership Laboratory 115</td>
<td>0</td>
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<tr>
<td>Courses in Major</td>
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<td></td>
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<table>
<thead>
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<th>Sophomore Year</th>
<th>Fall</th>
<th>Spring</th>
<th>Summer</th>
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<tr>
<td>MAS 210 - The Employment of Air and Space Power I</td>
<td>1</td>
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<td>MAS 215 - Leadership Laboratory 215</td>
<td>0</td>
<td></td>
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<tr>
<td>Courses in Major</td>
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<td></td>
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<tr>
<td>MAS 211 - The Employment of Air and Space Power II</td>
<td>1</td>
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</tr>
<tr>
<td>MAS 216 - Leadership Lab 216</td>
<td>0</td>
<td></td>
<td></td>
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<tr>
<td>Courses in Major</td>
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<td></td>
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<th>Junior Year</th>
<th>Fall</th>
<th>Spring</th>
<th>Summer</th>
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<tbody>
<tr>
<td>MAS 310 - Air Force Leadership and Management I</td>
<td>3</td>
<td></td>
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</tr>
<tr>
<td>MAS 315 - Leadership Laboratory 315</td>
<td>0</td>
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<tr>
<td>Courses in Major</td>
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<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>0</td>
<td></td>
<td></td>
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<tr>
<td>Courses in Major</td>
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<td></td>
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</tr>
<tr>
<td>Total</td>
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<th>Senior Year</th>
<th>Fall</th>
<th>Spring</th>
<th>Summer</th>
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</thead>
<tbody>
<tr>
<td>MAS 410 - National Security Affairs/ Preparation for Active Duty I</td>
<td>3</td>
<td></td>
<td></td>
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<tr>
<td>MAS 415 - Leadership Laboratory 415</td>
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<tr>
<td>Courses in Major</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>MAS 411 - National Security Affairs/ Preparation for Active Duty II</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MAS 416 - Leadership Lab 416</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Courses in Major</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Total</td>
<td>3</td>
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</tr>
</tbody>
</table>

**Total Program Credits: 18**

### Military Science - Army ROTC

Army Reserve Officers’ Training Corps (ROTC) is a unique course of study that complements an existing degree-producing program. By taking the Military Science courses, in addition to their regular major, MSU students are offered the opportunity to receive a Presidential Commission as an officer in the U.S. Army. A graduate of the program may elect to serve as an officer in either the active Army or in the National Guard/Army Reserve as a part-time soldier (one weekend a month and two weeks in the summer).

ROTC enhances a student’s education by providing unique leadership and management training. The experiences provided by Army ROTC have proven to make a significant impact in the graduate’s endeavors with many large businesses and corporations actively seeking this qualification for potential 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.
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.

American Studies Courses

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 HSTAcourse
- One (1) NASX course

American Studies Courses

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ANTY 215IS</td>
<td>Human Prehistory</td>
<td>3</td>
</tr>
<tr>
<td>ANTY 225IS</td>
<td>Culture, Language, and Society</td>
<td>3</td>
</tr>
<tr>
<td>ANTY 332</td>
<td>Native North America</td>
<td>3</td>
</tr>
<tr>
<td>ANTY 351</td>
<td>Archaeology of North America</td>
<td>3</td>
</tr>
<tr>
<td>ARTH 201IA</td>
<td>Art of World Civilization II</td>
<td>4</td>
</tr>
<tr>
<td>ARTH 430</td>
<td>19th Century Art</td>
<td>3</td>
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<tr>
<td>ARTH 440</td>
<td>20th Century Art</td>
<td>3</td>
</tr>
<tr>
<td>ECNS 101IS</td>
<td>Economic Way of Thinking</td>
<td>3</td>
</tr>
<tr>
<td>ECNS 372</td>
<td>Economic History of US</td>
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</tr>
<tr>
<td>GPHY 121D</td>
<td>Human Geography</td>
<td>3</td>
</tr>
<tr>
<td>GPHY 325</td>
<td>Cultural Geography</td>
<td>3</td>
</tr>
<tr>
<td>GPHY 431</td>
<td>Historical Geography</td>
<td>3</td>
</tr>
<tr>
<td>FILM 106A</td>
<td>(Last offered Fall 2014)</td>
<td>3</td>
</tr>
<tr>
<td>HSTA 311</td>
<td>Early America</td>
<td>3</td>
</tr>
<tr>
<td>HSTA 316</td>
<td>American Civil War Era</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

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>AMST 101D</td>
<td>Introduction to American Studies</td>
<td>3</td>
</tr>
<tr>
<td>LIT 110IH</td>
<td>Introduction to Literature</td>
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<tr>
<td>NASX 105D</td>
<td>Intro Native Amer Studies</td>
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<tr>
<td>PSCI 210IS</td>
<td>Introduction to American Government</td>
<td>3</td>
</tr>
</tbody>
</table>

American Studies Courses - Focus Requirement

- 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. 220)
- B.S. in Microbiology (p. 225)
- B.A. in Modern Languages and Literatures (p. 230)
- B.A. in Philosophy (p. 237)
- B.S. in Physics (p. 239)
- B.A. in Political Science (p. 243)
- B.S. in Psychology (p. 247)
- B.A. in Religious Studies (p. 248)
- B.S. in Sociology (p. 250)

Non-degree program

- Pre-Medical/Pre-Health Professions (p. 246)
- Pre-Veterinary Program (http://catalog.montana.edu/undergraduate/letters-science/pre-veterinary-program)

Foundation Courses

All students, regardless of program focus area, must complete the following courses:
<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>HSTA 318</td>
<td>Origins of Modern America: From the Civil War to WWII</td>
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</tr>
<tr>
<td>HSTA 322</td>
<td>Am History: WWII to Present</td>
<td>3</td>
</tr>
<tr>
<td>HSTA 406</td>
<td>McCarthy/Ike/Truman</td>
<td>3</td>
</tr>
<tr>
<td>HSTA 407</td>
<td>Gender in US &amp; Canadian West</td>
<td>3</td>
</tr>
<tr>
<td>HSTA 408</td>
<td>Gender in America</td>
<td>3</td>
</tr>
<tr>
<td>HSTA 412</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>
</tr>
<tr>
<td>HSTA 450</td>
<td>History of American Indians</td>
<td>3</td>
</tr>
<tr>
<td>HSTA 460</td>
<td>Montana and the West</td>
<td>3</td>
</tr>
<tr>
<td>HSTA 464</td>
<td>Trans-Mississippi West</td>
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<tr>
<td>HSTA 468</td>
<td>History of Yellowstone</td>
<td>3</td>
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<td>HSTA 470</td>
<td>American Environmental History</td>
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<tr>
<td>HSTA 482</td>
<td>History of American Technology</td>
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</tr>
<tr>
<td>LIT 214D</td>
<td>Regional Literature</td>
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<tr>
<td>LIT 308</td>
<td>Multicultural Literature</td>
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<tr>
<td>LIT 310</td>
<td>American Literature to 1900</td>
<td>3</td>
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<tr>
<td>LIT 311</td>
<td>American Literature after 1900</td>
<td>3</td>
</tr>
<tr>
<td>LIT 371</td>
<td>(Last offered Spring 2015)</td>
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<tr>
<td>LIT 372</td>
<td>(Last offered Spring 2015)</td>
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<tr>
<td>LIT 431R</td>
<td>Studies in Major Author/s</td>
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<tr>
<td>MOR 301</td>
<td>Museum Practices</td>
<td>3</td>
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<tr>
<td>MUSI 130</td>
<td>History of Jazz</td>
<td>3</td>
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<tr>
<td>NASX 205D</td>
<td>Native Americans Contemp Soc</td>
<td>3</td>
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<tr>
<td>NASX 232D</td>
<td>MT Indian Cult, Hist, Cur Issu</td>
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<tr>
<td>NASX 239</td>
<td>Native North American History through Art and Material Culture</td>
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<td>NASX 280IS</td>
<td>NA Studies Rsrch Theors/Mhds</td>
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<td>NASX 304</td>
<td>Native American Belief &amp; Phil</td>
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<td>NASX 310</td>
<td>Native Cultures of N America</td>
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<td>NASX 340</td>
<td>Native American Literature</td>
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<tr>
<td>NASX 360</td>
<td>Native Americans and Cinema</td>
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<td>NASX 430</td>
<td>American Indian Education</td>
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<tr>
<td>NASX 476</td>
<td>Amer Indian Policy and Law</td>
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<td>PHL 255D</td>
<td>Philosophy and Culture</td>
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<tr>
<td>PHL 328</td>
<td>Philosophy and Film</td>
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<tr>
<td>PHL 354</td>
<td>Philosophy of Race</td>
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<td>PHOT 113RA</td>
<td>Understanding Photography</td>
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<td>PHOT 303</td>
<td>Early History of Photography</td>
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<tr>
<td>PHOT 304</td>
<td>Recent History of Photography</td>
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<td>PSCI 214S</td>
<td>Principles of Political Science</td>
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<tr>
<td>PSCI 306</td>
<td>Legislative Process</td>
<td>3</td>
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<td>PSCI 346</td>
<td>American Presidency</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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<tr>
<td>RLST 220D</td>
<td>Interpretations of Amrcn Relig</td>
<td>3</td>
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<td>SOCI 301S</td>
<td>Introduction to Sociology</td>
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<tr>
<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>
<td>3</td>
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<td>SOCI 333</td>
<td>Sociology of Education</td>
<td>3</td>
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<tr>
<td>SOCI 340</td>
<td>Social Movements</td>
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<td>SOCI 345</td>
<td>Sociology of Organizations</td>
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<tr>
<td>SOCI 359</td>
<td>Crime, Justice and Media</td>
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<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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<td>SOCI 470</td>
<td>Environmental Sociology</td>
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<td>WGSS 201H</td>
<td>Intro to Feminist Theories</td>
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<tr>
<td>WGSS 301R</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 203IA - American Popular Music
- LIT 310 - American Literature to 1900, or 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>
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<tr>
<td>NASX 105D - Intro Native Amer Studies</td>
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<tr>
<td>Modern Language</td>
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**Sophomore Year**

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<tr>
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<tbody>
<tr>
<td>HSTA 101IH - American History I</td>
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<td>or HSTA 102IH - American History II</td>
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<td>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</td>
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</tr>
<tr>
<td>LIT 110IH - Introduction to Literature</td>
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<td>American Studies general requirements</td>
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<td>University Core and Electives</td>
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<td>Year Total:</td>
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**Junior Year**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
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<tbody>
<tr>
<td>LIT 310 - American Literature to 1900</td>
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<tr>
<td>or LIT 311 - American Literature after 1900</td>
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<td>American Studies general requirements</td>
<td>3</td>
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<tr>
<td>Focus Area requirements</td>
<td>3</td>
</tr>
<tr>
<td>Electives</td>
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<td>Year Total:</td>
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**Senior Year**

<table>
<thead>
<tr>
<th>Course</th>
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<tbody>
<tr>
<td>American Studies general requirements</td>
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</table>
Focus Area requirements 3
Electives 6
AMST 401R - Seminar in American Studies 4
American Studies general requirements 6
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 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

Freshman Year Credits
Fall Spring
WRIT 101W - College Writing I 3
AMST 101D - Introduction to American Studies 3
Modern Language 4
University Core and Electives 5
NASX 105D - Intro Native Amer Studies 3
Modern Language 4
University Core and Electives 8
Year Total: 15 15

Sophomore Year Credits
Fall Spring
LIT 110IH - Introduction to Literature 3
HSTA 101IH - American History I 4
LIT 310 - American Literature to 1900 or LIT 311 - American Literature after 1900 3
University Core and Electives 5
AMST 202RA - The Arts in America or MUSI 203IA - American Popular Music 3
HSTA 102IH - American History II 4
American Studies general requirements 3
University Core and Electives 5
Year Total: 15 15

Junior Year Credits
Fall Spring
HSTA 160D - Introduction to the Am West 4
American Studies general requirements 6
Focus Area requirements 3
Electives 2

Senior Year Credits
Fall Spring
American Studies general requirements 6
Focus Area requirements 3
Electives 6
AMST 401R - Seminar in American Studies 4
American Studies general requirements 3
Focus Area requirements 3
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 Credits
Fall Spring
WRIT 101W - College Writing I 3
AMST 101D - Introduction to American Studies 3
Modern Language 4
University Core and Electives 5
LIT 110IH - Introduction to Literature 3
NASX 105D - Intro Native Amer Studies 3
Modern Language 4
University Core and Electives 5
Year Total: 15 15

Sophomore Year Credits
Fall Spring
LIT 310 - American Literature to 1900 3
American Studies general requirements 3
University Core and Electives 9
AMST 202RA - The Arts in America or MUSI 203IA - American Popular Music 3
American Studies general requirements 6
University Core and Electives 6
Year Total: 15 15
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. 186)
- Anthropology Minor (non-teaching) (p. 185)

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.

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
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<tbody>
<tr>
<td>HSTA 101IH - American History I</td>
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<tr>
<td>or HSTA 102IH - American History II</td>
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<tr>
<td>or HSTA 160D - Introduction to the Am West</td>
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<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>PSCI 210IS - Introduction to American Government</td>
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<tr>
<td>Focus Area requirements</td>
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<td>Electives</td>
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**Senior Year**

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<tr>
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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>Focus Area requirements</td>
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<td>Electives</td>
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<td><strong>Year Total:</strong></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. 333)
- M.A. of Arts in American Studies (p. 333)

Montana State University
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>
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<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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<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>
<tr>
<td>SOCI 201D - Social Problems</td>
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<td>University Core Seminar</td>
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<tr>
<td>Math Core</td>
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<td>University Core and Electives</td>
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**Sophomore Year**

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<td>ANTY 215IS - Human Prehistory</td>
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<tr>
<td>ANTY 225IS - Culture, Language, and Society</td>
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<td>PHL 236Q - Logic</td>
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<td>University Core and Electives</td>
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**Junior Year**

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<td>ANTY 313 - Biological Anthropology</td>
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<td>ANTY 472 - Descriptive Linguistics</td>
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<td>ANTY 300-400 -- Archaeology elective</td>
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<td>HSTR 417 - Early Modern Science</td>
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<td>HSTR 419 - Modern Science</td>
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<td>ANTY 300-400 --Cultural Anthropology Elective</td>
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**Senior Year**

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<tr>
<td>ANTY 300-400 --Electives</td>
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<td>ANTY 425R - Social Organization or ANTY 428RS - Anthropological Theory</td>
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<td><strong>Year Total:</strong></td>
<td><strong>27</strong></td>
</tr>
</tbody>
</table>

**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. 78) 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. 187)

**Undergraduate Minor**

- Genetics Minor (Non-Teaching) (p. 90)

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. 334)
- Master of Science in Neuroscience (p. 334)
- Doctor of Philosophy in Biological Sciences (p. 334)
- Doctor of Philosophy in Neuroscience (p. 334)

How to apply:

1) Prior to applying, all prospective graduate students need to secure a faculty sponsor. Contact CBN faculties 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; and
3) After fulfilling the above, you will be contacted by the CBN department (Patricia LaDue) regarding the official steps of your application.

Please:
- Do not contact any of CBN faculties regarding the process. Only contact them regarding the funding and sponsorship. Direct your questions regarding to the process to patricia.ladue@montana.edu; and
- 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>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOH 185 - Integrated Physiology I</td>
<td>4</td>
</tr>
<tr>
<td>CHMY 141 - College Chemistry I</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>
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<tr>
<td>University Core and Electives</td>
<td>1</td>
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<tr>
<td>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>M 161Q - Survey of Calculus</td>
<td>4</td>
</tr>
<tr>
<td>CLS 101US - Knowledge and Community</td>
<td>3</td>
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<td><strong>Year Total:</strong></td>
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**Sophomore Year**

<table>
<thead>
<tr>
<th>Course</th>
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<tbody>
<tr>
<td>BIOH 313 - Neurophysiology</td>
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</tr>
<tr>
<td>CHMY 321 - Organic Chemistry I</td>
<td>4</td>
</tr>
<tr>
<td>PHSX 205 - College Physics I</td>
<td>4</td>
</tr>
<tr>
<td>University Core and Electives</td>
<td>4</td>
</tr>
<tr>
<td>BIOH 320 - Biomedical Genetics</td>
<td>3</td>
</tr>
<tr>
<td>CHMY 323 - Organic Chemistry II</td>
<td>4</td>
</tr>
<tr>
<td>PHSX 207 - College Physics II</td>
<td>4</td>
</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>
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<th>Course</th>
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<td>BCH 380 - Biochemistry</td>
<td>5</td>
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<tr>
<td>WRIT 201 - College Writing II</td>
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<tr>
<td>or WRIT 221 - Intermediate Tech Writing</td>
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<td>University Core and Electives</td>
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<tr>
<td>BIOB 425 - Adv Cell &amp; Molecular Biology</td>
<td>3</td>
</tr>
<tr>
<td>BIOB 420 - Evolution</td>
<td>3</td>
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<td>University Core and Electives</td>
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<td><strong>Year Total:</strong></td>
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</table>

**Senior Year**

<table>
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<th>Course</th>
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</thead>
<tbody>
<tr>
<td>University Core and Elective</td>
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</tr>
<tr>
<td>BIOB 499 - Senior Thesis/Capstone</td>
<td>2</td>
</tr>
<tr>
<td>University Core and Elective</td>
<td>13</td>
</tr>
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<td><strong>Year Total:</strong></td>
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</tr>
<tr>
<td><strong>Total Program Credits:</strong></td>
<td>120</td>
</tr>
</tbody>
</table>

**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:

- BIOB 410 - Immunology
- BIOB 476R - Gene Construction
writing. Students interested in the more quantitative and physical aspects or related fields such as medicine, patent law, chemical industry, or science technical electives, allows the students to prepare for careers in chemistry. This option includes a central core of chemistry courses that, together with chemistry or a biochemistry minor.

The Department of Chemistry and Biochemistry participates in several areas of chemistry: analytical, biochemistry, inorganic, organic and physical. 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 is directed. 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 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. 190)
- Biochemistry Option (p. 189)
- Teaching Option (p. 192)

Undergraduate Minors

- Astrobiology Minor (Non-Teaching) (p. 189)
- Biochemistry Minor (Non-Teaching) (p. 189)
- 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 leading research 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. 337)
- M.S. in Biochemistry (p. 336)
- Ph.D. in Chemistry (p. 337)
- Ph.D. in Biochemistry (p. 337)

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 Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASTR 100IN</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></td>
</tr>
<tr>
<td>or ASTR 373</td>
<td>Stars, Galaxies, and the Universe</td>
<td></td>
</tr>
<tr>
<td>BIOB 301IN</td>
<td>Principles of Biological Diversity</td>
<td>4</td>
</tr>
<tr>
<td>or BIOB 201</td>
<td>Cellular and Molecular Biology</td>
<td></td>
</tr>
<tr>
<td>or BIOB 100</td>
<td>Principles of Living Systems</td>
<td></td>
</tr>
<tr>
<td>ERTH 101IN</td>
<td>Earth System Sciences</td>
<td>4</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></td>
</tr>
<tr>
<td>or CHMY 102CS</td>
<td>Applying Chemistry to Society</td>
<td></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>
<td>3-4</td>
<td></td>
</tr>
<tr>
<td>BIOL 3xx</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CHMY 3xx</td>
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<td></td>
</tr>
<tr>
<td>PHYS 3xx</td>
<td></td>
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</table>

Elective Courses

Choose 6 credits 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>ASTR 371</td>
<td>Solar System Astronomy</td>
<td></td>
</tr>
<tr>
<td>ASTR 373</td>
<td>Stars, Galaxies, and the Universe</td>
<td></td>
</tr>
<tr>
<td>BCH 380</td>
<td>Biochemistry</td>
<td></td>
</tr>
<tr>
<td>BCH 441</td>
<td>Biochemistry of Macromolecules</td>
<td></td>
</tr>
<tr>
<td>BCH 442</td>
<td>Metabolic Regulation</td>
<td></td>
</tr>
<tr>
<td>BIOB 375</td>
<td>General Genetics</td>
<td></td>
</tr>
<tr>
<td>BIOB 420</td>
<td>Evolution</td>
<td></td>
</tr>
<tr>
<td>BIOE 370</td>
<td>General Ecology (equiv to 270)</td>
<td></td>
</tr>
<tr>
<td>BIOM 360</td>
<td>General Microbiology</td>
<td></td>
</tr>
<tr>
<td>ERTH 505</td>
<td>Geomicrobiology</td>
<td></td>
</tr>
<tr>
<td>HSTR 207CS</td>
<td>Sci and Tech in World History</td>
<td></td>
</tr>
<tr>
<td>HSTR 282CS</td>
<td>Darwinian Revolution</td>
<td></td>
</tr>
<tr>
<td>HSTR 417</td>
<td>Early Modern Science</td>
<td></td>
</tr>
<tr>
<td>HSTR 419</td>
<td>Modern Science</td>
<td></td>
</tr>
<tr>
<td>PHL 242CS</td>
<td>Sci/Pseudo Sc &amp; Subjectivity</td>
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<tr>
<td>PHL 345</td>
<td>Philosophy of Science</td>
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<tr>
<td>RLS 402</td>
<td>Natural/Unnatural/Supernatural</td>
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Total Credits 32-34

Biochemistry Minor (Non-Teaching)

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<tr>
<th>Course Code</th>
<th>Course Title</th>
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<tbody>
<tr>
<td>BCH 441</td>
<td>Biochemistry of Macromolecules</td>
<td>3</td>
</tr>
<tr>
<td>BCH 442</td>
<td>Metabolic Regulation</td>
<td>3</td>
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<tr>
<td>BCH 444R</td>
<td>Biochemistry &amp; Molecular Biology Methods</td>
<td>3</td>
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<td>CHMY 141</td>
<td>College Chemistry I</td>
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<td>Honors College Chemistry I</td>
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<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>
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</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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<td>CHMY 323</td>
<td>Organic Chemistry II</td>
<td>4</td>
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<td>or CHMY 333</td>
<td>Honors Organic Chemistry II</td>
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<tr>
<td>M 161EQ</td>
<td>Survey of Calculus</td>
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</tr>
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<td>University Core and Electives</td>
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<tr>
<td>BCH 294</td>
<td>Seminar/Workshop</td>
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</tr>
<tr>
<td>BIOB 201</td>
<td>Cellular and Molecular Biology</td>
<td>4</td>
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<tr>
<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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<tr>
<td>any BCH/CHMY course 301 or higher, except BCH 380 or BCH/CHMY 490, 492,494 and 499</td>
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Total Credits 28

Biochemistry Option

Freshman Year

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<td>or CHMY 151</td>
<td>Honors College Chemistry I</td>
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<tr>
<td>STAT 216Q</td>
<td>Introduction to Statistics</td>
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<td>University Core and Electives</td>
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<tr>
<td>BCH 294</td>
<td>Seminar/Workshop</td>
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<tr>
<td>BIOL 201</td>
<td>Cellular and Molecular Biology</td>
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<td>or CHMY 153</td>
<td>Honors College Chemistry II</td>
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<tr>
<td>M 161EQ</td>
<td>Survey of Calculus</td>
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Sophomore Year

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<th>Course Title</th>
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<tbody>
<tr>
<td>PHSX 20 - 220</td>
<td>Physics I (w/ calculus)</td>
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<td>CHMY 321</td>
<td>Organic Chemistry I</td>
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</tr>
<tr>
<td>or CHMY 331</td>
<td>Honors Organic Chemistry I</td>
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</tr>
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<td>University Core and Electives</td>
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<td>CHMY 311</td>
<td>Fundamental Analytical Chem</td>
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<td>CHMY 323</td>
<td>Organic Chemistry II</td>
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<tr>
<td>or CHMY 333</td>
<td>Honors Organic Chemistry II</td>
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</tr>
<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>
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</tr>
<tr>
<td>University Core and Electives</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Year Total:</td>
<td>14</td>
<td></td>
</tr>
<tr>
<td>Year Total:</td>
<td>15</td>
<td></td>
</tr>
</tbody>
</table>
Electives Include

Acceptable Physical and Biological Sciences Electives must be in courses numbered 300 and above.

A minimum of 120 credits is required for graduation; 42 of these credits are required.

Please note that this course would be in addition to the core requirement.

All students are encouraged to take a 200 level English writing course.

Senior Year Credits

Physical and Biological Science Electives

University Core and Electives

Year Total: 15

Fall Credit

Spring Credit

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 BCH 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 BCH 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.

Additional Physical and Biological Sciences Electives

Acceptable Physical and Biological Sciences Electives Include

- BIOB 375 General Genetics
- BIOB 410 Immunology
- BIOB 412 Hybridomas
- BIOB 413 Flow Cytometry
- BIOB 414 Advanced Microscopy
- BIOB 415 Adv Immunology Methods
- BIOB 420 Evolution
- BIOB 425 Adv Cell & Molecular Biology
- BIOB 428 Molecular Evolution
- BIOB 430 Plant Biotechnology
- BIOB 438 Developmental Mechanisms
- BIOB 476R Gene Construction
- BIOH 313 Neuropsychology
- BIOH 323 Human Developmental Biology
- BIOH 405 Hematology
- BIOH 406 Hematology Laboratory
- BIOH 411 Adv Human Anatomy
- BIOH 422 Genes and Cancer
- BIOH 425 Sensory Neuropsychology
- BIOH 455 Molecular Medicine
- BIOM 360 General Microbiology
- BIOM 400 Medical Microbiology
- BIOM 410 Microbial Genetics
- BIOM 415 Microbial Diversity, Ecology, and Evolution
- BIOM 421 Concepts of Plant Pathology
- BIOM 430 Applied and Environmental Microbiology
- BIOM 431 Medical Bacteriology
- BIOM 432 Med Bacteriology Lab
- BIOM 435 Virology
- BIOM 441 Eukaryotic Pathogens
- BIOM 450 Microbial Physiology
- BIOM 452 Soil & Environmental Microbiology
- BIOM 455 Research Methds in Microbiology
- BOO 310 Comparative Vertebrate Anatomy
- BOO 412 Animal Physiology
- BOO 433 Plant Physiology
- BOO 437 Plant Development
- BOO 458 Plant Cell Physiology
- BOO 460 Plant Metabolism
- CHMY 401 Advanced Inorganic Chemistry
- CHMY 421 Advanced Instrument Analysis
- EBIO 438 Bioprocess Engin
- NUTR 421 Macronutrient Metabolism
- NUTR 422 Micronutrient Metabolism
- NUTR 422 Macronutrient Metabolism
- NUTR 421 Macronutrient Metabolism

Chemistry (Professional) Option

Freshman Year Credits

- CHMY 141 - College Chemistry I
- or CHMY 151 - Honors College Chemistry I
- CHMY 194 - Seminar/Workshop
- M 171Q - Calculus I
- or M 181Q - Honors Calculus I
- University Core and Electives
- CHMY 143 - College Chemistry II
- or CHMY 153 - Honors College Chemistry II
- M 172Q - Calculus II
- or M 182Q - Honors Calculus II
PHSX 220 - Physics I (w/ calculus) 4
or PHSX 240 - Honors Gen & Mod Phys I
CHMY 294 - Seminar/Workshop 1
University Core and Electives 3
Year Total: 15 16

Sophomore Year

<table>
<thead>
<tr>
<th>Credits</th>
<th>Fall</th>
<th>Spring</th>
</tr>
</thead>
</table>
| CHMY 321 - Organic Chemistry I 4 | \n| or CHMY 331 - Honors Organic Chemistry I \n| M 273Q - Multivariable Calculus 4 | \n| PHSX 222 - Physics II (w/ calculus) 4 | \n| or PHSX 242 - Honors Gen & Mod Phys II \n| University Core and Electives 3 \n| BIOB 160 - Principles of Living Systems 4 \n| or BIOB 260 - Cellular and Molecular Biology \n| CHMY 311 - Fundamental Analytical Chem 4 | \n| CHMY 323 - Organic Chemistry II 4 \n| or CHMY 333 - Honors Organic Chemistry II \n| University Core and Electives 3 | \nYear Total: 15 15

Junior Year

<table>
<thead>
<tr>
<th>Credits</th>
<th>Fall</th>
<th>Spring</th>
</tr>
</thead>
</table>
| CHMY 371 - Physical Chemistry-Quantum Chemistry and Spectroscopy I 3 | \n| CHMY 372 - Physical Chemistry Laboratory I 1 | \n| CHMY 394 - Seminar/Workshop 1 | \n| CHMY 417 - Synthetic Chemistry 3 \n| or CHMY 421 - Advanced Instrument Analysis \n| CHMY 490R - Undergraduate Research 3 | \n| University and Core Electives 3 \n| CHMY 373 - Physical Chemistry - Kinetics and Thermodynamics 3 | \n| CHMY 374 - Physical Chemistry Lab II 2 | \n| CHMY 401 - Advanced Inorganic Chemistry 3 | \n| CHMY 490R - Undergraduate Research 3 | \n| University Core and Electives 4 | \nYear Total: 14 15

Senior Year

<table>
<thead>
<tr>
<th>Credits</th>
<th>Fall</th>
<th>Spring</th>
</tr>
</thead>
</table>
| BCH 441 - Biochemistry of Macromolecules 3 | \n| CHMY 421 - Advanced Instrument Analysis 3 \n| or CHMY 417 - Synthetic Chemistry \n| Physical Science Electives 6 | \n| University Core and Electives 3 | \n| CHMY 494 - Seminar/Workshop 1 | \n| CHMY 499 - Senior Thesis/Capstone 3 \n| Physical Science Electives 3 | \n| University Core and Electives 11 | \nYear Total: 15 15

Total Program Credits: 120

---

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>Credits</th>
<th>Fall</th>
<th>Spring</th>
</tr>
</thead>
</table>
| BCH 442 - Metabolic Regulation 3 | \n| BCH 444R - Biochemistry & Molecular Biology Methods 3 | \n| CHMY 350 - Astrobiology 3 | \n| CHMY 515 - Structure and Bonding in Inorganic Chemistry 3 | \n| CHMY 516 - Mechanisms and Dynamics in Inorganic Chemistry 3 | \n| CHMY 523 - Organic Reaction Mechanisms 3 | \n| CHMY 524 - Mass Spectrometry 3 | \n| CHMY 526 - Adv Protein NMR Spectroscopy 3 | \n| CHMY 533 - Physical Organic Chemistry 3 | \n| CHMY 535 - Reagent Chemistry 3 | \n| CHMY 540 - Organic Synthesis 3 | \n| CHMY 551 - Organic Structure Elucidation 3 | \n| CHMY 554 - Organometallic Chemistry 3 | \n| CHMY 557 - Quantum Mechanics 3 | \n| CHMY 558 - Classical & Stat Thermodynamic 3 | \n| CHMY 559 - Kinetics & Dynamics 3 | \n| M 221 - Introduction to Linear Algebra 3 | \n| M 274 - Introduction to Differential Equation 4 | \n| M 333 - Linear Algebra 3 | \n| PHSX 224 - Physics III 4 | \n| PHSX 320 - Classical Mechanics 4 | \n| PHSX 423 - Electricity and Magnetism I 3 | \n
Chemistry Minor (Non-Teaching)

Required Course

<table>
<thead>
<tr>
<th>Credits</th>
<th>Fall</th>
<th>Spring</th>
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</thead>
<tbody>
<tr>
<td>CHMY 141 - College Chemistry I 4</td>
<td>\n</td>
<td>or CHMY 151 - Honors College Chemistry I \n</td>
</tr>
<tr>
<td>CHMY 361 - Elements of Physical Chemistry \n&amp; CHMY 362 - Elements of Physical Chemistry Lab \n</td>
<td>CHMY 371 - Physical Chemistry-Quantum Chemistry and Spectroscopy I \n&amp; CHMY 373 - and Physical Chemistry - Kinetics and Thermodynamics \n&amp; CHMY 372 - and Physical Chemistry Laboratory I</td>
<td></td>
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</table>
## Chemical and Biochemical Electives

### Senior Year

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
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<tbody>
<tr>
<td>BCH 490R - Undergraduate Research</td>
<td>3</td>
</tr>
<tr>
<td>CHMY 494 - Seminar/Workshop</td>
<td>3</td>
</tr>
<tr>
<td>BCH 441 - Biochemistry of Macromolecules</td>
<td>3</td>
</tr>
<tr>
<td>CHMY 362 - Elements of Physical Chemistry Lab</td>
<td>3</td>
</tr>
<tr>
<td>CHMY 331 - Organic Chemistry</td>
<td>3</td>
</tr>
<tr>
<td>CHMY 323 - Organic Chemistry II</td>
<td>3</td>
</tr>
<tr>
<td>PHSX 205 - College Physics I</td>
<td>3</td>
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<tr>
<td>CHMY 311 - Fundamental Analytical Chemistry</td>
<td>3</td>
</tr>
<tr>
<td>CHMY 333 - Honors Organic Chemistry II</td>
<td>3</td>
</tr>
<tr>
<td>PHSX 207 - College Physics II</td>
<td>3</td>
</tr>
<tr>
<td>EDU 370 - Integrating Tech into Educ</td>
<td>3</td>
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<td>Year Total:</td>
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### Year Total:

<table>
<thead>
<tr>
<th></th>
<th>15</th>
<th>16</th>
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</thead>
</table>

### Acceptable Chemical and Biochemical Electives

Include:

- CHMY 350 - Astrobiology
- CHMY 401 - Advanced Inorganic Chemistry
- CHMY 417 - Synthetic Chemistry
- CHMY 421 - Advanced Instrument Analysis
- BCH 442 - Metabolic Regulation
- BCH 444R - Biochemistry & Molecular Biology Methods

## 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. 194), Water Resources (p. 198) and Earth Science Teaching (p. 137). 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/cces/, 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

### Credits

<table>
<thead>
<tr>
<th>Fall</th>
<th>Spring</th>
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</thead>
<tbody>
<tr>
<td>15</td>
<td>16</td>
</tr>
</tbody>
</table>
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. 194)
- Geology Option (p. 195)
- GIS/Planning Option (p. 193)
- Paleontology Option (p. 196)
- Snow Science Option (p. 197)

**Undergraduate Minors**

- Earth Science Teaching (p. 137)
- GIS Minor (Non-Teaching) (p. 194)
- Water Resources Minor (Non-Teaching) (p. 198)

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 geochemistry. 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. 338)
- M.S. in Land Rehabilitation (p. 277) (Interdisciplinary degree)
- Ph.D. in Earth Sciences (p. 338)

**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 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 in 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/Spatial 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>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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<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 121D</td>
<td>Human Geography</td>
<td>3</td>
</tr>
<tr>
<td>GPHY 141D</td>
<td>Geography of World Regions</td>
<td>3</td>
</tr>
<tr>
<td>ECNS 101IS</td>
<td>Economic Way of Thinking</td>
<td>3</td>
</tr>
<tr>
<td>MART 145RA</td>
<td>Web Design</td>
<td>3</td>
</tr>
<tr>
<td>WRIT 101W</td>
<td>College Writing I</td>
<td>3</td>
</tr>
<tr>
<td>University Core, Prerequisites and Electives</td>
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<td>8</td>
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<td><strong>Year Total:</strong></td>
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<table>
<thead>
<tr>
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<th>Course Title</th>
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<tbody>
<tr>
<td>GPHY 284</td>
<td>Intro to GIS Science &amp; Cartog</td>
<td>3</td>
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<tr>
<td>ENSC 2451N</td>
<td>Soils</td>
<td>3</td>
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<tr>
<td>PSCI 2101S</td>
<td>Introduction to American Government</td>
<td>3</td>
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<tr>
<td>CSCI 111</td>
<td>Programming with Java I</td>
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<tr>
<td><strong>Take EITHER:</strong></td>
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<td><strong>3-6</strong></td>
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<tr>
<td>STAT 216Q</td>
<td>Introduction to Statistics</td>
<td>1-3</td>
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<tr>
<td>&amp; STAT 217Q</td>
<td>Intermediate Statistical Concepts</td>
<td>1-3</td>
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<tr>
<td>OR</td>
<td></td>
<td></td>
</tr>
<tr>
<td>STAT 332</td>
<td>Statistics for Scientists and Engineers</td>
<td>3</td>
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<tr>
<td><strong>Take ONE of the following:</strong></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>
<td>3</td>
</tr>
<tr>
<td><strong>Take ONE of the following:</strong></td>
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<tr>
<td>DDSN 114</td>
<td>Introduction to CAD</td>
<td>3</td>
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<tr>
<td>SRVY 230</td>
<td>Intro to Srvg for Engineers</td>
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**Fourth Year**

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<tr>
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<th>Course Title</th>
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<tr>
<td>Intro &amp; Advanced Electives</td>
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<tr>
<td><strong>Year Total:</strong></td>
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</table>

**Total Credits Required:**

**Freshman Year:** 30 credits

**Sophomore Year:** 30 credits

**Junior Year:** 30 credits

**Senior Year:** 30 credits

**Total Credits Required:** 120 credits
University Core, Prerequisites and Electives  5-8  
Year Total:  30  

**Junior Year**  
<table>
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<th>Course</th>
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<tr>
<td>ERTH 303 - Weather and Climate</td>
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<tr>
<td>ERTH 307 - Principles of Geomorphology</td>
<td>4</td>
</tr>
<tr>
<td>GPHY 384 - Adv GIS and Spatial Analysis</td>
<td>3</td>
</tr>
<tr>
<td>GPHY 365 - Geographical Planning</td>
<td>3</td>
</tr>
<tr>
<td>GPHY 357 - GPS Fund/App in Mapping</td>
<td>3</td>
</tr>
<tr>
<td>GPHY 426 - Remote Sensing</td>
<td>3</td>
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<tr>
<td><strong>Take TWO of the following:</strong></td>
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</tr>
<tr>
<td>GPHY 321 - Urban Geography</td>
<td></td>
</tr>
<tr>
<td>GPHY 322 - Economic Geography</td>
<td></td>
</tr>
<tr>
<td>GPHY 445 - Adv. Regional Geography</td>
<td></td>
</tr>
<tr>
<td>PSCI 423 - Politics of Development</td>
<td></td>
</tr>
<tr>
<td><strong>University Core, Prerequisites and Electives</strong></td>
<td>5</td>
</tr>
<tr>
<td><strong>Year Total:</strong></td>
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</tbody>
</table>

**Senior Year**  
<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
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<tbody>
<tr>
<td>GPHY 484R - Applied GIS &amp; Spatial Analysis</td>
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<td><strong>Take SIX of the following:</strong></td>
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<tr>
<td>BIOE 370 - General Ecology (equiv to 270)</td>
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<tr>
<td>BIOE 375 - Ecological Responses to Climate Change</td>
<td></td>
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<tr>
<td>BIOE 416 - Alpine Ecology</td>
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<tr>
<td>NRSM 421 - Holistic Thought/Mgmt</td>
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<tr>
<td>NRSM 430 - Natural Resource Law</td>
<td></td>
</tr>
<tr>
<td>NRSM 453 - Habitat Inventory and Analysis</td>
<td></td>
</tr>
<tr>
<td>NRSM 455 - Riparian Ecology &amp; Management</td>
<td></td>
</tr>
<tr>
<td>GPHY 411 - Biogeography</td>
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<tr>
<td>GPHY 429R - Applied Remote Sensing</td>
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<tr>
<td>GPHY 441R - Mountain Geography</td>
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<tr>
<td>GPHY 457 - Adv GPS Mapping for GIS</td>
<td></td>
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<tr>
<td>GPHY 461 - Tourism Planning</td>
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<tr>
<td>ERTH 432R - Surface Water Resources</td>
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<tr>
<td>STAT 411 - Methods for Data Analysis I</td>
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<tr>
<td>STAT 412 - Methods for Data Analysis II</td>
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<td>STAT 436 - Introduction to Time Series Analysis</td>
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<td>STAT 446 - Sampling</td>
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<td>CSCI 440 - Database Systems</td>
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<td>SRVY 375 - Analytic Photogrammetry and Remote Sensing</td>
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<td><strong>University Core, Prerequisites and Electives</strong></td>
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<td><strong>Year Total:</strong></td>
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</table>

**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**  
<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>GPHY 284 - Intro to GIS Science &amp; Cartog</td>
<td>3</td>
</tr>
<tr>
<td>GPHY 384 - Adv GIS and Spatial Analysis</td>
<td>3</td>
</tr>
<tr>
<td>GPHY 484R - Applied GIS &amp; Spatial Analysis</td>
<td>3</td>
</tr>
<tr>
<td>GPHY 357 - GPS Fund/App in Mapping</td>
<td>3</td>
</tr>
<tr>
<td>GPHY 426 - Remote Sensing</td>
<td>3</td>
</tr>
<tr>
<td><strong>Take ONE of the following:</strong></td>
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<tr>
<td>STAT 217Q - Intermediate Statistical Concepts</td>
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</tr>
<tr>
<td>STAT 332 - Statistics for Scientists and Engineers</td>
<td></td>
</tr>
<tr>
<td><strong>Take TWO of the following:</strong></td>
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</tr>
<tr>
<td>SRVY 230 - Intro to Srvyg for Engineers</td>
<td></td>
</tr>
<tr>
<td>DDSN 114 - Introduction to CAD</td>
<td></td>
</tr>
<tr>
<td>STAT 408 - Statistical Computing and Graphical Analysis</td>
<td></td>
</tr>
<tr>
<td>STAT 446 - Sampling</td>
<td></td>
</tr>
<tr>
<td>CSCI 440 - Database Systems</td>
<td></td>
</tr>
<tr>
<td>SRVY 375 - Analytic Photogrammetry and Remote Sensing</td>
<td></td>
</tr>
<tr>
<td>GPHY 429R - Applied Remote Sensing</td>
<td></td>
</tr>
<tr>
<td>GPHY 457 - Adv GPS Mapping for GIS</td>
<td></td>
</tr>
<tr>
<td>GPHY 492 - Independent Study</td>
<td></td>
</tr>
<tr>
<td><strong>Total Credits</strong>:</td>
<td>23</td>
</tr>
</tbody>
</table>

**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.
student’s course sequence may differ from that shown depending upon the

date the student enters the program and the availability of courses.

<table>
<thead>
<tr>
<th>Freshman Year</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>Year Total:</td>
<td>30</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Sophomore Year</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>Year Total:</td>
<td>30</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Junior Year</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>GPHY 384 - Adv GIS and Spatial Analysis</td>
<td>3</td>
</tr>
<tr>
<td>ERTH 303 - Weather and Climate</td>
<td>3</td>
</tr>
<tr>
<td>Capstone Course</td>
<td></td>
</tr>
<tr>
<td>Take the following in the senior year:</td>
<td></td>
</tr>
<tr>
<td>GPHY 425 - Geographic Thought</td>
<td>3</td>
</tr>
<tr>
<td>Choose five courses from the following and one methods course</td>
<td>18</td>
</tr>
<tr>
<td>OR four courses from the following and two methods courses:</td>
<td></td>
</tr>
<tr>
<td>ERTH 307 - Principles of Geomorphology</td>
<td></td>
</tr>
<tr>
<td>ERTH 450R - Snow Dynamics and Accumulation</td>
<td></td>
</tr>
<tr>
<td>GPHY 411 - Biogeography</td>
<td></td>
</tr>
<tr>
<td>ERTH 484 - Quaternary Environment</td>
<td></td>
</tr>
<tr>
<td>GPHY 325 - Cultural Geography</td>
<td></td>
</tr>
<tr>
<td>GPHY 321 - Urban Geography</td>
<td></td>
</tr>
<tr>
<td>GPHY 322 - Economic Geography</td>
<td></td>
</tr>
<tr>
<td>GPHY 365 - Geographical Planning</td>
<td></td>
</tr>
<tr>
<td>GPHY 431 - Historical Geography</td>
<td></td>
</tr>
<tr>
<td>GPHY 461 - Tourism Planning</td>
<td></td>
</tr>
<tr>
<td>GPHY 441R - Mountain Geography</td>
<td></td>
</tr>
<tr>
<td>GPHY 446 - East Asia in the Global System</td>
<td></td>
</tr>
<tr>
<td>GPHY 445 - Adv. Regional Geography</td>
<td></td>
</tr>
<tr>
<td>Methods Courses</td>
<td></td>
</tr>
<tr>
<td>GPHY 484R - Applied GIS &amp; Spatial Analysis</td>
<td></td>
</tr>
<tr>
<td>GPHY 426 - Remote Sensing</td>
<td></td>
</tr>
<tr>
<td>GPHY 357 - GPS Fund/App in Mapping</td>
<td></td>
</tr>
<tr>
<td>GPHY 429R - Applied Remote Sensing</td>
<td></td>
</tr>
<tr>
<td>STAT 411 - Methods for Data Analysis I</td>
<td></td>
</tr>
<tr>
<td>Selected minor or minor emphasis**</td>
<td>21</td>
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<tr>
<td>University Core and Electives</td>
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<tr>
<td>Year Total:</td>
<td>60</td>
</tr>
</tbody>
</table>

| 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.

<table>
<thead>
<tr>
<th>Human Geography Emphasis</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Choose 12 credits from the following:</td>
<td></td>
</tr>
<tr>
<td>ANTY 101D - Anthropology and the Human Experience</td>
<td>3</td>
</tr>
<tr>
<td>PSCI 210S - Introduction to American Government</td>
<td>3</td>
</tr>
<tr>
<td>SOCI 101S - Introduction to Sociology</td>
<td>3</td>
</tr>
<tr>
<td>ECNS 101S - Economic Way of Thinking</td>
<td>3</td>
</tr>
<tr>
<td>ECNS 202 - Principles of Macroeconomics</td>
<td>3</td>
</tr>
<tr>
<td>ERTH 212RN - Yellowstone: Scientific Lab</td>
<td>4</td>
</tr>
<tr>
<td>Take an additional 9 credits of Advisor-approved upper division electives</td>
<td>9</td>
</tr>
</tbody>
</table>

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, Geography, and Geology (1 course only from within the department). The courses used here cannot be used to fulfill the other course requirements in the Geography Option.

<table>
<thead>
<tr>
<th>Physical Geography Emphasis</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIBO 170IN - Principles of Biological Diversity</td>
<td>4</td>
</tr>
<tr>
<td>CHMY 121IN - Introduction to General Chemistry</td>
<td>4</td>
</tr>
<tr>
<td>GEO 105IN - Oceanography</td>
<td>3</td>
</tr>
<tr>
<td>ENSC 245IN - Soils</td>
<td>3</td>
</tr>
<tr>
<td>ERTH 212RN - Yellowstone: Scientific Lab</td>
<td>4</td>
</tr>
<tr>
<td>Take an additional 9 credits of Advisor-approved upper division electives</td>
<td>9</td>
</tr>
</tbody>
</table>

The advisor-approved upper division courses (minimum 9 credits) will be selected from course offerings in the 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.

<table>
<thead>
<tr>
<th>Geology Option</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>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</td>
<td></td>
</tr>
</tbody>
</table>
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</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>ERTH 101IN - Earth System Sciences</td>
<td>4</td>
</tr>
<tr>
<td>or ERTH 201IN - Honors Earth System Science</td>
<td></td>
</tr>
<tr>
<td>ERTH 102CS - Topics in Earth Sciences¹</td>
<td>1</td>
</tr>
<tr>
<td>GEO 211 - Earth History and Evolution</td>
<td>3</td>
</tr>
<tr>
<td>M 171Q - Calculus I</td>
<td>4</td>
</tr>
<tr>
<td>M 172Q - Calculus II</td>
<td>4</td>
</tr>
<tr>
<td>University Core and Electives</td>
<td>4</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>BIOB 170IN - Principles of Biological Diversity</td>
<td>4</td>
</tr>
<tr>
<td>GEO 208IN - Earth Materials</td>
<td>3</td>
</tr>
<tr>
<td>GPHY 284 - Intro to GIS Science &amp; Cartog</td>
<td>3</td>
</tr>
<tr>
<td>GPHY 384 - Adv GIS and Spatial Analysis</td>
<td>3</td>
</tr>
<tr>
<td>PHSX 205 - College Physics I</td>
<td>4</td>
</tr>
<tr>
<td>PHSX 207 - College Physics II</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>
</tbody>
</table>

**Junior Year**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ERTH 303 - Weather and Climate</td>
<td>3</td>
</tr>
<tr>
<td>ERTH 307 - Principles of Geomorphology</td>
<td>4</td>
</tr>
<tr>
<td>GEO 302 - Mineralogy and Optical Mineral</td>
<td>4</td>
</tr>
<tr>
<td>GEO 309 - Sedimentation and Stratigraphy</td>
<td>4</td>
</tr>
<tr>
<td>GEO 315 - Structural Geology</td>
<td>4</td>
</tr>
<tr>
<td>STAT 332 - Statistics for Scientists and Engineers</td>
<td>3</td>
</tr>
<tr>
<td>University Core and Electives</td>
<td>8</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>GEO 429R - Field Geology²</td>
<td>6</td>
</tr>
<tr>
<td>GEO 433 - Global Tectonics</td>
<td>3</td>
</tr>
<tr>
<td>GEO 448 - Sedimentary Petrology</td>
<td>3</td>
</tr>
<tr>
<td>GEO 449 - Metamorphic Petrology³</td>
<td>3</td>
</tr>
<tr>
<td>or GEO 450 - Igneous Petrology</td>
<td></td>
</tr>
<tr>
<td>Take at least three of the following:</td>
<td></td>
</tr>
<tr>
<td>ERTH 450R - Snow Dynamics and Accumulation</td>
<td></td>
</tr>
<tr>
<td>ERTH 484 - Quaternary Environment</td>
<td></td>
</tr>
<tr>
<td>ERTH 494 - Seminar</td>
<td></td>
</tr>
<tr>
<td>GEO 310 - Invertebrate Paleontology</td>
<td></td>
</tr>
<tr>
<td>GEO 411 - Vertebrate Paleontology</td>
<td></td>
</tr>
<tr>
<td>GEO 417 - Taphonomy: Fossil Preservation</td>
<td></td>
</tr>
<tr>
<td>GEO 440 - Volcanology</td>
<td></td>
</tr>
<tr>
<td>GEO 445 - Glacial Geology</td>
<td></td>
</tr>
<tr>
<td>GEO 490R - Undergraduate Research</td>
<td></td>
</tr>
<tr>
<td>GEO 491 - Special Topics</td>
<td></td>
</tr>
<tr>
<td>GEO 492 - Independent Study⁴</td>
<td></td>
</tr>
<tr>
<td>GEO 498 - Internship</td>
<td></td>
</tr>
<tr>
<td><strong>One course from the following can be counted as an elective:</strong></td>
<td></td>
</tr>
<tr>
<td>GPHY 357 - GPS Fund/App in Mapping</td>
<td></td>
</tr>
<tr>
<td>GPHY 426 - Remote Sensing</td>
<td></td>
</tr>
<tr>
<td>GPHY 484R - Applied GIS &amp; Spatial Analysis</td>
<td></td>
</tr>
<tr>
<td>University Core and Electives</td>
<td>21</td>
</tr>
<tr>
<td><strong>Year Total:</strong></td>
<td><strong>30</strong></td>
</tr>
</tbody>
</table>

**Total Program Credits:** 120

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**

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</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>
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</tr>
<tr>
<td>ERTH 101IN - Earth System Sciences</td>
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</tr>
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<td>or ERTH 201IN - Honors Earth System Science</td>
<td></td>
</tr>
<tr>
<td>ERTH 102CS - Topics in Earth Sciences¹</td>
<td>1</td>
</tr>
<tr>
<td>GEO 211 - Earth History and Evolution</td>
<td>3</td>
</tr>
<tr>
<td>M 171Q - Calculus I</td>
<td>4</td>
</tr>
<tr>
<td>M 172Q - Calculus II</td>
<td>4</td>
</tr>
<tr>
<td>University Core and Electives</td>
<td>4</td>
</tr>
<tr>
<td><strong>Year Total:</strong></td>
<td><strong>30</strong></td>
</tr>
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</table>

**Sophomore Year**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOB 170IN - Principles of Biological Diversity</td>
<td>4</td>
</tr>
<tr>
<td>GEO 208IN - Earth Materials</td>
<td>3</td>
</tr>
<tr>
<td>GPHY 284 - Intro to GIS Science &amp; Cartog</td>
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</tr>
<tr>
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<tr>
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</tr>
<tr>
<td>PHSX 207 - College Physics II</td>
<td>4</td>
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<tr>
<td>University Core and Electives</td>
<td>9</td>
</tr>
<tr>
<td><strong>Year Total:</strong></td>
<td><strong>30</strong></td>
</tr>
</tbody>
</table>

**Year Total:** 30

**Total Program Credits:** 120

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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.

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<tr>
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<tr>
<td>University Core and Electives</td>
<td>4</td>
</tr>
<tr>
<td><strong>Year Total:</strong></td>
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</tr>
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</table>

**Sophomore Year**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
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<td>BIOB 170IN - Principles of Biological Diversity</td>
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<tr>
<td>GEO 208IN - Earth Materials</td>
<td>3</td>
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<tr>
<td>GPHY 284 - Intro to GIS Science &amp; Cartog</td>
<td>3</td>
</tr>
<tr>
<td>GPHY 384 - Adv GIS and Spatial Analysis</td>
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<td>PHSX 207 - College Physics II</td>
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<tr>
<td>University Core and Electives</td>
<td>9</td>
</tr>
<tr>
<td><strong>Year Total:</strong></td>
<td><strong>30</strong></td>
</tr>
</tbody>
</table>
A minimum of 120 credits is required for graduation; 42 of these credits must be in courses numbered 300 or above.

**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**

<table>
<thead>
<tr>
<th>Freshman Year</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>M 171Q - Calculus I</td>
<td>4</td>
</tr>
<tr>
<td>M 172Q - Calculus II</td>
<td>4</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>CHMY 141 - College Chemistry I</td>
<td>4</td>
</tr>
<tr>
<td>CHMY 143 - College Chemistry II</td>
<td>4</td>
</tr>
<tr>
<td>PHSX 205 - College Physics I</td>
<td>4</td>
</tr>
<tr>
<td>PHSX 207 - College Physics II</td>
<td>4</td>
</tr>
<tr>
<td>ERTH 303 - Weather and Climate</td>
<td>3</td>
</tr>
<tr>
<td>University Core and Electives</td>
<td>11</td>
</tr>
<tr>
<td>Year Total:</td>
<td>30</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Junior Year</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ERTH 307 - Principles of Geomorphology</td>
<td>4</td>
</tr>
</tbody>
</table>

**Elective Courses**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOO 310 - Comparative Vertebrate Anatomy</td>
<td>4</td>
</tr>
<tr>
<td>ERTH 484 - Quaternary Environment</td>
<td>3</td>
</tr>
<tr>
<td>ERTH 494 - Seminar</td>
<td>1</td>
</tr>
<tr>
<td>GEO 312 - Dinosaur Paleontology</td>
<td>3</td>
</tr>
<tr>
<td>GEO 415 - Macrovolution/Fossil Record</td>
<td>3</td>
</tr>
<tr>
<td>GEO 449 - Metamorphic Petrology</td>
<td>3</td>
</tr>
<tr>
<td>GEO 450 - Igneous Petrology</td>
<td>3</td>
</tr>
<tr>
<td>GEO 490R - Undergraduate Research</td>
<td>3</td>
</tr>
<tr>
<td>GEO 491 - Special Topics</td>
<td>3</td>
</tr>
<tr>
<td>GEO 492 - Independent Study</td>
<td>3</td>
</tr>
<tr>
<td>GEO 498 - Internship</td>
<td>3</td>
</tr>
<tr>
<td>GPHY 411 - Biogeography</td>
<td>3</td>
</tr>
<tr>
<td>GPHY 357 - GPS Fund/App in Mapping</td>
<td>3</td>
</tr>
</tbody>
</table>

**Upper Division Paleontology Course Electives**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>GEO 310 - Invertebrate Paleontology</td>
<td>3</td>
</tr>
<tr>
<td>GEO 330 - Paleontology Lab Techniques</td>
<td>2</td>
</tr>
<tr>
<td>GEO 411 - Vertebrate Paleontology</td>
<td>3</td>
</tr>
<tr>
<td>GEO 417 - Taphonomy: Fossil Preservation</td>
<td>3</td>
</tr>
<tr>
<td>GEO 419 - Field Paleontology ***</td>
<td>2</td>
</tr>
</tbody>
</table>

* Students are required to take 3 credits of ERTH 102CS to fulfill department requirements as well as Core 2.0
** GEO 429R Should be taken SUMMER of either Junior or Senior year.
*** Taken during summer of Sophomore or Junior year

**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.
**Select one of the following areas of Emphasis:**

### Snow Geography, Snow Mechanics, Snow Statistics

**Snow Geography Emphasis**
- BIBO 170IN Principles of Biological Diversity 4
- GPHY 121D Human Geography 3
- GPHY 284 Intro to GIS Science & Cartography 3
- STAT 332 Statistics for Scientists and Engineers 3
- GPHY 365 Geographical Planning 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 Eng 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
- Additional 6 upper division credits needed to graduate

**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 Regent’s 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.

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**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 curriculum review officer and signs the application for a Non-Teaching Minor after approval and forwarding by departmental advisors. This minor requires a minimum of 21 credits. The courses are grouped into basic and applied research and social sciences courses. Students are expected to create a diverse program, with course selections from both 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 major 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 should be sent to the committee chair. The written appeal should identify the substitution and present a brief rationale.

**Required Courses**
- ENSC 272CS Water Resources (classroom in Fall, online in Spring) 3
- Choose one of the following: 3
  - ENSC 498 Internship
  - GPHY 498 Internship
  - ECIV 498 Internship
  - PSCI 498 Internship

**Restricted Electives**
- Take 15 credits; at least one from each subject area

**Basic Science Courses**
- BIOE 428 Freshwater Ecology 3
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<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; Environmnt Microbiology</td>
<td>3</td>
</tr>
<tr>
<td>CHMY 311</td>
<td>Fundamental Analytical Chem</td>
<td>4</td>
</tr>
<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>
</tr>
<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 Biogeochem</td>
<td>3</td>
</tr>
<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>ERTH 450R</td>
<td>Snow Dynamics and Accumulation</td>
<td>4</td>
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</tbody>
</table>

**Applied Science Courses**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>EIV 331</td>
<td>Engineering Hydrology</td>
<td>2</td>
</tr>
<tr>
<td>EENV 340</td>
<td>Princ of Envir Engineering</td>
<td>3</td>
</tr>
<tr>
<td>EENV 441</td>
<td>Natural Treatment Systems</td>
<td>3</td>
</tr>
<tr>
<td>ENSC 353</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>
<td>3</td>
</tr>
<tr>
<td>GPHY 384</td>
<td>Adv GIS and Spatial Analysis</td>
<td>3</td>
</tr>
<tr>
<td>GPHY 426</td>
<td>Remote Sensing</td>
<td>3</td>
</tr>
<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>
</tbody>
</table>

**Social Science Courses**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</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.

**Water Resources Minor Faculty**

- Cathy Whitlock, Chair - IoE/Earth Sciences
- Clayton Marlow - Animal & Range Sciences
- Al Cunningham - Center for Biofilm Engineering
- Paul Sturman - Center for Biofilm Engineering
- Anne Camper - Center for Biofilm Engineering/CoE
- Joel Cahoon - Civil Engineering
- Otto Stein - Civil Engineering
- Jordy Hendriks - Earth Sciences
- Jamie McEvoy - Earth Sciences
- Wyatt Cross - Ecology
- Tom McMahon - Ecology
- Tom McMahon - Ecology
- Linda Young - Political Science
- Paul Stoy - Land Resources and Environmental Sciences
- Linda Young - Political Science
- Duncan Patten - Water Center

**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 basic 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.

**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. 201)
- Fish and Wildlife Ecology and Management (p. 202)
- Organismal Biology (p. 203)
- Biology Teaching (p. 200)
**Undergraduate Minors**
- Astrobiology Minor (Non-Teaching) (p. 189)
- Genetics Minor (Non-Teaching) (p. 90)

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. 339)
- M.S. in Fish and Wildlife Management (p. 340)
- Ph.D. in Fish and Wildlife Biology (p. 341)
- Ph.D. in Biological Sciences (p. 340)
- Ph.D. in Ecology and Environmental Sciences (p. 340) (interdisciplinary)

**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 (24 to 25 credits of basic biology courses, plus BCH 380 or BIOM 103IN, and 12 Biology elective credits); supporting chemistry, physics, and mathematics courses; 30 credits in the university core; and 32 credits of professional preparation. Biology electives must include 7 to 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>Fall</th>
<th>Credits</th>
<th>Spring</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOB 170IN - Principles of Biological Diversity</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>CHMY 141 - College Chemistry I</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>WRIT 101W - College Writing I</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>M 161Q - Survey of Calculus</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>University Core and Electives</td>
<td>0-3</td>
<td></td>
</tr>
<tr>
<td>BIOB 160 - Principles of Living Systems</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>CHMY 143 - College Chemistry II</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>COM 110US - or CLS 101US - Knowledge and Community</td>
<td>3</td>
<td></td>
</tr>
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</table>

**Sophomore Year**

<table>
<thead>
<tr>
<th>Credits</th>
<th>Fall</th>
<th>Spring</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHMY 211 - Elements of Organic Chemistry</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>PHSX 205 - College Physics I</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>EDU 202 - Early Field Experience</td>
<td>1</td>
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</tr>
<tr>
<td>EDU 211D - Multicultural Education</td>
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<tr>
<td>University Core and Electives</td>
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</tr>
<tr>
<td>BCH 380 - Biochemistry</td>
<td>5</td>
<td></td>
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<tr>
<td>Choose one of the following:</td>
<td>3-5</td>
<td></td>
</tr>
<tr>
<td>BIOM 103IN - Unseen Universe: Microbes (3)</td>
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<tr>
<td>BIOM 360 - General Microbiology (5)</td>
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<tr>
<td>PHSX 207 - College Physics II</td>
<td>4</td>
<td></td>
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<tr>
<td>EDU 223IS - Educ Psych and Adolescent Dev</td>
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<tr>
<td>University Core and Electives</td>
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</table>

**Junior Year**

<table>
<thead>
<tr>
<th>Credits</th>
<th>Fall</th>
<th>Spring</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOB 375 - General Genetics or BIOB 377 - Practical Genetics</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>BIOO 412 - Animal Physiology or BIOO 433 - Plant Physiology</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>EDU 382 - Assessmt, Curric, Instructn</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>BIOM 318 - Biometry or STAT 216Q - Introduction to Statistics</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>University Core and Electives</td>
<td>3-6</td>
<td></td>
</tr>
<tr>
<td>BOE 370 - General Ecology (equiv to 270)</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>BOE 420 - Evolution</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>BOE 499 - Senior Thesis/Capstone</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>EDU 370 - Integrating Tech into Educ</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>University Core and Electives</td>
<td>5-6</td>
<td></td>
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**Senior Year**

<table>
<thead>
<tr>
<th>Credits</th>
<th>Fall</th>
<th>Spring</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOE 408 - Rocky Mountain Vegetation</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>EDU 497 - Methods</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>EDU 395 - Practicum</td>
<td>1-3</td>
<td></td>
</tr>
<tr>
<td>EDSP 306 - Exceptional Learners</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Upper Division Biology Elective</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>University Core and Electives</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>EDU 495 - Student Teaching</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>EDU 408 - Professional Issues: K-12</td>
<td>2</td>
<td></td>
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<tr>
<td>PRAXIS exam</td>
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<td></td>
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</tbody>
</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 (BIOB, BIOE, BIOC, 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>Fall Credits</th>
<th>Spring Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOE 103CS - Environmental Science and Society</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>COMX 111US - Introduction to Public Speaking (formerly COM 110US) or CLS 101US - Knowledge and Community</td>
<td>3</td>
</tr>
<tr>
<td>University Core and Electives</td>
<td>0-3</td>
</tr>
<tr>
<td>PHSX 205 - College Physics I</td>
<td>4</td>
</tr>
<tr>
<td>M 161Q - Survey of Calculus</td>
<td>4</td>
</tr>
<tr>
<td>WRIT 101W - College Writing I</td>
<td>3</td>
</tr>
<tr>
<td>BIOB 160 - Principles of Living Systems (Chem pre-req)</td>
<td>4</td>
</tr>
<tr>
<td>University Core and Additional Electives</td>
<td>0-3</td>
</tr>
<tr>
<td><strong>Year Total:</strong></td>
<td><strong>14-17</strong></td>
</tr>
</tbody>
</table>

Sophomore Year

<table>
<thead>
<tr>
<th>Fall Credits</th>
<th>Spring Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHL 236Q - Logic</td>
<td>3</td>
</tr>
<tr>
<td>STAT 216Q - Introduction to Statistics</td>
<td>3</td>
</tr>
<tr>
<td>CHMY 143 - College Chemistry II</td>
<td>4</td>
</tr>
<tr>
<td>ENSC 110 - Lnd Res Environ Sciences</td>
<td>3</td>
</tr>
<tr>
<td>WRIT 201 - College Writing II</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>ECNS 101IS - Economic Way of Thinking</td>
<td>3</td>
</tr>
<tr>
<td>Take one of the following:</td>
<td>3-4</td>
</tr>
<tr>
<td><strong>Year Total:</strong></td>
<td><strong>15-18</strong></td>
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</table>

Junior Year

<table>
<thead>
<tr>
<th>Fall Credits</th>
<th>Spring Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ERTH 101IN - Earth System Sciences</td>
<td>3</td>
</tr>
<tr>
<td>ERTH 102CS - Topics in Earth Sciences</td>
<td>3</td>
</tr>
<tr>
<td>STAT 217Q - Intermediate Statistical Concepts</td>
<td>3</td>
</tr>
<tr>
<td><strong>Year Total:</strong></td>
<td><strong>16</strong></td>
</tr>
</tbody>
</table>

Senior Year

<table>
<thead>
<tr>
<th>Fall Credits</th>
<th>Spring Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOE 440R - Conservation Biology</td>
<td>3</td>
</tr>
<tr>
<td>Take two of the following:</td>
<td>3-6</td>
</tr>
<tr>
<td>BIOE 428 - Freshwater Ecology</td>
<td>3</td>
</tr>
<tr>
<td>BIOE 445 - Macrosystems ecology: Linking plants, animals, and ecosystems across scales</td>
<td>3</td>
</tr>
<tr>
<td>BIOE 455 - Plant Ecology</td>
<td>3</td>
</tr>
<tr>
<td>BIOE 415 - Ichthyology</td>
<td>3</td>
</tr>
<tr>
<td>BIOE 470 - Ornithology</td>
<td>3</td>
</tr>
<tr>
<td>BIOE 475 - Mammalogy</td>
<td>3</td>
</tr>
<tr>
<td>Social Sciences Elective</td>
<td>3</td>
</tr>
<tr>
<td>University CORE and Additional Electives</td>
<td>3-6</td>
</tr>
<tr>
<td>Complete two of the above list</td>
<td>3-6</td>
</tr>
<tr>
<td>Social Sciences Elective</td>
<td>3</td>
</tr>
<tr>
<td>University CORE and Additional Electives</td>
<td>6-9</td>
</tr>
<tr>
<td><strong>Year Total:</strong></td>
<td><strong>15-18</strong></td>
</tr>
</tbody>
</table>

**Total Program Credits:** 120

* Semester for completing WRIT 101W is assigned for freshmen during Orientation.

Social Sciences Elective Block

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**

**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
- BIBO 435 - Plant Systematics 3
- BIBO 484 - Population Genetics (not currently offered) 3

**Environmental Science:**
- ENSC 245IN - Soils 3
- ENSC 272CS - Water Resources 3
- ENSC 353 - 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

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.

**Requirements for Admission to Upper Division Courses in Biology**

For admission to upper division (numbered 300 or higher) Biology (BIOB, BIOE, BIBO) 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>
</tr>
</thead>
<tbody>
<tr>
<td>WILD 201 - Intro to Fish and Wildlife</td>
<td>1</td>
</tr>
<tr>
<td>BIOE 103CS - Environmental Science and Society</td>
<td>3</td>
</tr>
</tbody>
</table>

Choose one of the following:

<table>
<thead>
<tr>
<th>Credits</th>
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<tbody>
<tr>
<td>3</td>
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</table>

**Year Total:**

<table>
<thead>
<tr>
<th>Credits</th>
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<tbody>
<tr>
<td>14-17</td>
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</table>

**Sophomore Year**

<table>
<thead>
<tr>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>3-6</td>
</tr>
</tbody>
</table>

**Year Total:**

<table>
<thead>
<tr>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>14-17</td>
</tr>
</tbody>
</table>

**Junior Year**

<table>
<thead>
<tr>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-3</td>
</tr>
</tbody>
</table>

**Year Total:**

<table>
<thead>
<tr>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>15-18</td>
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</table>

**Senior Year**

<table>
<thead>
<tr>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-3</td>
</tr>
</tbody>
</table>

**Year Total:**

<table>
<thead>
<tr>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>15-18</td>
</tr>
</tbody>
</table>
## 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.

## Organismal Biology Option

### Freshman Year

<table>
<thead>
<tr>
<th>Credits</th>
<th>Fall</th>
<th>Spring</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIBOB 1701N - Principles of Biological Diversity</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>CHMY 141 - College Chemistry I (Completed Level 3 math pre-requisite)</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>COMX 111US - Introduction to Public Speaking (formerly COM 110US) or CLS 101US - Knowledge and Community</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>University Core and Electives, or Math pre-reqs</td>
<td>4-6</td>
<td></td>
</tr>
<tr>
<td>Year Total:</td>
<td>15-17</td>
<td>15-17</td>
</tr>
</tbody>
</table>

### Sophomore Year

<table>
<thead>
<tr>
<th>Credits</th>
<th>Fall</th>
<th>Spring</th>
</tr>
</thead>
<tbody>
<tr>
<td>M 161Q - Survey of Calculus</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>PHSX 205 - College Physics I or PHSX 220 - Physics I (w/ calculus)</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>BIBOB 318 - Biometry or STAT 216Q - Introduction to Statistics</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>CHMY 211 - Elements of Organic Chemistry or CHMY 321 - Organic Chemistry I</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>University Core and Electives</td>
<td>2</td>
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<td>Year Total:</td>
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<td>14-15</td>
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### Junior Year

<table>
<thead>
<tr>
<th>Credits</th>
<th>Fall</th>
<th>Spring</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIBOB 375 - General Genetics</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>University Core and Electives</td>
<td>12-15</td>
<td></td>
</tr>
<tr>
<td>BIBOB 370 - General Ecology (equiv to 270)</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>BIBOB 420 - Evolution</td>
<td>3</td>
<td></td>
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<tr>
<td>University Core and Electives</td>
<td>9-12</td>
<td></td>
</tr>
<tr>
<td>Year Total:</td>
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<td>15-18</td>
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</tbody>
</table>

### Senior Year

<table>
<thead>
<tr>
<th>Credits</th>
<th>Fall</th>
<th>Spring</th>
</tr>
</thead>
<tbody>
<tr>
<td>University Core and Electives</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td>BIBOB 499 - Senior Thesis/Capstone</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>University Core and Electives</td>
<td>13-15</td>
<td></td>
</tr>
</tbody>
</table>

* 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.
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. 269)

Economics

Freshman Year

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>COM 110US -</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>M 161Q - Survey of Calculus or M 171Q - Calculus I</td>
<td>4</td>
</tr>
<tr>
<td>University Core and Electives</td>
<td>14</td>
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<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>ACTG 201 - Principles of Financial Acct</td>
<td>3</td>
</tr>
<tr>
<td>ECNS 204IS - Microeconomics’</td>
<td>3</td>
</tr>
<tr>
<td>WRIT 201 - College Writing II</td>
<td>3</td>
</tr>
<tr>
<td>STAT 216Q - Introduction to Statistics</td>
<td>3</td>
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<td>University Core and Electives</td>
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</tr>
<tr>
<td>Year Total:</td>
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</table>

Junior Year

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECNS 301 - Intermediate Micro with Calc</td>
<td>3</td>
</tr>
<tr>
<td>ECNS 303 - Intermediate Macro with Calc</td>
<td>3</td>
</tr>
<tr>
<td>ECNS 432R - Benefit-Cost Analysis or ECNS 403R - Intro to Econometrics</td>
<td>3</td>
</tr>
<tr>
<td>STAT 217Q - Intermediate Statistical Concepts</td>
<td>3</td>
</tr>
<tr>
<td>University Core and Electives</td>
<td>48</td>
</tr>
</tbody>
</table>
A student must receive a grade of C- or better in all courses required for the Economics Minor (Non-Teaching).

Electives Must Include:

- AGBE 337 Agricultural Law 3
- or BGEN 361 Principles of Business Law 3

Choose one of the following:

- BMGT 205 Prof Business Communication 3
- WRIT 221 Intermediate Tech Writing 3
- WRIT 326 Advanced Composition 3
- WRIT 429 Professional Writing 3

Social Sciences 6

(required but excluding AGBE/ECNS; the 6 credits must be from one or more of the following disciplines: anthropology, geography, political science, psychology, sociology, or history)

Upper division selected courses in AGBE/ECNS ** 15

** At least two AGBE/ECNS courses (6 credits) at the 400 level or higher are required, excluding seminars, 490’s/492’s.

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 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.

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.

<table>
<thead>
<tr>
<th>Economics Requirements</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECNS 101IS</td>
<td>3</td>
</tr>
<tr>
<td>ECNS 202</td>
<td>3</td>
</tr>
<tr>
<td>ECNS 204IS</td>
<td>3</td>
</tr>
<tr>
<td>ECNS 301</td>
<td>3</td>
</tr>
<tr>
<td>ECNS 303</td>
<td>3</td>
</tr>
</tbody>
</table>

Choose three of the following: 3

- AGBE 321 Economics of Ag Marketing
- AGBE 345 Ag Finance and Credit Analysis
- AGBE 421 Advanced Ag Marketing
- AGBE 445 Agribusiness Management
- AGBE 451RS Economics of Ag Policy
- AGBE 467 Quantitative Method in Ag Econ
- ECNS 305R Peer Leadership in Economics
- ECNS 309 Managerial Economics
- ECNS 312 Labor Economics
- ECNS 313 Money and Banking
- ECNS 314 International Economics
- ECNS 317 Economic Development
- ECNS 320 Public Finance
- ECNS 332 Econ of Natural Resources
- ECNS 345 Econ Org. Fin., & Credit
- ECNS 401 Microeconomic Theory
- ECNS 403R Intro to Econometrics
- ECNS 406 Industrial Organization
- ECNS 432R Benefit-Cost Analysis

Supporting Requirements

| STAT 216Q Introduction to Statistics | 3 |
| M 161Q Survey of Calculus | 4 |
| or M 171Q Calculus I | 4 |

Total Credits 31

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. 341)

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.

Freshman Year
- WRIT 101W - College Writing I 3
- LIT 201 - Intro to Literary Studies 3
- LIT 233 - Classical Foundations of Literature 3
  or LIT 240 - The Bible as Literature 3
- LING 210IH - Intro to Language/Linguistics 3
  or LING 238 - Structure and Function of Language 3
- University Core and Electives 18
- Year Total: 30

Senior Year
- LIT 494RH - Seminar: Research Issues 3
- Two English Department electives, ENGL, LIT, WRIT, one must be 300 level or above 6
- University Core and Electives 23
- Year Total: 32

Sophomore and Junior Year
- LIT 300 - Literary Criticism 3
- Choose two of the following: 6
  - LIT 285D - Mythologies
  - LIT 308 - Multicultural Literature
  - LIT 335 - Women and Literature
  - LIT 382 - Literature for Children/Adolescents
  - LIT 440 - Studies in World Literature
- Choose two of the following: 6
  - LIT 323 - (Choose two of the following):
  - LIT 324 - British Literature of the 16th and 17th Centuries
  - LIT 325 - British Literature of the Restoration/18th Century
  - LIT 310 - American Literature to 1900
- University Core and Electives 28
- Year Total: 58

Total Program Credits: 120

WRIT 101W credits count for the Core Foundations written requirement. These credits are not counted as part of the total English Major, Literature Option.

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 101IS - Indiv and Fam Dev: Lifespan 3
- LIT 201 - Intro to Literary Studies 3
- LIT 233 - Classical Foundations of Literature 3
  or LIT 240 - The Bible as Literature 3
- WRIT 101W - College Writing I 3
- University Core and Electives 16
- Year Total: 29

Sophomore Year
- WRIT 201 - College Writing II 3
- LING 238 - Structure and Function of Language 3
- EDU 211D - Multicultural Education 3
- EDU 223IS - Educ Psych and Adolescent Dev 3
- LIT 300 - Literary Criticism 3
Choose three of the following:

- LIT 310 - American Literature to 1900
- LIT 311 - American Literature after 1900
- LIT 324 - British Literature of the 16th and 17th Centuries
- LIT 325 - British Literature of the Restoration/18th Century
- LIT 326 - British Literature of the 19th Century to the Present

University Core and Electives


Freshman Year

- WRIT 101W - College Writing I
- WRIT 205 - Intro to Writing Studies

One of the following Literature courses:

- LIT 201 - Intro to Literary Studies
- LIT 214D - Regional Literature
- LIT 285D - Mythologies

University Core and Electives


Sophomore and Junior Year

- WRIT 201 - College Writing II
- WRIT 221 - Intermediate Tech Writing

Choose four of the following:

- 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 429 - Professional Writing
- CRWR 340 - Intermediate Creative Writing Workshop
- ENGL 450 - Rhetoric and Composition

Choose four of the following:

- WRIT 201 - Intro to Literary Studies
- LIT 214D - Regional Literature
- LIT 233 - Classical Foundations of Literature
- LIT 240 - The Bible as Literature
- LIT 285D - Mythologies
- LIT 300 - Literary Criticism
- LIT 308 - Multicultural Literature
- LIT 310 - American Literature to 1900

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.
English Minor: Literature (Non-Teaching)

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
LIT 233  Classical Foundations of Literature 3
or LIT 240  The Bible as Literature

Choose two of the following: 6
LIT 310  American Literature to 1900
LIT 311  American Literature after 1900
LIT 323
LIT 324  British Literature of the 16th and 17th Centuries
LIT 325  British Literature of the Restoration/18th Century
LIT 326  British Literature of the 19th Century to the Present

LIT 371
LIT 372

Choose three of the following: 9
LIT 110IH  Introduction to Literature
LIT 214D  Regional Literature
LIT 285D  Mythologies
LIT 300  Literary Criticism
LIT 308  Multicultural Literature
LIT 335  Women and Literature
LIT 337
LIT 382  Literature for Children/Adolescents
LIT 431RH  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

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 nine of those being upper-division credits.

English Minor: Writing (Non-Teaching)

Choose seven of the following: 21
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 301
LING 338  Language and English Education
WRIT 201  College Writing II
WRIT 221  Intermediate Tech Writing
WRIT 326  Advanced Composition
WRIT 371  Digital Rhetorics and Multimodal Writing

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 nine 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. 209)
- 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. 138)
- 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. 342)
• PhD in History (p. 342)

History Minor (Non-Teaching)

Choose one of the following: 3-4

<table>
<thead>
<tr>
<th>Course</th>
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<tbody>
<tr>
<td>HSTR 101IH - Western Civilization I</td>
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<tr>
<td>HSTR 102IH - Western Civilization II</td>
</tr>
<tr>
<td>HSTR 282CS - Darwinian Revolution</td>
</tr>
</tbody>
</table>

Choose two of the following: 6-8

<table>
<thead>
<tr>
<th>Course</th>
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</thead>
<tbody>
<tr>
<td>HSTR 130D - Latin American History</td>
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<tr>
<td>HSTR 135D - The Modern Middle East</td>
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<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>
</tbody>
</table>

Choose one of the following: 4

<table>
<thead>
<tr>
<th>Course</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>
</tbody>
</table>

Choose three courses to complete 9 credits from the following: 9

<table>
<thead>
<tr>
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<td>HSTA 311 - Early America</td>
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<td>HSTA 408 - Gender in America</td>
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<tr>
<td>HSTA 409 - Food in America</td>
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<tr>
<td>HSTA 412IH - American Thought and Culture</td>
</tr>
<tr>
<td>HSTA 416 - Race and Class in America</td>
</tr>
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<td>HSTA 450 - History of American Indians</td>
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<td>HSTA 460 - Montana and the West</td>
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<td>HSTA 464 - Trans-Mississippi West</td>
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<td>HSTA 468 - History of Yellowstone</td>
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<tr>
<td>HSTA 470 - American Environmental History</td>
</tr>
<tr>
<td>HSTA 482 - History of American Technology</td>
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<tr>
<td>HSTA 490R - Undergraduate Research</td>
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<tr>
<td>HSTA 491 - Special Topics</td>
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<tr>
<td>HSTA 492 - Independent Study</td>
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<tr>
<td>HSTR 302 - Ancient Greece</td>
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<td>HSTR 304 - Ancient Rome</td>
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<td>HSTR 322 - 19th Century Europe</td>
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<td>HSTR 324 - 20th Century Europe</td>
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<td>HSTR 330 - History of Mexico</td>
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<td>HSTR 340 - Age of the Shoguns</td>
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<td>HSTR 342 - Japan’s Long 19th Century</td>
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<td>HSTR 345 - Modern China</td>
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<td>HSTR 346 - Modern India</td>
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<td>HSTR 350 - Modern Britain</td>
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<td>HSTR 353 - Modern France</td>
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<td>HSTR 359 - Russia to 1917</td>
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<tr>
<td>HSTR 362 - Modern Germany</td>
</tr>
<tr>
<td>HSTR 366 - Middle East/20th Century</td>
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<tr>
<td>HSTR 372 - The World at War</td>
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<td>HSTR 375 - Eurasian Borderlands</td>
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<tr>
<td>HSTR 376 - Twentieth Century War</td>
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<td>HSTR 407 - Soviet Union: Rise &amp; Fall</td>
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<tr>
<td>HSTR 415 - Gender and Technology</td>
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<tr>
<td>HSTR 417 - Early Modern Science</td>
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<tr>
<td>HSTR 419 - Modern Science</td>
</tr>
<tr>
<td>HSTR 423 - European Intellectual History</td>
</tr>
<tr>
<td>HSTR 425 - Mapping the World</td>
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<td>HSTR 430 - Latin Amer Soc History</td>
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<td>HSTR 431 - Race in Latin America</td>
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<tr>
<td>HSTR 433 - Latin American Perspectives</td>
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<td>HSTR 434 - Gender in Latin America</td>
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<td>HSTR 436 - Armed Conflict Mod Lat Am</td>
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<td>HSTR 443 - Gender in Asia</td>
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<td>HSTR 445 - Environ, Health &amp; Sci in Japan</td>
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<td>HSTR 446 - Science and Medicine in China</td>
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<tr>
<td>HSTR 468 - The Making of Modern Turkey</td>
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<td>HSTR 482 - Animal Histories</td>
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<td>HSTR 484 - World Environmental History</td>
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<tr>
<td>HSTR 486 - Museum History</td>
</tr>
<tr>
<td>HSTR 490R - Undergraduate Research</td>
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<tr>
<td>HSTR 491 - Special Topics</td>
</tr>
<tr>
<td>HSTR 492 - Independent Study</td>
</tr>
<tr>
<td>NASX 450 - History of American Indians</td>
</tr>
<tr>
<td>SPNS 430 - Latin Amer Perspectives</td>
</tr>
</tbody>
</table>

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.

History Option

Freshman Year

Choose one of the following: 3-4

<table>
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</table>
HSTA 102IH - American History II
HSTA 160D - Introduction to the Am West

One Year Modern Language 8
University Core and Electives 14
Year Total: 30

Sophomore Year Credits
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 208RH - Sci,Envir,Tech,Soc: Common Exp
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
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
NASX 450 - History of American Indians

University Core and Electives 19
Year Total: 27-30

Junior Year Credits
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 355 - 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 Credits
HSTR 499R - Sen Capstone: Hist Methodology 3
Choose five of the following electives, excluding courses taken to fulfill above requirements: 15
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
HSTA 490R - Undergraduate Research
HSTA 491 - Special Topics
HSTA 492 - Independent Study
HSTA 302 - Ancient Greece
HSTA 304 - Ancient Rome
HSTA 322 - 19th 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 350 - Modern Britain
HSTR 353 - Modern France
HSTR 359 - Russia to 1917
HSTR 362 - Modern Germany
HSTR 366 - Middle East/20th Century
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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

12

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>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>CLS 101US</td>
<td>Knowledge and Community</td>
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<tr>
<td>WRIT 101W</td>
<td>College Writing I</td>
<td>3</td>
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<tr>
<td>EDU 202</td>
<td>Early Field Experience</td>
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Choose two of the following:

<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>HSTA 101IH</td>
<td>American History I</td>
<td>7</td>
</tr>
<tr>
<td>HSTA 102IH</td>
<td>American History II</td>
<td>8</td>
</tr>
<tr>
<td>HSTA 160D</td>
<td>Introduction to the Am West</td>
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**Sophomore Year**

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<tr>
<th>Course Code</th>
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<tbody>
<tr>
<td>EDU 223IS</td>
<td>Educ Psych and Adolescent Dev</td>
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</tr>
<tr>
<td>EDU 382</td>
<td>Assessmt, Curric, Instructn</td>
<td>3</td>
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<tr>
<td>EDU 211D</td>
<td>Multicultural Education</td>
<td>3</td>
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Choose two of the following:

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<tr>
<td>HSTR 130D</td>
<td>Latin American History</td>
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<td>HSTR 135D</td>
<td>The Modern Middle East</td>
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<tr>
<td>HSTR 140D</td>
<td>Modern Asia</td>
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<td>HSTR 145D</td>
<td>Reinventing Japan</td>
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<td>HSTR 160D</td>
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<td>HSTR 205CS</td>
<td>The World Environment</td>
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<td>HSTR 207CS</td>
<td>Sci and Tech in World History</td>
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<tr>
<td>RLST 110D</td>
<td>Religion, Conflict &amp; Politics</td>
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Choose one of the following:

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<td>Early America</td>
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<td>American Civil War Era</td>
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<td>Food in America</td>
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<td>Trans-Mississippi West</td>
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<td>HSTA 470</td>
<td>American Environmental History</td>
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<td>History of American Technology</td>
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**Junior Year**

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<td>Integrating Tech into Educ</td>
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<tr>
<td>EDU 497</td>
<td>Methods</td>
<td>3</td>
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<td>GPHY 141D</td>
<td>Geography of World Regions</td>
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<td>EDSP 306</td>
<td>Exceptional Learners</td>
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<tr>
<td>HSTR 350</td>
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<td></td>
</tr>
<tr>
<td>HSTR 353</td>
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<td></td>
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<tr>
<td>HSTR 359</td>
<td>Russia to 1917</td>
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<tr>
<td>HSTR 362</td>
<td>Modern Germany</td>
<td></td>
</tr>
<tr>
<td>HSTR 372</td>
<td>The World at War</td>
<td></td>
</tr>
<tr>
<td>HSTR 376</td>
<td>Twentieth Century War</td>
<td></td>
</tr>
<tr>
<td>HSTR 407</td>
<td>Soviet Union: Rise &amp; Fall</td>
<td></td>
</tr>
<tr>
<td>HSTR 419</td>
<td>Modern Science</td>
<td></td>
</tr>
<tr>
<td>HSTR 423</td>
<td>European Intellectual History</td>
<td></td>
</tr>
<tr>
<td>HSTR 425</td>
<td>Mapping the World</td>
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</tr>
</tbody>
</table>

Choose two of the following: 6

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
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<tbody>
<tr>
<td>HSTR 330</td>
<td>History of Mexico</td>
</tr>
<tr>
<td>HSTR 340</td>
<td>Age of the Shoguns</td>
</tr>
<tr>
<td>HSTR 342</td>
<td>Japan’s Long 19th Century</td>
</tr>
<tr>
<td>HSTR 345</td>
<td>Modern China</td>
</tr>
<tr>
<td>HSTR 346</td>
<td>Modern India</td>
</tr>
<tr>
<td>HSTR 366</td>
<td>Middle East/20th Century</td>
</tr>
<tr>
<td>HSTR 375</td>
<td>Eurasian Borderlands</td>
</tr>
<tr>
<td>HSTR 407</td>
<td>Soviet Union: Rise &amp; Fall</td>
</tr>
<tr>
<td>HSTR 425</td>
<td>Mapping the World</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 443</td>
<td>Gender in Asia</td>
</tr>
<tr>
<td>HSTR 444</td>
<td>Gender in Japan</td>
</tr>
<tr>
<td>HSTR 445</td>
<td>Environ, Health &amp; Sci in Japan</td>
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<tr>
<td>HSTR 468</td>
<td>The Making of Modern Turkey</td>
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<td>World Environmental History</td>
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University Core and Electives 9

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
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<tbody>
<tr>
<td>EDU 495</td>
<td>Student Teaching</td>
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<tr>
<td>EDU 408</td>
<td>Professional Issues: K-12</td>
</tr>
<tr>
<td>HSTR 499R</td>
<td>Sen Capstone: Hist Methodology</td>
</tr>
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Choose four of the following, excluding courses that were taken to fulfill requirements above: 12

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
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</thead>
<tbody>
<tr>
<td>HSTA 311</td>
<td>Early America</td>
</tr>
<tr>
<td>HSTA 316</td>
<td>American Civil War Era</td>
</tr>
<tr>
<td>HSTA 318</td>
<td>Origins of Modern America: From the Civil War to WWII</td>
</tr>
<tr>
<td>HSTA 322</td>
<td>Am History: WWII to Present</td>
</tr>
<tr>
<td>HSTA 406</td>
<td>McCarthy/Ike/Truman</td>
</tr>
<tr>
<td>HSTA 407</td>
<td>Gender in US &amp; Canadian West</td>
</tr>
<tr>
<td>HSTA 408</td>
<td>Gender in America</td>
</tr>
<tr>
<td>HSTA 409</td>
<td>Food in America</td>
</tr>
<tr>
<td>HSTA 412H</td>
<td>American Thought and Culture</td>
</tr>
<tr>
<td>HSTA 416</td>
<td>Race and Class in America</td>
</tr>
<tr>
<td>HSTA 460</td>
<td>Montana and the West</td>
</tr>
<tr>
<td>HSTA 464</td>
<td>Trans-Mississippi West</td>
</tr>
<tr>
<td>HSTA 468</td>
<td>History of Yellowstone</td>
</tr>
<tr>
<td>HSTA 470</td>
<td>American Environmental History</td>
</tr>
<tr>
<td>HSTA 482</td>
<td>History of American Technology</td>
</tr>
<tr>
<td>HSTR 302</td>
<td>Ancient Greece</td>
</tr>
<tr>
<td>HSTR 304</td>
<td>Ancient Rome</td>
</tr>
<tr>
<td>HSTR 322</td>
<td>19th Century Europe</td>
</tr>
<tr>
<td>HSTR 324</td>
<td>20th Century Europe</td>
</tr>
<tr>
<td>HSTR 330</td>
<td>History of Mexico</td>
</tr>
<tr>
<td>HSTR 340</td>
<td>Age of the Shoguns</td>
</tr>
<tr>
<td>HSTR 342</td>
<td>Japan’s Long 19th Century</td>
</tr>
<tr>
<td>HSTR 345</td>
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<tr>
<td>HSTR 407</td>
<td>Soviet Union: Rise &amp; Fall</td>
</tr>
<tr>
<td>HSTR 417</td>
<td>Early Modern Science</td>
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<tr>
<td>HSTR 419</td>
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<tr>
<td>HSTR 445</td>
<td>Environ, Health &amp; Sci in Japan</td>
</tr>
<tr>
<td>HSTR 446</td>
<td>Science and Medicine in China</td>
</tr>
<tr>
<td>HSTR 468</td>
<td>The Making of Modern Turkey</td>
</tr>
<tr>
<td>HSTR 482</td>
<td>Animal Histories</td>
</tr>
<tr>
<td>HSTR 484</td>
<td>World Environmental History</td>
</tr>
<tr>
<td>HSTR 486</td>
<td>Museum History</td>
</tr>
<tr>
<td>NASX 450</td>
<td>History of American Indians</td>
</tr>
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University Core and Electives 12

Year Total: 33

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
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<tbody>
<tr>
<td>EDU 495</td>
<td>Student Teaching</td>
</tr>
<tr>
<td>EDU 408</td>
<td>Professional Issues: K-12</td>
</tr>
</tbody>
</table>

Year Total: 27-30

Total Program Credits: 120

The History Teaching option does not require a teaching minor, but students who are considering a public school career are strongly urged to acquire a teaching minor. If a student does choose a teaching minor, the student should expect to require more than 120 credits to complete the program.
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.

**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:

**Required Courses**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<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>
</tr>
</tbody>
</table>

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 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
- JPNS 361IH - Japanese Text and Cinema
- JPNS 440 - Independent Study

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 students 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>
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</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>
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<tr>
<td>JPNS 102D</td>
<td>Elementary Japanese II</td>
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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>JPNS 201D</td>
<td>Intermediate Japanese I</td>
<td>3</td>
</tr>
<tr>
<td>JPNS 202D</td>
<td>Intermediate Japanese II</td>
<td>3</td>
</tr>
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</table>

Choose one of the following: 3

- ARTH 360 - History of Asian Art and Architecture
- HSTR 140D - Modern Asia
- HSTR 345 - Modern China
- HSTR 346 - Modern India
- HSTR 443 - Gender in Asia
- 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**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>JPNS 305</td>
<td>Japanese Adv Conversations</td>
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Choose four of the following: 6

- 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

Montana State University
The equivalent of four semesters of Spanish language is required. 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

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
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</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>HSTR 130D</td>
<td>Latin American History</td>
<td>4</td>
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</table>

### Elective Courses

Choose four from the following for a minimum of 9 credits in junior and senior level courses (300 and 400 level):

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>HSTR 330</td>
<td>History of Mexico</td>
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<tr>
<td>HSTR 430</td>
<td>Latin Amer Soc History</td>
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<td>HSTR 431</td>
<td>Race in Latin America</td>
<td>3</td>
</tr>
<tr>
<td>HSTR 434</td>
<td>Gender in Latin America</td>
<td>3</td>
</tr>
<tr>
<td>SPNS 330</td>
<td>Modern Cultures Latin America</td>
<td>3</td>
</tr>
<tr>
<td>SPNS 332</td>
<td>Contemp Latin Amer Literature</td>
<td>3</td>
</tr>
<tr>
<td>SPNS 335IH</td>
<td>Travel in Latin Am Lit &amp; Film</td>
<td>3</td>
</tr>
<tr>
<td>SPNS 361</td>
<td>Latin American Text &amp; Cinema</td>
<td>3</td>
</tr>
<tr>
<td>SPNS 416</td>
<td>Latin America: Culture and Revolution</td>
<td>3</td>
</tr>
</tbody>
</table>

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 deepen students’ understanding of museums, and to better position them to learn about possible employment in the museum field.

In consultation with a Museum Studies Minor advisor in the Department of History and Philosophy, students in the minor select 12 credits from a secondary field outside their major and appropriate to museum topics. Half of these credits must be at the 300 or 400 level. The goal of this secondary field is for students to develop expertise beyond their major that would be of use to them in a museum career. Generally, all 12 credits should be in one area, though interdisciplinary secondary fields may be considered where intellectually warranted. The minimum number of credits for a non-teaching minor is twenty-one, with nine of those being upper division credits; the Museum Studies Minor must meet this requirement. Students may fulfill this requirement by majoring in one of the following secondary fields if, in addition, they choose 12 credits from an additional one of the secondary fields. Some possible secondary fields are noted below, though other appropriate fields may be considered in consultation with an advisor.

- Anthropology
- Art History
- Biology
- Business Administration
- Education
- English Literature
- English Writing
- Geography
Science, the Environment, Technology, and Society (SETS)

The SETS major offers a multi-disciplinary course of study that analyzes science, technology, and the environment within their broader cultural contexts, including intellectual and social history, environmental history, religious studies, and philosophy.

Students will choose one of several specialties as a focus for their coursework, such as Philosophy of Science, History of Science and Technology, Science and Technology Policy, or Environmental History. 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 Year

Choose two of the following:

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
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<td>HSTA 102IH</td>
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<tr>
<td>HSTA 160D</td>
<td></td>
</tr>
<tr>
<td>HSTR 101IH</td>
<td></td>
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<td>HSTR 102H</td>
<td></td>
</tr>
<tr>
<td>HSTR 130D</td>
<td></td>
</tr>
<tr>
<td>HSTR 135D</td>
<td></td>
</tr>
<tr>
<td>HSTR 140D</td>
<td></td>
</tr>
<tr>
<td>HSTR 145D</td>
<td></td>
</tr>
<tr>
<td>HSTR 160D</td>
<td></td>
</tr>
<tr>
<td>PHL 101IH -Intro</td>
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</tbody>
</table>

or PHL 110IH - Intro Ethics

University Core and Electives

Year Total: 28-30

Sophomore Year

Choose one of the following:

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>RLST 100D -</td>
<td>3-4</td>
</tr>
<tr>
<td>or RLST 110D</td>
<td></td>
</tr>
</tbody>
</table>

Choose an approved Science/Technology/Social Science course, consult with a SETS advisor.

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.

University Core and Electives

Year Total: 34-36

Junior Year

Choose one of the following:

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>PHL 303</td>
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<td>PHL 321</td>
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<td>PHL 322</td>
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<td>PHL 353</td>
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<td>PHL 354</td>
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</tr>
<tr>
<td>RLST 402</td>
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</tbody>
</table>

Choose an approved Science/Technology/Social Science course--consult with a SETS advisor.

Year Total: 30

Senior Year

Choose six of the following:

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>HSTA 412IH -</td>
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<tr>
<td>or HSTA 412IH</td>
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<td>HSTR 417</td>
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<td>HSTR 419</td>
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<td>HSTR 446</td>
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<td>HSTA 470</td>
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<td>HSTA 482</td>
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<td>HSTA 484</td>
<td></td>
</tr>
<tr>
<td>HSTA 486</td>
<td></td>
</tr>
</tbody>
</table>

Choose an approved Science/Technology/Social Science course--consult with a SETS advisor.

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 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/lsdegree.

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 science.

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. 217)
Quaternity Option (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.

Sophomore Year
<table>
<thead>
<tr>
<th>Credits</th>
<th>Fall</th>
<th>Spring</th>
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<tbody>
<tr>
<td>LS 301 - Integrative Seminar</td>
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<tr>
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<td>STAT 216Q - Introduction to Statistics</td>
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Junior Year
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<tr>
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<td>PHL 322 - Philosophy &amp; Envirnmntl Ethics</td>
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Senior Year
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<tr>
<td>LS 301 - Integrative Seminar</td>
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</table>
Public Policy Electives (see below) 6
Electives 3
LS 401 - Senior Project 4
Natural Science Electives (see below) 3
Public Policy Electives (see below) 3
Electives 5
Year Total: 16 15

Total Program Credits: 120

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>
<td>BIOE 370</td>
<td>General Ecology (equiv to 270)</td>
<td>3</td>
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<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 421</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>BIBO 162CS</td>
<td>Insects and Human Society</td>
<td>3</td>
</tr>
<tr>
<td>BIBO 220</td>
<td>General Botany</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>
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<tr>
<td>ENSC 272CS</td>
<td>Water Resources</td>
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<td>ENSC 444</td>
<td>Watershed Hydrology</td>
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<td>ENSC 454</td>
<td>Landscape Pedology</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>ERTH 212RN</td>
<td>Yellowstone: Scientific Lab</td>
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<tr>
<td>ERTH 303</td>
<td>Weather and Climate</td>
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<td>ERTH 307</td>
<td>Principles of Geomorphology</td>
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<td>ERTH 432R</td>
<td>Surface Water Resources</td>
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<tr>
<td>GEO 103CS</td>
<td>Intro to Envrmntl Geology</td>
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<tr>
<td>GEO 215IN</td>
<td>Oceanography</td>
<td>3</td>
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<tr>
<td>GEO 240</td>
<td>Hydrogeology</td>
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<td>GPHY 411</td>
<td>Biogeography</td>
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</tr>
<tr>
<td>GPHY 426</td>
<td>Remote Sensing</td>
<td>3</td>
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<tr>
<td>GPHY 441R</td>
<td>Mountain Geography</td>
<td>4</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>
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<td>NRSM 102</td>
<td>Montana Range Plants</td>
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<td>NRSM 240</td>
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<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>
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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>
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<tr>
<td>WILD 201</td>
<td>Intro to Fish and Wildlife</td>
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<tr>
<td>WILD 438</td>
<td>Wildlife Habitat Ecology</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>Course Code</th>
<th>Course 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>
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<tr>
<td>BMGT 406</td>
<td>Negotiation/Dispute Resolution</td>
<td>3</td>
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<tr>
<td>BMGT 473</td>
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<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>
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<tr>
<td>ECNS 332</td>
<td>Econ of Natural Resources</td>
<td>3</td>
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<tr>
<td>GPHY 141D</td>
<td>Geography of World Regions</td>
<td>3</td>
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<tr>
<td>GPHY 284</td>
<td>Intro to GIS Science &amp; Cartog</td>
<td>3</td>
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<tr>
<td>GPHY 321</td>
<td>Urban Geography</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>
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<tr>
<td>GPHY 384</td>
<td>Adv GIS and Spatial Analysis</td>
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<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>
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<td>HSTA 470</td>
<td>American Environmental History</td>
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<td>HSTR 484</td>
<td>World Environmental History</td>
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<td>NRSM 421</td>
<td>Holistic Thought/Mgmt</td>
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<td>Natural Resource Law</td>
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<tr>
<td>PSCI 210IS</td>
<td>Introduction to American Government</td>
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<tr>
<td>PSCI 306</td>
<td>Legislative Process</td>
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<td>PSCI 362</td>
<td>Natural Resource Policy</td>
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<tr>
<td>PSCI 406</td>
<td>The Political Economy of Energy</td>
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<td>PSCI 436</td>
<td>Politics of Food &amp; Hunger</td>
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<td>PSCI 441</td>
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<tr>
<td>RLST 223IH</td>
<td>Sacrifice, Rite &amp; Ritual</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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<td>SFBS 445R</td>
<td>Culinary Marketing: Farm/Table</td>
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<tr>
<td>SOCI 355</td>
<td>Population and Society</td>
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<tr>
<td>SOCI 470</td>
<td>Environmental Sociology</td>
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</tbody>
</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.

### 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) from an approved list of global/multicultural courses spanning a wide range of disciplines. Students in this option select a specific area studies focus (e.g. Latin America, Asia, Europe, Native American, or Women’s Studies) in which they take 12 additional credits (6 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. Students 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 or area studies courses as appropriate.

**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>4</td>
<td>Modern Language</td>
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**Sophomore Year**

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<td>Modern Language</td>
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<td>Electives</td>
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<td>Integrative Studies</td>
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**Junior Year**

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<td>Area Studies Electives (see below)</td>
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<tr>
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<td>Global &amp; Multicultural Electives (see below)</td>
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<td>Area Studies Electives</td>
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**Senior Year**

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</table>

**Total Program Credits:** 120

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:**

- AGSC 465R Health, Agriculture, Poverty 4
- ANTY 101D Anthropology and the Human Experience 3
- ANTY 225IS Culture, Language, and Society 3
- ARCH 221 World Architecture: Modern to Contemporary 3
- ARCH 322IA World Architecture I 3
- ARCH 323IA World Architecture II 3
- ARTH 462 Islamic Art And Architecture 3
- BGEN 242D Intro to Int’l Business 3
- BGEN 245D Cultural Dimensions of International Business 3
- BMGT 464 International Management 3
- BMKT 441 International Marketing 3
- ECNS 314 International Economics 3
- ECNS 317 Economic Development 3
- EDU 211D Multicultural Education 3
- GPHY 121D Human Geography 3
- GPHY 141D Geography of World Regions 3
- GPHY 325 Cultural Geography 3
- HSTA 416 Race and Class in America 3
- HSTR 135D The Modern Middle East 4
- HSTR 160D Modern World History 4
- HSTR 366 Middle East/20th Century 3
- HSTR 468 The Making of Modern Turkey 3
- HSTR 484 World Environmental History 3
- LIT 214D Regional Literature 3
- LIT 285D Mythologies 3
- LIT 308 Multicultural Literature 3
- LIT 440 Studies in World Literature 3
- ML 100H Intro to World Cultures 3
- MUSI 307IA World Music 3
- PHL 110H Intro Ethics:Good and Evil 3
- PHL 255D Philosophy and Culture 3
- PHL 308 Language and the World 3
- PHL 354 Philosophy of Race 3
- PSCI 230D Introduction to International Relations 3
- PSCI 331 International Relations Theory 3
- 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
Europe

ANTH 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 320H 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 361H Japanese Text and Cinema 3

PHL 270 Philosophies of Asia 3

RLST 202D Hindu Traditions 3

RLST 203D Buddhist Traditions 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 Contemp Soc 3

NASX 105D Intro Native Amer Studies 3

NASX 232D MT Indian Cult, Hist, Cur Issu 3

NASX 239 Native North American History through Art and Material Culture 3

NASX 280IS NA Studies Rsrch Theors/Mthds 3

NASX 304 Native American Belief & Phil 3

NASX 310 Native Cultures of N America 3

NASX 340 Native American Literature 3

NASX 360 Native Americans and Cinema 3

NASX 405 Gndr Iss In Native Amer Stdies 3

NASX 415 Native Food Systems 3

NASX 430 American Indian Education 3

NASX 440 Montana Indian Literature 3

NASX 450 History of American Indians 3

NASX 476 Amer Indian Policy and Law 3

Women’s Studies

ANTY 337 Sex, Gender, Sexuality Japan 3

FTTH 220 Human Sexuality 3

HSTA 407 Gender in US & Canadian West 3

HSTA 408 Gender in America 3

HSTR 415 Gender and Technology 3

HSTR 434 Gender in Latin America 3

HSTR 443 Gender in Asia 3

HSTR 444 Gender in Japan 3

LIT 335 Women and Literature 3

NASX 405 Gndr Iss In Native Amer Stdies 3

PHL 351 Philosophy and Feminism 3

PSYX 235D Contemp Issues in Human Sexual 3

PSYX 335 Psychology of Gender 3

RLST 321 Religion and Gender 3

SOCI 326 Sociology of Gender 3

SOCI 434 Sociology of Human Sexuality 3

WGSS 201IH Intro to Feminist Theories 3

WGSS 301RH Integrative Seminar in Women’s Studies 3
Up to 12 credits required in a minor or in a second degree program may be applied toward the Global & Multicultural and Area Studies electives.

Quaternity Option

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).

<table>
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<tr>
<th>Freshman Year</th>
<th>Credits</th>
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<td>Integrative Studies - Natural Sciences</td>
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<td>Quaternity - Humanities</td>
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<tbody>
<tr>
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<tr>
<td>Quaternity - Fine Arts</td>
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Quaternity - Humanities 3
Quaternity - Natural Sciences 3
Quaternity - Social Sciences 3

<table>
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<tr>
<th>Credits</th>
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</table>

Total Program Credits: 120

* Up to 6 credits required in a minor or in a second degree program may be applied toward the 12 credit elective requirement in arts, humanities, natural science or mathematics, or social sciences.

Per MSU requirements for the degree, a minimum of 42 credits must be in courses numbered 300 and above.

Mathematical Sciences

The Department of Mathematical Sciences has programs leading to the Bachelor of Science, the Master of Science, and the Doctor of Philosophy degrees. The B.S. options in mathematics, applied mathematics, statistics, and teaching are listed below.

Many undergraduate courses are sufficiently basic to be of general interest. Detailed and current information on undergraduate course offerings is available from the department.

The four-year baccalaureate curriculum in mathematics is flexible and can accommodate students desiring to concentrate in mathematics, applied mathematics, mathematics teaching, or statistics. Programs in these concentrations are designed with the help of faculty advisors.

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
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. 222)
- Applied Mathematics Option (p. 221)
- Statistics Option (p. 224)
- Mathematics Teaching Option (p. 223)

Undergraduate Minors

- Mathematics Minor (Non-Teaching) (p. 222)
- Mathematics Teaching Minor (p. 139)
- Statistics Minor (Non-Teaching) (p. 224)

Department of Mathematical Sciences

Degrees Offered

- M.S. in Mathematics (p. 343)
- M.S. in Statistics (p. 344)
- Ph.D. in Mathematics (p. 345)
- Ph.D. in Mathematics (Mathematics Education Emphasis) (p. 346)
- Graduate Certificate in Applied Statistics (p. 343)

Applied Mathematics Option

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<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>
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<tr>
<td>or M 181Q</td>
<td>Honors Calculus I</td>
<td></td>
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<tr>
<td>M 172Q</td>
<td>Calculus II</td>
<td>4</td>
</tr>
<tr>
<td>or M 182Q</td>
<td>Honors Calculus II</td>
<td></td>
</tr>
<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>
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<td>or M 283Q</td>
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<tr>
<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>4</td>
</tr>
<tr>
<td>M 348</td>
<td>Techniques of Applied Math I</td>
<td>3</td>
</tr>
<tr>
<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>
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<tr>
<td>M 441</td>
<td>Numerical Linear Algebra &amp; Optimization</td>
<td>3</td>
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<tr>
<td>M 442</td>
<td>Numerical Solution of Differential Equations</td>
<td>3</td>
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STAT 332 Statistics for Scientists and Engineers  3
Choose four from the following math or statistics electives:  *  12
M 330 History of Mathematics
M 333 Linear Algebra
M 383 Introduction to Analysis I
M 384 Introduction to Analysis II
M 430 Mathematical Biology
M 431 Abstract Algebra I
M 450 Applied Mathematics I
M 451 Applied Mathematics II
M 454 Introduction of Dynamical Systems I
M 455 Introduction to Dynamical Systems II
M 472 Introduction to Complex Analysis
STAT 421 Probability Theory
STAT 422 Mathematical Statistics
PHSX 220 Physics I (w/ calculus)  4
PHSX 222 Physics II (w/ calculus)  **  4
PHSX 224 Physics III  **  4

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

<table>
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<th>Course</th>
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<td>Fall</td>
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<td>M 171Q - Calculus I</td>
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<td>or M 181Q - Honors Calculus I</td>
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<tr>
<td>M 172Q - Calculus II</td>
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<tr>
<td>or M 182Q - Honors Calculus II</td>
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<tr>
<td>M 221 - Introduction to Linear Algebra</td>
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<td>M 242 - Methods of Proof</td>
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<tr>
<td>M 273Q - Multivariable Calculus</td>
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<tr>
<td>or M 283Q - Honors Multivariable Calculus</td>
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<tr>
<td>M 274 - Introduction to Differential Equation</td>
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<tr>
<td>or M 284 - Honors Introduction to Differential Equations</td>
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<tr>
<td>M 348 - Techniques of Applied Math I</td>
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<td>M 349 - Techniques of Applied Mathematics II</td>
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<td>M 386R - Software Applications in Mathematics</td>
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<td>M 441 - Numerical Linear Algebra &amp; Optimization</td>
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<td>M 442 - Numerical Solution of Differential Equations</td>
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Sophomore Year

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<td>Spring</td>
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<tr>
<td>M 221 - Introduction to Linear Algebra</td>
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<tr>
<td>M 273Q - Multivariable Calculus</td>
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Mathematics Minor (Non-Teaching)

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Mathematics Option

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<td>M 274</td>
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**Total Credits:** 60

* Six of these fifteen credits must be from M 430, M 441, M 442, M 450, M 451, M 454, M 455, or M 472.

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

<table>
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<td>or M 181Q</td>
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<td>M 172Q</td>
<td>Calculus II</td>
<td>4</td>
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<tr>
<td>or M 182Q</td>
<td>Honors Calculus II</td>
<td>4</td>
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<tr>
<td>PHSX 222</td>
<td>Physics II (w/ calculus)</td>
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Total Credits: 28
University Core and Electives 4
Year Total: 15 15

**Sophomore Year**

<table>
<thead>
<tr>
<th>Credits</th>
<th>Fall</th>
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<tbody>
<tr>
<td>M 242 - Methods of Proof</td>
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<td>M 273Q - Multivariable Calculus</td>
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<td>or M 283Q - Honors Multivariable Calculus</td>
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<tr>
<td>M 221 - Introduction to Linear Algebra</td>
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<tr>
<td>M 274 - Introduction to Differential Equation</td>
<td>4</td>
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<td>or M 284 - Honors Introduction to Differential Equations</td>
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<td>STAT 332 - Statistics for Scientists and Engineers</td>
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**Junior Year**

<table>
<thead>
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<th>Credits</th>
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<tbody>
<tr>
<td>M 333 - Linear Algebra</td>
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<tr>
<td>M 383 - Introduction to Analysis I</td>
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<td></td>
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<tr>
<td>Math or Stat Elect (See List Above)</td>
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<tr>
<td>M 384 - Introduction to Analysis II</td>
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<td>Math or Stat Elect (See List Above)</td>
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**Senior Year**

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<tr>
<td>M 431 - Abstract Algebra I</td>
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**Total Program Credits:** 120

### Mathematics Teaching Option

**Single Subject Endorsement (p. 223)**

<table>
<thead>
<tr>
<th>Credits</th>
<th>Fall</th>
<th>Spring</th>
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<tbody>
<tr>
<td>EDU 211D - Multicultural Education</td>
<td>3</td>
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<tr>
<td>EDU 223IS - Educ Psych and Adolescent Dev</td>
<td>3</td>
<td></td>
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<tr>
<td>EDU 370 - Integrating Tech into Educ</td>
<td>2</td>
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<tr>
<td>EDU 382 - Assessmt, Curric, Instructn</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>EDU 395 - Practicum</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>EDU 408 - Professional Issues: K-12</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>EDU 497 - Methods</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>EDU 497R - Methods: 5-8 Mathematics</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>EDU 495 - Student Teaching</td>
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</table>

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**

<table>
<thead>
<tr>
<th>Credits</th>
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<th>Spring</th>
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<tbody>
<tr>
<td>EDU 101US - Teaching and Learning</td>
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<tr>
<td>or CLS 101US - Knowledge and Community</td>
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<tr>
<td>or CLS 201US - Knowledge and Community</td>
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<tr>
<td>or COM 110US -</td>
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<tr>
<td>or LS 101US - Ways of Knowing</td>
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<tr>
<td>or UH 201US - Texts &amp; Critics:Knowledge</td>
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<tr>
<td>or UH 301US - Texts and Critics II</td>
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<tr>
<td>or US 101US - First Year Seminar</td>
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<tr>
<td>or US 121US - ED, SOC, Issues, Digital Age</td>
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<tr>
<td>FCS 101IS - Indiv and Fam Dev: Lifespan</td>
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<tr>
<td>or EDEC 160 - Early Childhood through Adolescent Development</td>
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<tr>
<td>M 171Q - Calculus I</td>
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<tr>
<td>University and Core Electives</td>
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<td>EDU 202 - Early Field Experience</td>
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<td>WRIT 101W - College Writing I</td>
<td>3</td>
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<tr>
<td>M 172Q - Calculus II</td>
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<td>PHSX 205 - College Physics I</td>
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<td>Year Total:</td>
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**Sophomore Year**

<table>
<thead>
<tr>
<th>Credits</th>
<th>Fall</th>
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<tbody>
<tr>
<td>EDU 382 - Assessmt, Curric, Instructn</td>
<td>3</td>
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<tr>
<td>M 328 - Higher Math for Sec Teachers</td>
<td>3</td>
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<td>Math/Stat (300+)</td>
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<tr>
<td>University Core and Electives</td>
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<tr>
<td>EDU 497R - Methods: 5-8 Mathematics</td>
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<td></td>
</tr>
<tr>
<td>EDU 395 - Student Teaching</td>
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</table>

**Junior Year**

<table>
<thead>
<tr>
<th>Credits</th>
<th>Fall</th>
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<tbody>
<tr>
<td>EDU 408 - Professional Issues: K-12</td>
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</tr>
<tr>
<td>EDU 497 - Methods</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>EDU 497R - Methods: 5-8 Mathematics</td>
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<tr>
<td>EDU 495 - Student Teaching</td>
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</tbody>
</table>
Statistics Minor (Non-Teaching)

STAT 217Q Intermediate Statistical Concepts 3
or STAT 332 Statistics for Scientists and Engineers
Eight credits of Math (171 or higher) 8
Twelve credits of STAT (408 or higher) 12
Total Credits 23

Statistics Option

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 333 Linear Algebra 3
or M 441 Numerical Linear Algebra & Optimization
STAT 217Q Intermediate Statistical Concepts (Preferred and requires STAT 216Q as a prerequisite) 3
or STAT 332 Statistics for Scientists and Engineers
STAT 408 Statistical Computing and Graphical Analysis 3
STAT 411 Methods for Data Analysis I 3
STAT 412 Methods for Data Analysis II 3
STAT 421 Probability Theory 3
STAT 422 Mathematical Statistics 3
STAT 441 Experimental Design 3
STAT 446 Sampling 3
Choose four from the following: 12
STAT 431 Nonparametric Statistics
STAT 436 Introduction to Time Series Analysis
STAT 437 Introduction to Applied Multivariate Analysis
STAT 439 Introduction to Categorical Data Analysis
STAT 448 Mixed Effects Models
STAT 490R Undergraduate Research
STAT 491 Special Topics
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

Fall Spring
CLS 101US - Knowledge and Community 3
or COM 110US -
M 171Q - Calculus I 4
University Core and Electives 8
WRIT 101W - College Writing I 3
M 172Q - Calculus II 4
University Core and Electives 9
Year Total: 15 16

Sophomore Year

Fall Spring
M 273Q - Multivariable Calculus 4
M 242 - Methods of Proof 3
STAT 217Q - Intermediate Statistical Concepts
or STAT 332 - Statistics for Scientists and Engineers
Science Electives 4
M 221 - Introduction to Linear Algebra 3
STAT 408 - Statistical Computing and Graphical Analysis 3
Science Electives 3
University Core and Electives 6
Year Total: 14 15

Junior Year

Fall Spring
M 333 - Linear Algebra 3
or M 441 - Numerical Linear Algebra & Optimization
STAT 411 - Methods for Data Analysis I 3
STAT 446 - Sampling 3
Science Electives 3
University Core and Electives 3
STAT 412 - Methods for Data Analysis II 3
STAT 441 - Experimental Design 3
Science Electives 3
University Core and Electives 6
Year Total: 15 15

Senior Year

Fall Spring
STAT 421 - Probability Theory 3
Math or Stat Elect (See List Above) 6
University Core and Electives 6
STAT 422 - Mathematical Statistics 3
Math or Stat Elect (See List Above) 6
University Core and Electives 6
Year Total: 15 15

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
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. 78) 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 three options: Microbiology, Environmental Health, and Medical Laboratory Science. 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 Health Education 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 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 a 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. 229)
- Microbiology Option: Pre-Medical Track (p. 230)
• Microbiology Option: Pre-Veterinary Track (http://catalog.montana.edu/undergraduate/letters-science/microbiology/microbiology-option-prevet-track)
• Microbiology Option: Environmental Microbiology Track (p. 228)
• Microbiology Option: Environmental Health Track (p. 228)
• Medical Laboratory Science Option (p. 226)

Undergraduate Minors
• Genetics Minor (Non-Teaching) (p. 90)
• Microbiology Minor (Non-Teaching) (p. 227)

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.

Graduate Programs
• M.S. in Microbiology and Immunology (Plan A) (p. 273)
• M.S. in Microbiology and Immunology (Plan B) (p. 274)
• Ph.D. in Microbiology (p. 274) and Immunology

Medical Laboratory Science Option
• Plan A (p. 226)
• Plan B (p. 227)

Plan A
Freshman Year

<table>
<thead>
<tr>
<th>Course</th>
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<tbody>
<tr>
<td>BIOM 101 - Careers in Microbiology</td>
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<tr>
<td>CHMY 141 - College Chemistry I</td>
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<td>CHMY 143 - College Chemistry II</td>
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<td>BIOB 160 - Principles of Living Systems</td>
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<td>BIOH 201 - Hum Anatomy &amp; Physiology I</td>
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Sophomore Year

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<th>Course</th>
<th>Fall</th>
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<tr>
<td>CHMY 211 - Elements of Organic Chemistry</td>
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<tr>
<td>BIOH 211 - Hum Anatomy &amp; Physiology II</td>
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<tr>
<td>University Core and Electives</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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<tr>
<td>STAT 216Q - Introduction to Statistics</td>
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Junior Year

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<tr>
<th>Course</th>
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<tbody>
<tr>
<td>BIOM 494 - Seminar/Workshop (two semesters)</td>
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<tr>
<td>or BIOM 497 - Educational Methods: Microbiology</td>
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<td>BIOM 410 - Microbial Genetics</td>
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<tr>
<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>
<td>3</td>
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<td>BIOH 405 - Hematology</td>
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<tr>
<td>BIOM 410 - Microbial Genetics</td>
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<tr>
<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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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>Spring</th>
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<tbody>
<tr>
<td>BIOH 476 - Clinical Microbiology II</td>
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</tr>
<tr>
<td>BIOH 477 - Clinical Chemistry and Urinalysis II</td>
<td>3</td>
<td></td>
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<tr>
<td>BIOH 478 - Clinic Immunohematology/ Serology</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>BIOH 479 - Clinical Immunology</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>BIOH 473 - Laboratory Practice II</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>BIOH 474 - Clinical Hematology II</td>
<td>2</td>
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<tr>
<td>BIOH 475 - Clinical Hemostasis</td>
<td>1</td>
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<tr>
<td>BIOH 482 - Laboratory Practice III</td>
<td>2</td>
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<tr>
<td>BIOH 484 - Clinical Hematology III</td>
<td>2</td>
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<tr>
<td>BIOH 486 - Clinical Microbiology III</td>
<td>2</td>
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<tr>
<td>and Molecular Diagnostics</td>
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<tr>
<td>BIOH 487 - Clinical Chemistry III</td>
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<tr>
<td>BIOH 488 - Clinical Immunohematology</td>
<td>3</td>
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<tr>
<td>BIOH 489 - Laboratory Management</td>
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### BIOH 464 - Clinical Hematology and Body Fluids
- 2

### BIOH 466 - Clin Microbiology I
- 3

### BIOH 467 - Clinical Chemistry I
- 3

### BIOH 468 - Clinical Immunohematology I
- 3

### BIOH 469 - Essentials of Clinical Lab Practice
- 1

**Total Program Credits:** 37

If student is accepted and attends Sacred Heart Medical Center (Spokane) or Colorado Center for MLS (Denver) for their Senior Professional Year:

- **BIOH 470**
  - Summer Clinical Laboratory (12 credits)
  - 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
  - 12-13

- **BIOH 471**
  - Professional Training I (Fall Semester)
  - Clinical Immunohematology II; Clinical Chemistry I; Clinical Hematology I; Clinical Laboratory I; Clinical Microbiology I; Clinical Laboratory II; Clinical Immunology; Medical Mycology
  - 12-13

- **BIOH 472**
  - Professional Training II (Spring Semester)
  - Clinical Immunohematology III; Clinical Microbiology II; Clinical Hematology II
  - 12-13

**Suggested Electives for Plan A**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOM 405</td>
<td>Host-Associated Microbiomes</td>
<td>4</td>
</tr>
<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>
<td>3</td>
</tr>
<tr>
<td>BIOM 435</td>
<td>Virology</td>
<td>3</td>
</tr>
<tr>
<td>BIOM 455</td>
<td>Research Methds in Microbiology</td>
<td>4</td>
</tr>
<tr>
<td>BIOM 428</td>
<td>Molecular Evolution</td>
<td>3</td>
</tr>
<tr>
<td>BIOM 425</td>
<td>Toxicology: Science of Poisons</td>
<td>3</td>
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</tbody>
</table>

**Microbiology Minor (Non-Teaching)**

- **BIOM 103IN**
  - Unseen Universe: Microbes
  - 3

- **BIOM 250**
  - Microbiology for Health Sciences: Infectious Diseases

- **BIOM 160**
  - Principles of Living Systems
  - 4

- **BIOM 160**
  - Principles of Living Systems
  - 4

- **BIOM 360**
  - General Microbiology
  - 141 & 143; co-req CHMY 211 or 321

- **BIOM 405**
  - Host-Associated Microbiomes
  - 4

- **BIOM 430**
  - Applied and Environmental Microbiology
  - 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 430**
  - Applied and Environmental Microbiology
  - 4
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

<table>
<thead>
<tr>
<th>Course Code</th>
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<th>Credits</th>
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<tbody>
<tr>
<td>CHMY 141</td>
<td>College Chemistry I</td>
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<td>BIOM 101</td>
<td>Careers in Microbiology</td>
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<td>PSYX 100IS</td>
<td>Intro to Psychology</td>
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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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<tr>
<td>M 161Q</td>
<td>Survey of Calculus</td>
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#### Sophomore Year

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<tr>
<td>CHMY 321</td>
<td>Organic Chemistry I</td>
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<td>BIOH 201</td>
<td>Hum Anatomy &amp; Physiology I</td>
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<td>CHMY 323</td>
<td>Organic Chemistry II</td>
<td>4</td>
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<td>BIOH 211</td>
<td>Hum Anatomy &amp; Physiology II</td>
<td>4</td>
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<td>BIOM 360</td>
<td>General Microbiology</td>
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#### Junior Year

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<tr>
<td>BIOO 262IN</td>
<td>Introduction to Entomology</td>
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<tr>
<td>PHSX 205</td>
<td>College Physics I</td>
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<td>STAT 216Q</td>
<td>Introduction to Statistics</td>
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<tr>
<td>BCH 380</td>
<td>Biochemistry</td>
<td>5</td>
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<tr>
<td>BIOM 431</td>
<td>Medical Bacteriology</td>
<td>3</td>
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<td>BIOM 432</td>
<td>Med Bacteriology Lab</td>
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<tr>
<td>PHSX 207</td>
<td>College Physics II</td>
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#### Senior Year

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<th>Course Title</th>
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<tbody>
<tr>
<td>BIOM 494</td>
<td>Seminar/Workshop</td>
<td>1</td>
</tr>
<tr>
<td>BIOM 440</td>
<td>Applied and Environmental Microbiology</td>
<td>4</td>
</tr>
<tr>
<td>or BIOM 415</td>
<td>Microbial Diversity, Ecology, and Evolution</td>
<td></td>
</tr>
<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>
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<tr>
<td>BIOM 494</td>
<td>Seminar/Workshop</td>
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<tr>
<td>Year Total:</td>
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</table>

### Total Program Credits: 120

#### 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.

- BIOM 405 Host-Associated Microbiomes 4
- BIOM 425 Toxicology: Science of Poisons 3
- BIOM 435 Virology 3
- BIOM 428 Molecular Evolution 3
- BIOM 455R Research Mtds in Microbiology 4
- ENSC 245IN Soils 3
- ENSC 272CS Water Resources 3
- ENSC 460 Soil Remediation 3
- ENSC 461 Restoration Ecology 3
- EENV 445 Hazardous Waste Treatment 3
- EENV 447 Hazardous Waste Management 3
- SFBS 146 Introduction to Sustainable Food and Bioenergy Systems 3
- NUTR 226 Food Fundamentals 3
- NUTR 227 Food Fundamentals Lab 2

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

#### Freshman 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>
</tr>
<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>
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</tr>
<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>
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<tr>
<td>Math requirements</td>
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</tbody>
</table>

#### Year Total: 15

#### Suggested Electives

- M 165Q - Calculus for Technology I 4
- or M 171Q - Calculus I 1
**Montana State University**

- **M 166Q** - Calculus for Technology II  
- or **M 172Q** - Calculus II

For other Plans:
- **M 161Q** - Survey of Calculus  
- or **BIOB 318** - Biometry

**University Core and Electives**  
- 11-12 credits

**Year Total:**  
- 30 credits

**Sophomore Year**  

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
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<tbody>
<tr>
<td>CHMY 321 - Organic Chemistry I</td>
<td>4</td>
</tr>
<tr>
<td>or CHMY 331 - Honors Organic Chemistry I</td>
<td></td>
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<tr>
<td>CHMY 323 - Organic Chemistry II</td>
<td>4</td>
</tr>
<tr>
<td>or CHMY 333 - Honors Organic Chemistry II</td>
<td></td>
</tr>
<tr>
<td>BIOM 360 - General Microbiology</td>
<td>5</td>
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</table>

Choose one of the following sequences:  
- 0-10 credits

For General Plan
- PHSX 205 - College Physics I  
- or PHSX 220 - Physics I (w/ calculus)  
- 4 credits

For General Plan
- PHSX 207 - College Physics II  
- or PHSX 222 - Physics II (w/ calculus)  
- 4 credits

For Population Biol. & Ecology Plan
- BIOB 375 - General Genetics  
- 3 credits
- BIOE 370 - General Ecology (equiv to 270)  
- 3 credits

For Bioinformatics Plan: (TBA)

**University Core and Electives**  
- 7-17 credits

**Year Total:**  
- 30 credits

**Junior Year**  

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>BCH 380 - Biochemistry</td>
<td>5</td>
</tr>
<tr>
<td>BIOM 410 - Microbial Genetics</td>
<td>3</td>
</tr>
<tr>
<td>BIOM 430 - Applied and Environmental Microbiology</td>
<td>4</td>
</tr>
<tr>
<td>BCH 442 - Metabolic Regulation</td>
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</tbody>
</table>

**University Core and Electives**  
- 15 credits

**Year Total:**  
- 30 credits

**Senior Year**  

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
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<tbody>
<tr>
<td>BIOM 450 - Microbial Physiology</td>
<td>3</td>
</tr>
<tr>
<td>BIOM 494 - Seminar/Workshop (take twice for two credits)</td>
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</tr>
</tbody>
</table>

Choose one of the following sequences:  
- 9-18 credits

For General Plan
- BCH 441 - Biochemistry of Macromolecules  
- 3 credits
- BIOM 455R - Research Mthds in Microbiology  
- 4 credits
- BIOM 452 - Soil & Envirnmnl Microbiology  
- 3 credits

For Population Biol. & Ecology Plan
- BIOM 452 - Soil & Envirnmnl Microbiology  
- 3 credits
- BIOM 415 - Microbial Diversity, Ecology, and Evolution  
- 3 credits
- BIOB 420 - Evolution  
- 3 credits

For Bioinformatics Plan
- BCH 441 - Biochemistry of Macromolecules  
- 3 credits
- BIOM 455R - Research Mthds in Microbiology  
- 4 credits
- BCH 444R - Biochemistry & Molecular Biology Methods  
- 3 credits
- BIOB 428 - Molecular Evolution  
- 3 credits

For Ag & Bioremediation Plan
- BIOM 452 - Soil & Envirnmnl Microbiology  
- 3 credits
- BIOM 421 - Concepts of Plant Pathology  
- 3 credits
- AGSC 450 - Plant Disease Control  
- 3 credits

- ENSC 353 - Environmental Biogeochemistry  
- 3 credits
- ENSC 460 - Soil Remediation  
- 3 credits
- BIO 423 - Mycology  
- 3 credits

**Math Requirements**  

Choose one of the following sequences:
- **M 161Q** - Survey of Calculus  
- or **BIOB 318** - Biometry
- or **STAT 216Q** - Introduction to Statistics

**Year Total:**  
- 29 credits

**Total Program Credits:**  
- **119 credits**

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>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOB 160 - Principles of Living Systems</td>
<td>4</td>
</tr>
<tr>
<td>or BIOB 260 - Cellular and Molecular Biology</td>
<td></td>
</tr>
<tr>
<td>CHMY 141 - College Chemistry I</td>
<td>4</td>
</tr>
<tr>
<td>or CHMY 151 - Honors College Chemistry I</td>
<td></td>
</tr>
<tr>
<td>CHMY 143 - College Chemistry II</td>
<td>4</td>
</tr>
<tr>
<td>or CHMY 153 - Honors College Chemistry II</td>
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</tbody>
</table>

**Math Requirements**  

Choose one of the following sequences:
- **M 161Q** - Survey of Calculus  
- or **BIOB 318** - Biometry

**Year Total:**  
- 30 credits

**Sophomore Year**  

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
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<tbody>
<tr>
<td>BIOM 321 - Organic Chemistry I</td>
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<tr>
<td>or CHMY 331 - Honors Organic Chemistry I</td>
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<tr>
<td>CHMY 323 - Organic Chemistry II</td>
<td>4</td>
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<tr>
<td>or CHMY 333 - Honors Organic Chemistry II</td>
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<tr>
<td>CHMY 321 - Organic Chemistry I</td>
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For General Plan
- PHSX 205 - College Physics I  
- or PHSX 220 - Physics I (w/ calculus)  
- 4 credits

For General Plan
- PHSX 207 - College Physics II  
- or PHSX 222 - Physics II (w/ calculus)  
- 4 credits

For Population Biol. & Ecology Plan
- BIOB 375 - General Genetics  
- 3 credits

**Math Requirements**  

Choose one of the following sequences:
- **M 161Q** - Survey of Calculus  
- or **BIOB 318** - Biometry

**Year Total:**  
- 30 credits

**Junior Year**  

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
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<tr>
<td>BCH 380 - Biochemistry</td>
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<tr>
<td>BIOM 410 - Microbial Genetics</td>
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<tr>
<td>BIOM 430 - Applied and Environmental Microbiology</td>
<td>4</td>
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<tr>
<td>BCH 442 - Metabolic Regulation</td>
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**University Core and Electives**  
- 10 credits

**Year Total:**  
- 30 credits

**Senior Year**  

<table>
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<tr>
<td>BIOM 450 - Microbial Physiology</td>
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<tr>
<td>BIOM 494 - Seminar/Workshop (take two semesters)</td>
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| *Math Requirements*  
Choose one of the following sequences:  
- **M 161Q** - Survey of Calculus  
- or **BIOB 318** - Biometry
Microbiology Option: Pre-Medical Track

Freshman Year

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<tbody>
<tr>
<td>BIOH 185 - Integrated Physiology I (F)</td>
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<td>or BIOB 170IN - Principles of Biological Diversity</td>
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<tr>
<td>BIOB 260 - Cellular and Molecular Biology (F,S)</td>
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<td>or BIOB 160 - Principles of Living Systems</td>
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<tr>
<td>CHMY 141 - College Chemistry I (F)</td>
<td>4</td>
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<td>CHMY 143 - College Chemistry II (S)</td>
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<td>M 161Q - Survey of Calculus (F,S,Su)</td>
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Sophomore Year

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<tr>
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<td>CHMY 321 - Organic Chemistry I (F)</td>
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<td>CHMY 323 - Organic Chemistry II (S)</td>
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<td>BIOH 201 - Hum Anatomy &amp; Physiology I (F)</td>
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<td>BIOH 211 - Hum Anatomy &amp; Physiology II (S)</td>
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<td>STAT 216Q - Introduction to Statistics (F,S)</td>
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Junior Year

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<tr>
<td>BIOC 410 - Immunology (F)</td>
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<tr>
<td>BIOC 375 - General Genetics (F)</td>
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<td>or BIOC 320 - Biomedical Genetics</td>
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<tr>
<td>BCH 380 - Biochemistry (F)</td>
<td>5</td>
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<tr>
<td>or BCH 441 and BCH 442</td>
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<td>PHSX 205 - College Physics I (F)</td>
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<td>PHSX 207 - College Physics II (S)</td>
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Senior Year

<table>
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<tr>
<th>Course</th>
<th>Credits</th>
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<tbody>
<tr>
<td>BIOM 450 - Microbial Physiology (F)</td>
<td>3</td>
</tr>
<tr>
<td>BIOM 494 - Seminar/Workshop (take twice F and S)</td>
<td>2</td>
</tr>
<tr>
<td>BIOC 410 - Microbial Genetics (S)</td>
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<tr>
<td>BIOM 400 - Medical Microbiology (S)</td>
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<tr>
<td>or BIOM 431 - Medical Bacteriology</td>
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<tr>
<td>BIOM 405 - Host-Associated Microbiomes (F)</td>
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<tr>
<td>or BIOM 430 - Applied and Environmental Microbiology</td>
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<tr>
<td>or BIOM 415</td>
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Total Program Credits: 120

Microbiology Electives

A minimum of 25 credits of additional Microbiology courses, some of which are listed below.

<table>
<thead>
<tr>
<th>Course</th>
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<tbody>
<tr>
<td>BIOM 101 - Careers in Microbiology (1 cr)</td>
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<tr>
<td>BIOM 405 - Host-Associated Microbiomes</td>
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<tr>
<td>BIOM 425 - Toxicology: Science of Poisons</td>
<td></td>
</tr>
<tr>
<td>BIOM 431 - Medical Bacteriology (3 cr)</td>
<td></td>
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<tr>
<td>BIOM 432 - Med Bacteriology Lab (2 cr)</td>
<td></td>
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<tr>
<td>BIOM 435 - Virology (3 cr)</td>
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<td>BIOM 441 - Eukaryotic Pathogens (4 cr)</td>
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</tr>
<tr>
<td>BIOM 455R - Research Mthds in Microbiology (4 cr)</td>
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<tr>
<td>BIOM 490R - Undergraduate Research (1-4 cr)</td>
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<td>or BIOM 490R applied to MB electives</td>
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<tr>
<td>BIOM 497 - Educational Methods: Microbiology (2 cr)</td>
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<tr>
<td>BIOC 410 - Immunology (3 cr)</td>
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<tr>
<td>BIOC 428 - Molecular Evolution (3 cr)</td>
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</tr>
<tr>
<td>BIOC 405 - Hematology (3 cr)</td>
<td></td>
</tr>
<tr>
<td>BIOC 406 - Hematology Laboratory</td>
<td></td>
</tr>
</tbody>
</table>

Other suggested courses

A minimum of 120 credits is required for graduation; 42 of those credits must be in courses numbered 300 and above.

Electives (you need 13 credits)

Recommended

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOM 425 - Toxicology: Science of Poisons (S)</td>
<td>3</td>
</tr>
<tr>
<td>BIOM 435 - Virology (F)</td>
<td>3</td>
</tr>
<tr>
<td>BIOM 432 - Med Bacteriology Lab (S)</td>
<td>2</td>
</tr>
<tr>
<td>BIOC 441 - Eukaryotic Pathogens (S)</td>
<td>4</td>
</tr>
<tr>
<td>BIOC 405 - Hematology (F)</td>
<td>3</td>
</tr>
<tr>
<td>BIOC 490R - Undergraduate Research (F,S)</td>
<td>1-3</td>
</tr>
</tbody>
</table>

Electives: Other (One of the following can be substituted for a Microbiology Elective)

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOC 313 - Neurophysiology (F)</td>
<td>3</td>
</tr>
<tr>
<td>BIOC 323 - Human Developmental Biology (S)</td>
<td>4</td>
</tr>
<tr>
<td>BIOC 420 - Evolution (S)</td>
<td>3</td>
</tr>
<tr>
<td>BIOC 425 - Adv Cell &amp; Molecular Biology (S)</td>
<td>3</td>
</tr>
</tbody>
</table>

Recommended University Core & Electives

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>PSYX 110IS - Honors Intro to Psychology (F,S,Su)</td>
<td>4</td>
</tr>
<tr>
<td>SOCI 101IS - Introduction to Sociology (F,S)</td>
<td>3</td>
</tr>
</tbody>
</table>

A minimum of 120 credits is required for graduation; 42 of those credits must be in courses numbered 300 and above.

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 literature 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. Lower division courses are designed to teach the five language skills: speaking, listening, understanding culture, reading, and writing. Advanced courses provide students with comprehensive knowledge of the important writers and movements of each language. Other advanced courses concentrate on history and contemporary culture. For students interested in teaching, K-12 teaching options are offered in French, German, and Spanish. The Department, in conjunction with the Department of History & Philosophy, offers 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. 232)
- German Studies Option (p. 233)
- Latin American and Latino Studies Option (p. 234)
- Hispanic Studies Option (p. 233)

Minors

- China Studies Minor (p. 231)
- French and Francophone Studies Minor (p. 232)
- German Studies Minor (p. 233)
- Japan Studies Minor (p. 233)
- Hispanic Studies Minor (p. 233)
- Latin American and Latino Studies Minor (p. 235)

Language Teaching Programs

Majors

- French K-12 Teaching Option (p. 232)
- German K-12 Teaching Option (p. 232)
- Spanish K-12 Teaching Option (p. 235)

Minors

- French Teaching Minor (p. 138)
- German Teaching Minor (p. 138)
- Spanish Teaching Minor (p. 139)

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 (Non-Teaching)

The Department of Modern Languages and Literatures offers a non-teaching 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. 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:

Language Courses

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHIN 101</td>
<td>Elementary Chinese I</td>
<td>4</td>
</tr>
<tr>
<td>CHIN 102D</td>
<td>Elementary Chinese II</td>
<td>4</td>
</tr>
<tr>
<td>CHIN 201D</td>
<td>Intermediate Chinese I</td>
<td>4</td>
</tr>
<tr>
<td>CHIN 202D</td>
<td>Intermediate Chinese II</td>
<td>4</td>
</tr>
</tbody>
</table>

Non-language Courses

Choose one of the following:  3

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHIN 130D</td>
<td>Historical and Literary Journey into Modern China</td>
<td></td>
</tr>
<tr>
<td>CHIN 211D</td>
<td>Chinese Culture &amp; Civilization</td>
<td></td>
</tr>
<tr>
<td>RLST 203D</td>
<td>Buddhist Traditions</td>
<td></td>
</tr>
<tr>
<td>ANTY 225S</td>
<td>Culture, Language, and Society</td>
<td></td>
</tr>
<tr>
<td>HSTR 140D</td>
<td>Modern Asia</td>
<td></td>
</tr>
</tbody>
</table>

Choose three of the following:  9

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ARTH 360</td>
<td>History of Asian Art and Architecture</td>
<td></td>
</tr>
<tr>
<td>CHIN 320I</td>
<td>History of Chinese Cinema</td>
<td></td>
</tr>
<tr>
<td>HSTR 345</td>
<td>Modern China</td>
<td></td>
</tr>
<tr>
<td>HSTR 443</td>
<td>Gender in Asia</td>
<td></td>
</tr>
<tr>
<td>HSTR 446</td>
<td>Science and Medicine in China</td>
<td></td>
</tr>
<tr>
<td>ML 491</td>
<td>Special Topics (Asian Civilization: on-line only)</td>
<td></td>
</tr>
<tr>
<td>ML 490R</td>
<td>Undergraduate Research **</td>
<td></td>
</tr>
<tr>
<td>or ML 492</td>
<td>Independent Study</td>
<td></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 490 R 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>Year</th>
<th>Credits</th>
<th>Courses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Freshman Year</td>
<td></td>
<td>FRCH 101 - Elementary French I</td>
</tr>
<tr>
<td></td>
<td></td>
<td>FRCH 102D - Elementary French II</td>
</tr>
<tr>
<td></td>
<td></td>
<td>EDU 202 - Early Field Experience</td>
</tr>
<tr>
<td></td>
<td></td>
<td>FCS 101IS - Indiv and Fam Dev: Lifespan *</td>
</tr>
<tr>
<td></td>
<td></td>
<td>EDU 222IS - Educ Psych &amp; Child Development or EDU 223IS - Educ Psych and Adolescent Dev</td>
</tr>
<tr>
<td></td>
<td></td>
<td>University Core and Electives 15 (EDU 101US is recommended for teaching majors to fulfill a Core requirement)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Year Total: 30</td>
</tr>
<tr>
<td>Sophomore Year</td>
<td></td>
<td>FRCH 201D - Intermediate French I</td>
</tr>
<tr>
<td></td>
<td></td>
<td>FRCH 202D - Intermediate French II</td>
</tr>
<tr>
<td></td>
<td></td>
<td>EDU 211D - Multicultural Education</td>
</tr>
<tr>
<td></td>
<td></td>
<td>EDU 370 - Integrating Tech into Educ</td>
</tr>
<tr>
<td></td>
<td></td>
<td>University Core and Electives 19</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Year Total: 30</td>
</tr>
<tr>
<td>Junior and Senior Year</td>
<td></td>
<td>EDU 382 - Assessmt, Curric, Instructn</td>
</tr>
<tr>
<td></td>
<td></td>
<td>EDU 395 - Practicum</td>
</tr>
<tr>
<td></td>
<td></td>
<td>EDU 408 - Professional Issues: K-12</td>
</tr>
<tr>
<td></td>
<td></td>
<td>EDU 496 - Methods: K-12 Modern Languages</td>
</tr>
<tr>
<td></td>
<td></td>
<td>EDU 495 - Student Teaching</td>
</tr>
<tr>
<td></td>
<td></td>
<td>EDU 495 - Student Teaching K-8</td>
</tr>
<tr>
<td></td>
<td></td>
<td>EDSP 306 - Exceptional Learners</td>
</tr>
<tr>
<td></td>
<td></td>
<td>FRCH 490R - Undergraduate Research</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Take 25 additional upper division FRCH credits. (ML 344 and ML 492 may be counted toward this upper division requirement.)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>University Core and Electives 5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Year Total: 60</td>
</tr>
<tr>
<td>Total Program Credits</td>
<td></td>
<td>120</td>
</tr>
</tbody>
</table>

* 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 (Non-Teaching)**

<table>
<thead>
<tr>
<th>Year</th>
<th>Credits</th>
<th>Courses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Freshman Year</td>
<td></td>
<td>FRCH 101 - Elementary French I</td>
</tr>
<tr>
<td></td>
<td></td>
<td>FRCH 102D - Elementary French II</td>
</tr>
<tr>
<td></td>
<td></td>
<td>EDU 202 - Early Field Experience</td>
</tr>
<tr>
<td></td>
<td></td>
<td>EDU 211D - Multicultural Education</td>
</tr>
<tr>
<td></td>
<td></td>
<td>EDU 370 - Integrating Tech into Educ</td>
</tr>
<tr>
<td></td>
<td></td>
<td>University Core and Electives 15 (EDU 101US is recommended for teaching majors to fulfill a Core requirement)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Year Total: 30</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. 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.

<table>
<thead>
<tr>
<th>Year</th>
<th>Credits</th>
<th>Courses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Freshman Year</td>
<td></td>
<td>GRMN 101 - Elementary German I</td>
</tr>
<tr>
<td></td>
<td></td>
<td>GRMN 102D - Elementary German II</td>
</tr>
<tr>
<td></td>
<td></td>
<td>EDU 202 - Early Field Experience</td>
</tr>
<tr>
<td></td>
<td></td>
<td>FCS 101IS - Indiv and Fam Dev: Lifespan *</td>
</tr>
<tr>
<td></td>
<td></td>
<td>EDU 222IS - Educ Psych &amp; Child Development</td>
</tr>
<tr>
<td></td>
<td></td>
<td>or EDU 223IS - Educ Psych and Adolescent Dev</td>
</tr>
<tr>
<td></td>
<td></td>
<td>University Core and Electives 17 (EDU 101US is recommended for teaching majors to fulfill a Core requirement)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Year Total: 30</td>
</tr>
<tr>
<td>Sophomore Year</td>
<td></td>
<td>GRMN 201D - Intermediate German I</td>
</tr>
<tr>
<td></td>
<td></td>
<td>GRMN 202D - Intermediate German II</td>
</tr>
<tr>
<td></td>
<td></td>
<td>EDU 211D - Multicultural Education</td>
</tr>
<tr>
<td></td>
<td></td>
<td>EDU 370 - Integrating Tech into Educ</td>
</tr>
</tbody>
</table>

**French and Francophone Studies Option**

<table>
<thead>
<tr>
<th>Year</th>
<th>Credits</th>
<th>Courses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Freshman Year</td>
<td></td>
<td>FRCH 101 - Elementary French I</td>
</tr>
<tr>
<td></td>
<td></td>
<td>FRCH 102D - Elementary French II</td>
</tr>
<tr>
<td></td>
<td></td>
<td>EDU 202 - Early Field Experience</td>
</tr>
<tr>
<td></td>
<td></td>
<td>FCS 101IS - Indiv and Fam Dev: Lifespan *</td>
</tr>
<tr>
<td></td>
<td></td>
<td>EDU 222IS - Educ Psych &amp; Child Development</td>
</tr>
<tr>
<td></td>
<td></td>
<td>or EDU 223IS - Educ Psych and Adolescent Dev</td>
</tr>
<tr>
<td></td>
<td></td>
<td>University Core and Electives 24 (EDU 101US is recommended for teaching majors to fulfill a Core requirement)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Year Total: 30</td>
</tr>
<tr>
<td>Sophomore Year</td>
<td></td>
<td>FRCH 201D - Intermediate French I</td>
</tr>
<tr>
<td></td>
<td></td>
<td>FRCH 202D - Intermediate French II</td>
</tr>
<tr>
<td></td>
<td></td>
<td>EDU 211D - Multicultural Education</td>
</tr>
<tr>
<td></td>
<td></td>
<td>EDU 370 - Integrating Tech into Educ</td>
</tr>
<tr>
<td></td>
<td></td>
<td>University Core and Electives 29 (EDU 101US is recommended for teaching majors to fulfill a Core requirement)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Year Total: 60</td>
</tr>
<tr>
<td>Total Program Credits</td>
<td></td>
<td>120</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.
University Core and Electives 19
Year Total: 30

**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 Student Teaching K-8</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>EDSP 306</td>
<td>Exceptional Learners</td>
<td>3</td>
</tr>
<tr>
<td>GRMN 450R</td>
<td>Sem:German Lit and Culture</td>
<td>3</td>
</tr>
</tbody>
</table>

Take at least 25 GRMN credits. (ML 100, ML 344, and ML 490 may be counted toward this 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 of 40 credits required in the department.

### German Minor (Non-Teaching)

**Freshman Year**  
<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>
</tbody>
</table>

Year Total: 6

**Sophomore Year**  
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<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>
</tbody>
</table>

Year Total: 6

**Junior and Senior Year**  
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>GRMN 301</td>
<td>Oral and Written Expression I</td>
<td>3</td>
</tr>
<tr>
<td>or GRMN 302</td>
<td>Oral and Written Expression II</td>
<td></td>
</tr>
</tbody>
</table>

Take 12 additional upper division GRMN credits (4 courses).  
Year Total: 12

**Total Program Credits:** 27

### Hispanic Studies Minor (Non-Teaching)

**Freshman Year**  
<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>Elementary Spanish II</td>
<td>3</td>
</tr>
</tbody>
</table>

Year Total: 6

**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>
</tbody>
</table>

Year Total: 6

**Junior and Senior Year**  
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Take 15 credits of upper division SPNS courses.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Year Total: 15

**Total Program Credits:** 27

### German Studies Option

**Freshman Year**  
<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>
</tbody>
</table>

Year Total: 24

**Sophomore Year**  
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<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>
</tbody>
</table>

Year Total: 30

**Junior and Senior Year**  
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Take 27 additional GRMN credits. ML100, ML344, and ML490 may be counted toward this requirement.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**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.

### Japan Studies Minor (Non-Teaching)

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. 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**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<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>
</tr>
</tbody>
</table>

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 325H Others in Japanese Lit/Culture
- JPNS 340 Japanese Adv Reading & Grammar
- JPNS 361H Japanese Text and Cinema

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.

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**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>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>HSTR 130D</td>
<td>Latin American History</td>
<td>4</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>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPNS 250</td>
<td>Spanish for Healthcare Prof</td>
<td></td>
</tr>
<tr>
<td>SPNS 329</td>
<td>Early Cultures of Latin America</td>
<td></td>
</tr>
<tr>
<td>SPNS 330</td>
<td>Modern Cultures Latin America</td>
<td></td>
</tr>
<tr>
<td>SPNS 332</td>
<td>Contemp Latin Amer Literature</td>
<td></td>
</tr>
<tr>
<td>SPNS 335H</td>
<td>Travel in Latin Am Lit &amp; Film</td>
<td></td>
</tr>
<tr>
<td>SPNS 350</td>
<td>US Latino Cultures</td>
<td></td>
</tr>
<tr>
<td>SPNS 351</td>
<td>US Latino Literature</td>
<td></td>
</tr>
<tr>
<td>SPNS 352H</td>
<td>US Latino Text and Cinema</td>
<td></td>
</tr>
<tr>
<td>SPNS 361</td>
<td>Latin American Text and Cinema</td>
<td></td>
</tr>
<tr>
<td>SPNS 371</td>
<td>Latin America in Focus</td>
<td></td>
</tr>
<tr>
<td>SPNS 416</td>
<td>Latin America: Culture and Revolution</td>
<td></td>
</tr>
<tr>
<td>SPNS 430</td>
<td>Latin Amer Perspectives</td>
<td></td>
</tr>
<tr>
<td>SPNS 445</td>
<td>Hispanic Caribbean: Cuba, Puerto Rico, Dominican Republic</td>
<td></td>
</tr>
<tr>
<td>HSTR 430</td>
<td>Latin Amer Soc History</td>
<td></td>
</tr>
<tr>
<td>HSTR 431</td>
<td>Race in Latin America</td>
<td></td>
</tr>
<tr>
<td>HSTR 432</td>
<td>Colonial Latin America</td>
<td></td>
</tr>
<tr>
<td>HSTR 433</td>
<td>Latin American Perspectives</td>
<td></td>
</tr>
<tr>
<td>HSTR 434</td>
<td>Gender in Latin America</td>
<td></td>
</tr>
<tr>
<td>HSTR 436</td>
<td>Armed Conflict Mod Lat Am</td>
<td></td>
</tr>
<tr>
<td>HSTR 438</td>
<td>Human Rights in Latin America</td>
<td></td>
</tr>
<tr>
<td>PSCI 423</td>
<td>Politics of Development</td>
<td></td>
</tr>
<tr>
<td>SOCI 485</td>
<td>Political Sociology</td>
<td></td>
</tr>
</tbody>
</table>
Required Courses

**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 Tías youth center in León, Nicaragua
- Health entity/organization in León, Nicaragua
- Other opportunity approved by LALS advisor

**Total credits: 47-49**

**Foundation course: 4**

**Area requirements: 24**

**Language requirements: 15**

**Research: 3**

**Experiential Learning: 1-3**

**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 & 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.

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 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</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>
</tbody>
</table>

**SPNS 201D** Intermediate Spanish I 3
**SPNS 202D** Intermediate Spanish II 3
**HSTR 130D** Latin American History 4

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, SOCI, HSTR, etc):

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPNS 329</td>
<td>Early Cultures of Latin America</td>
<td></td>
</tr>
<tr>
<td>SPNS 330</td>
<td>Modern Cultures Latin America</td>
<td></td>
</tr>
<tr>
<td>SPNS 332</td>
<td>Contemp Latin Amer Literature</td>
<td></td>
</tr>
<tr>
<td>SPNS 335IH</td>
<td>Travel in Latin Am Lit &amp; Film</td>
<td></td>
</tr>
<tr>
<td>SPNS 350</td>
<td>US Latino Cultures</td>
<td></td>
</tr>
<tr>
<td>SPNS 351</td>
<td>US Latino Literature</td>
<td></td>
</tr>
<tr>
<td>SPNS 352IH</td>
<td>US Latino Text and Cinema</td>
<td></td>
</tr>
<tr>
<td>SPNS 361</td>
<td>Latin American Text and Cinema</td>
<td></td>
</tr>
<tr>
<td>SPNS 371</td>
<td>Latin America in Focus</td>
<td></td>
</tr>
<tr>
<td>SPNS 416</td>
<td>Latin America: Culture and Revolution</td>
<td></td>
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<tr>
<td>SPNS 430</td>
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<td>Race in Latin America</td>
<td></td>
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<td>HSTR 432</td>
<td>Colonial Latin America</td>
<td></td>
</tr>
<tr>
<td>HSTR 433</td>
<td>Latin American Perspectives</td>
<td></td>
</tr>
<tr>
<td>HSTR 436</td>
<td>Armed Conflict Mod Lat Am</td>
<td></td>
</tr>
<tr>
<td>SOCI 368</td>
<td>Latino Immigration</td>
<td></td>
</tr>
<tr>
<td>SOCI 370</td>
<td>Sociology of Globalization</td>
<td></td>
</tr>
<tr>
<td>SOCI 485</td>
<td>Political Sociology</td>
<td></td>
</tr>
<tr>
<td>PSCI 423</td>
<td>Politics of Development</td>
<td></td>
</tr>
</tbody>
</table>

**Total Credits: 28**

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.

**Freshman Year**

<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>EDU 202</td>
<td>Early Field Experience</td>
<td>1</td>
</tr>
<tr>
<td>FCS 101S</td>
<td>Indiv and Fam Dev: Lifespan</td>
<td>3</td>
</tr>
<tr>
<td>EDU 222IS</td>
<td>Edu Psych &amp; Child Development</td>
<td>3</td>
</tr>
<tr>
<td>University Core and Electives (EDU 101US is recommended for teaching majors to fulfill a Core requirement)</td>
<td>17</td>
<td></td>
</tr>
<tr>
<td><strong>Year Total:</strong></td>
<td></td>
<td><strong>30</strong></td>
</tr>
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</table>

**Sophomore Year**

<table>
<thead>
<tr>
<th>Course</th>
<th>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>
</tbody>
</table>
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 (AI-SE) 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 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/nas).

Undergraduate Minor

- Native American Studies Minor (Non-Teaching) (p. 237)

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 (AI-SE) 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. 349)
- Online certificate in Native American Studies (p. 364)

**Native American Studies Minor (Non-Teaching)**

The minor in Native American Studies is designed to enhance the student’s major area of study, offering an 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 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 232D</td>
<td>MT Indian Cult, Hist, Cur Issu</td>
<td>3</td>
</tr>
<tr>
<td>NASX 476</td>
<td>Amer Indian Policy and Law</td>
<td>3</td>
</tr>
<tr>
<td>NASX Electives</td>
<td></td>
<td>12</td>
</tr>
<tr>
<td><strong>Total Credits</strong></td>
<td></td>
<td><strong>21</strong></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 Edu, 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 490R Undergraduate Research/NASX 490R Undergraduate Research and no more than four (4) semester credits of NASX 498 Internship/Cooperative Edu 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 department certifying officer.

Any student wishing a minor in Native American Studies must file an "Application for a Non-teaching Minor" with the Registrar’s Office before graduation. Please consult 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 Contemp Soc</td>
<td>3</td>
</tr>
<tr>
<td>NASX 232D</td>
<td>MT Indian Cult, Hist, Cur Issu</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 Belief &amp; Phil</td>
<td>3</td>
</tr>
<tr>
<td>NASX 310</td>
<td>Native Cultures of N 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>Gndr Iss In Native Amer Stdies</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>Amer Indian Policy and Law</td>
<td>3</td>
</tr>
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<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>
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<td>NASX 494</td>
<td>Seminar</td>
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<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. 238)
- Philosophy and Religion Option (p. 238)
Undergraduate Minors

- Astrobiology Minor (Non Teaching) (p. 189)
- Philosophy Minor (Non-Teaching) (p. 238)

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.

<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>
<tr>
<td>PHL 361RH</td>
<td>Hist of Philo:Ancient/Medieval</td>
<td>3</td>
</tr>
<tr>
<td>PHL 362</td>
<td>History of Philosophy: Modern</td>
<td>3</td>
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<tr>
<td>Choose one of the following:</td>
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<tr>
<td>PHL 312</td>
<td>Contemporary Moral Problems</td>
<td></td>
</tr>
<tr>
<td>PHL 310</td>
<td>Moral Theory</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; Environmnt Ethics</td>
<td></td>
</tr>
<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 305</td>
<td>Contemporary Philosophy</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>
</tbody>
</table>

Philosophy Electives: at least three credits must be upper division

Total Credits: 21

Philosophy Option

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>
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</tbody>
</table>

Intro to Philosophy - choose one of the following

- 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

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>PHL 236Q</td>
<td>Logic</td>
<td>3</td>
</tr>
<tr>
<td>Choose one of the following in political philosophy/aesthetic:</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>PHL 327</td>
<td>Aesthetics and the Arts</td>
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<tr>
<td>PHL 328</td>
<td>Philosophy and Film</td>
<td></td>
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<tr>
<td>PHL 350RH</td>
<td>State, Community &amp; Individual</td>
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<tr>
<td>PHL 351</td>
<td>Philosophy and Feminism</td>
<td></td>
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<tr>
<td>PHL 353</td>
<td>Philosophy and Technology</td>
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<tr>
<td>PHL 354</td>
<td>Philosophy of Race</td>
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University Core and Electives

Year Total: 16

Junior Year

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHL 236Q</td>
<td>History of Philosophy: Modern</td>
<td>3</td>
</tr>
<tr>
<td>PHL 365</td>
<td>Philosophy of Mind and Consciousness</td>
<td></td>
</tr>
</tbody>
</table>

Choose one of the following in ethics:

- PHL 303 - Approaches to Epistemology
- PHL 304 - Metaphysics
- PHL 305 - Contemporary Philosophy
- PHL 307 - Language and the World
- PHL 345 - Philosophy of Science
- PHL 365 - Phil of Mind and Consciousness

University Core and Electives

Year Total: 21

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

<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>
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University Core and Electives

Year Total: 24

Sophomore Year

<table>
<thead>
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<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>
<tr>
<td>Choose one of the following in modern language:</td>
<td></td>
<td>3</td>
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<tr>
<td>PHL 204IH</td>
<td>Intro to the Hebrew Bible</td>
<td></td>
</tr>
<tr>
<td>PHL 205IH</td>
<td>Introduction to New Testament</td>
<td></td>
</tr>
<tr>
<td>PHL 206HI</td>
<td>Origins of God</td>
<td></td>
</tr>
<tr>
<td>PHL 207IH</td>
<td>Myth and Belief</td>
<td></td>
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University Core and Electives

Year Total: 13

Junior Year

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHL 236Q</td>
<td>History of Philosophy: Modern</td>
<td>3</td>
</tr>
<tr>
<td>PHL 365</td>
<td>Philosophy of Race</td>
<td></td>
</tr>
</tbody>
</table>

Choose one of the following in ethics:

- PHL 303 - Approaches to Epistemology
- PHL 304 - Metaphysics
- PHL 305 - Contemporary Philosophy
- PHL 307 - Language and the World
- PHL 345 - Philosophy of Science
- PHL 365 - Phil of Mind and Consciousness

University Core and Electives

Year Total: 30
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 work 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 (OpTcC), 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. 497)
- Physics-Astronomy (ASTR) Courses (p. 397)

Undergraduate Programs
- Professional Option (p. 242)
- Interdisciplinary Option (p. 241)
- Physics Teaching Option (p. 241)

Undergraduate Minor
- Physics Minor (Non-Teaching) (p. 241)
- Optics Minor (Non-Teaching) (http://catalog.montana.edu/undergraduate/engineering/electrical-computer-engineering/electrical-engineering/optics-minor-nteaching)
- Materials Minor (Non-Teaching) (http://catalog.montana.edu/undergraduate/engineering/mechanical-industrial-engineering/materials-minor)
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. 351)

Interdisciplinary Option

Freshman Year

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
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<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>
</tr>
<tr>
<td>or M 171Q - Calculus I</td>
<td></td>
</tr>
<tr>
<td>University Core and Electives</td>
<td>7</td>
</tr>
<tr>
<td>PHSX 242 - Honors Gen &amp; Mod Phys II*</td>
<td>4</td>
</tr>
<tr>
<td>M 182Q - Honors Calculus II (Recommended)</td>
<td>4</td>
</tr>
<tr>
<td>or M 172Q - Calculus II</td>
<td></td>
</tr>
<tr>
<td>Biol, Chem, or Earth Science Electives</td>
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</tr>
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<td>University Core and Electives</td>
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<tr>
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Sophomore Year

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
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<tbody>
<tr>
<td>PHSX 200 - Research Programs in Physics</td>
<td>1</td>
</tr>
<tr>
<td>PHSX 224 - Physics III</td>
<td>4</td>
</tr>
<tr>
<td>M 283Q - Honors Multivariable Calculus (Recommended)</td>
<td>4</td>
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<tr>
<td>or M 273Q - Multivariable Calculus</td>
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</tr>
<tr>
<td>PHSX 261 - Laboratory Electronics I</td>
<td>2</td>
</tr>
<tr>
<td>Declared Area</td>
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<tr>
<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

<table>
<thead>
<tr>
<th>Course</th>
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</thead>
<tbody>
<tr>
<td>PHSX 320 - Classical Mechanics</td>
<td>4</td>
</tr>
<tr>
<td>PHSX 343 - Modern Physics</td>
<td>3</td>
</tr>
<tr>
<td>PHSX 490R - Undergraduate Research</td>
<td>1</td>
</tr>
<tr>
<td>Declared Area</td>
<td>4</td>
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<tr>
<td>Math Electives</td>
<td>3</td>
</tr>
<tr>
<td>PHSX 423 - Electricity and Magnetism I</td>
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<td>Math Electives</td>
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<td>University Core and Electives</td>
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Senior Year

<table>
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<tr>
<th>Course</th>
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<tbody>
<tr>
<td>PFSX 461 - Quantum Mechanics I</td>
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<tr>
<td>PHSX 490R - Undergraduate Research</td>
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<td>Physics Electives</td>
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<tr>
<td>Declared Area</td>
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<td>University Core and Electives</td>
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<tr>
<td>PHSX 499R - Senior Capstone Seminar</td>
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<td>Year Total:</td>
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</table>

Total Program Credits: 120

* The 6 credits of mathematics electives are to be selected from M 221 and MATH and STAT courses numbered 300 and above. The 6 credits of physics electives are to be selected from PHSX 253 and PHSX and ASTR courses numbered 300 and above. The physics elective can include no more than 1 credit of PHSX 494, 3 credits of PHSX 492, 3 credits of PHSX 490R, or 4 credits of the combination of PHSX 494, PHSX 492, and PHSX 490R. PHSX 401, PHSX 402, PHSX 403, and PHSX 405 cannot be counted towards physics electives. Courses in declared area must be at least 100 level or higher and approved by the physics advisor. A minimum of 120 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 the academic advisor’s approval.

Physics Minor (Non-Teaching)

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHSX 240 - Honors Gen &amp; Mod Phys I (Recommended)</td>
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</tr>
<tr>
<td>or PHSX 220 - Physics I (w/ calculus)</td>
<td></td>
</tr>
<tr>
<td>PHSX 242 - Honors Gen &amp; Mod Phys II (Recommended)</td>
<td>4</td>
</tr>
<tr>
<td>or PHSX 222 - Physics II (w/ calculus)</td>
<td></td>
</tr>
<tr>
<td>PHSX 224 - Physics III</td>
<td>4</td>
</tr>
<tr>
<td>PHSX 301 - Intro Theoretical Physics</td>
<td>3</td>
</tr>
<tr>
<td>PHSX 343 - Modern Physics</td>
<td>3</td>
</tr>
<tr>
<td>or PHSX 320 - Classical Mechanics</td>
<td></td>
</tr>
<tr>
<td>Physics electives (PHSX 261 or PHSX 262 or PHSX or ASTR courses 300 level or above)</td>
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<tr>
<td>Total Credits:</td>
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</table>

Students who complete PHSX 343 require 10 credits of physics elective. Students who complete PHSX 320 require 9 credits of physics elective. The physics electives can include no more than 1 credit of PHSX 494, 3 credits of PHSX 492, 3 credits of PHSX 490R, or 4 credits of the combination of PHSX 494, PHSX 492, and PHSX 490R. PHSX 401, PHSX 402, PHSX 403, and PHSX 405 cannot be counted towards physics electives.

Physics Teaching Option

Freshman Year

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>FCS 101IS - Indiv and Fam Dev: Lifespan</td>
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</tr>
<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>
</tr>
<tr>
<td>or M 171Q - Calculus I</td>
<td></td>
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<tr>
<td>University Core and Electives</td>
<td>5</td>
</tr>
<tr>
<td>EDU 202 - Early Field Experience</td>
<td>1</td>
</tr>
<tr>
<td>PHSX 242 - Honors Gen &amp; Mod Phys II*</td>
<td>4</td>
</tr>
<tr>
<td>M 182Q - Honors Calculus II (Recommended)</td>
<td>4</td>
</tr>
<tr>
<td>or M 172Q - Calculus II</td>
<td></td>
</tr>
<tr>
<td>Biol, Chem, or Earth Science Electives</td>
<td>3</td>
</tr>
<tr>
<td>University Core and Electives</td>
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</tr>
<tr>
<td>Year Total:</td>
<td>16</td>
</tr>
</tbody>
</table>

* Students who complete PHSX 343 require 10 credits of physics elective. Students who complete PHSX 320 require 9 credits of physics elective. The physics electives can include no more than 1 credit of PHSX 494, 3 credits of PHSX 492, 3 credits of PHSX 490R, or 4 credits of the combination of PHSX 494, PHSX 492, and PHSX 490R. PHSX 401, PHSX 402, PHSX 403, and PHSX 405 cannot be counted towards physics electives.
## Professional Option

### Freshman Year

<table>
<thead>
<tr>
<th>Course</th>
<th>Fall</th>
<th>Spring</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHSX 240 - Honors Gen &amp; Mod Phys I</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>M 181Q - Honors Calculus I (Recommended) or M 171Q - Calculus I</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>University Core and Electives</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>PHSX 242 - Honors Gen &amp; Mod Phys II</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>M 182Q - Honors Calculus II (Recommended) or M 172Q - Calculus II</td>
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<td></td>
</tr>
<tr>
<td>Biol, Chem, or Earth Science Electives</td>
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<td></td>
</tr>
<tr>
<td>University Core and Electives</td>
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<td></td>
</tr>
<tr>
<td>Year Total:</td>
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### Sophomore Year

<table>
<thead>
<tr>
<th>Course</th>
<th>Fall</th>
<th>Spring</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHSX 200 - Research Programs in Physics</td>
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<td>1</td>
</tr>
<tr>
<td>PHSX 224 - Physics III</td>
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<td>4</td>
</tr>
<tr>
<td>M 283Q - Honors Multivariable Calculus (Recommended) or M 273Q - Multivariable Calculus</td>
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<td>4</td>
</tr>
<tr>
<td>PHSX 261 - Laboratory Electronics I</td>
<td></td>
<td>2</td>
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<tr>
<td>University Core and Electives</td>
<td></td>
<td>4</td>
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<tr>
<td>PHSX 262 - Laboratory Electronics II</td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>PHSX 301 - Intro Theoretical Physics</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>M 284 - Honors Introduction to Differential Equations (Recommended) or M 274 - Introduction to Differential Equation</td>
<td></td>
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<tr>
<td>University Core and Electives</td>
<td></td>
<td>6</td>
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<tr>
<td>Year Total:</td>
<td>15</td>
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</table>

### Junior Year

<table>
<thead>
<tr>
<th>Course</th>
<th>Fall</th>
<th>Spring</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHSX 320 - Classical Mechanics</td>
<td></td>
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</tr>
<tr>
<td>PHSX 343 - Modern Physics</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>PHSX 242 - Honors Gen &amp; Mod Phys II</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>University Core and Electives</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>PHSX 423 - Electricity and Magnetism I</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>M 329 - Modern Geometry</td>
<td></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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### Senior Year

<table>
<thead>
<tr>
<th>Course</th>
<th>Fall</th>
<th>Spring</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHSX 425 - Electricity and Magnetism II</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>PHSX 461 - Quantum Mechanics I</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>PHSX 444 - Advanced Physics Lab</td>
<td></td>
<td>4</td>
</tr>
<tr>
<td>PHSX 490R - Undergraduate Research</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Math Electives</td>
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<tr>
<td>University Core and Electives</td>
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</tr>
<tr>
<td>PHSX 446 - Thermodynamics &amp; Stat Mech</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>Math Electives</td>
<td></td>
<td>3</td>
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<tr>
<td>Physics Electives</td>
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<td>3</td>
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<tr>
<td>University Core and Electives</td>
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<td>3</td>
</tr>
<tr>
<td>Year Total:</td>
<td>15</td>
<td>15</td>
</tr>
</tbody>
</table>

### Total Program Credits: 128

*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".*
University Core and Electives  7
Year Total:  15  15
Total Program Credits:  120

- See note below on substitutions.

The 9 credits of mathematics electives are to be selected from M 221 and M and STAT courses numbered 300 and above. The 7 credits of physics electives are to be selected from PHSX 253 and PHSX and ASTR courses numbered 300 and above. The physics elective can include no more than 1 credit of PHSX 494, 3 credits of PHSX 492, 3 credits of PHSX 490R, or 4 credits of the combination of PHSX 494, PHSX 492, and PHSX 490R. PHSX 401, PHSX 402, PHSX 403, and PHSX 405 can not be counted towards physics electives. A minimum of 120 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.

Politcal Science

Bachelors of Arts in Political Science
The study of Political Science gives the student 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. 243)
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. 243)
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. 243)
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. 244)
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
- 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 202 Media and Politics
- PSCI 206 Legislative Process
- PSCI 341 Political Parties and Elections
- 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 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 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 Intro to Conducting Political Inquiry
PSCI 210IS Intro to American Government
PSCI 214IS Principles of Political Science
PSCI 230D Intro to International Relations
PSCI 240 Intro to Public Administration
ECNS 101IS Economic Way of Thinking

And take at least 3 regularly scheduled upper division Political Science classes.

Freshman Year Credits
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
CLS 101US - Knowledge and Community 3
WRIT 101W - College Writing I 3
M 145Q - Math for the Liberal Arts 3
University Core and Electives 9
Year Total: 30

Sophomore Year Credits
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 341 - Political Parties and Elections 3
PSCI 346 - American Presidency 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 27
Year Total: 60

Senior Year Credits
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.

Undergraduate Curriculum in Political Science
- Policy and Analysis Option (p. 245)
- International Relations Option (p. 244)
- Political Institutions Option (p. 245)
- Political Theory Option (p. 246)

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. 353) page.

International Relations Option

Freshman Year Credits
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
CLS 101US - Knowledge and Community 3
WRIT 101W - College Writing I 3
M 145Q - Math for the Liberal Arts 3
University Core and Electives 9
Year Total: 30

Sophomore Year Credits
And Junior Year
Two Semesters Univ. Level Foreign Language/CLEP/Existing Bilingualism 6
ECNS 101IS - Economic Way of Thinking 3
Choose three of the following:
PSCI 331 - International Relations Theory 3
PSCI 406 - The Political Economy of Energy 3
PSCI 418 - The Politics of War & Peace 3
PSCI 423 - Politics of Development 3
PSCI 434 - International Law 3
PSCI 436 - Politics of Food & Hunger 3
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.

**Policy and Analysis Option**

<table>
<thead>
<tr>
<th>Freshman Year</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>PSCI 200 - Introduction to Conducting Political Inquiry</td>
<td>3</td>
</tr>
<tr>
<td>PSCI 210IS - Introduction to American Government</td>
<td>3</td>
</tr>
<tr>
<td>PSCI 214IS - Principles of Political Science</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>
</tr>
<tr>
<td>WRIT 101W - College Writing I</td>
<td>3</td>
</tr>
<tr>
<td>M 145Q - Math for the Liberal Arts</td>
<td>3</td>
</tr>
<tr>
<td>University Core and Electives</td>
<td>9</td>
</tr>
<tr>
<td>Year Total:</td>
<td>30</td>
</tr>
</tbody>
</table>

**Sophomore Year | Credits**

<table>
<thead>
<tr>
<th>And Junior Year</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>ECNS 101IS - Economic Way of Thinking</td>
<td>3</td>
</tr>
<tr>
<td>PSCI 310 - Applied Political Analysis</td>
<td>3</td>
</tr>
<tr>
<td>Choose three of the following:</td>
<td></td>
</tr>
<tr>
<td>PSCI 362 - Natural Resource Policy</td>
<td>3</td>
</tr>
<tr>
<td>PSCI 406 - The Political Economy of Energy</td>
<td>3</td>
</tr>
<tr>
<td>PSCI 407 - Public Policy Analysis</td>
<td>3</td>
</tr>
<tr>
<td>PSCI 423 - Politics of Development</td>
<td>3</td>
</tr>
<tr>
<td>PSCI 436 - Politics of Food &amp; Hunger</td>
<td>3</td>
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<tr>
<td>One upper division International Relations course</td>
<td>3</td>
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<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>
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<tr>
<td>Year Total:</td>
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</table>

**Senior Year | Credits**

| 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 Institutions Option**

<table>
<thead>
<tr>
<th>Freshman Year</th>
<th>Credits</th>
</tr>
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<tbody>
<tr>
<td>PSCI 200 - Introduction to Conducting Political Inquiry</td>
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<tr>
<td>PSCI 210IS - Introduction to American Government</td>
<td>3</td>
</tr>
<tr>
<td>PSCI 214IS - Principles of Political Science</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>
</tr>
<tr>
<td>WRIT 101W - College Writing I</td>
<td>3</td>
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<tr>
<td>M 145Q - Math for the Liberal Arts</td>
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<tr>
<td>University Core and Electives</td>
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<tr>
<td>Year Total:</td>
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</table>

**Sophomore Year | Credits**

<table>
<thead>
<tr>
<th>And Junior Year</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>ECNS 101IS - Economic Way of Thinking</td>
<td>3</td>
</tr>
<tr>
<td>PSCI 310 - Applied Political Analysis</td>
<td>3</td>
</tr>
<tr>
<td>Choose three of the following:</td>
<td></td>
</tr>
<tr>
<td>PSCI 362 - Natural Resource Policy</td>
<td>3</td>
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<tr>
<td>PSCI 406 - The Political Economy of Energy</td>
<td>3</td>
</tr>
<tr>
<td>PSCI 407 - Public Policy Analysis</td>
<td>3</td>
</tr>
<tr>
<td>PSCI 423 - Politics of Development</td>
<td>3</td>
</tr>
<tr>
<td>PSCI 436 - Politics of Food &amp; Hunger</td>
<td>3</td>
</tr>
<tr>
<td>One upper division International Relations course</td>
<td>3</td>
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<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>30</td>
</tr>
<tr>
<td>Year Total:</td>
<td>60</td>
</tr>
</tbody>
</table>

**Senior Year | Credits**

| 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**  
<table>
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<tr>
<th>Course</th>
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</thead>
<tbody>
<tr>
<td>PSCI 200 - Introduction to Conducting Political Inquiry</td>
<td>3</td>
</tr>
<tr>
<td>PSCI 210IS - Introduction to American Government</td>
<td>3</td>
</tr>
<tr>
<td>PSCI 214IS - Principles of Political Science</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>
</tr>
<tr>
<td>WRIT 101W - College Writing I</td>
<td>3</td>
</tr>
<tr>
<td>M 145Q - Math for the Liberal Arts</td>
<td>3</td>
</tr>
<tr>
<td>University Core and Electives/Internship - PSCI 498</td>
<td>9</td>
</tr>
<tr>
<td><strong>Year Total:</strong></td>
<td>30</td>
</tr>
</tbody>
</table>

**Sophomore Year**  
<table>
<thead>
<tr>
<th>And Junior Year</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECNS 101IS - Economic Way of Thinking</td>
<td>3</td>
</tr>
<tr>
<td>PHL 236Q - Logic</td>
<td>3</td>
</tr>
<tr>
<td>Choose three of the following:</td>
<td></td>
</tr>
<tr>
<td>PSCI 323 - Modern Political Thought</td>
<td>3</td>
</tr>
<tr>
<td>PSCI 354 - Contemporary Issues in Political Theory</td>
<td>3</td>
</tr>
<tr>
<td>PSCI 356 - Classical Political Thought</td>
<td>3</td>
</tr>
<tr>
<td>PSCI 454 - Cinema and Political Theory</td>
<td>3</td>
</tr>
<tr>
<td>PSCI 455 - Politics &amp; Virtue</td>
<td>3</td>
</tr>
<tr>
<td>One upper division Policy &amp; Analysis course</td>
<td>3</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>University Core and Electives/Internship - PSCI 498</td>
<td>30</td>
</tr>
<tr>
<td><strong>Year Total:</strong></td>
<td>60</td>
</tr>
</tbody>
</table>

**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.

### 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/wwwus/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/hpa). 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>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>STAT 216Q - Introduction to Statistics (3 cr)</td>
<td>3</td>
</tr>
<tr>
<td>BIOH 185 - Integrated Physiology I (4 cr)</td>
<td>4</td>
</tr>
<tr>
<td><strong>Choose one of the following:</strong></td>
<td></td>
</tr>
<tr>
<td>CHMY 141 - College Chemistry I (4 cr)</td>
<td></td>
</tr>
<tr>
<td>CHMY 151 - Honors College Chemistry I (4 cr)</td>
<td></td>
</tr>
<tr>
<td><strong>US Core: 3 - 4 cr (Students may select any University Seminar (US) core course)</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Total Credits</strong></td>
<td>14-15</td>
</tr>
</tbody>
</table>

#### Spring Credits

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>M 161Q - Survey of Calculus (4 cr)</td>
<td>4</td>
</tr>
<tr>
<td>BI0B 260 - Cellular and Molecular Biology (4 cr)</td>
<td>4</td>
</tr>
<tr>
<td>MEDS 140 - Intro Medicine Health (1 cr)</td>
<td>1</td>
</tr>
<tr>
<td><strong>Take one of the following:</strong></td>
<td></td>
</tr>
<tr>
<td>CHMY 143 - College Chemistry II (4 cr)</td>
<td></td>
</tr>
<tr>
<td>CHMY 153 - Honors College Chemistry II (4 cr)</td>
<td></td>
</tr>
<tr>
<td><strong>Take one of the following:</strong></td>
<td></td>
</tr>
<tr>
<td>WRIT 101W - College Writing I (3 cr) if needed, or take:</td>
<td></td>
</tr>
<tr>
<td>WRIT 201 - College Writing II (3 cr)</td>
<td></td>
</tr>
<tr>
<td>LIT 110H - Introduction to Literature (3 cr)</td>
<td></td>
</tr>
<tr>
<td><strong>Total Credits</strong></td>
<td>16-17</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. 246) 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. 246)

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/postbacc)). To learn more about these programs, please click on the aforementioned webpage links or catalog links below:

- Post Baccalaureate Pre-Medical Certificate (http://catalog.montana.edu/graduate/interdisciplinary-other-programs/post-baccalaureate-pre-med-certif)
- Master of Science in Health Sciences (p. 370)

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. 247)
- Psychology Minor (Non-Teaching) (p. 248)

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

- M.S. in Psychology (p. 354) (with an emphasis on psychological science)

Psychological Science and Applied Psychology Options

<table>
<thead>
<tr>
<th>Freshman Year</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 145Q - Math for the Liberal Arts (or higher)</td>
<td></td>
</tr>
<tr>
<td>STAT 216Q - Introduction to Statistics</td>
<td></td>
</tr>
<tr>
<td>Psychology Electives</td>
<td>6</td>
</tr>
<tr>
<td>Year Total:</td>
<td>10</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Sophomore Year</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>

<table>
<thead>
<tr>
<th>Junior Year</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>PSYX 490R - Undergraduate Research</td>
<td>3</td>
</tr>
<tr>
<td>or PSYX 495 - Field Pract in Applied Psy</td>
<td>6</td>
</tr>
<tr>
<td>Psychology Electives</td>
<td>6</td>
</tr>
<tr>
<td>Year Total:</td>
<td>9</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Senior Year</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 360 Social Psychology
- PSYX 385 Psychology of Personality
Psychology Minor (Non-Teaching)

PSYX 100IS Intro to Psychology 4
PSYX 223 Research Design and Analysis I 4
PSYX 225 Research Design and Analysis II 3
Choose at least four of the following: 12
PSYX 230 Developmental Psychology

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.

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. 249)
- Religious Studies Minor (p. 249)

The Department of History, Philosophy and Religious Studies currently offers no Graduate Studies in Religious Studies.
# Religious Studies Major Curriculum

## Degree Requirements
- **Core Curriculum**: 27-30
- **Religious Studies courses**: 38-39
- **Foreign Language requirement**: 8
- **Methodologies requirement**: 6
- **Capstone course RLST 499R**: 3
- **Electives**: 38

**Total Credits**: 120-124

## Four-Year Plan

### Freshman Year
<table>
<thead>
<tr>
<th>Credits</th>
<th>Course(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>CLS 101US - Knowledge and Community</td>
</tr>
<tr>
<td>3</td>
<td>WRIT 101W - College Writing I</td>
</tr>
<tr>
<td>3-4</td>
<td>Choose one of the following:</td>
</tr>
<tr>
<td></td>
<td>RLST 100D - Intro to the Study of Religion</td>
</tr>
<tr>
<td></td>
<td>RLST 110D - Religion, Conflict &amp; Politics</td>
</tr>
<tr>
<td></td>
<td>RLST 220H - Interpretations of Amrcn Relig</td>
</tr>
<tr>
<td>8</td>
<td>One Year Foreign Language</td>
</tr>
<tr>
<td>13</td>
<td>Other University Core and Electives</td>
</tr>
</tbody>
</table>

**Year Total**: 30-31

### Sophomore Year
<table>
<thead>
<tr>
<th>Credits</th>
<th>Course(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>RLST 202D - Hindu Traditions</td>
</tr>
<tr>
<td>3</td>
<td>or RLST 203D - Buddhist Traditions</td>
</tr>
<tr>
<td></td>
<td>Choose one of the following:</td>
</tr>
<tr>
<td></td>
<td>RLST 201 - Islam</td>
</tr>
<tr>
<td></td>
<td>RLST 204H - Intro to the Hebrew Bible</td>
</tr>
<tr>
<td></td>
<td>RLST 205H - Introduction to New Testament</td>
</tr>
<tr>
<td>6</td>
<td>Choose two of the following that have not been used to fulfill a requirement:</td>
</tr>
<tr>
<td></td>
<td>RLST 201 - Islam</td>
</tr>
<tr>
<td></td>
<td>RLST 202D - Hindu Traditions</td>
</tr>
<tr>
<td></td>
<td>RLST 203D - Buddhist Traditions</td>
</tr>
<tr>
<td></td>
<td>RLST 204H - Intro to the Hebrew Bible</td>
</tr>
<tr>
<td></td>
<td>RLST 205H - Introduction to New Testament</td>
</tr>
<tr>
<td></td>
<td>RLST 206H - Origins of God</td>
</tr>
<tr>
<td></td>
<td>RLST 207H - Myth and Belief</td>
</tr>
<tr>
<td></td>
<td>RLST 217H - Religion, Sci &amp; Environment</td>
</tr>
<tr>
<td></td>
<td>RLST 220H - Interpretations of Amrcn Relig</td>
</tr>
<tr>
<td></td>
<td>RLST 223H - Sacrifice, Rite &amp; Ritual</td>
</tr>
<tr>
<td></td>
<td>RLST 291 - Special Topics</td>
</tr>
<tr>
<td>18</td>
<td>University Core and Electives</td>
</tr>
</tbody>
</table>

**Year Total**: 30

### Junior Year
<table>
<thead>
<tr>
<th>Credits</th>
<th>Course(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>9</td>
<td>Choose three of the following:</td>
</tr>
<tr>
<td></td>
<td>RLST 321 - Religion and Gender</td>
</tr>
<tr>
<td></td>
<td>RLST 325 - Religion and Literature</td>
</tr>
<tr>
<td></td>
<td>RLST 326 - Topics in Religion</td>
</tr>
<tr>
<td></td>
<td>RLST 330 - Religion of Ancient Egypt</td>
</tr>
<tr>
<td></td>
<td>RLST 332 - Archaeology &amp; Religion</td>
</tr>
<tr>
<td></td>
<td>RLST 370 - Philosophy of Religion</td>
</tr>
<tr>
<td>12</td>
<td>Electives</td>
</tr>
</tbody>
</table>

**Year Total**: 30-31

**Total Program Credits**: 120-122

## 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>Credits</th>
<th>Course(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>RLST 100D - Intro to the Study of Religion</td>
</tr>
<tr>
<td>3</td>
<td>or RLST 110D - Religion, Conflict &amp; Politics</td>
</tr>
<tr>
<td>3</td>
<td>RLST 202D - Hindu Traditions</td>
</tr>
<tr>
<td>3</td>
<td>or RLST 203D - Buddhist Traditions</td>
</tr>
<tr>
<td>6</td>
<td>Choose two of the following:</td>
</tr>
<tr>
<td></td>
<td>RLST 201 - Islam</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.

<table>
<thead>
<tr>
<th>Credits</th>
<th>Course(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>15</td>
<td>University Core and Electives</td>
</tr>
<tr>
<td>30</td>
<td>Year Total:</td>
</tr>
</tbody>
</table>

### Senior Year
<table>
<thead>
<tr>
<th>Credits</th>
<th>Course(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>RLST 499RH - Senior Capstone</td>
</tr>
<tr>
<td>6-7</td>
<td>Choose two of the following:</td>
</tr>
<tr>
<td></td>
<td>RLST 402 - Natural/Unnatural/Supernatural</td>
</tr>
<tr>
<td></td>
<td>RLST 405 - Text and Image</td>
</tr>
<tr>
<td></td>
<td>RLST 407 - Violence &amp; Religion</td>
</tr>
<tr>
<td></td>
<td>RLST 410 - What is Religion?</td>
</tr>
<tr>
<td></td>
<td>RLST 490R - Undergraduate Research</td>
</tr>
<tr>
<td></td>
<td>RLST 491 - Special Topics</td>
</tr>
<tr>
<td></td>
<td>RLST 492 - Independent Study</td>
</tr>
</tbody>
</table>

**Year Total**: 30-31

**Total Program Credits**: 120-122
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 311, and SOCI 455. 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. 251)

General Sociology and Criminology Options

<table>
<thead>
<tr>
<th>Freshman Year</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<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>
<td>30</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Sophomore Year</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<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>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Junior Year</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Choose one of the following:</td>
<td></td>
</tr>
<tr>
<td>SOCI 455 - Classical Sociological Theory (General Sociology Option)</td>
<td>3</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>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Senior Year</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>SOCI 499 - Senior Thesis Capstone</td>
<td>3</td>
</tr>
<tr>
<td>Sociology Electives</td>
<td>9</td>
</tr>
</tbody>
</table>
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 201I  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 325I  Others in Japanese Lit/Culture
  LIT 326  British Literature of the 19th Century to the Present
  LIT 335  Women and Literature
  LIT 371  Studies in Literary Topics
  NASX 405  Gnrd Iss In Native Amer Studs
  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

College of Nursing

Helen I. Melland, Dean
A. Gretchen McNeely, Associate Dean for Undergraduate Programs
Donna A. Williams, Associate Dean for Research and Graduate Education
Vision
MSU College of Nursing will be internationally recognized for innovation, discovery, excellence and leadership in education, research and practice.

Mission
Our mission is to enhance the health of the people of Montana, our nation, and the global community by providing leadership for professional nursing through excellence in education, research, practice and service.

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 metaparadigm: 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. It “intentionally fosters use of multiple fields of study, use of wide-ranging knowledge of science, cultures, and society; high level intellectual and practical skills; an active commitment to personal and social responsibility; demonstrated ability to apply learning to complex problems and challenges; and personal engagement as a responsible citizen in a global society” (Association of American Colleges and Universities, College Learning for the New Global Century, 2007, p. 4). 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 (by June 1 annually). 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 student.

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 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. All required courses must be completed with a grade of C or better (C- grades are not acceptable).
2. Required courses may not be repeated more than once, regardless of when or where taken.
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 GPA must be at least 2.75 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, 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).

At least 3 of the 5 required natural science courses must be completed with a grade of C or better to apply to the nursing program. 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 121N 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 121N 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 101S Introduction to Sociology 3
- STAT 216Q Introduction to Statistics 3
- WRIT 101W College Writing I 3
Upper division placement is dependent upon the grade point average in required lower division courses, although students are also asked to indicate the campus of their choice.

A wait list of students with 2.75 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 2.75 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).

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 will have completed all 10 required prerequisite courses with a grade of C or better by the end of the fall semester prior to the mid-May start date. Submission of an application packet is required which includes: official transcripts from every college/university attended; and a background check by the June 1st deadline.

Application Deadline

Applications are due June 1st for students who desire to begin the accelerated option the following summer. No applications will be processed if received after the deadline or if submitted without the required components in the application packet, including the required background check.

Transfer Students

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 likely be required as well.

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 2001 ANA Code of Ethics for Nurses, Provision 3.4 states, "Nursing is responsible and accountable for assuring that only those individuals demonstrating the knowledge, skill, practice experiences, commitments, and integrity essential to professional practice are allowed to enter into and continue to practice within the profession. Nurse educators have a responsibility to ensure that basic competencies are achieved and to promote a commitment to professional practice prior to entry of an individual into practice.”

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 aiding 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).

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

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.

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. 255)

Graduate Programs
- Master of Nursing (MN) (p. 356)
- Doctor of Nursing Practice (DNP) Degree (p. 357)
- Nursing Education certificate (non-degree option) (p. 365)

Nursing

Required Lower Division 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
- SOCI 101IS Introduction to Sociology
- FCS 101IS Indiv and Fam Dev: Lifespan

Natural Science Inquiry (IN)
- CHMY 121IN Introduction to General Chemistry

Research and Creative Experience (R)
- NRSG 387R Research in Health Care

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
- NRSG 220 Foundats Ethcl Nrsng Recitatn
- NRSG 225 Fndtns Plng Prvdng Clin Nrs Cr
- NRSG 238 Hlth Assmnt Across Lifespan
- NRSG 258 Principles of Pathophysiology

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
- NRSG 341 - Psychosocial Nursing Concepts
- NRSG 346 - Nurs Care of Childbearing Family
- NRSG 348 - Nursing Care of Child & Family
- NRSG 352 - Acute and Chronic Illness
- NRSG 377 - Intro to Community Based Nrsng
- NRSG 387R - Research in Health Care
Year Total: 26

Senior Year
- NRSG 418 - Hlth Policy/Hlth Care Econ Cln
- NRSG 437 - Psychiatric Nursing
- NRSG 444 - Care Management
- NRSG 454 - Urgent and Palliative Care
Credits
NRSG 477 - Pop Based Nursing Care in Comm 6
NRSG 487 - Nursing Ldrshp/Mgmnt Dvlpmnt 6
Year Total: 29

Total Program Credits: 55

- 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.

Elective credits as required to meet the minimum of 120 required credits for graduation.

Gallatin College
Bob Hietala, Dean
Sarah Maki, Associate Dean

Programs Available
- AAS in Aviation (p. 257)
- AAS in Design Drafting Technology (p. 259)
- AAS in Interior Design (p. 258)
- Associate of Arts (p. 256)
- Associate of Science (p. 257)
- CAS in Bookkeeping (p. 258)
- CAS in CNC Machine Technology (http://catalog.montana.edu/undergraduate/gallatin-college/workforce-programs/CNC-machine-technology)
- CAS in Health Information Coding (p. 259)
- CAS in Medical Assistant (p. 261)
- CAS in Welding Technology (p. 261)
- Professional Certificate in Business Management (p. 258)

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. 256)
- Associate of Science Degree (p. 257)

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)
Gallatin College’s relevant coursework, state-of-the-art classrooms, and their career opportunities, or who are interested in a career change. With the needs of students who want to improve their skills and advance their educational goals, our graduates are highly prepared for careers in a variety of industries.

**Undergraduate Programs**
- Aviation (p. 257)
- Bookkeeping (p. 258)
- Business Management (p. 258)
- CNC Machine Technology (http://catalog.montana.edu/undergraduate/gallatin-college/workforce-programs/CNC-machine-technology)
- Design Drafting Technology (p. 259)
- Health Information Coding (p. 259)
- Interior Design (p. 260)
- Medical Assistant (p. 261)
- Welding Technology (p. 261)

**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 technologies.

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 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.

### Bookkeeping: Certificate of Applied Science Degree (CAS)

#### 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.

<table>
<thead>
<tr>
<th>Year 1</th>
<th>Fall</th>
<th>Credits</th>
<th>Spring</th>
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<tbody>
<tr>
<td>AVFT 121 - Private Pilot - Fundamentals</td>
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<tr>
<td>AVFT 122 - Private Pilot - Flight</td>
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<tr>
<td>AVFT 130 - Meteorology for Aviation</td>
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<td>CAPP 120 - Introduction to Computers</td>
<td>3</td>
<td></td>
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<tr>
<td>AVFT 141 - Advanced Navigation Systems*</td>
<td>3</td>
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<tr>
<td>AVFT 143 - Instrument Ground</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>
<td>3</td>
<td></td>
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<td>AVFT 171 - Aircraft Systems for Pilots</td>
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<tr>
<td>WRIT 101W - College Writing I</td>
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<td><strong>Year Total:</strong></td>
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<tr>
<td>AVFT 245 - Commercial Ground*</td>
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<tr>
<td>AVFT 250 - Commercial Flight 1 Single Eng</td>
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<tr>
<td>AVFT 252 - Commercial Flight 1 Multi Eng</td>
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<tr>
<td>AVFT 260 - Aviation Safety</td>
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<td>COMX 115 - Introduction to Interpersonal Communication</td>
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<td>Choose one of the following:</td>
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<tr>
<td>M 145Q - Math for the Liberal Arts**</td>
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<td>M 121Q - College Algebra</td>
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<tr>
<td>(or any other Quantitative core math class)</td>
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<td>AVFT 251 - Commercial Flight 2 Single Eng*</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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<td>AVFT 263 - Aviation Regulations and Professional Conduct</td>
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<td>Natural Science or Contemporary Issues in Science with Lab</td>
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**Total Program Credits:** 60

* Indicates prerequisites needed.
** Placement in course(s) is determined by placement assessment.

A grade of "C-" or above is required for all courses for graduation.

Many students need preliminary math and writing courses before enrolling in the program requirements. These courses may increase the total number of program credits. Students should review their math and English placement before planning out their full program schedules.

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<thead>
<tr>
<th>Credits</th>
<th>Fall</th>
<th>Spring</th>
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<tr>
<td>ACTG 101 - Accounting Procedures I</td>
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<tr>
<td>ACTG 180 - Payroll Accounting</td>
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<tr>
<td>CAPP 120 - Introduction to Computers</td>
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<td></td>
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<tr>
<td>CAPP 156 - Microsoft Excel</td>
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<tr>
<td>COMX 102 - Interpersonal Skills in the Workplace</td>
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<tr>
<td>WRIT 104 - Workplace Communications</td>
<td>2</td>
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<tr>
<td>ACTG 102 - Accounting Procedures II**</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>ACTG 205 - Computerized Accounting*</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>ACTG 122 - Accounting &amp; Business Decision*</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>ACTG 125 - QuickBooks*</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>TASK 127 - Business Office Procedures</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td><strong>Total Program Credits:</strong></td>
<td>33</td>
<td></td>
</tr>
</tbody>
</table>

* Indicates prerequisites needed
** Co-requisite courses

A grade of C- or better is required for all courses for graduation.

This program begins in the FALL SEMESTER ONLY and enrollment in this program is LIMITED. Please contact Gallatin College for more information on start dates and enrollment availability.

### Business Management

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;

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A grade of "C-" or above is required for all courses for graduation.

This program begins in the FALL SEMESTER ONLY and enrollment in this program is LIMITED. Please contact Gallatin College for more information on start dates and enrollment availability.
Montana State University

- 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.

BGEN 105 • Introduction to Business 3
ACTG 101 • Accounting Procedures I 4
BMGT 210 • Small Business Entrepreneurship 3
BMGT 215 • Human Resource Management 3
BMGT 240IS • Business Research Methods 3

Please select three of the following courses: 9
ACTG 122 • Accounting & Business Decision
ACTG 125 • QuickBooks
TASK 127 • Business Office Procedures
BMKT 112 • Applied Sales
BMKT 222 • Customer Service and Marketing

**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.
- 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.

**CAPP 120 Introduction to Computers (may be taken concurrently first semester, previously, or waived based on placement test--check with Program Director)**

<table>
<thead>
<tr>
<th>Year 1</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fall</td>
<td></td>
</tr>
<tr>
<td>COMX 115 - Introduction to Interpersonal Communication</td>
<td>3</td>
</tr>
<tr>
<td>CSTN 148 - Blueprint Codes and Est.</td>
<td>2</td>
</tr>
<tr>
<td>CSTN 173 - Arch Construct and Material</td>
<td>3</td>
</tr>
<tr>
<td>DDSN 113 - Technical Drafting</td>
<td>3</td>
</tr>
<tr>
<td>DDSN 118 - CAD I</td>
<td>4</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Credits</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Fall</td>
<td>Spring</td>
</tr>
<tr>
<td>DDSN 112 - Professional Practices</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>DDSN 124 - Descriptive Geometry</td>
<td>4</td>
<td></td>
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<tr>
<td>DDSN 186 - CAD II</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>MFTG 205 - Manufacturing Process</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>WRIT 101W - College Writing I</td>
<td>3</td>
<td></td>
</tr>
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Year Total: 15

<table>
<thead>
<tr>
<th>Year 2</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fall</td>
<td></td>
</tr>
<tr>
<td>DDSN 166 - Revit I</td>
<td>3</td>
</tr>
<tr>
<td>DDSN 265 - Architectural Drafting</td>
<td>3</td>
</tr>
<tr>
<td>DDSN 275 - Computer Rendering</td>
<td>3</td>
</tr>
<tr>
<td>Math Elective</td>
<td>3</td>
</tr>
<tr>
<td>DDSN 255 - Machine Drafting</td>
<td>3</td>
</tr>
<tr>
<td>DDSN 298 - Internship</td>
<td>4</td>
</tr>
<tr>
<td>DDSN 299 - Capstone</td>
<td>3</td>
</tr>
<tr>
<td>ITS 280 - Computer Repair Maintenance</td>
<td>4</td>
</tr>
<tr>
<td>Take at least 2 of the following:</td>
<td>6</td>
</tr>
<tr>
<td>DDSN 244 - GIS and Mapping</td>
<td>3</td>
</tr>
<tr>
<td>DDSN 245 - Civil Drafting</td>
<td>1</td>
</tr>
<tr>
<td>DDSN 255 - Machine Drafting</td>
<td>3</td>
</tr>
<tr>
<td>DDSN 266 - Revit II</td>
<td>3</td>
</tr>
<tr>
<td>DDSN 276 - Presentation &amp; Animation</td>
<td>1</td>
</tr>
</tbody>
</table>

Year Total: 15

Total Program Credits: 63-72

1. Indicates prerequisites required
2. Placement in course(s) is determined by placement assessment
3. Requires Program Director approval for enrollment

Many students need preliminary math and writing courses before enrolling in the program requirements. These courses may increase the total number of program credits. Students should review their math and English placement before planning out their full program schedules.

A grade of “C-” or above is required for graduation in each course.

Students wishing to apply comparative course work for Degree and/or Prerequisite credit must have received a B or better in that course work and receive Program Director approval.

Math requirement options—Can be fulfilled by taking the following courses:

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>M 108 Business Mathematics</td>
<td>3</td>
</tr>
<tr>
<td>M 121Q College Algebra</td>
<td>3</td>
</tr>
<tr>
<td>M 145Q Math for the Liberal Arts</td>
<td>3</td>
</tr>
<tr>
<td>M 151Q Precalculus</td>
<td>4</td>
</tr>
</tbody>
</table>

Comparative AP Credit may also be used if approved by MSU and the Program Director.

**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.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>AHMS 144</td>
<td>Medical Terminology</td>
<td>3</td>
</tr>
<tr>
<td>AH 140</td>
<td>Pharmacology</td>
<td>2</td>
</tr>
<tr>
<td>BIOH 112</td>
<td>Human Form &amp; Function I</td>
<td>3</td>
</tr>
<tr>
<td>AHMS 160</td>
<td>Beginning Procedural Coding</td>
<td>4</td>
</tr>
<tr>
<td>AHMS 162</td>
<td>Beginning Diagnostic Coding</td>
<td>4</td>
</tr>
<tr>
<td>BIOH 113</td>
<td>Human Form and Function II</td>
<td>3</td>
</tr>
<tr>
<td>AHMS 100</td>
<td>Math Applications Health</td>
<td>3</td>
</tr>
<tr>
<td>AHMS 156</td>
<td>Medical Billing Fundamentals</td>
<td>3</td>
</tr>
<tr>
<td>AHMS 158</td>
<td>Legal and Regulatory Aspects of Healthcare</td>
<td>2</td>
</tr>
<tr>
<td>AHMS 250</td>
<td>Advanced Medical Coding</td>
<td>4</td>
</tr>
<tr>
<td>CAPP 120</td>
<td>Introduction to Computers</td>
<td>3</td>
</tr>
<tr>
<td>COMX 102</td>
<td>Interpersonal Skills in the Workplace</td>
<td>1</td>
</tr>
<tr>
<td>WRIT 104</td>
<td>Workplace</td>
<td>2</td>
</tr>
</tbody>
</table>

**Total Program Credits:** 35

* 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**

Interior designers will draft, sketch, and use computer-aided-drafting (CAD) to design non-load bearing interior construction. Function and aesthetics are important in completing the furnishings, lighting, and finishes with a client’s tastes in mind. Projects may include designing a room in a private residence, planning for renovation and expansion, and coordinating the interior arrangement of a large building complex.

Areas of expertise include space planning, kitchen and bath design, helping clients select fixtures and furnishings, supervising the coordination of colors and materials, obtaining estimates within the project budget, and overseeing the execution of the project.

**Job opportunities**

Interior designers are qualified to work in a range of different settings, including independent consulting, design firms, architecture firms, kitchen and bath design, retail and window display, home builders, flooring and furnishing retailers, lighting stores, and many others.

Interior design is one of the design fields subject to government regulation because designed spaces must conform to laws and building codes, including accessibility standards for the disabled and elderly. According to the American Society for Interior Designers, 29 states require interior designers to be licensed or registered.

**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>Credits</th>
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<tbody>
<tr>
<td>IDSN 101</td>
<td>Intro to Interior Design</td>
<td>3</td>
</tr>
<tr>
<td>IDSN 130</td>
<td>Interior Design Graphics</td>
<td>3</td>
</tr>
<tr>
<td>DDDS 118</td>
<td>CAD I</td>
<td>4</td>
</tr>
<tr>
<td>WRIT 101W</td>
<td>College Writing I</td>
<td>3</td>
</tr>
<tr>
<td>IDSN 131</td>
<td>Presentation Drawing</td>
<td>3</td>
</tr>
<tr>
<td>IDSN 135</td>
<td>Fundamentals of Space Planning</td>
<td>3</td>
</tr>
<tr>
<td>IDSN 225</td>
<td>Light/Color/Lighting Systems</td>
<td>3</td>
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<tr>
<td>CSTN 173</td>
<td>Arch Construct and Material</td>
<td>3</td>
</tr>
<tr>
<td>M 108</td>
<td>Business Mathematics</td>
<td>3</td>
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<tr>
<td>Take one of the following:</td>
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<td>3</td>
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<tr>
<td>DDDS 166</td>
<td>Revit I</td>
<td></td>
</tr>
<tr>
<td>DDDS 276</td>
<td>Presentation &amp; Animation</td>
<td></td>
</tr>
<tr>
<td>COMX 115</td>
<td>Introduction to Interpersonal Communication</td>
<td>3</td>
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</table>

**Year Total:** 13 18 3
### Year 2

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
<th>Fall</th>
<th>Spring</th>
<th>Summer</th>
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<tbody>
<tr>
<td>IDSN 122</td>
<td>Textiles and Interior Finishes</td>
<td>3</td>
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<tr>
<td>IDSN 240</td>
<td>Studio I Residential*</td>
<td>4</td>
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<tr>
<td>IDSN 266</td>
<td>Kitchen and Bath I*</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IDSN 110</td>
<td>Hist of Int Dsgn I Ancnt-1900</td>
<td>3</td>
<td></td>
<td></td>
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<tr>
<td>DDSN 275</td>
<td>Computer Rendering</td>
<td>3</td>
<td></td>
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<tr>
<td>IDSN 298</td>
<td>Internship</td>
<td>3-5</td>
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<tr>
<td>IDSN 111</td>
<td>Hist Int Dsgn II 1900-Contemp</td>
<td>3</td>
<td></td>
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<tr>
<td>IDSN 250</td>
<td>Studio II Commercial*</td>
<td>4</td>
<td></td>
<td></td>
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<tr>
<td>IDSN 267</td>
<td>Kitchen and Bath II*</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IDSN 275</td>
<td>Professional Practices*</td>
<td>3</td>
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<tr>
<td>Choose one elective from the following:</td>
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<td>3-4</td>
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<tr>
<td>IDSN 292</td>
<td>Independent Study</td>
<td></td>
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<tr>
<td>ARTZ 105RA</td>
<td>Visual Language - Drawing</td>
<td></td>
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<tr>
<td>PSYX 100IS</td>
<td>Intro to Psychology</td>
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</table>

**Year Total:**

<table>
<thead>
<tr>
<th>Fall</th>
<th>Spring</th>
<th>Summer</th>
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</thead>
<tbody>
<tr>
<td>20-22</td>
<td>17-18</td>
<td></td>
</tr>
</tbody>
</table>

**Total Program Credits:** 66-68

* Indicates prerequisites needed.

** Placement in course(s) is determined by placement assessment.

A grade of “C-” or above is required for all courses for graduation.

*Many students need preliminary math and writing courses before enrolling in the program requirements. These courses may increase the total number of program credits. Students should review their math and English placement before planning out their full program schedules.*

### 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>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
<th>Fall</th>
<th>Spring</th>
<th>Summer</th>
</tr>
</thead>
<tbody>
<tr>
<td>AH 140</td>
<td>Pharmacology</td>
<td>2</td>
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<tr>
<td>AHMS 144</td>
<td>Medical Terminology</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BIOH 112</td>
<td>Human Form &amp; Function I</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AHMA 201</td>
<td>MA Clinical Procedures I</td>
<td>4</td>
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<tr>
<td>COMX 102</td>
<td>Interpersonal Skills in the Workplace</td>
<td>1</td>
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<td>WRIT 104</td>
<td>Workplace Communications</td>
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**AHMA 203 - MA Clinical Procedures II**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
<th>Fall</th>
<th>Spring</th>
<th>Summer</th>
</tr>
</thead>
<tbody>
<tr>
<td>AHMA 280</td>
<td>Med Assisting Exam Prep*</td>
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<tr>
<td>AHMS 100</td>
<td>Math Applications Health</td>
<td>3</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>AHMS 158</td>
<td>Legal and Regulatory Aspects of Healthcare</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AHMS 220</td>
<td>Medical Office Procedures</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BIOH 113</td>
<td>Human Form and Function II*</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AHMA 298</td>
<td>Medical Assisting Externship</td>
<td>4</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

**Total Program Credits:** 35

* Indicates prerequisites needed.

*This program begins in the FALL SEMESTER ONLY and enrollment in this program is LIMITED. Please contact Gallatin College for more information on start dates and enrollment availability.*

### 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.

#### 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
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 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.

**University Programs**

- Academic Advising Center (p. 263)
- McNair’s Scholarship Program (p. 263)
- MSU Leadership Fellows Certificate (p. 263)
- National Student Exchange (p. 263)
- Pre-Law Advising (p. 263)
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 requirements and courses that will apply to a wide range of curricula. Advising is available by appointment or 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/mcnairstudent/, e-mail: mcnairstudent@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. 264).

**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 scheduled several times during the academic year
- US 140 Introduction to Law and the Legal Profession – a one credit exploratory course (Fall semester)

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 and Health Professions (offered spring semesters)
For more information about the Pre-Med Intake Major, please click here (p. 246). (http://catalog.montana.edu/undergraduate/letters-science/pre-med-intake/index.html&step=text)

**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. 94) 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, bioprospecting 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**

The MSU Leadership Fellows Certificate, www.montana.edu/lf, challenges students to discover their true potential by developing ethical and critical thinking skills, leadership skills and leadership effectiveness. The Leadership Fellows Program strives to empower students with abilities and motivation to create positive change in society.

16 total credits of leadership course work are required for the certificate. Four credits are the foundational and capstone courses: UC 202 Leadership Foundations, 3 credits, and UC 302 Leadership Capstone, 1 credit. Within both courses, students will practice leadership skills by engaging in 10 hours of community/campus service and participating in MSU leadership-focused events and trainings.

The remaining 12 credits are fulfilled from the approved list of Leadership Electives (http://www.montana.edu/lf/electives.html). Students may take a maximum of 6 credits in their Major/Minor toward the Leadership Electives.

Students interested in pursuing the MSU Leadership Fellows Certificate should register for the UC 202 course. During UC 302, students will complete an application that allows notation on their academic transcript and their resume.

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</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>UC 202</td>
<td>Leadership Foundations</td>
<td>3</td>
</tr>
<tr>
<td>UC 302</td>
<td>Leadership Capstone</td>
<td>1</td>
</tr>
<tr>
<td>Leadership Electives</td>
<td></td>
<td>12</td>
</tr>
</tbody>
</table>

**Total Credits**

16

For more information about the MSU Leadership Fellows Certificate, please click here (p. 264). (http://catalog.montana.edu/undergraduate/letters-science/pre-med-intake/index.html&step=text)
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. The Carnegie Foundation recognizes MSU as one of 108 research universities with "very high research activity" and graduate education is one of the keys to achieving this ranking. With over $90 million in annual research expenditures, MSU’s research enterprise is fueled by the scholarship of skilled graduate students.

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. 268)
Home Page: http://www.montana.edu/econ/
- Master of Science in Applied Economics (p. 269)

Division of Agriculture Education (p. 268)
Home Page: www.ag.montana.edu/ageducation/
- Master of Science in Agricultural Education (p. 360)

American Studies (p. 332)
Home Page: http://www.montana.edu/amst/index.html
- Master of Arts in American Studies (p. 333)
- Doctor of Philosophy in American Studies (p. 333)

Department of Animal and Range Sciences (p. 269)
Home Page: http://animalrange.montana.edu/degrees-grad.htm
- Master of Science in Animal and Range Sciences (p. 270)
- Master of Science in Land Rehabilitation (p. 277) (Interdisciplinary)
- Doctor of Philosophy in Animal and Range Sciences (p. 271)

School of Architecture (p. 280)
Home Page: http://www.arch.montana.edu/pages/programs/programs.php
- Master of Architecture (p. 282)
- Certificate of Professional Practice of Architecture (p. 365)

School of Art (p. 283)
Home Page: http://www.msuchoolsart.com/
- Master of Fine Arts (p. 284)
- Master of Art in Art History (p. 283)

Jake Jabs College of Business & Entrepreneurship (JJCBE) (p. 378)
Home Page: http://www.montana.edu/cob/
- Master of Professional Accountancy (p. 378)

Department of Cell Biology and Neuroscience (p. 333)
Home Page: http://www.montana.edu/cbn/grad_program_requirements.html
- Master of Science in Biological Sciences (p. 334)
- Master of Science in Neuroscience (p. 334)
- Doctor of Philosophy in Biological Sciences (p. 334)
- Doctor of Philosophy in Neuroscience (p. 334)

Department of Chemical and Biological Engineering (p. 316)
Home Page: http://www.chbe.montana.edu/
- Master of Science in Chemical Engineering (p. 316)
- Master of Science in Environmental Engineering (p. 317)
- Master of Engineering In Chemical Engineering (p. 319)
- Master of Engineering in Bioengineering (p. 320)
- Doctor of Philosophy in Engineering (p. 320)
- Doctor of Philosophy in Materials Science (p. 376)

Department of Chemistry and Biochemistry (p. 334)
Home Page: http://www.chemistry.montana.edu/graduate/
- Master of Science in Chemistry (p. 337)
- Master of Science in Biochemistry (p. 336)
- Doctor of Philosophy in Chemistry (p. 337)
- Doctor of Philosophy in Biochemistry (p. 337)
- Doctor of Philosophy in Materials Science (p. 376)

Department of Civil Engineering (p. 324)
Home Page: http://www.coe.montana.edu/ce/
- Master of Science in Civil Engineering (p. 325)
- Master of Science in Environmental Engineering (p. 317)
- Master of Science in Land Rehabilitation (p. 277)
- Master of Construction Engineering Management (PMSEM) (p. 374)
• Doctor of Philosophy in Engineering (p. 320) *(Options in Environmental Engineering, Civil Engineering, Applied Mechanics)*

**Department of Computer Science (p. 325)**  
Home Page: [http://www.cs.montana.edu/](http://www.cs.montana.edu/)

• Master of Science in Computer Science (p. 326)
• Doctor of Philosophy in Computer Science (p. 326)

**Department of Earth Sciences (p. 337)**  
Home Page: [http://www.montana.edu/wwwes/programs/graduate.htm](http://www.montana.edu/wwwes/programs/graduate.htm)

• Master of Science in Earth Sciences (p. 338)
• Master of Science in Land Rehabilitation (p. 277) *(Interdisciplinary)*
• Doctor of Philosophy in Earth Sciences (p. 338)

**Department of Ecology (p. 339)**  
Home Page: [http://www.montana.edu/ecoecology/](http://www.montana.edu/ecoecology/)

• Master of Science in Biological Sciences (p. 339)
• Master of Science in Fish and Wildlife Management (p. 340)
• Doctor of Philosophy in Fish and Wildlife Biology (p. 341)
• Doctor of Philosophy in Biological Sciences (p. 340)
• Doctor of Philosophy in Ecology and Environmental Sciences (p. 340) *(Interdisciplinary)*

**Department of Education (p. 285)**  
Home Page: [http://www.montana.edu/wwweduc/grad/index.shtml](http://www.montana.edu/wwweduc/grad/index.shtml)

• Master of Education
  • Adult and Higher Education (p. 303)
  • Curriculum and Leadership (p. 305)
  • Educational Leadership (p. 309)
• Doctor of Education
  • Adult and Higher Education (p. 291)
  • Curriculum and Instruction (p. 294)
  • Educational Leadership (p. 295)
• Educational Specialist in Educational Leadership (p. 301)
• College Teaching Certificate (p. 289)
• School Library Media Graduate Endorsement (p. 290)

**Department of Electrical and Computer Engineering (p. 326)**  
Home Page: [http://www.coe.montana.edu/ee/research/eegrad1.htm](http://www.coe.montana.edu/ee/research/eegrad1.htm)

• Master of Science in Electrical Engineering, Plan A (p. 327) *(Thesis)*
• Master of Science in Electrical Engineering, Plan B (p. 328) *(Professional Paper)*
• Master of Engineering in Electrical Engineering (p. 327)
• M.S. in Optics Plan A (p. 328) *(Thesis)*
• M.S. in Optics Plan B (p. 328) *(Professional Paper)*
• Doctor of Philosophy in Engineering (p. 329) *(Option in Electrical and Computer Engineering)*
• Doctor of Philosophy in Materials Science (p. 376)

**College of Engineering (p. 315)**  
Home Page: [http://www.coe.montana.edu/](http://www.coe.montana.edu/)

**Department of English (p. 341)**  
Home Page: [http://www.montana.edu/english/grad_overview.html](http://www.montana.edu/english/grad_overview.html)

• Master of Arts in English (p. 341)

**School of Film and Photography (p. 284)**  
Home Page: [http://naturefilm.montana.edu/](http://naturefilm.montana.edu/)

• Master of Fine Arts in Science and Natural History Filmmaking (p. 284)

**Department of Health and Human Development (p. 311)**  
Home Page: [http://www.montana.edu/hhd/](http://www.montana.edu/hhd/)

• Counseling (p. 311)
• Exercise and Nutrition Sciences (p. 313)
• Family & Consumer Sciences (p. 314)
• Family Financial Planning (p. 314)
• Food, Family and Community Health Sciences (p. 314)
• Master of Education in School Counseling (p. 311)

**Department of History and Philosophy (p. 342)**  
Home Page: [http://www.montana.edu/wwwhi/](http://www.montana.edu/wwwhi/)

• Master of Arts in History (p. 342)
• Doctor of Philosophy in History (p. 342)

**Department of Land Resources and Environmental Sciences (p. 276)**  
Home Page: [http://landresources.montana.edu/](http://landresources.montana.edu/)

• Master of Science in Entomology (p. 276) *(Coordinating department)*
• Master of Science in Land Rehabilitation (p. 277)
• Master of Science in Land Resources and Environmental Sciences (p. 278)
• Doctor of Philosophy in Ecology and Environmental Sciences (p. 278)

**Department of Mathematical Sciences (p. 343)**  
Home Page: [http://www.math.montana.edu/grad/index_future.html](http://www.math.montana.edu/grad/index_future.html)

• Master of Science in Mathematics (p. 343)
• Master of Science in Mathematics (p. 361) *(Mathematics Education option)*
• Master of Science in Statistics (p. 344)
• Doctor of Philosophy in Mathematics (p. 345)
• Doctor of Philosophy in Mathematics (p. 346) *(Mathematics Education option)*
• Doctor of Philosophy in Statistics (p. 347)
• Applied Statistics Certificate (p. 343)

**Department of Mechanical and Industrial Engineering (p. 330)**  
Home Page: [http://www.coe.montana.edu/mie/](http://www.coe.montana.edu/mie/)

• Master of Science in Mechanical Engineering (p. 331)
• Master of Science in Industrial and Management Engineering (p. 330)
• Doctor of Philosophy in Engineering (p. 320) *(Options in Industrial Engineering and Mechanical Engineering)*
• Doctor of Philosophy in Materials Science (p. 376)
Department of Microbiology and Immunology (p. 347)
Home Page: http://www.montana.edu/mbim/
- M.S. in Immunology and Infectious Diseases (p. 273)
- M.S. in Microbiology, Plan A (p. 273) (Thesis)
- M.S. in Microbiology, Plan B (p. 274) (Professional Paper)
- Ph.D. in Microbiology (p. 274)
- Ph.D. in Immunology and Infectious Diseases (p. 275)

Molecular BioSciences Program
Home Page: http://mbprogram.montana.edu/index.asp

Department of Native American Studies (p. 348)
Home Page: http://www.montana.edu/wwwnas/
- Master of Arts in Native American Studies (p. 349)
- Online Certificate in Native American Studies (p. 364)

College of Nursing (p. 355)
Home Page: http://www.montana.edu/nursing/
- Master of Nursing (MN) (p. 356)
- Doctor of Nursing Practice (DNP) Degree (p. 357)
- Nursing Education Certificate (p. 365) (Non-degree option)

Department of Physics (p. 351)
Home Page: www.physics.montana.edu
- Master of Science in Physics (p. 352)
- Doctor of Philosophy in Physics (p. 352)
- Doctor of Philosophy in Materials Science (p. 376)

Department of Plant Sciences (p. 278)
Home Page: http://plantsciences.montana.edu/studentinfo/grad/student_grad.html
- Master of Science in Plant Pathology (p. 279)
- Master of Science in Plant Science (p. 279)
- Doctor of Philosophy in Plant Science (p. 279)

Department of Political Science (p. 353)
Home Page: http://www.montana.edu/wwwcat/programs/grad_mpa.htm
- Master of Public Administration (p. 353)

Department of Psychology (p. 354)
Home Page: http://www.montana.edu/wwwpy/
- Master of Science in Psychological Science (p. 355)

Master of Science in Science Education
Home Page: http://www.montana.edu/msse/
- Master of Science in Science Education (p. 372)

Interdisciplinary Programs
- Doctor of Philosophy in Ecology and Environmental Sciences (p. 278)
- IGERT: Geobiological Systems (p. 370)
- Master of Science in Environmental Engineering (p. 317)
- Master of Science in Health Science (p. 370)
- Master of Science in Science Education (p. 372)
- Molecular Biosciences Program (p. 372)
- Professional Master of Science and Engineering Management (p. 374)
- Post Baccalaureate Pre-Medical Certificate (p. 373)
- WWAMI Medical Education Program (p. 377)
- Doctor of Philosophy in Materials Science (p. 376)

On-Line Options through Extended University
http://eu.montana.edu/online/degrees/

Graduate Programs
- Master of Science in Agricultural Education (p. 360)
- Master of Education in Curriculum and Instruction (p. 305)
- Master of Science in Health and Human Development-Family Financial Planning (p. 314)
- Master of Science in Land Resources and Environmental Sciences (p. 278)
- Mathematics Education Option (p. 361)
- Nursing MN (p. 356)
- Nursing DNP (p. 357)
- Master of Science in Science Education (p. 372)
- Science and Engineering Management (p. 362)
- Professional Master of Science and Engineering Management (p. 374) (PMSEM)

Graduate Certificates
- Addiction Counseling (p. 364)
- Architecture, Professional Practice of (p. 365)
- Chemistry Teaching Certificate (p. 366)
- Earth Science Teaching Certificate (p. 367)
- Elementary School Science Teaching Certificate (p. 367)
- Life Science Teaching Certificate (p. 367)
- Native American Studies (p. 364)
- Nursing Education (p. 365)
- School Library Media (p. 290)
- Science Teaching (p. 366)
- Physics Teaching Certificate (p. 368)

College of Agriculture

Graduate Programs Available
Agricultural Education Program (p. 268)
- M.S. in Agricultural Education (p. 268)

Department of Agricultural Economics and Economics (p. 268)
- M.S. in Applied Economics (p. 268)

Department of Animal and Range Sciences (p. 269)
- M.S. in Animal and Range Sciences (p. 270)
- M.S. in Land Rehabilitation (interdisciplinary) (p. 277)
- Ph.D. in Animal and Range Sciences (p. 271)

Department of Land Resources and Environmental Sciences (p. 276)
- M.S. in Entomology (p. 276) (coordinating department)
- M.S. in Land Rehabilitation (p. 277)
- M.S. in Land Resources and Environmental Sciences (p. 278)
• Ph.D. in Ecology and Environmental Sciences (Interdisciplinary) (p. 278)

Department of Microbiology and Immunology (p. 271)
• M.S. in Immunology and Infectious Diseases (p. 273)
• M.S. in Microbiology (Plan A) (p. 273)
• M.S. in Microbiology (Plan B) (p. 274)
• Ph.D. in Microbiology (p. 274)
• Ph.D. in Immunology and Infectious Diseases (p. 275)

Department of Plant Sciences and Plant Pathology (p. 278)
• M.S. in Plant Pathology (p. 279)
• M.S. in Plant Science (p. 279)
• Ph.D. in Plant Science (p. 279)

Interdisciplinary Programs (p. 369)
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)
Assistant Professor and Graduate Coordinator: Dr. Shannon Arnold (http://ag.montana.edu/ageducation/facultyandstaff.html)

Admission
In order to apply for the Ag 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), and Graduate Seminar (AGED 594).

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. 360)

Department of Agricultural Economics and Economics

Department Head
Dr. Wendy Stock
P.O. Box 179290
306 Linfield Hall, Bozeman, MT 59717-2920
Tel: 406-994-3701 Fax: 406-994-4838
Email: agecon@montana.edu (wstock@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 scores from the Test of English as a Foreign Language (TOEFL) with a score of 550 or higher for the written format (or 80 for the internet format), or the Test of Spoken English (TSE/SPEAK) with a score of 50 or higher. 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, 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. 269)

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 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), 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 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

Interim Department Head
Dr. Pat Hatfield
103 Animal Bioscience Building, Bozeman, MT 59717
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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 i.e., universities, colleges, and/or community colleges), three reference letters (letters cannot be from the intended major professor or potential committee members) submitted during the application process, and a personal statement.

Complete application package must be received by the department by the following deadlines:
- For admission Fall semester - June 1
- For admission Spring semester - November 1
- For admission Summer semester - April 1

**Degrees Offered**
- M.S. in Animal and Range Sciences (p. 270)
- M.S. in Land Rehabilitation (interdisciplinary) (p. 277)
- Ph.D. in Animal and Range Sciences (p. 271)

**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 areas 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

**Graduate Animal Science Block**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</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>

**NOTE:** students emphasizing meat science in the Biology Emphasis can substitute –Biochemistry of Macromolecules for one of the two 500-level courses.
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)

By the time a student finishes the M.S. degree in Animal & Range Sciences (Animal 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 170IN 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 262IN Introduction to Entomology)
- Food Science / Meat Science (Introductory Food Science or upper division food science or food safety course)

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.

Department of Microbiology and Immunology

http://www.montana.edu/mbim/
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, phycology, 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. 273)
- M.S. in Microbiology (Plan A) (p. 273)
- M.S. in Microbiology (Plan B) (p. 274)
- Ph.D. in Microbiology (p. 274)
- Ph.D. in Immunology and Infectious Diseases (p. 275)

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>Title</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>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 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 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/cat_trans_credits.html).
- 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
  - MB 515  Microbial Ecology (Spring alt odd)  3
  - MB 552  Adv Soil & Env Microbiology (Spring alt even)  3

- 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

* Students who will be working with animals in their research are required to take MB 501.

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 Cornner-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/cat_trans_credits.html).
• Transfer credits – see The Graduate School policy on Transferring Credits (http://www.montana.edu/gradschool/cat_trans_credits.html).
• Two-thirds of the minimum 30 credits must be at the 5XX-level.
• At least half of these 30 credits must be in the major subject area (MB).

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
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

* Students who will be working with animals in their research are required to take MB 501.

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 Cornner-Morris library.

Ph.D. in Microbiology

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.
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/cat_trans_credits.html).

**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**
  - 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**
  - MB 515 Microbial Ecology (Spring alt odd) 3
  - MB 552 Adv Soil & Env Microbiology (Spring alt even) 3

- **Earth 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

* Students who will be working with animals in their research are required to take MB 501.

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.

**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/cat_pass_fail.html).

**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.

- **25 credits coursework**
- **35 credits 690**
- **60 credits total**

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOC 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>
</tr>
</tbody>
</table>

**Total Credits**

60
Department of Land Resources and Environmental Sciences

Montana State University
334 Leon Johnson Hall
P.O. Box 173120
Bozeman, MT 59717-3120
406-994-7060 Email: lresinfo@montana.edu

Home Page: http://landresources.montana.edu

Graduate student research projects are related to the diverse interests of LRES faculty members. The department conducts research projects in land rehabilitation, restoration ecology for land and streams, watershed science, hydrology, biogeochemistry, land-atmosphere exchange, plant and soil ecology, environmental microbiology, cropping systems and sustainability, environmental risk assessment, integrated pest and weed management, and insect behavior and ecology.

Department Head
Dr. Tracy Sterling
334 Leon Johnson Hall
406-994-7060 Email: tracy.sterling@montana.edu

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. An appropriate faculty mentor must agree to serve as the student’s major adviser as a condition of admission. 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.

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. The sum of the verbal and quantitative scores should be at least 1000 for GRE scores before July, 2011. The sum of the verbal and quantitative scores should be a minimum of 288 for the current GRE tests. Generally the scores should not be more than five years old, but exceptions have been made.

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. 276) (coordinating department)
- M.S. in Land Rehabilitation (p. 277)
- M.S. in Land Resources and Environmental Sciences (p. 278)
- Ph.D. in Ecology and Environmental Sciences (Interdisciplinary) (p. 278)

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. The sum of the verbal and quantitative scores should be at least 1000 for GRE scores before July, 2011. The sum of the verbal and quantitative scores should be a minimum of 288 for the current GRE tests. Generally the scores should not be more than five years old, but exceptions have been made.

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 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.

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>BIOO 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></td>
<td>Take one of the following:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>AGSC 401 Integrated Pest Management</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>ANSC 410 Veterinary Entomology and Parasitology</td>
<td></td>
</tr>
<tr>
<td></td>
<td>ENTO 525 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.

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/ecology) (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 Animal and Range Sciences (http://animalrange.montana.edu), Plant Sciences and Plant Pathology (http://plantsciences.montana.edu) and Microbiology and Immunology (http://www.montana.edu/mibi) (College of Agriculture), Earth Sciences (http://www.montana.edu/earthsciences) (College of Letters and Science) and the College of Nursing (http://www.montana.edu/nursing).

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/
- Animal and Range Sciences - http://animalrange.montana.edu/
- Earth Sciences - http://www.montana.edu/earthsciences
- Nursing - http://www.montana.edu/wwwnu/

Department of Plant Sciences and Plant Pathology

Montana State University
324 Leon Johnson Hall, Bozeman, MT 59717
406-994-4832 Email: pppgrad@montana.edu

Department Head

Dr. John Sherwood (http://plantsciences.montana.edu/faculty/orstaff/faculty/sherwood/sherwood.html)
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
degrees offered

all students are required to register for PSPP 594 Seminar (a 1 credit course). Requirements are set by the student's graduate committee; however, there are no set course requirements for plant sciences degree programs.

required courses

assistantships are requested through the student's home department. Assistantships are awarded on a competitive basis. Assistantships are requested through the student's home department.

financial assistance

assumptions are available from several sources including state, farm commodity groups and federal grants. For information, contact the department.

m.s. in plant pathology

for an MS in plant pathology, most 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.

financial assistance

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

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.

financial assistance

department research projects employ modern molecular biological and biotechnological techniques as well as traditional plant pathological techniques.

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. 280)
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. The Professional Practice of Architecture is a fully online, one year certificate program.

- Master of Architecture (p. 282)
- Professional Practice of Architecture (p. 365) (online certificate)

School of Art (p. 283)
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. 284)
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. 283)

School of Film and Photography (p. 284)
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. 284)

Dean, College of Arts & Architecture
Nancy C. Cornwall, Ph.D.
217 Cheever Hall, Bozeman, MT 59717
406-994-4405 Email: nancy.cornwell@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 Email: arch.montana.edu

Degree Offered
- Master of Architecture
- Certificate of Professional Practice 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) or project and graduate electives. The Plan B Program requires that students successfully complete a Master 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.

Portfolio 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. For 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.

12 points Outstanding/ 9 points Excellent/ 6.5 points Good *
Required Minimum/ 3 points Poor/ 0 points Unacceptable

- 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 www.montana.edu/wwwdg/

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.
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 I</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>ARCH 526</td>
<td>Advanced Architectural Theory</td>
</tr>
<tr>
<td>ARCH 535</td>
<td>Adv Bldg Sys Integration</td>
</tr>
<tr>
<td>ARCH 558</td>
<td>Comprehensive Design Studio</td>
</tr>
<tr>
<td>Graduate Electives</td>
<td>3</td>
</tr>
<tr>
<td><strong>Total Credits</strong></td>
<td><strong>15</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Semester II</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>ARCH 551</td>
<td>Advanced Arch Studio</td>
</tr>
<tr>
<td>ARCH 575</td>
<td>Professional Paper</td>
</tr>
<tr>
<td>Graduate Electives</td>
<td>6</td>
</tr>
<tr>
<td><strong>Total Credits</strong></td>
<td><strong>16</strong></td>
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</table>

<table>
<thead>
<tr>
<th>Semester III</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Graduate Electives</td>
<td>5</td>
</tr>
<tr>
<td>ARCH 560</td>
<td>Masters Studio Project</td>
</tr>
<tr>
<td><strong>Total Credits</strong></td>
<td><strong>11</strong></td>
</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 538, 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. 282)
- Certificate of Professional Practice of Architecture (p. 365)

**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) Advanced Architectural Theory (ARCH 536) ARCH 536) Comprehensive Design Studio (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) and Adv Bldg Sys Integration (ARCH 535) ARCH 535) ARCH 535) ARCH 535), a required Professional Paper (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 525 Advanced Arch Studio (6 credits) are studios that are classified as experimental or theoretical design studios. These studios may be design/built 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) and Adv Bldg Sys Integration (ARCH 535) in conjunction with Comprehensive Design Studio (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 I - Fall Semester
ARCH 558 Comprehensive Design Studio 6
ARCH 535 Adv Bldg Sys Integration 3
ARCH 525 Special Design Topic 3
Graduate Electives 3
Total Credits 15

Year I - Spring Semester
ARCH 551 Advanced Arch Studio 6
ARCH 575 Professional Paper 4

Year 2 - Fall Semester
Graduate Electives 5
ARCH 560 Masters Studio Project 6
Total Credits 11

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. 284)
- M.A. in Art History (p. 283)

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 Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ARTH 501</td>
<td>Pedagogy and Professionalism</td>
<td>2</td>
</tr>
<tr>
<td>ARTH 506</td>
<td>Methods and Critical Theory</td>
<td>3</td>
</tr>
<tr>
<td>ARTH 590</td>
<td>Master’s Thesis</td>
<td>3</td>
</tr>
<tr>
<td>Five Required Core Courses</td>
<td></td>
<td>15</td>
</tr>
<tr>
<td>Two Elective Courses</td>
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<td>6</td>
</tr>
<tr>
<td>One Foreign Language Course</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>Total Credits</td>
<td></td>
<td>32</td>
</tr>
</tbody>
</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 a statement of intent if you wish to apply for a teaching assistantship. Completed applications for the following academic year must be received by February 15.

Qualified students may be admitted to The Graduate School on a regular or provisional basis. Provisional acceptance is usually based on undergraduate deficiencies.

<table>
<thead>
<tr>
<th>Program Requirements</th>
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</thead>
<tbody>
<tr>
<td>Total Credits</td>
</tr>
<tr>
<td>Studio credits (ARTZ 500 level)</td>
</tr>
<tr>
<td>Art History</td>
</tr>
<tr>
<td>ARTH 451</td>
</tr>
<tr>
<td>ARTH 590</td>
</tr>
<tr>
<td>ARTZ 594</td>
</tr>
<tr>
<td>Total Credits</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.

**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**

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.

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**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. 284)

**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.

- **FILM 504** Film and Documentary Theory 3
- **FILM 505** Crit Approch Nat Hst Filmmaking 3
- **FILM 506** Crit Approach Sci Filmmaking 3
- **FILM 510** Fundamentals of Filmmaking 3
- **FILM 513** Advanced Cinematography 3
- **FILM 515** Science and Natural History Film Prod. 3
- **FILM 517** Production Management 3
- **FILM 518** Writing for Documentary and Non-Fiction Film 3
- **FILM 519** Post Production Workflow 3
- **FILM 521** Interactive Documentary 3
- **FILM 523** Second Year Film Prep 2
- **FILM 524** Research Methods 3
- **FILM 525** Second Year Film Prod 3
- **FILM 526** Alternative Nonfiction 3
- **FILM 533** Adv Prob TV and Internet Prod 1-9
- **FILM 560** Post Production Meets Info Design 3
- **FILM 581** Special Professional Proj 1-3
- **FILM 590** Master’s Thesis 1-15
- **FILM 592** Independent Study 1-3
- **FILM 598** Professional Internship 1-12
- **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**

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**College of Education, Health and Human Development**

Lynda Ransdell, Dean
250 Reid Hall, Bozeman, MT 59717
406-994-4133 Email: ehhddean@montana.edu

**Department of Education (p. 285)**
- College Teaching Certificate (p. 289)
- School Library Media Graduate Endorsement (p. 290)
- MEd
  - Adult and Higher Education (p. 303)
  - Curriculum and Instruction (p. 305)
  - Educational Leadership (p. 309)
- EdD
  - Adult and Higher Education (p. 291)
  - Curriculum and Instruction (p. 294)
  - Educational Leadership (p. 295)
- EdS
  - EdS. in Educational Leadership (p. 301)
- PhD
  - Adult and Higher Education (p. 297)
  - Curriculum and Instruction (p. 299)
  - Educational Leadership (p. 300)

**Department of Health and Human Development (p. 311)**
- Addiction Counseling Certificate (http://catalog.montana.edu/graduate/education-health-human-development/graduate/extended-university/addiction-counseling)
- Counseling (p. 311)
- Exercise and Nutrition Sciences (p. 313)
- Family & Consumer Sciences (p. 314)
- Family Financial Planning (http://catalog.montana.edu/graduate/education-health-human-development/health-human-development/family-financial-planning)
- Food, Family and Community Health Sciences (p. 314)

**Northern Plains Transition to Teaching (NPTT) (p. 368)**
- Certificate Leading to Secondary Teacher Licensure (p. 369)
- Master of Education (p. 369)

**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
The Department of Education’s graduate offerings are divided into three units: Curriculum & Instruction, Educational Leadership, and Adult & Higher Education. The 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 (Ed.S.) 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:

- Educational Leadership: Dr. Tena Versland, 406-994-6799 or email tena.versland@montana.edu
- Adult & Higher Education: Dr. Carrie B. Myers, 406-994-4203 or email cbmyers@montana.edu
- Curriculum & Instruction: Dr. Ann Ewbank, 406-994-5788 or email ann.ewbank@montana.edu

Adult and Higher Education
http://www.montana.edu/education/grad/ahs/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 PhD in Education (PhD) 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 provides 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 Education, (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 K-20 educational systems.

The Adult & Higher Education Program also offers a Certificate in College Teaching (CTC) 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 a range of colleges and universities.

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, subject area supervisors, curriculum coordinators, and educational scholars and researchers. The MEd degree has three options: the Professional Educator, Educational Research, 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) 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) STEM Education, (3) the K-20 Education, (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 K-20 educational systems.

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.

Educational Leadership
http://www.montana.edu/education/grad/edlead/index.html

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: 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 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) 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. 289)
  - School Library Media Certificate (p. 290)

- **M.Ed.**
  - Adult and Higher Education (p. 303)
  - Curriculum and Instruction (p. 305)
  - Educational Leadership (p. 309)

- **Ed.D.**
  - Adult and Higher Education (p. 291)
  - Curriculum and Instruction (p. 294)
  - Educational Leadership (p. 295)

- **Ed.S. in Educational Leadership**

- **Ph.D.**
  - Adult and Higher Education (p. 297)
  - Curriculum and Instruction (p. 299)
  - Educational Leadership (p. 300)

**Administrative Licensure**

The Educational Leadership program at Montana State University is nationally accredited by Teacher Education Accreditation Council/Council for the Accreditation of Educator Preparation (TEAC/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. 287)
- Out of State School Administrative License (p. 288)
- Superintendent Licensure (p. 288)
- Principal Licensure (p. 309)

**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.

**Program of Study**

In order to qualify for the BPE/OPI Internship, candidates must have completed or be concurrently enrolled in the following courses during their first semester of the internship.

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>EDLD 507</td>
<td>Foundational Educational Leadership</td>
<td>3</td>
</tr>
<tr>
<td>EDLD 508</td>
<td>Supervision of Instruction</td>
<td>3</td>
</tr>
<tr>
<td>EDLD 532</td>
<td>School Law</td>
<td>3</td>
</tr>
<tr>
<td><strong>Total Credits</strong></td>
<td></td>
<td><strong>9</strong></td>
</tr>
</tbody>
</table>

**How to Apply**

Candidates interested in the Board of Public Education/OPI Internship should contact the Educational Leadership faculty to discuss requirements for Licensure.

**Educational Leadership Faculty**

Dr. Tena Versland  
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

**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:

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>EDLD 565</td>
<td>K-12 Instructional Leadership</td>
<td>3</td>
</tr>
<tr>
<td>EDLD 655</td>
<td>MT Legal &amp; Policy Studies</td>
<td>3</td>
</tr>
</tbody>
</table>

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 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:

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>EDLD 655</td>
<td>MT Legal &amp; Policy Studies</td>
<td>3</td>
</tr>
<tr>
<td>EDLD 650</td>
<td>MT Finance &amp; Facilities</td>
<td>3</td>
</tr>
</tbody>
</table>

**How to Apply**

Contact the Educational Leadership faculty to discuss requirements for Licensure and visit the Extended University website below to register for classes.

http://btc.montana.edu/courses/aspx/credit.aspx

**Educational Leadership Faculty**

Dr. Tena Versland  
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

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**Program of Study**

All candidates are required to complete 15 credits of most master’s courses.

<table>
<thead>
<tr>
<th>Course</th>
<th>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>Personnel Mgmt in Education</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 Exper in Ed Ldrshp</td>
<td>3</td>
</tr>
</tbody>
</table>

Total Credits 15
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 and visit the Extended University website below to register for classes.
http://btc.montana.edu/courses/aspx/credit.aspx

Educational Leadership Faculty
Dr. Tena Versland
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
Montana State University
PO Box 172880
Reid Hall 215, Bozeman, MT 59717-2880
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.

Program Flow
A total of 12 credits of course work 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
EDLD 530 College Teaching

EDLD 574 Field Exper in Ed Ldrship (Section-006, College Teaching Practicum)
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
EDLD 509 Issues/Trends in High Ed
EDLD 510 Org & Adm of Higher Ed
EDLD 528 College Students
EDLD 529 Postsecond Dist Delivered Educ
EDLD 531 Theoretical Fndtns/Col Stdnts
EDLD 535 Student Services
EDLD 592 Independent Study
EDLD 598 Internship
other courses approved by committee
Total Credits 12

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/wwwdg/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

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: May 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

School Library Media Graduate Endorsement

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 Masters degree (MEd) in Curriculum & Instruction after completion of all Library Media coursework. The Masters 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 (http://catalog.montana.edu/graduate/education-health-human-development/education/med-curriculum-leadership/professional-educator-option).

Program Flow

Following admission, the student should register for the course(s) offered in the upcoming semester through the Extended University website. Two courses are typically offered each semester (three in the summer).

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>
<tr>
<td>EDCI 546</td>
<td>Schl 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>Mgmt of Information/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
406-994-5799 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: May 1st
Spring Semester: November 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
• Fall Semester: May 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: August 15th
• Spring Semester: January 2nd
• Summer Semester: May 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

Doctor of Education in Adult & Higher Education

Objectives
At the Doctor of Education level, the Adult & Higher Education program offers two specializations:

Higher Education Administration

The EdD in Higher Education Administration specialization is intended for individuals who will contribute to the administrative leadership 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. (51-60 credits beyond the master’s).

Higher Education Academics

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 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. (51-60 credits beyond the master’s).

Program Flow
After acceptance, 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 student will become acquainted with the Adult & Higher Education faculty and identify a permanent chair and committee members.

In the third semester of enrollment, the student with committee approval, will establish and submit their program of study to The Graduate School and clarify plans for the comprehensive examination on a set of prescribed courses. Near the end of completing course requirements, the student will write the comprehensive exam. The student will meet with the committee for the oral clarification 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 at least 3 hours of Doctoral Thesis (EDLD 690) 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 work with the chair and committee readers with progress being made each semester towards completion of the dissertation. The student defends the dissertation.

Committees
Each doctoral student’s committee must consist of at least five 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 Dean of The Graduate School. A fifth member of the committee is an approved faculty member appointed by The Graduate School and serves as the graduate representative.

Chairs
The student should carefully select his/her 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. The level of mastery expected will vary according to the program. Students should refer to The Graduate School’s web page at: http://www.montana.edu/gradschool/policy/degreq_doctoral.html

Near the end of completing coursework and before the dissertation proposal defense, 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:

• 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 three 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.

The oral defense of comprehensive exams must occur before November 1st in the fall semester and before spring break in the spring semester. The oral defense of the thesis, portfolio, or final dissertation must occur 14 working days before the last day of the semester.

### 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

**Dr. Carrie Myers, Program Leader**  
Higher Education and Research classes  
cbmyers@montana.edu

**Dr. Sweeney Windchief**  
Higher Education and Research classes  
sweeney.windchief@montana.edu

**Dr. Tricia Seifert**  
Higher Education and Research classes  
tricia.seifert@montana.edu

### EdD in Higher Education Options:

- EdD Higher Education Academics (Teaching) (p. 292)
- EdD Higher Education Administration (p. 293)

### Application Process for the EdD in Higher Education

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. GPA calculation sheet (The form is provided during the application process).
2. Resume/Curriculum vitae.
3. 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).

4. Academic Transcripts – Provide official transcripts verifying all Bachelors degree and Masters degree course work. These can be unofficially uploaded during the application process; however, official transcripts will also need to be submitted directly to the Department of Education Graduate Programs Office, 215 Reid Hall, PO Box 172880, Montana State University, 59717. Transcripts will be evaluated for rigor and academic fit. Electronic transcripts are also acceptable as long as they arrive directly from the applicants certifying university.

5. Personal essay – Suggested length is 2-3 pages, double-spaced. The applicant should briefly describe the following: background, prior professional and leadership experience, why the interest in the EdD program, and how the applicant plans to use the degree.

6. Three (3) professional references – The letters should be from individuals qualified to assess one’s ability and potential as a graduate student and/or be able to attest to the applicants work ethic and professionalism. References from relatives are not acceptable.

7. 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.

8. For International Applicants ONLY – International applicants must fill out an International Student Financial Certificate

### 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.

*Note* - By submitting materials by the preferred deadline, accepted students will be eligible for Graduate Teaching Assistantships and early registration.

- Fall Semester: May 1st
- Spring Semester: November 1st
- Summer Semester: April 1st

The following is the absolute deadline date for 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 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  
Email: margaret.secrest@montana.edu

### EdD Higher Education Academics (Teaching) Option

**Objectives**

This EdD Higher Education Academics specialization is for persons who wish to contribute to the academic leadership of a college or university (51-60 credits beyond the master’s).
Program of Study

Core Courses (12 Credit Hours) 12
- EDLD 505  Hist & Phil of Amer Higher Ed
- EDLD 510  Org & Adm of Higher Ed
- EDLD 528  College Students
- EDLD 537  Inst Resch & Assessment
  or EDLD 511  Planning Program Assessment

Academics Specialized Courses (15-24 credit hours) 15
- EDLD 509  Issues/Trends in High Ed
- EDLD 512  Fin Adm in High Ed
- EDLD 513  Resource & Prog Mgmt
- EDCI 513  Critical Race Theory
- NASX 523  Am Indians/Minority in High Ed
- EDLD 529  Postsecond Dist Delivered Educ
- EDLD 530  College Teaching
- EDLD 531  Theoretical Fndtns/Col Stdnts
- EDLD 533  Law & Policy in High Ed
- EDLD 535  Student Services
  Graduate level courses may be selected from the Adult Education specialization or other departments that will strengthen the student’s program of study. These courses need to be selected in consultation with the chair.

Statistics and Research Courses (10 Credit Hours beyond the masters) 10
- EDCI 502  Educational Statistics II
- EDCI 507  Qualitative Educational Rsch
- EDCI 607  Quantitative Educational Rsch
- EDCI 594  Seminar

Dissertation (14 Credit Hours) 14
- EDLD 690  Doctoral Thesis

Total Credits 51-60
* EDCI 506, EDCI 502 or equivalent are prerequisite courses.

Faculty
Prospective Faculty:

It is important for prospective faculty members to understand that the ideal is to complete a doctoral degree focused on the content area of the field/discipline in which they wish to teach. However, faculty with a minimum of eighteen graduate credit hours in a content area are sometimes appointed to faculty positions. This minimum can be earned at the master’s level, or partially or even fully earned as part of one’s EdD focus in Higher Education Academics (Teaching).

Current Faculty:

Faculty who hold teaching positions with only a master’s degree and do not need or wish to pursue a terminal degree in their discipline/field may find the Higher Education Academics (Teaching) focus will meet their desire to enhance teaching skills and academic management potential. Of course, one might also pursue additional hours in their content area as part of the EdD focus in Higher Education Academics (Teaching).

Internship

Students with no professional experience working in higher education academics are expected to provide evidence of having gained such experience. This should be done prior to completing the dissertation or they must register for a three credit higher education academics Internship (EDLD 598) in addition to all of the above course requirements.

Higher Education Administration Option

Objectives

This EdD Higher Education Administration specialization is for persons who wish to contribute to the administrative leadership of a college or university. The primary objective of the program is to produce informed practitioners for mid-to-upper level management or administrative positions. These individuals typically manage or direct non-academic operational functions and/or work in academic and administrative staff positions. A minimum of 51-60 credit hours is required. Students who have received a master’s degree from the Adult & Higher Education program at MSU-Bozeman or a related master’s degree will work with their adviser on designing a program of study.

The MEd

The opportunity to complete an MEd with an Adult Education specialization and move into the EdD program will be contingent on the student’s professional history and ambitions, academic record, and Adult & Higher Education’s ability to offer the student a new, academically challenging, comprehensive course of study.

Program of Study

Core Courses (12 Credit Hours) 12
- EDLD 505  Hist & Phil of Amer Higher Ed
- EDLD 510  Org & Adm of Higher Ed
- EDLD 528  College Students
- EDLD 537  Inst Resch & Assessment
  or EDLD 511  Planning Program Assessment

Administration Specialized Courses (15-24 credit hours) 15
- EDLD 509  Issues/Trends in High Ed
- EDLD 512  Fin Adm in High Ed
- EDLD 513  Resource & Prog Mgmt
- EDCI 513  Critical Race Theory
- NASX 523  Am Indians/Minority in High Ed
- EDLD 529  Postsecond Dist Delivered Educ
- EDLD 530  College Teaching
- EDLD 531  Theoretical Fndtns/Col Stdnts
- EDLD 533  Law & Policy in High Ed
- EDLD 535  Student Services
  Graduate level courses may be selected from other Higher Education courses or other departments that will strengthen the student’s program of study. These courses need to be selected in consultation with the chair.

Statistics and Research Courses (10 Credit Hours beyond the masters) 10
- EDCI 502  Educational Statistics II
- EDCI 507  Qualitative Educational Rsch
- EDCI 607  Quantitative Educational Rsch
- EDCI 594  Seminar

Dissertation (14 Credit Hours) 14
Program of Study

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>EDLD 690</td>
<td>Doctoral Thesis</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Total Credits</strong></td>
<td><strong>51-60</strong></td>
</tr>
</tbody>
</table>

**Internship**

Students with no professional experience working in higher education administration must provide evidence of having gained such experience. This should be done prior to completing the dissertation or they must register for a three-credit higher education administration Internship (EDLD 598) in addition to all of the above course requirements.

**Doctor of Education in Curriculum & Instruction**

**Program Objectives**

The Doctor of Education 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 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 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 schools 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: 9
  - EDCI 502 Educational Statistics II
  - EDCI 506 Applied Ed Rsch
  - EDCI 507 Qualitative Educational Rsch
  - EDCI 607 Quantitative Educational Rsch

- Research Electives appropriate to area of specialization & approved by Graduate Advisor

- Curriculum & Instruction Core - 3 credits; choose from the following: 3
  - EDCI 508 Adv Educational Psychology
  - EDCI 532 General School Curriculum
  - EDCI 541 History & Philosophy of Ed
  - EDCI 544 Phil Issues in Ed

- Curriculum & Instruction Electives appropriate to area of specialization & approved by Graduate Advisor

- Internships/Apprenticeships - 3 credits; choose from the following: 3
  - EDCI 598 Internship (Teaching)
  - EDCI 598 Internship (Supervision)
  - EDCI 598 Internship (Research)
  - EDCI 592 Independent Study

- Courses selected appropriate to area of specialization & approved by Graduate Advisor

- **Total Credits**

**Committees**

Each doctoral student’s committee must consist of at least five 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 Dean of The Graduate School. A fifth member of the committee is an approved faculty member appointed by The Graduate School and serves as the graduate representative.

**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 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.

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**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 are listed here: http://www.montana.edu/gradschool/policy/degreq_doctoral.html#degreq_doc_gen and Department of Education degree requirements are listed on the department website.

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**Application Process for the EdD in Curriculum and Instruction**

Applicants are required to submit the following documentation via the Graduate School Online Application System (http://www.montana.edu/wwdg/apply.html)

- 1. Completed Graduate School Application
- 2. Resume/Curriculum Vitae
- 3. GPA calculation sheet for Masters Degree (provided during the application process)
- 4. Academic Transcripts – Official transcripts from all higher education institutions attended should be sent to the Department of Education Graduate Programs Office, 215 Reid Hall, PO Box 172880, Montana State University, Bozeman, MT 59717. It is not necessary to submit a transcript if the applicant degree was from MSU. Unofficial transcripts can be uploaded during the online application process for initial review.
- 5. 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.
- 6. Three (3) Professional References
- 7. 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.
- 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.
  - International Student Financial Certificate (http://www.montana.edu/wwdg/pdf_files/fin_cert.pdf)

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**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. Applicants who submit all materials by the preferred deadline will be considered for Graduate Teaching Assistantships and early registration.

- Fall Semester: May 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: August 15th
- Spring Semester: January 2nd
- Summer Semester: May 15th

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**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.

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**Contact Information**

Dr. Ann Ewbank
Program Leader
406-994-5799 Email: a.ewbank@montana.edu
(tena.versland@montana.edu)nn.ewbank@montana.edu

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**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 Masters Superintendent Licensure (http://catalog.montana.edu/graduate/education-health-human-development/education/administrative-licensure/superintendent-licensure)).

## 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 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.

### Program of Study

<table>
<thead>
<tr>
<th>Doctoral Core</th>
<th>Credits</th>
</tr>
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<tbody>
<tr>
<td>EDCI 508</td>
<td>Adv Educational Psychology</td>
</tr>
<tr>
<td>EDLD 610</td>
<td>Ldrship and Organizational Thry</td>
</tr>
<tr>
<td>EDLD 630</td>
<td>Supervision &amp; Instruct Ldrship</td>
</tr>
<tr>
<td>EDLD 643</td>
<td>Leading Social Justice</td>
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<tr>
<td>EDLD 657</td>
<td>Ed Policy &amp; Politics</td>
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<td>EDLD 591</td>
<td>Special Topics</td>
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<tr>
<th>Superintendent Certification Required Courses</th>
<th>Credits</th>
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<tr>
<td>EDLD 620</td>
<td>The School Superintendent</td>
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<tr>
<td>EDLD 645</td>
<td>Personnel Mgmt in Education</td>
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<tr>
<td>EDLD 650</td>
<td>MT Finance &amp; Facilities</td>
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<td>EDLD 655</td>
<td>MT Legal &amp; Policy Studies</td>
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<tr>
<th>Research Required Core</th>
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<td>EDCI 502</td>
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<td>EDCI 507</td>
<td>Qualitative Educational Rsch</td>
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<td>EDCI 607</td>
<td>Quantitative Educational Rsch</td>
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<tr>
<th>Dissertation Credits</th>
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<tbody>
<tr>
<td>EDLD 690</td>
<td>Doctoral Thesis</td>
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</table>

| Total Credits | 53 |

## Committees

Each doctoral student’s committee must consist of at least five 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 Dean of the Graduate School. A fifth member of the committee is an approved faculty member appointed by the Graduate School and serves as the graduate representative.

## 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 Ed.D. degree beyond these minimums are available through the Department of Education. All Ed.D. 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 each of the three program’s websites.

## 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
Application process:

Applicants are to submit the following documentation during the Application System.

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. 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, 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:
      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 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.
   5. Self-Nomination Letter: In two pages please describe why you want a terminal degree and what key thinkers and/or research has informed your current leadership practice.
   6. Academic Transcripts: Official transcripts verifying all Bachelor’s Degree course work and Master’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.

7. Official GRE or MAT scores: 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).
8. For International Applicants ONLY TOEFL (http://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.

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.

*Note - By submitting materials by the preferred deadline, accepted students will be eligible for Graduate Teaching Assistantships and early registration.

Fall Semester: May 1st
Spring Semester: November 1st
Summer Semester: April 1st

The following are the final 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: August 15th
Spring Semester: January 2nd
Summer Semester: May 15th

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

Doctor of Philosophy in Adult & Higher Education

Objectives

Program faculty research foci include student development and student affairs, institutional research and assessment, scholarship of teaching and learning, faculty roles and responsibilities, K-20 student educational trajectory and higher education outcomes, particularly for students placed at risk, comparative and international higher education, and administration and leadership in higher education. In most cases the diversity of learners and institutions represented in adult and higher education is addressed, and
students are encouraged to develop specialization via course assignments. Required courses vary by degree and background of the student.

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 with working students as a target group and are generally offered evenings and weekends. Many courses are offered as hybrid courses with a combination of face-to-face and distance delivery.

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

<table>
<thead>
<tr>
<th>Course Category</th>
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<td>EDLD 505 Hist &amp; Phil of Amer Higher Ed</td>
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<td>EDCI 508 Adv Educational Psychology</td>
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<td>EDLD 643 Leading Social Justice</td>
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<td>EDCI 594 Seminar</td>
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<td>(Higher education Administration and Higher Education Academics).</td>
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<td>Required Research Courses - 9 credits</td>
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<tr>
<td>EDCI 502 Educational Statistics II</td>
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<td>EDCI 507 Qualitative Educational Rsch</td>
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<td>EDCI 607 Quantitative Educational Rsch</td>
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<td>Advanced Research Electives - choose 9 credits</td>
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<td>EDLD 511 Planning Program Assessment</td>
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<td>EDCI 513 Critical Race Theory</td>
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<td>EDCI 608 Advanced Educational Rsch</td>
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<td>EDLD 613 Indigenous Methodologies in Educational Research</td>
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<td>EDU 615</td>
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<td>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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<td>EDLD 690 Doctoral Thesis</td>
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<td>Total Credits</td>
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</table>

Residency Requirement
The PhD requires one year of full-time residency. The residency requirement consists of two consecutive semesters of full-time enrollment (9 credits per semester) in PhD coursework.

Committees
Each doctoral student’s committee must consist of at least five 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 Dean of The Graduate School. A fifth member of the committee is an approved faculty member appointed by The Graduate School and serves as the graduate representative.

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
At PhD students in Adult & Higher Education 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 written and oral comprehensive examinations. Options for meeting the requirements of the comprehensive exam are available on the Department of Education website: http://www.montana.edu/education/grad/ahe/ahe_phd.html. 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 are listed here: http://www.montana.edu/gradschool/cat_for_doc_stud.html and Department of Education degree requirements are listed on the department website.

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/ahe/applications.html) web page. Apply online through the Graduate School (http://www.montana.edu/gradschool/admissions/apply.html).
Contact Information
Dr. Carrie Myers, Program Leader
Higher Education and Research classes
cbmeyers@montana.edu

Dr. Sweeney Windchief
Higher Education and Research classes
sweeney.windchief@montana.edu

Dr. Tricia Seifert
Higher Education and Research classes
tricia.seifert@montana.edu

Maggie Secrest
Graduate Program Assistant
PO Box 172880
Montana State University
Reid Hall 215, Bozeman, MT 59717-2880
margaret.secrest@montana.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 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

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Required Research Courses - 9 credits

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<tbody>
<tr>
<td>EDCI 502</td>
<td>Educational Statistics II</td>
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<td>EDCI 507</td>
<td>Qualitative Educational Rsch</td>
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<td>Quantitative Educational Rsch</td>
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<td>EDCI 513</td>
<td>Critical Race Theory</td>
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<td>EDCI 615</td>
<td>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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Dissertation - 18 credits

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<tbody>
<tr>
<td>EDLD 690</td>
<td>Doctoral Thesis</td>
</tr>
</tbody>
</table>

Total Credits 64

Residency Requirement
The PhD requires one year of full-time residency. The residency requirement consists of two consecutive semesters of full-time enrollment (9 credits per semester) in PhD coursework.

Committees
Each doctoral student’s committee must consist of at least five 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 Dean of The Graduate School. A fifth member of the committee is an approved faculty member appointed by The Graduate School and serves as the graduate representative.

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 written and oral comprehensive examinations. Options for meeting the requirements of the comprehensive exam are available on the Department of Education website: [http://www.montana.edu/education/grad/ci/CurricandInstr_phd.html](http://www.montana.edu/education/grad/ci/CurricandInstr_phd.html). 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 are listed here: [http://www.montana.edu/gradschool/cat_for_doc_stud.html](http://www.montana.edu/gradschool/cat_for_doc_stud.html) and Department of Education degree requirements are 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](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](http://www.montana.edu/gradschool/admissions/apply.html)).

**Contact Information**

Dr. Ann Ewbank  
Program Leader  
406-994-5799  
Email: a.ewbank@montana.edu  
(tena.versland@montana.edu)  
(maggie.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 Education 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, (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 505 Hist & Phil of Amer Higher Ed  
- EDCI 508 Adv Educational Psychology  
- EDLD 530 College Teaching  
- EDLD 610 Ldrshp and Organizational Thry  
- EDLD 643 Leading Social Justice

**Required Core Content Courses - 4 credits**

- EDCI 594 Seminar  
- EDU 670

**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**

- EDCI 502 Educational Statistics II  
- EDCI 507 Qualitative Educational Rsch  
- EDCI 607 Quantitative Educational Rsch

**Advanced Research Electives - choose 9 credits**

- EDLD 511 Planning Program Assessment  
- EDCI 513 Critical Race Theory  
- EDLD 537 Inst Resch & Assessment  
- EDU 606  
- EDCI 608 Advanced Educational Rsch  
- EDU 611  
- EDLD 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**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>EDLD 690</td>
<td>18</td>
</tr>
<tr>
<td>Doctoral Thesis</td>
<td></td>
</tr>
</tbody>
</table>

**Total Credits** 64

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**Residency Requirement**

The PhD requires one year of full-time residency. The residency requirement consists of two consecutive semesters of full-time enrollment (9 credits per semester) in PhD coursework.

---

**Committees**

Each doctoral student's committee must consist of at least five 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 Dean of The Graduate School. A fifth member of the committee is an approved faculty member appointed by The Graduate School and serves as the graduate representative.

---

**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 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 written and oral comprehensive examinations. Options for meeting the requirements of the comprehensive exam are available on the Department of Education website: http://www.montana.edu/education/grad/edlead/edlead_phd.html. The comprehensive exams must be completed by the posted Graduate School deadlines.

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**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 are listed here: http://www.montana.edu/gradschool/cat_for_doc_stud.html and Department of Education degree requirements are 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) website.

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  
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Dr. David Henderson  
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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

**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. 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 Superintendednt Core (EDLD 620, EDLD 645, EDLD 650, EDLD 655) are offered every summer on campus during a two-week window in June.

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**Program of Study**

**Specialist Core**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>EDLD 610</td>
<td>Ldrshp and Organizational Thry</td>
</tr>
<tr>
<td>EDLD 620</td>
<td>The School Superintendent</td>
</tr>
<tr>
<td>EDLD 630</td>
<td>Supervision &amp; Instruct Ldrshp</td>
</tr>
<tr>
<td>EDLD 645</td>
<td>Personnel Mgmt in Education</td>
</tr>
<tr>
<td>EDLD 650</td>
<td>MT Finance &amp; Facilities</td>
</tr>
<tr>
<td>EDLD 655</td>
<td>MT Legal &amp; Policy Studies</td>
</tr>
</tbody>
</table>

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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) 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:**
   1. 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 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) 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** (http://www.montana.edu/wwwdg/pdf_files/fin_cert.pdf)

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### Field Experience

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>EDLD 574</td>
<td>Field Exper in Ed Ldrshp (Field Experience may be waived based on experience and goals)</td>
<td>3</td>
</tr>
</tbody>
</table>

### Professional Paper

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>EDLD 575</td>
<td>Prof Paper &amp; Project</td>
<td>3</td>
</tr>
</tbody>
</table>

**Total Credits:** 30

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### Committee

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 Dean of The Graduate School.

### Chairs

The student should carefully select his/her chair after thorough conversations with the approved Education Leadership faculty members. The chair will serve as the student’s primary adviser. 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 solution employed; and 4) provide recommendations grounded in research to solve the problem.

### Additional Educational 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.

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.

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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.
*Note - By submitting materials by the preferred deadline, accepted students will be eligible for early registration.

- Fall Semester: May 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: August 15th
- Spring Semester: January 2nd
- Summer Semester: May 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

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. 304)
- Community education
- Religious education
- Workplace training and development

Student Affairs (p. 305)
- Residence life
- Career services
- Athletics
- Student government

Higher Education (p. 305)
- Entry-level general administrative positions in higher education
- Intercollegiate athletics
- Institutional development

Program Flow
After acceptance, the student will be assigned a temporary advisor and should then meet with his/her assigned advisor. The student becomes acquainted with the Adult & Higher Education faculty and identifies a permanent chair and committee members. During the second semester of enrollment, the student, with committee approval, will establish and submit their program of study to the Graduate School and clarify plans for the comprehensive examination on a set of prescribed courses. Near the completion of coursework, the student will write the comprehensive examination. If deemed necessary by any member of the student’s committee after reading the written responses, an oral clarification examination may be required. Students writing a thesis will not be required to write a comprehensive examination. However, during the defense of the thesis, committee members will ask questions about material covered in courses taken in the student’s master’s program.

Initial courses are scheduled to include:

- Student Affairs -- Educational Statistics I (EDCI 501), Applied Ed Rsch (EDCI 506), Org & Adm of Higher Ed (EDLD 510), and College Students (EDLD 528)
- Higher Education -- Educational Statistics I (EDCI 501), Applied Ed Rsch (EDCI 506), Hist & Phil of Amer Higher Ed (EDLD 505), and Org & Adm of Higher Ed (EDLD 510)

Committees
Each master’s 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 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 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. 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. The specific format of this exam will be determined by the chair in consultation with the committee. Depending upon the format, an oral clarification may be required. In addition, students may be required to meet with the committee to provide clarification of responses.

The oral defense of comprehensive exams must occur before November 1st in the fall semester and before spring break in the spring semester. The oral defense of the thesis, portfolio, or final dissertation must occur 14 days before the Graduate Office deadline for spring and fall semesters.

Contact Information
Dr. Carrie Myers, Program Leader
Higher Education and Research classes
Dr. Sweeney Windchief
Higher Education and Research classes
sweeney.windchief@montana.edu

Dr. Tricia Seifert
Higher Education and Research classes
tricia.seifert@montana.edu

MEd in Adult and Higher Education Options:
• Adult Education Option (p. 304)
• Higher Education Option (p. 305)
• Student Affairs Option (p. 305)

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).
   b. Submit documented evidence of masters level verbal and quantitative skills in lieu of test scores. This may include reports or quantitative calculations completed for a job, or documentation of work responsibilities using masters level verbal and quantitative skills.
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

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.

*Note - By submitting materials by the preferred deadline, accepted students will be eligible for early registration.

Fall Semester: May 1st
Spring Semester: November 1st
Summer Semester: April 1st

The following is the absolute deadline date for 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 fall semester.

Fall Semester: August 15th

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 MEd 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 plan is designed to develop skills in working with adult learner within formal and informal contexts such as community education, nonprofit settings, religious education, corporate training, and workforce development. (30 credits).

Program of Study

<table>
<thead>
<tr>
<th>Adult Education Core - 12 credit hours</th>
<th>12</th>
</tr>
</thead>
<tbody>
<tr>
<td>EDLD 501</td>
<td>Found Adult Education</td>
</tr>
<tr>
<td>EDLD 511</td>
<td>Planning Program Assessment</td>
</tr>
<tr>
<td>EDLD 513</td>
<td>Resource &amp; Prog Mgmt</td>
</tr>
<tr>
<td>EDLD 510</td>
<td>Org &amp; Adm of Higher Ed</td>
</tr>
<tr>
<td>Statistics and Research - 6 credit hours</td>
<td>6</td>
</tr>
<tr>
<td>EDCI 501</td>
<td>Educational Statistics I</td>
</tr>
<tr>
<td>EDCI 506</td>
<td>Applied Ed Rsch</td>
</tr>
<tr>
<td>Electives or Internship - 12 credit hours</td>
<td>12</td>
</tr>
<tr>
<td>Twelve hours of electives may include some Internship or Program Thesis hours. Electives can include other higher education/student affairs courses.</td>
<td></td>
</tr>
</tbody>
</table>

Total Credits 30
Internship
Students with no professional experience working in an adult education program must provide evidence of having gained such experience prior to completing the program or they must register for a three-credit adult education internship (EDLD 598).

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 postsecondary settings such as registrar, institutional research & assessment, library, marketing, and entry level programing and administration. (30+ credits).

Program of Study
Higher Education Core - 12 credit hours 12
EDLD 505 Hist & Phil of Amer Higher Ed
EDLD 510 Org & Adm of Higher Ed
EDLD 528 College Students
EDLD 537 Inst Resch & Assessment
or EDLD 511 Planning Program Assessment

Higher Education Specialized Courses - 12 credit hours from the following: 12
EDLD 509 Issues/Trends in High Ed
EDLD 512 Fin Adm in High Ed
EDLD 513 Resource & Prog Mgmt
EDLD 529 Postsecond Dist Delivered Educ
EDLD 530 College Teaching
EDLD 531 Theoretical Fndtns/Col Stdnts
EDLD 532 Law & Policy in High Ed
EDLD 535 Student Services

Statistics and Research - 6 credits 6
EDCI 501 Educational Statistics I
EDCI 506 Applied Ed Rsch

Total Credits 30

Internship
Students with no professional experience working in college student affairs must provide evidence of having gained such experience prior to completing their plan or they must register for a three-credit student affairs internship (EDLD 598 Internship).

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 [Online Program](http://catalog.montana.edu/graduate/education-health-human-development/education/med-curriculum-leadership/professional-educator-option)
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
- Library Media Certificate Core

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 postsecondary settings such as residence life, career services, athletics, and student government. (30+ credits).
Technology Education (http://catalog.montana.edu/graduate/education-health-human-development/education/med-curriculum-leadership/technology-education-option)

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 (http://catalog.montana.edu/graduate/education-health-human-development/education/med-curriculum-leadership/educational-researcher-option)

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 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 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/cl/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
406-994-5799 Email: a (tena.versland@montana.edu) mn.ewbank@montana.edu (ann.ewbank@montana.edu)

Options

- Professional Educator Option (p. 307)
- Educational Researcher Option (p. 308)
- Technology Education Option (p. 309)

Application Process

Applicants are required to submit the following documentation during the online application process through The Graduate School (http://www.montana.edu/wwwdg/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, 215 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. **Three (3) Personal Essays** – Each essay should be a maximum of 2 pages in length, typed, double spaced, and must respond to the following:
   a. **Essay 1** - Describe your career goals for the future and how you see the completion of a Master’s degree in Curriculum & Instruction as helping you achieve your goals.
   b. **Essay 2** - 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.
   c. **Essay 3** - 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/wwwdg/pdf_files/fin_cert.pdf).

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

**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**

<table>
<thead>
<tr>
<th>Signature Content - 12 credits</th>
<th>12</th>
</tr>
</thead>
<tbody>
<tr>
<td>EDCI 504</td>
<td>Assessment and Evaluation in Education</td>
</tr>
<tr>
<td>EDCI 506</td>
<td>Applied Ed Rsch</td>
</tr>
<tr>
<td>EDCI 514</td>
<td>Mentoring New Teachers</td>
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<tr>
<td>EDCI 531</td>
<td>Contemp Issues in Ed</td>
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<tr>
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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>Amer Indian Studies for Ed</td>
</tr>
<tr>
<td>EDCI 551</td>
<td>Education Technology: Teaching, Learning, and Leadership</td>
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</table>

Electives relevant to licensure area and approved by graduate adviser

<table>
<thead>
<tr>
<th>Master's Capstone - 3 credits</th>
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<tbody>
<tr>
<td>EDCI 575</td>
<td>Professional Paper and Project</td>
</tr>
</tbody>
</table>

**Total Credits** 30
Program of Study for Secondary (6-12) Teachers

Signature Content - 12 credits
- EDCI 504 Assessment and Evaluation in Education
- EDCI 506 Applied Ed Rsch
- EDCI 514 Mentoring New Teachers
- EDCI 531 Contemp Issues in Ed

Core Content - 15 credits; choose from the following
- EDCI 507 Qualitative Educational Rsch
- EDCI 508 Adv Educational Psychology
- EDCI 532 General School Curriculum
- EDCI 540 Amer Indian Studies for Ed

Electives relevant to licensure area and approved by graduate adviser

Master's Capstone - 3 credits
- EDCI 575 Professional Paper and Project

Total Credits 30

Program of Study for K-12 Music Teachers

Signature Content - 12 credits
- EDCI 504 Assessment and Evaluation in Education
- EDCI 506 Applied Ed Rsch
- EDCI 514 Mentoring New Teachers
- EDCI 531 Contemp Issues in Ed

Core Content - 9 credits
- MUSI 504 Studies in Hist and Analysis
- MUSE 530 Music, Society, Education
- MUSE 532 Music Ed: Res and Practice

Music Education Electives - 6 credits; choose from the following
- MUSI 540 Advanced Conducting
- MUSE 542 Graduate Vocal Pedagogy
- MUST 544 Comp App Mus Ed
- MUSE 545 General Music Practicum
- MUSI 595 Applied Music
- upper division ensembles

Master's Capstone - 3 credits
- EDCI 575 Professional Paper and Project

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
- EDCI 522 Info Resources & Services
- EDCI 549 Organization of Information in School Library Media Centers
- EDCI 546 Schl Library Media Specialist
- EDCI 547 Info Inquiry & Ed Change
- EDCI 548 Mgmt of Information/Resources
- EDCI 549 Applications of Literature for Children and Young Adults

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.

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
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.

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 outcome of the examination. The Chair will lead the Committee to a
determination regarding the passing or failing of both the Written and Oral
components of the Comprehensive Examination.

Comprehensive Examinations are 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 Comprehensive
Examination 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 Comprehensive Examination is considered to be
a failed exam. A failed examination may be repeated once. At least two
months must elapse before the second examination takes place.

Failure to pass a second examination results in termination of graduate
study and dismissal from the academic program. Students who are
dismissed from the program due to a failed comprehensive examination 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

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<tr>
<th>Course Code</th>
<th>Title</th>
<th>Credits</th>
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<td>EDCI 514</td>
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<tr>
<td>EDCI 531</td>
<td>Contemp Issues in Ed</td>
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Signature Content - 15 credits choose from the following

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<th>Credits</th>
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<td>TE 501</td>
<td>History and Philosophy of Technology Ed</td>
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<tr>
<td>TE 530</td>
<td>3D Modeling &amp; Animation</td>
<td>3</td>
</tr>
<tr>
<td>TE 594</td>
<td>Seminar</td>
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<td>EDCI 532</td>
<td>General School Curriculum</td>
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</tr>
<tr>
<td>EDCI 555</td>
<td>Technology, Instructional Design, and Learner Success</td>
<td>3</td>
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<tr>
<td>EDCI 571</td>
<td>In-Service Education</td>
<td>3</td>
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<tr>
<td></td>
<td>Electives relevant to licensure area &amp; approved by graduate advisor</td>
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Master’s Capstone - 3 credits

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<tr>
<th>Course Code</th>
<th>Title</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>EDCI 575</td>
<td>Professional Paper and Project</td>
<td>3</td>
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</tbody>
</table>

Total Credits 30

Master of Education in Educational Leadership

Objectives

The Educational Leadership program at Montana State University 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. 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 an MEd granted upon graduation.

This program of study has been developed to prepare effective K-12
principals. Using a hybrid delivery model, it seeks to meet the needs of
students unable to routinely visit the Bozeman campus or those seeking the
convenience of online learning. Courses will be delivered using distance
educational methods during the school year and some instructors may
require students to attend a face to face instructional sessions. Other face
to face sessions will be held in conjunction with various administrator
association meetings once 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>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>EDLD 507</td>
<td>Fndtns of Educational Ldrshp</td>
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</tr>
<tr>
<td>EDLD 508</td>
<td>Supervision of Instruction</td>
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</tr>
<tr>
<td>EDLD 515</td>
<td>Planned Change</td>
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<tr>
<td>EDLD 520</td>
<td>Schools &amp; Diverse Communities</td>
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<tr>
<td>EDLD 526</td>
<td>Evaluating School Programs</td>
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<td>EDLD 532</td>
<td>School Law</td>
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<td>EDLD 534</td>
<td>Data Driven Decisions</td>
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<td>EDLD 555</td>
<td>School Finance</td>
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<tr>
<td>EDLD 565</td>
<td>K-12 Instructional Leadership</td>
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</tr>
<tr>
<td>EDLD 574</td>
<td>Field Exped in Ed Ldrshp (I &amp; II)</td>
<td>6</td>
</tr>
</tbody>
</table>

Total Credits 33
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 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.

The Master’s Capstone
Near the end of completing course work, MEd students will complete a written capstone paper. The specific format of this paper will be included in the Field Experience Handbook. Students may be required to meet with the committee to provide clarification of responses. The capstone experience may also include a weekend face to face meeting/retreat on the MSU campus.

Contact Information
Dr. Tena Versland
Program Leader
406-994-6799 Email: tena.versland@montana.edu

Dr. Bill Ruff
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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
*Prior to applying for an Educational Leadership program, applicants must hold a Class I teaching license, should have 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) (and pay a non-refundable $60 application fee). 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) 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.

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.

*Note - By submitting materials by the preferred deadline, accepted students will be eligible for early registration.

- Fall Semester: May 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: August 15th
- Spring Semester: January 2nd
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 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 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 program.

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 www.montana.edu/hhd or by calling 406 994-3242.
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

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<tr>
<th>Course</th>
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<th>Credits</th>
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<td>HDCO 502</td>
<td>Cnsl Ethic Prof Orient</td>
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<tr>
<td>HDCO 508</td>
<td>Counseling Theories I</td>
<td>3</td>
</tr>
<tr>
<td>HDCO 558</td>
<td>Career Counseling</td>
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### Fall

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<tr>
<td>HDCO 503</td>
<td>Prof Issues in Counseling</td>
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<tr>
<td>HDCO 510</td>
<td>Counseling Theories II</td>
<td>3</td>
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<td>HDCO 521</td>
<td>Counseling Skills Lab</td>
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<td>HDCO 522</td>
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### Spring

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<td>HDCO 523</td>
<td>Theory and Practice of Addiction</td>
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<td>HDCO 525</td>
<td>Counsel Child &amp; Adolescents</td>
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<td>HDCO 550</td>
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<td>HDCO 564</td>
<td>Diagnosis and Mental Health</td>
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<td>HDCO 571</td>
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### Summer

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<td>HDCO 551</td>
<td>Appraisal</td>
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<td>HDCO 598</td>
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### Fall

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<tr>
<td>HDCO 563</td>
<td>Multicultural Awareness</td>
<td>3</td>
</tr>
<tr>
<td>HDCO 565</td>
<td>Marital &amp; Relationship Counsel</td>
<td>3</td>
</tr>
<tr>
<td>HDCO 598</td>
<td>Internship</td>
<td>2</td>
</tr>
</tbody>
</table>

### Spring

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>HDCO 569</td>
<td>Advanced Family Counseling</td>
<td>3</td>
</tr>
<tr>
<td>HDCO 598</td>
<td>Internship</td>
<td>2</td>
</tr>
</tbody>
</table>

### Electives

<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>EDCI 502</td>
<td>Educational Statistics II</td>
<td>3</td>
</tr>
</tbody>
</table>

Total Credits: 60

---

### 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

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>HDCO 502</td>
<td>Cnsl Ethic Prof Orient</td>
<td>2</td>
</tr>
<tr>
<td>HDCO 508</td>
<td>Counseling Theories I</td>
<td>3</td>
</tr>
<tr>
<td>HDCO 558</td>
<td>Career Counseling</td>
<td>2</td>
</tr>
</tbody>
</table>

### Fall

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>HDCO 503</td>
<td>Prof Issues in Counseling</td>
<td>3</td>
</tr>
<tr>
<td>HDCO 510</td>
<td>Counseling Theories II</td>
<td>3</td>
</tr>
<tr>
<td>HDCO 521</td>
<td>Counseling Skills Lab</td>
<td>1</td>
</tr>
<tr>
<td>HDCO 522</td>
<td>Group Counseling</td>
<td>3</td>
</tr>
</tbody>
</table>

### Spring

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>HDCO 530</td>
<td>Mind-Body Well-Being Self-Care</td>
<td>3</td>
</tr>
<tr>
<td>HDCO 564</td>
<td>Diagnosis and Mental Health</td>
<td>3</td>
</tr>
<tr>
<td>HDCO 550</td>
<td>Counseling Research and Eval</td>
<td>2</td>
</tr>
<tr>
<td>HDCO 568</td>
<td>Mental Health Methods</td>
<td>3</td>
</tr>
<tr>
<td>HDCO 571</td>
<td>Prof Counsel Practicum</td>
<td>3</td>
</tr>
</tbody>
</table>

### Summer

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>HDCO 524</td>
<td>Consultation and Crisis: Theory and Practice</td>
<td>3</td>
</tr>
<tr>
<td>HDCO 551</td>
<td>Appraisal</td>
<td>3</td>
</tr>
<tr>
<td>HDCO 598</td>
<td>Internship</td>
<td>2</td>
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</table>

### Fall

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>HDCO 554</td>
<td>Develop Theory Across Lifespan</td>
<td>3</td>
</tr>
<tr>
<td>HDCO 563</td>
<td>Multicultural Awareness</td>
<td>3</td>
</tr>
<tr>
<td>HDCO 598</td>
<td>Internship</td>
<td>2</td>
</tr>
</tbody>
</table>

### Spring

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>HDCO 523</td>
<td>Theory and Practice of Addiction</td>
<td>2</td>
</tr>
<tr>
<td>HDCO 598</td>
<td>Internship</td>
<td>2</td>
</tr>
</tbody>
</table>

Total Credits: 60
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 CACREP. In addition, students in the School Counseling option also study aspects of counseling germane to the school setting. The program focuses on a comprehensive and developmental approach to designing and implementing a school counseling program, 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.

Partial List of Electives

<table>
<thead>
<tr>
<th>Partial List of Electives</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHTH 435 Human Response To Stress</td>
<td>3</td>
</tr>
<tr>
<td>HDCO 525 Counsel Child &amp; Adolescents</td>
<td>3</td>
</tr>
<tr>
<td>HDCO 526 Adventure Counseling</td>
<td>3</td>
</tr>
<tr>
<td>HDCO 556 Sexuality Counseling</td>
<td>3</td>
</tr>
<tr>
<td>HDCO 565 Marital &amp; Relationship Counseling</td>
<td>3</td>
</tr>
<tr>
<td>HDCO 569 Advanced Family Counseling</td>
<td>3</td>
</tr>
<tr>
<td>HDCO 575 Prof Paper/Project</td>
<td>1-4</td>
</tr>
</tbody>
</table>

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.

Ideally, entering graduate students will have a bachelor’s degree in health enhancement or physical education, athletic training, and or appropriate practical experience for the sport and coaching sciences program. 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. 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 3
- STAT 401 Applied Methods in Statistics 3
- or EDCCI 501 Educational Statistics I 3

### Spring
Family & Consumer Sciences

Family and Consumer Sciences Option

This master’s option offers an area of study in early childhood education/child development and family science. Students must successfully complete a 36-credit minimum course of study. The department is not accepting applications to the Family and Consumer Sciences program at this time. Please see the Family and Community Health option under Food, Family and Community Health.

Family Financial Planning

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 www.montana.edu/hhd. Depending on the students’ goals, undergraduate degree, and course work, additional courses may be added or deleted to supplement the curriculum.

### Family and Community Health Program

**Year 1**

<table>
<thead>
<tr>
<th>Fall</th>
<th>Credits</th>
<th>Spring</th>
</tr>
</thead>
<tbody>
<tr>
<td>EDCI 501 - Educational Statistics I</td>
<td>3</td>
<td>EDCI 502 - Educational Statistics II</td>
</tr>
<tr>
<td>HHD 501 - Prof Comm Skills in HHD</td>
<td>3</td>
<td>EDCI 507 - Qualitative Educational Rsch</td>
</tr>
<tr>
<td>HTH 455 - The Ethic of Care</td>
<td>3</td>
<td>FCS 464 - Gndr, Rce, Clss, and Fam Diver</td>
</tr>
<tr>
<td>or KIN 440R - Sport Psychology</td>
<td></td>
<td>FCS 465R - Family Law &amp; Public Policy</td>
</tr>
<tr>
<td>HEE 506 - Exercise and Chronic Disease</td>
<td>3</td>
<td>HEE 506 - Exercise and Chronic Disease</td>
</tr>
<tr>
<td>HHD 512 - Research Methods in HHD</td>
<td>3</td>
<td>HHTH 455 - The Ethic of Care</td>
</tr>
<tr>
<td>Electives</td>
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<td>NASX 524 - Contemp Iss in Am Indian Std</td>
</tr>
<tr>
<td>Year Total:</td>
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<td>NASX 530 - Federal Law and Indian Policy</td>
</tr>
<tr>
<td></td>
<td></td>
<td>PSCI 436 - Politics of Food &amp; Hunger</td>
</tr>
<tr>
<td></td>
<td></td>
<td>PSCI 559 - Program Evaluation and Policy Analysis</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Total Program Credits:</td>
</tr>
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</table>

**Electives (other electives can be approved by the advisor)**

- BMGT 469 - Community Entrepreneurship & Nonprofit Management
- EDCI 501 - Educational Statistics I
- HHD 501 - Prof Comm Skills in HHD
- Elective
- CHTH 503 - Community-Based Participatory Research
- HDCO 554 - Develop Theory Across Lifespan
- HHD 512 - Research Methods in HHD

**Year 2**

<table>
<thead>
<tr>
<th>Fall</th>
<th>Credits</th>
<th>Spring</th>
</tr>
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<tbody>
<tr>
<td>CHTH 575 - Professional Paper and Project or CHTH 590 - Master’s Thesis</td>
<td>3-6</td>
<td>CHTH 575 - Professional Paper and Project or CHTH 590 - Master’s Thesis</td>
</tr>
<tr>
<td>Electives tailored to program</td>
<td>3-6</td>
<td>Electives tailored to program</td>
</tr>
<tr>
<td>Year Total:</td>
<td>6-12</td>
<td>6-9</td>
</tr>
<tr>
<td>Course</td>
<td>Title</td>
<td>Credits</td>
</tr>
<tr>
<td>-----------</td>
<td>----------------------------------------------------------------------</td>
<td>---------</td>
</tr>
<tr>
<td>SFBS 429</td>
<td>Small Business and Entrepreneurship in Food and Health</td>
<td>3</td>
</tr>
<tr>
<td>SFBS 551</td>
<td>Global Food Perspectives</td>
<td>3</td>
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</tbody>
</table>

**Sustainable Food Systems Program**

**Fall**
- HHD 501 Prof Comm Skills in HHD 3
- STAT 401 Applied Methods in Statistics 3
- or EDCI 501 Educational Statistics I
- 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

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>SFBS 541</td>
<td>Culinary Marketing: Farm to Table</td>
<td>3</td>
</tr>
<tr>
<td>or SFBS 598</td>
<td>Internship</td>
<td>3</td>
</tr>
<tr>
<td>SFBS 551</td>
<td>Global Food Perspectives</td>
<td>3</td>
</tr>
</tbody>
</table>
- Electives tailored to program 0-3

**Electives (other electives can be approved by the advisor)**

- AGSC 428 Sustainable Cropping Systems 3
- AGSC 465R Health, Agriculture, Poverty 4
- AGED 482 Non-Formal Teaching Methods in Agriculture 3
- BMGT 410 Sustainable Business Practices 3
- BMGT 469 Community Entrepreneurship & Nonprofit Management 3
- CHTH 428 Health Disparities 3
- CHTH 502 Theories and Models in Health 3
- CHTH 503 Community-Based Participatory Research 3
- HDCO 563 Multicultural Awareness 3
- HSTA 409 Food in America 3
- HTH 455 The Ethic of Care 3
- LRRE 528 Sust Crop Systems 1
- NASX 415 Native Food Systems 3
- PSCI 406 The Political Economy of Energy 3
- PSCI 436 Politics of Food & Hunger 3
- SFBS 429 Small Business and Entrepreneurship in Food and Health 3

**College of Engineering**

**Graduate Programs Available**

**Department of Chemical and Biological Engineering (p. 316)**
- M.S. in Chemical Engineering (p. 316)
- M.S. in Environmental Engineering (p. 317)
- Master of Engineering In Chemical Engineering (p. 319)
- Master of Engineering in Bioengineering (p. 320)
- Ph.D. in Engineering (p. 320)
- Ph.D. in Materials and Science (p. 376)

**Department of Civil Engineering (p. 324)**
- M.S. in Civil Engineering (p. 325)
- M.S. in Environmental Engineering (p. 318)
- Professional Master of Construction Engineering Management (PMSEM) (p. 374)
- Ph.D. in Ecology and Environmental Sciences (Interdisciplinary) (p. 278)
- Ph.D. in Engineering (p. 320)

**Department of Computer Science (p. 325)**
- M.S. in Computer Science (p. 326)
- Ph.D. in Computer Science (p. 326)

**Department of Electrical and Computer Engineering (p. 326)**
- M.Eng in Electrical Engineering (p. 327)
- M.S. in Electrical Engineering, Plan A (thesis) (p. 327)
- M.S. in Electrical Engineering, Plan B (professional paper) (p. 328)
- M.S. in Optics, Plan A (thesis) (p. 328)
- M.S. in Optics, Plan B (professional paper) (p. 328)
- Ph.D. in Engineering, Electrical & Computer Engineering option (p. 329)
- Ph.D. in Materials Science (p. 376)

**Department of Mechanical and Industrial Engineering (p. 330)**
- M.S. in Industrial and Management Engineering (p. 330)
- M.S. in Mechanical Engineering (p. 331)
- M.Eng. in Mechanical Engineering (p. 331)
- Ph.D. in Engineering -- Industrial Engineering and Mechanical Engineering options (p. 320)
- Ph.D. in Materials Science (p. 376)

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.
212 Roberts Hall
406-994-2272 Email:bgunnink@ce.montana.edu

**Associate Dean for Research**
Anne K. Camper, Ph.D.
212 Roberts Hall
406-994-2272 Email: anne_c@erc.montana.edu

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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 (p. 316)
• M.S. in Environmental Engineering (p. 317)
• Master of Engineering In Chemical Engineering (p. 319)
• Master of Engineering in Bioengineering (p. 320)
• Ph.D. in Engineering (p. 320)
• Ph.D. in Materials Science (p. 376)

Program Requirements (M.S. and Ph.D.)

The Master of Science program requires 30 credits total (including a minimum of 10 credits of ECHM 590 Master’s Thesis). One half of total credits required for the degree must be at the 500 level. The chemical engineering program for students from other disciplines requires appropriate background remedial coursework in addition to the previously listed requirements.

The Ph.D. program requires specific coursework, depending on the option, 60 total credits (18 thesis credits).

Doctoral candidates will register for dissertation research in one of the five departments offering the above options. Course requirements for the Engineering Ph.D. include completion of 2 credits of ENGR 610 Rsch & Mthds in Engineering, two courses in Mathematical systems, a minimum of eighteen (18) credits of doctoral dissertation, and other courses chosen to support the proposed doctoral program that are approved by the candidate’s committee. All doctoral candidates will be required to pass three examinations: a Ph.D. Qualifying Examination taken during the first year of the student’s doctoral program, a Ph.D. Comprehensive Examination taken within two years of qualifying for the doctoral program, and a Ph.D. Dissertation Defense. Students are expected to be familiar with the individual program degree requirements as well as those of The Graduate School.

M.S. in Chemical Engineering

Degree Options

• M.S. in Chemical Engineering - Thesis Option (Plan A) (p. 317)
• M.S. in Chemical Engineering - Thesis Option (Plan B) (p. 317)
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:

- ECHM 594 Seminar (can be taken twice) 1
- ECHM 503 Thermodynamics 3
- ECHM 533 Transport Phenomena 3
- ECHM 575 Research or Prof Paper/Project 1-4

Plus, a course in each of the following areas:

<table>
<thead>
<tr>
<th>Reaction Engineering</th>
<th>Advanced Mathematics</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECHM 510 Reaction Engineering/Modeling (Sp alt. Years) 3</td>
<td>EGEN 505 Advanced Engineering Analysis 3</td>
</tr>
<tr>
<td>or EBIO 566 Fundamentals of Biofilm Engr</td>
<td>or EGEN 506 Numerical Sol to Engr Problems</td>
</tr>
</tbody>
</table>

Examinations

For Non-Thesis Option (Plan B) Students:

- Defense of professional paper
- Comprehensive examination

Environmental Engineering

Contact

Civil Engineering Department (http://www.coe.montana.edu/ce)
Email: cedept@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 Assistants sections for more information.

Degree Options
• M.S. in Environmental Engineering - Thesis Option (Plan A) (p. 319)
• M.S. in Environmental Engineering - Non-Thesis Option (Plan B) (p. 318)

M.S in Environmental Engineering

Degree Options
• M.S. in Environmental Engineering - Thesis Option (Plan A) (p. 319)
• M.S. in Environmental Engineering - Non-Thesis Option (Plan B) (p. 318)

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.

<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 Envir 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>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:

Course 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>ECHM 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>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>EENV 534</td>
<td>Environ Eng Investigation</td>
<td>2</td>
</tr>
<tr>
<td>ECHM 594</td>
<td>Seminar (Required)</td>
<td>1</td>
</tr>
<tr>
<td>ECHM 533</td>
<td>Transport Phenomena</td>
<td>3</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 Department, 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 (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.

**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 or ECHM 510</td>
<td>2</td>
</tr>
<tr>
<td>or ECHM 510</td>
<td>Reaction Engineering/Modeling</td>
<td></td>
</tr>
<tr>
<td>or EBI 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</td>
<td>1-10</td>
</tr>
</tbody>
</table>

**Additional Recommended Courses**

- ECV 529 Groundwater Contamination 3
- ECV 594 Seminar (Required) 1
- EBI 566 Fundamentals of Biofilm Engr 3
- ECHM 503 Thermodynamics 3
- ECHM 533 Transport Phenomena 3
- EENV 594 Groundwater Contamination 3
- EENV 590 Master’s Thesis (Required) 10
- EENV 591 Special Topics 1-3
- EENV 592 Independent Study 1-3
- EENV 598 Internship 2

**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
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:

- ECHM 594 Seminar (can be taken twice) 1
- ECHM 553 Transport Phenomena 3

Plus, a course in each of the following areas:

Reaction Engineering
- EBI0 566 Fundamentals of Biofilm Engr 3
- or ECHM 510 Reaction Engineering/Modeling

Advanced Mathematics
- EGEN 505 Advanced Engineering Analysis 3
- or EGEN 506 Numerical Sol to Engr Problems

Course in Environmental Engineering Processes
- EENV 562 Water Treatment Process/Design 3
- or EENV 563 Wastewater Treat Proc/Design

Engineering Ph.D.

Dean
Brett Gunnink

Associate Dean for Faculty & Administration
Anne K. Camper

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: geotechnics, 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, biochemistry, colloidal system 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 advance 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.

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 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.

Degrees Offered

- Ph.D. in Computer Science (p. 326)
- Ph.D. in Engineering with options in:
  - Applied Mechanics
  - Civil Engineering
  - Chemical Engineering
  - Electrical & Computer Engineering (p. 329)
  - 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 & Mthds 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</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENGR 610</td>
<td>3</td>
</tr>
<tr>
<td>ENGR 694</td>
<td>2</td>
</tr>
<tr>
<td>Advanced Mathematics - see declared option coursework *</td>
<td>3</td>
</tr>
<tr>
<td>Numerical Methods - see declared option coursework *</td>
<td>3</td>
</tr>
<tr>
<td>Other Graded Courses - see declared option coursework</td>
<td>24</td>
</tr>
<tr>
<td>Dissertation</td>
<td>18</td>
</tr>
<tr>
<td>Additional Dissertation or Course credits</td>
<td>7</td>
</tr>
</tbody>
</table>

* Course content must be above and beyond that typically required for an undergraduate degree in the student’s Ph.D. option area.
** 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.

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
Examination Requirements

General information about forms required for completion of examinations can be found on The Graduate School’s website (http://www.montana.edu/gradschool/cat_for_doc_stud.html).

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.

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 exam will be administered during an 8-hour period of mutual agreement between the adviser, student and PhD option coordinator. The student will be given a packet of up to 10 questions on undergraduate Civil Engineering topics appropriate to the sub-discipline of the proposed research and related topics. Each problem will be designed to be solved in about an hour, and the student must submit 6 solutions. Problem solutions 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 completion of 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).

**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 (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:

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>EM 510</td>
<td>Elastic &amp; Inelastic Analysis I</td>
<td>3</td>
</tr>
<tr>
<td>EM 525</td>
<td>Continuum Mechanics</td>
<td>3</td>
</tr>
<tr>
<td>EMEC 530</td>
<td>Advanced Fluid Mechanics I</td>
<td>3</td>
</tr>
<tr>
<td>EM 560</td>
<td>Finite Elem Analys in Engr</td>
<td>3</td>
</tr>
</tbody>
</table>

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 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 (gpg) 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:

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<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>

Requirements include:

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>EM 525</td>
<td>Continuum Mechanics</td>
<td>3</td>
</tr>
<tr>
<td>Thermo-fluids Mechanics</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>Solid Mechanics</td>
<td></td>
<td>3</td>
</tr>
</tbody>
</table>

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.

**Industrial Engineering**

Ph.D. candidates under the IE Option must take a minimum of 30 credits of 400 level courses that includes the following coursework with a grade of B or better:

- The advanced mathematics and numerical methods classes are specified:
  - EGEN 505, EIND 555, or EIND 557 Advanced Mathematics 3
  - EIND 509 Numerical Methods 3

Students must take at least 6 credits from each of the three emphasis areas:

- Human Factors (e.g., EIND 510, EIND 511, EIND 513, EIND 514)
- Systems Modeling (e.g., EIND 509, EIND 557)
- Service Engineering (e.g., EIND 506, EIND 525, EIND 574)

The remaining credits to be established by the student and the major professor in consultation with the student’s graduate committee.

**Qualifying Examination:** The exam will be administered on the second Tuesday in February of the Spring semester. The undergraduate Industrial Engineering topics will include: work design and analysis (e.g. EIND 313), engineering economic analysis (e.g. EGEN 325), probability and statistics (e.g. EIND 354), principles of operations research (e.g. EIND 364). The exam will be 5 hours duration in an open book, open notes format. Each problem set will be graded by the faculty member who most recently taught the course. The results will be analyzed by the Industrial Engineering Ph.D. Option Coordinator, 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.

- EENV 441 Natural Treatment Systems 3
- EENV 443 Air Pollution Control 3
- EENV 445 Hazardous Waste Treatment 3
- EENV 447 Hazardous Waste Management 3
- EENV 534 Environ Eng Investigation 3
- EENV 561 Environ Eng Reactor Theory 2
- EENV 562 Water Treatment Process/Design 3
- EENV 565 Wastewater Treat Proc/Design 3
- ECIV 529 Groundwater Contamination 3
- EENV 565 Chem Sens/Instr Envir Biotech 2
- EBio 566 Fundamentals of Biofilm 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 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 PhD 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 choses to answer will be graded by the Faculty member that 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 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.

**Department of Civil Engineering**

Po Box 173900
Bozeman, MT 59717-3900
406-994-2111 Email: cedept@ce.montana.edu

Home Page: www.coe.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 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. 374) (PMSEM) 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.

**Admission**

A bachelor’s degree in a similar engineering field is normally required for admission to the graduate programs in the department, although graduates in the physical and life sciences may be accepted. In certain cases, students may be required to make up subject area deficiencies before being admitted to the graduate program.

For more detailed information, interested students are referred to the Admission Policies and Application Requirements sections of the departmental website. Successful applicants are accepted into both the department and The Graduate School.

**Interdisciplinary M.S. Degree in Land Rehabilitation**

The Department of Civil Engineering participates in the interdisciplinary M.S. degree in Land Rehabilitation. This program offers advanced study in disturbed land rehabilitation, site revegetation, soil remediation, riparian zone restoration, stream channel restoration, investigation of impacted geologic resources, and remediation of contaminated sites. Students wishing to obtain an M.S. in Land Rehabilitation through the Department of Civil Engineering are referred to the Interdisciplinary M.S. Degree in Land Rehabilitation description in the College of Agriculture section.

**Research Facilities**

The research facilities of the department include well-equipped laboratories for bituminous materials, concrete, hydraulics and irrigation, fluid mechanics, structures, stress analysis, computer analysis, photogrammetry, geotechnical engineering, and environmental engineering. Civil Engineering students also frequently utilize the research facilities of the Center for Biofilm Engineering (CBE), the Western Transportation Institute (WTI) and the Subzero Science and Engineering Laboratory (SSEL).

**Financial Assistance**

Teaching and research assistantships are available in the department. Teaching assistantships involve assisting professors with the conduct of classes including preparation and grading. Research assistantships provide the opportunity for work on a research project under the direction of a faculty member. Results of the research done on an assistantship may form the basis for the graduate student’s professional paper, thesis or dissertation.

For more information on appointment criteria for assistantships, see the Graduate Assistantships sections of the departmental website.

**Graduate Programs**

- M.S. in Civil Engineering (p. 325)
- M.S. in Environmental Engineering (p. 317)
- M.S. in Land Rehabilitation (p. 277)
- Professional Master of Science and Engineering Management (p. 374) (PMSEM)
- Ph.D. in Engineering (p. 320) (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/Proj (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.

**Department of Computer Science**

357 EPS Building
Bozeman, MT 59717
406-994-4780
www.cs.montana.edu

csinfo@cs.montana.edu

**Department Head**

John Paxton (http://www.cs.montana.edu/faculty/john-paxton.html)

**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
Required courses include:

must present and defend their thesis in a public departmental seminar. near the completion of their graduate program. Thesis Master's candidates refer to www.cs.montana.edu/current-students-masters-program.html.

beyond the Bachelor's degree. Students may pursue the Master's degree 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/current-students-phd.html.

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. 326)
- Ph.D. in Computer Science (p. 326)

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.

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/current-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.

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:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</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>
</tbody>
</table>

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/current-students-phd.html.

Required courses include:

<table>
<thead>
<tr>
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<th>Credits</th>
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</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>Doctoral Thesis (CSCI 690)</td>
<td>18</td>
<td></td>
</tr>
</tbody>
</table>

And four courses from the following:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<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>
<tr>
<td>CSCI 575</td>
<td>Computational Research Topics</td>
<td>3</td>
</tr>
</tbody>
</table>

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
Website: 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. 327)
- M.S. in Electrical Engineering Plan A (thesis) (p. 327)
- M.S. in Electrical Engineering Plan B (professional paper) (p. 328)
- M.S. in Optics Plan A (thesis) (p. 328)
- M.S. in Optics Plan B (professional paper) (p. 328)
- Ph.D. in Engineering, Electrical & Computer Engineering option (p. 329)
- Ph.D. in Materials Science (p. 376)

Additional information is available in the Electrical & Computer Engineering Department’s Graduate Student Handbook (http://www.coe.montana.edu/ee/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

500-600 Level Courses (18 or more credits) 18
Other Graduate Courses (400 Level or above, 12 or fewer credits) 12
Total Credits 30

**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)
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

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>EELE 575</td>
<td>3</td>
</tr>
<tr>
<td>500-600 Level Courses (17 or more credits)</td>
<td>17</td>
</tr>
<tr>
<td>Other Graduate Courses (400 level or above, 10 or fewer credits)</td>
<td>10</td>
</tr>
<tr>
<td><strong>Total Credits</strong></td>
<td><strong>30</strong></td>
</tr>
</tbody>
</table>

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): 6

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHSX 427</td>
<td>Advanced Optics</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>EELE 590</td>
<td>Masters’ Thesis</td>
</tr>
<tr>
<td>500-600 Level Courses (10 or more credits)</td>
<td>10</td>
</tr>
<tr>
<td>Other Graduate Courses (400 level or above, 10 or fewer credits)</td>
<td>10</td>
</tr>
<tr>
<td><strong>Total Credits</strong></td>
<td><strong>30</strong></td>
</tr>
</tbody>
</table>

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 PHSX and one EELE):  

<table>
<thead>
<tr>
<th>Code</th>
<th>Course</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHSX 427</td>
<td>Advanced Optics</td>
</tr>
<tr>
<td>PHSX 437</td>
<td>Laser Applications</td>
</tr>
<tr>
<td>EEE 482</td>
<td>Electro-Optical Systems</td>
</tr>
<tr>
<td>EEE 484</td>
<td>Laser Engineering</td>
</tr>
</tbody>
</table>

Choose one specialty course:  

<table>
<thead>
<tr>
<th>Code</th>
<th>Course</th>
</tr>
</thead>
<tbody>
<tr>
<td>EEE 581</td>
<td>Fourier Optics/Imaging Theory</td>
</tr>
<tr>
<td>EEE 582</td>
<td>Optical Design</td>
</tr>
<tr>
<td>PHSX 531</td>
<td>Nonlinear Optics/Laser Spectroscopy</td>
</tr>
<tr>
<td>CHMY 527</td>
<td>Analytic Optical Spectroscopy</td>
</tr>
<tr>
<td>CHMY 560</td>
<td>Symmetry, Orbitals, and Spectroscopy</td>
</tr>
</tbody>
</table>

Optics electives (choose at least 6 credits):  

Choose one specialty course:  

<table>
<thead>
<tr>
<th>Code</th>
<th>Course</th>
</tr>
</thead>
<tbody>
<tr>
<td>EEE 581</td>
<td>Fourier Optics/Imaging Theory</td>
</tr>
<tr>
<td>EEE 582</td>
<td>Optical Design</td>
</tr>
<tr>
<td>PHSX 531</td>
<td>Nonlinear Optics/Laser Spectroscopy</td>
</tr>
</tbody>
</table>

Technical electives (choose at least 12 credits):  

<table>
<thead>
<tr>
<th>Code</th>
<th>Course</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECE, Physics, Math, Chemistry, Business, etc.</td>
<td>(400-level or above)</td>
</tr>
</tbody>
</table>

Professional Paper (OPTI 575)  

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 the 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:
  - 24 credits of graded coursework
  - 7 credits of either additional graded coursework or additional dissertation work (EELE 690)

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
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/cat_grad_assist.html) sections for detailed information on appointment criteria.

Graduate Programs
- M.S. in Industrial and Management Engineering (p. 330)
- M.S. in Mechanical Engineering (p. 331)
- M.Eng. in Mechanical Engineering (p. 331)
- Ph.D. in Engineering -- Industrial Engineering and Mechanical Engineering options (p. 320)
- Ph.D. in Materials Science (p. 376)

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.

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:

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**Department of Mechanical and Industrial Engineering**

**Contact Information**

**Department Head**
Daniel A. Miller, Ph.D.
220 Roberts Hall; (406) 994-2203
dan.miller@me.montana.edu

**Graduate Program Coordinator**
Maria Velazquez
322 Roberts Hall; (406) 994-7193
maria.velazquez@ie.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/pdf_files/Masters%20Steps.pdf) 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/pdf_files/Doctoral%20Steps.pdf) and Ph.D. in Engineering sections for additional information.
I&ME 500-level courses** 12 (min.)
I&ME 400-level (or 400 level non-I&ME courses)* 9 (max.)
EIND 590 Master’s Thesis 10

If you earned a Non-Industrial Engineering undergraduate degree, then you take the following:
I&ME 500-level courses** 12 (min.)
I&ME 400-level courses* 9 (max.)
EIND 590 Master’s Thesis 10

** EIND 575 may not be used to satisfy degree requirements.
*** In fulfilling the 500 level requirements, students may elect to complete a maximum of six credits of EIND 575.

Plan B - Non-Thesis Option
If you earned a Non-Industrial Engineering undergraduate degree, then you take the following:
I&ME 500-level courses*** 21 (min.)
I&ME 400-level courses* 12 (max.)

A maximum of three credits of EIND 592 may be applied to satisfy 400 level requirement.

Materials 3
Thermos/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.

Link to M.Eng. home page for More Information (http://www.coe.montana.edu/m_eng.html#ME).

Research Requirements
For a M.S. in Mechanical Engineering, research is required in Plan A only.

Plan A - Thesis Option (MSME)
21 formal, graded course credits: 12 required, 9 elective; 1 seminar; 10 thesis = 32 credits minimum

Required Courses
EGEN 505 Advanced Engineering Analysis 3
EGEN 506 Numerical Sol to Engr Problems 3
EM 525 Continuum Mechanics 3
3 Graduate course credits outside the student’s emphasis 3
EMEC 594 Seminar 1
EMEC 590 Master’s Thesis (Minimum of 10 total credits required; take 1-10 per term.) 10

Elective Courses (Maximum of 3 cr. EMEC 592) 9

Plan B - Non-Thesis Option
The Plan B option substitutes a professional paper (3-4 credits) and additional coursework in lieu of the 10 thesis credits.

Master of Engineering in Mechanical Engineering (M.Eng. ME)
In addition to the required courses for the MSME, the Master of Engineering requires additional coursework in lieu of the 10 thesis credits. A minimum of 3 course credits in each of the following categories is required:

Materials 3
Thermos/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.

Link to M.Eng. home page for More Information (http://www.coe.montana.edu/m_eng.html#ME).

College of Letters and Science
Graduate Programs offered in the College of Letters and Science
American Studies Program (p. 332)
- M.A. in American Studies (p. 333)
- Ph.D. in American Studies (p. 333)

Department of Agricultural Economics and Economics (p. 268)
- M.S. in Applied Economics (p. 269)

Department of Cell Biology and Neuroscience (p. 333)
- M.S. in Biological Sciences (p. 334)
- M.S. in Neuroscience (p. 334)
- Ph.D. in Biological Sciences (p. 334)
- Ph.D. in Neuroscience (p. 334)

Department of Chemistry and Biochemistry (p. 334)
- M.S. in Chemistry (p. 337)
- M.S. in Biochemistry (p. 336)
- Ph.D. in Chemistry (p. 337)
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
- Acceptable Graduate Record Exam scores
- 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 online from The Graduate School (http://www.montana.edu/wwdg/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. 333)
- M.A. in American Studies (p. 333)

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 coursework 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 coursework will be selected from 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 Cell Biology and Neuroscience

Department Head
Frances Lefcort, Ph.D.

Graduate Coordinator
Charles Gray, Ph.D.

Montana State University
510 Leon Johnson Hall, Bozeman, MT 59717
406-994-5120 Email: cbn@cns.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/Graduate_Program.html.

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. Assistants will only be offered to formally admitted graduate students. Fellowships are available through MB program.

Degrees Offered

- Master of Science in Biological Sciences (p. 334)
- Master of Science in Neuroscience (p. 334)
- Doctor of Philosophy in Biological Sciences (p. 334)
- Doctor of Philosophy in Neuroscience (p. 334)

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 advisory 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. Ph.D. students will gain research experience through their doctoral work, journal or conference submissions, and attending conferences.

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.

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

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.

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) /Master’s Thesis (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.

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
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<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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<th>Course</th>
<th>Title</th>
<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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<th>Course</th>
<th>Title</th>
<th>Credits</th>
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</thead>
<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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Physical/Analytical

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<tr>
<th>Course</th>
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<th>Credits</th>
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</thead>
<tbody>
<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>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 microscope 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. For more information, please visit http://ccb.montana.edu/.

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.mbpromontana.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. 337)
- M.S. in Biochemistry (p. 336)
- Ph.D. in Chemistry (p. 337)
- Ph.D. in Biochemistry (p. 337)

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/

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, palaeoecology, biogeography, palaeoclimatology, 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, clastic 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 include 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 Paleocology 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 Lageson, a stratigraphic and basin analysis laboratory under the direction of Michael Gardner, a snow and avalanche laboratory under the direction of Jordy Hendriks, 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, pC ARC/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. 338)
- M.S. in Land Rehabilitation (p. 277) (Interdisciplinary degree)
- Ph.D. in Earth Sciences (p. 338)

**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 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 geochronology, 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 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: 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.

**Department of Ecology**

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The department offers advanced work leading to Master of Science degrees in biological sciences. 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 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.
- International students: a minimum TOEFL score of 550, 230 on the CBT, 7.0 on the IELTS test, or 80 on the iBT is required for admission.

All qualified students must secure an agreement from a faculty member who is willing to serve as major professor, or graduate academic adviser 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 that will allow the program to be completed. We highly recommend that you apply only after a faculty member indicates that he or she is willing to serve as your graduate adviser.

**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**

A Graduate Teaching Assistant appointment (GTA) is assigned in the semester before the next academic semester and reflect teaching needs and financial assistance needs. GTA’s 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 appointment (GRA’s) is a research 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 GRA’s depending upon funding sources.

**Degree Offered**

- M.S. in Biological Sciences (p. 339)
- M.S. in Fish and Wildlife Management (p. 340)
- Ph.D. in Fish and Wildlife Biology (p. 341)
- Ph.D. in Biological Sciences (p. 340)
- Ph.D. in Ecology and Environmental Sciences (p. 340) (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

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>BIOE 554</td>
<td>Foundations of Ecology &amp; Mgmt</td>
<td>1</td>
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<tr>
<td>BIOE 555</td>
<td>Communication in Ecol Sciences</td>
<td>1</td>
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</table>

Choose one

<table>
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<tr>
<th>Course Code</th>
<th>Course Title</th>
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<tbody>
<tr>
<td>BIOE 521</td>
<td>Conservation Biology</td>
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<tr>
<td>BIOE 548</td>
<td>Conservation Genetics</td>
</tr>
<tr>
<td>BIOE 532</td>
<td>Physiological Plant Ecol</td>
</tr>
<tr>
<td>WILD 501</td>
<td>Applied Population Ecology</td>
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Choose one

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<tr>
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<tbody>
<tr>
<td>BIOE 542</td>
<td>Community Ecology</td>
</tr>
<tr>
<td>BIOE 515</td>
<td>Landscape Ecol &amp; Mgmt</td>
</tr>
<tr>
<td>LRES 568</td>
<td>Ecosystem Biogeochem</td>
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</table>

Electives (minimum) 11-12

Thesis 10

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

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<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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</thead>
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<tr>
<td>BIOE 554</td>
<td>Foundations of Ecology &amp; Mgmt</td>
<td>1</td>
</tr>
<tr>
<td>BIOE 555</td>
<td>Communication in Ecol Sciences</td>
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Choose two

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<th>Course Title</th>
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<tbody>
<tr>
<td>BIOE 515</td>
<td>Landscape Ecol &amp; Mgmt</td>
</tr>
<tr>
<td>BIOE 521</td>
<td>Conservation Biology</td>
</tr>
<tr>
<td>WILD 501</td>
<td>Applied Population Ecology</td>
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<tr>
<td>WILD 504</td>
<td>Wildlife-Habitat Relationships</td>
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<td>WILD 525</td>
<td>Human Dimensions of Fisheries and Wildlife Management</td>
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Electives (minimum) 11-12

Thesis 10

Fisheries Interest Program

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<tbody>
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<td>Foundations of Ecology &amp; Mgmt</td>
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<td>WILD 510</td>
<td>Fisheries Science</td>
</tr>
<tr>
<td>WILD 513</td>
<td>Fisheries Habitat Management</td>
</tr>
<tr>
<td>WILD 525</td>
<td>Human Dimensions of Fisheries and Wildlife Management</td>
</tr>
</tbody>
</table>

Electives (minimum) 12

Thesis 10

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 or subjects. Other participating departments include Earth Science and Plant Science and Plant Pathology.

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/cces/html/course_list_S11.html) that may be applied to this interdisciplinary degree program and other helpful information on the degree website, http://www.montana.edu/cces/.

**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 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.
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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.

**Department of English**

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2-176 Wilson Hall, Bozeman MT 59717-2300
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Email: english@montana.edu

**Director of Graduate Studies**

Susan Kollin
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Tel: 406-994-5184 Email: susan.kollin@msu.montana.edu (dept@english.montana.edu)

**Department Chair**

Philip Gaines
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Tel: 406-994-3768 Email: gaines@montana.edu (dept@english.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.

**Admission**

University standards for admission with full standing to The Graduate School:

- 3.0 grade point average (A=4.0) and official transcripts for all undergraduate course work

Additionally, the Department of English requires:

- Three letters of recommendation from people who can comment on the applicants potential for success in a graduate program in English
- A personal essay in which the applicant discusses his/her reasons for pursuing the Master of Arts in English
- 10-15 page writing sample
- Optional--Official Graduate Record Exam (GRE) General Test score

*Deadline for admission and consideration for a teaching assistantship is January 31st. The final deadlines for admission only are July 1 (fall semester) and November 1 (spring semester). Deadlines for international students are May 15 (fall semester and September 15 (spring semester).*

**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. 341)

**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>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENGL 510</td>
<td>Studies in Critical Theory</td>
<td>3</td>
</tr>
<tr>
<td>ENGL 530</td>
<td>Writing Theory and Practice</td>
<td>3</td>
</tr>
<tr>
<td>ENGL 575</td>
<td>Professional Paper (Max 6 credits (Plan B Only))</td>
<td>1-10</td>
</tr>
<tr>
<td>ENGL 590</td>
<td>Master’s Thesis (1-10 credits (Plan A Only))</td>
<td></td>
</tr>
</tbody>
</table>

Electives

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENGL 505</td>
<td>Teaching College Compositions</td>
<td>2</td>
</tr>
<tr>
<td>ENGL 550</td>
<td>Focused Research Seminar (Max 6 credits)</td>
<td>3</td>
</tr>
<tr>
<td>ENGL 592</td>
<td>Independent Study</td>
<td>1-4</td>
</tr>
<tr>
<td>ENGL 598</td>
<td>Internship</td>
<td>1-12</td>
</tr>
<tr>
<td>ENGL 580</td>
<td>Special Topics (Max 9 credits)</td>
<td>1-4</td>
</tr>
</tbody>
</table>

Total Credits 30

Department of History and Philosophy

2-155 Wilson Hall
Boxeman, Montana 59717
406-994-4395
www.montana.edu/history/

Department Chair
Dr. Susan Cohen
2-155 Wilson Hall, Boxeman, MT 59717
406-994-4397

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.

Admission

Prospective graduate students should follow the guidelines in the Admission Policies and Application Requirements sections. The GRE General Exam is not required. Successful applicants are accepted into both the department and The Graduate School.

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. 342)
- PhD in History (p. 342)

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

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>HIST 503</td>
<td>America Before 1860</td>
<td>3</td>
</tr>
<tr>
<td>HIST 505</td>
<td>U.S History 1860-Prent</td>
<td>3</td>
</tr>
<tr>
<td>HIST 512</td>
<td>Topics in World History</td>
<td>3</td>
</tr>
<tr>
<td>HIST 540</td>
<td>History Methods</td>
<td>3</td>
</tr>
</tbody>
</table>

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
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 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.

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
- STAT 511 Methods of Data Analysis I 6
- STAT 512 and Methods of Data Analysis II 6
- Choose two from the following, at least one of which must be either STAT 446 or STAT 541
- STAT 446 Sampling
- STAT 431 Nonparametric Statistics
- STAT 436/536 Introduction to Time Series Analysis
- STAT 437 Introduction to Applied Multivariate Analysis
- STAT 439 Introduction to Categorical Data Analysis
- STAT 448 Mixed Effects Models
- STAT 525 Biostatistics
- STAT 528 Statistical Quality Control
- STAT 541 Experimental Design

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 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).

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. 343)
- M.S. in Mathematics (Mathematics Education Option) (p. 361)
- M.S. in Statistics (p. 344)
- Ph.D. in Mathematics (p. 345)
- Ph.D. in Mathematics - Education Specialization (p. 346)
- Ph.D. in Statistics (p. 347)
- Graduate Certificate in Applied Statistics (p. 343)
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) and Introduction to Analysis I (M 383)-M 384 Introduction to Analysis II). 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:

* 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, passing the written comprehensive exam, 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. Requirements for the written comprehensive exam are listed separately below.

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.

For more information, refer to The Department of Mathematics Graduate Handbook (http://www.math.montana.edu/grad/documents/handbook13.pdf) Online library of old comprehensive EXAMS (http://www.math.montana.edu/Documents/Comps/ms_math/Exams)

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 (15 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>STAT 502</td>
<td>and Intermediate Mathematical Statistics</td>
<td>6</td>
</tr>
<tr>
<td>STAT 505</td>
<td>Linear Models</td>
<td>6</td>
</tr>
<tr>
<td>STAT 506</td>
<td>and Advanced Regression Analysis</td>
<td></td>
</tr>
</tbody>
</table>
Additional requirements

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 450-500 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 of 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 The Graduate School degree requirements.

Departmental Requirements

Described below are the Department of Mathematical Sciences requirements for the Ph.D. in Mathematics. These departmental requirements supplement those set out by the Graduate School in the Graduate Catalog for Ph.D. Students.

There are no foreign language requirements or qualifying exam for a Ph.D. in Mathematics.

Ph.D. Committee

- The Ph.D. committee must include a minimum of five members excluding the Graduate School-assigned Graduate Representative.
- A committee must be formed before the end of the student’s second semester of study.
- The Committee Chairperson (Advisor) must be a faculty member within the Department of Mathematical Sciences.
- The first three committee members listed on a candidate’s Program of Study read and assess the dissertation.

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. In Mathematics 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. Part Differential Equations I (M 544)-Part 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**

**Education Specialization**

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 Course Work (60 credits)**

<table>
<thead>
<tr>
<th>Educational Statistics and Research Methods - required (9 credits)</th>
</tr>
</thead>
<tbody>
<tr>
<td>STAT 511</td>
</tr>
<tr>
<td>STAT 512</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</td>
</tr>
<tr>
<td>M 529</td>
</tr>
<tr>
<td>M 534</td>
</tr>
</tbody>
</table>

Internships - (may be waived based on prior experience)

| M 576 | Internship (Elementary - 3 credits) |
| M 576 | Internship (Secondary - 3 credits) |

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</td>
</tr>
<tr>
<td>M 504</td>
</tr>
<tr>
<td>M 505</td>
</tr>
<tr>
<td>M 511</td>
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<tr>
<td>M 512</td>
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<tr>
<td>M 544</td>
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<tr>
<td>M 545</td>
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<td>M 547</td>
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<td>M 551</td>
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<td>M 560</td>
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<td>M 561</td>
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<td>M 581</td>
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<td>M 582</td>
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<td>M 584</td>
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<td>M 585</td>
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<tr>
<td>M 586</td>
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<tr>
<td>M 591</td>
</tr>
<tr>
<td>M 592</td>
</tr>
</tbody>
</table>

Or another approved 500 level M or STAT course

**Dissertation - required (21 credits)**

<table>
<thead>
<tr>
<th>Doctoral Thesis</th>
</tr>
</thead>
</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 a Ph.D. comprehensive 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 material worthy of publication. There is no departmental foreign language requirement for the Ph.D.

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 directed study courses in Doc Reading & Research (STAT 689) in his/her area of specialty. Doctoral Thesis (STAT 690) are listed in the Graduate Catalog.

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 Ph.D. qualifying exam if the M.S. comprehensive exam was passed at the Ph.D. level. Other students are expected to take the Ph.D. qualifying exam as soon as course work in the M.S. core 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 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.

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. The student will be given several days to submit her/his written summaries.

Department of Microbiology and Immunology

Microbiology and Immunology office:
PO Box 173520
Tel: 406-994-2902 Fax: 406-994-4926

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.
Students are supported financially throughout their graduate training. Both teaching and research assistantships, and fellowships. Most of our graduate students are supported financially throughout their graduate training. Both

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 applicants 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, phycology, 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 IDEaA 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://cbpr.montana.edu/core.php)
- Cooley Laboratory (http://www.montana.edu/wwwmb/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. 273)
- M.S. in Microbiology and Immunology (Plan B) (p. 274)
- Ph.D. in Microbiology (p. 274) and Immunology

**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 send a letter of interest to the Native American Studies Department 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/apply):**

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, and how the M.A. in NAS will help the applicant reach long range goals.
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 resume.
7. The Graduate Record Exam (GRE): optional for those who feel it may strengthen their application.
The Following upper division and graduate level courses are offered in Graduate classes in Native American Studies on appointment criteria. Assistantships sections on the department website for detailed information completion of NASX 530 Federal Indian Law and Policy. See the Graduate or other NAS courses. A prerequisite for application is the successful will teach a section of Introduction to Native American Studies and/ includes a 6 credit tuition waiver and stipend. Selected graduate students Graduate Teaching Assistantships, awarded on a completive basis, are Financial Assistance departmental endorsement from Native American Studies. Applicants must be formally accepted by The Graduate School with departmental endorsement from Native American Studies. Deadlines For applicants also applying for teaching assistantships, the deadline is March 1 for the following academic year. For international students, the deadline is June 15 for Fall and November 1 for Spring semester. For all other applicants, the deadline is July 15 for Fall and November 15 for Spring semester. Financial Assistance Graduate Teaching Assistantships, awarded on a completive 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 Indian Law and Policy. See the Graduate Assistantships sections on the department 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>Grad Iss In Native Amer 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>Amer 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>
<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 Govt: 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>Contemp Iss in Am Indian Std</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 Mhd</td>
<td>3</td>
</tr>
<tr>
<td>NASX 550</td>
<td>Native Am: Dispelling the Myth</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 Lit and the West</td>
<td>3</td>
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<td>NASX 560</td>
<td>Native American Lit Tradition</td>
<td>3</td>
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<tr>
<td>NASX 575</td>
<td>Professional Paper</td>
<td>1-6</td>
</tr>
<tr>
<td>NASX 589</td>
<td>Graduate Consultation</td>
<td>1-3</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 online (http://www.montana.edu/gradschool/catalog.html). 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. 349)
- Online certificate in Native American Studies (p. 364)

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 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 12 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, 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, a professional paper, and a comprehensive oral examination. 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/cat_appl&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 send a letter of interest to the Native American Studies Department in order to ascertain the suitability of the program for the applicant.

Each applicant must submit the following during the online application process through The Graduate School (http://www.montana.edu/wwdg/apply.html) (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 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.
5. Three letters of recommendation addressing the applicant’s potential as a graduate student. The applicant will be prompted to submit contact information of their recommenders during the online application process.
6. A current curriculum vita or résumé.
7. International Applicants ONLY: Mandatory TOEFL score of 550 for students for whom English is not their first language.

Limited slots are available, and admissions are competitive.

### Deadlines & Assistantships

For students applying for teaching assistantships, the application deadline is March 1 for the following academic year. For international students, the deadline is May 15 for Fall and October 1 for Spring semester.

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 for detailed information on appointment criteria.

### Required Content Courses

**NASX 405**  Gnrd Iss In Native Amer Stdies  3
**NASX 415**  Native Food Systems  3
**NASX 430**  American Indian Education  3
**NASX 440**  Montana Indian Literature  3
**NASX 450**  History of American Indians  3
**NASX 476**  Amer Indian Policy and Law  3
**NASX 490R**  Undergraduate Research  1-6
**NASX 490Z**  Undergraduate Research  1-6
**NASX 491**  Special Topics  1-4
**NASX 492**  Independent Study  1-3
**NASX 494**  Seminar  1
**NASX 498**  Internship/Cooperative Educ  2-12
**NASX 505**  Proseminar Native Amer Studies  3
**NASX 515**  Native Food Systems  3
**NASX 520**  Fem/Gender Theories IN NAS  3
**NASX 521**  Tribal Govt: Yesterday & Today  3
**NASX 523**  Am Indians/Minority in High Ed  3

**NASX 490**  Proseminar Native Amer Studies  3
**NASX 415**  Native Food Systems  3
**NASX 430**  American Indian Education  3
**NASX 440**  Montana Indian Literature  3
**NASX 450**  History of American Indians  3
**NASX 476**  Amer Indian Policy and Law  3
**NASX 490R**  Undergraduate Research  1-6
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**NASX 520**  Fem/Gender Theories IN NAS  3
**NASX 521**  Tribal Govt: Yesterday & Today  3
**NASX 523**  Am Indians/Minority in High Ed  3

### 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

Thirty-one (31) credits minimum.

**Plan A – Thesis Option:**

- 10 credits (minimum) thesis credits
- ½ of total credits must be at 500 level
- Maximum of four (4) 570 credits

**Plan B – Non-thesis - Professional Paper or Project:**

- 15 credits (minimum) at 500 level
- Maximum of six (6) 570 credits
- Pass/Fail – Maximum of 3 credits allowed (excluding thesis)

### Requirements for both Plan A and Plan B:

- 400, 470, 476, 489, 490, 588, 589 credits – Not allowed on the program of study
- 500, 570, 576 credits – May not exceed 1/3 of total credits required for degree (no more than 10 credits)
- 575 credits – Maximum of six (6) credits (Plan B students only)
- 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)
- Course work may not be more than six (6) years old at time of graduation.
- Transfer credits – May not exceed 1/3 of 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).

### Graduate classes in Native American Studies

The following upper division and graduate level courses are offered in Native American Studies:

**NASX 405**  Gnrd Iss In Native Amer Stdies  3
**NASX 415**  Native Food Systems  3
**NASX 430**  American Indian Education  3
**NASX 440**  Montana Indian Literature  3
**NASX 450**  History of American Indians  3
**NASX 476**  Amer Indian Policy and Law  3
**NASX 490R**  Undergraduate Research  1-6
**NASX 490Z**  Undergraduate Research  1-6
**NASX 491**  Special Topics  1-4
**NASX 492**  Independent Study  1-3
**NASX 494**  Seminar  1
**NASX 498**  Internship/Cooperative Educ  2-12
**NASX 505**  Proseminar Native Amer Studies  3
**NASX 515**  Native Food Systems  3
**NASX 520**  Fem/Gender Theories IN NAS  3
**NASX 521**  Tribal Govt: Yesterday & Today  3
**NASX 523**  Am Indians/Minority in High Ed  3
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 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 programs in the form of research and teaching assistantships, fellowships, health insurance, and tuition and fee waivers.

Faculty Chair

Walter Fleming
PhD

Associate Professors

Matthew Herman
PhD

Kristin Ruppel
PhD

Assistant Professor

Gail Small
JD

Professor Emeritus

Wayne Stein
EdD

Katz Chair Emeriti

Henrietta Mann
PhD

William Yellowtail

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)
**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. 352)
- Ph.D. in Physics (p. 352)
- Ph.D. in Materials and Science (p. 376)
- M.S. in Optics Plan A (thesis) (p. 328)
- M.S. in Optics Plan B (professional paper) (p. 328)

**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**

**Coursework**

<table>
<thead>
<tr>
<th>Course</th>
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<tbody>
<tr>
<td>PHSX 594</td>
<td>Seminar (01 - Teaching Seminar)</td>
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</tr>
<tr>
<td>PHSX 594</td>
<td>Seminar (15 - Research Introduction Seminar)</td>
<td>1</td>
</tr>
<tr>
<td>PHSX 501</td>
<td>Advanced Classical Mechanics</td>
<td>3</td>
</tr>
<tr>
<td>PHSX 506</td>
<td>Quantum Mechanics I</td>
<td>3</td>
</tr>
<tr>
<td>PHSX 519</td>
<td>Electromagnetic Theory I</td>
<td>3</td>
</tr>
<tr>
<td>PHSX 566</td>
<td>Mathematical Physics I</td>
<td>3</td>
</tr>
<tr>
<td>Electives</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Thesis**

PHSX 590 Master’s Thesis (An acceptable thesis and at least 10 credits of this course are required)

**Examination**

A written comprehensive examination is required. A final oral examination is also required, covering the thesis and related areas.

**Plan-B Requirements**

**Coursework**

A minimum of 30 credits of acceptable course work is required, which shall be distributed as follows:

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
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<td>PHSX 594</td>
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<td>Electromagnetic Theory I</td>
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<tr>
<td>PHSX 520</td>
<td>Electromagnetic Theory II</td>
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<tr>
<td>PHSX 566</td>
<td>Mathematical Physics I</td>
<td>3</td>
</tr>
<tr>
<td>Electives</td>
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</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/grad/manual/exams.html](http://www.physics.montana.edu/grad/manual/exams.html)

**Ph.D. in Physics**

**Requirements**

<table>
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<th>Course</th>
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<td>PHSX 506 &amp; PHSX 507</td>
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<tr>
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</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
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 and private organizations. We are proud to have built a program careers at all levels of government and in a wide range of public, non-profit, and private organizations. The program stresses support and policy-making positions in public sector agencies, and non-profit and private organizations. 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 461, PHSX 490R, 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/manual/exams.html

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/wwwebg/. 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 graduate 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):
PSCI 551 Research Methods for Public Administrators 3
PSCI 552 Public Policy Processes 3
PSCI 554 Foundations of Public Administration 3
PSCI 555 Human Resources Management 3
PSCI 557 Public Budgeting & Finance 3
PSCI 558 Organization Dynamics 3
PSCI 520 Government Leadership & Administration 3
PSCI 560 Ethics and Public Service 3

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, (e.g. 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
Graduate Coordinator
PO Box 173440, Bozeman, MT 59717-3440
406-994-3801

Admission
The Graduate School application process can be completed online (http://www.montana.edu/gradschool/); however, during the application process applicants will be asked information listed on the Psychology Department’s supplemental application form (http://www.montana.edu/wwwpy/gradprogram-supplemental.pdf). Take a moment to review this information before applying. Please note, the application process also contains an essay requirement. Applicants must include a 1-2 page letter of intent/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 M.S. program in psychological science.

Overall, the Psychology department requires the following application materials during the online application process:

1. Supplemental information (found on link above)
2. GRE scores; subject test not required*
3. All previous college/university transcripts (official transcripts only); MSU graduates do not need to supply official transcripts
4. Three letters of recommendation (be prepared to supply your recommenders contact information)
5. Letter of intent/personal statement

* The Psychology Department also 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. 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 February 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 for Graduate Students section on the departmental home page for more information (assistantships are requested by the student’s home department).

Graduate Program
• M.S. in Psychology (with an emphasis on psychological science) (p. 355)

The Department of Psychology at Montana State University offers a research-oriented Master of Science (M.S.) 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 two-year graduate program is to train students to conduct 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 or MBA-type program. We are a program for students who want to continue on to a doctoral program in psychology and conduct research.

To satisfy the degree requirements, students must work intensively with their advisor to complete a research project culminating in a written master’s thesis. Six graduate-level psychology courses and one additional supporting course (e.g., biology, statistics, and sociology) are also required. 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.

M.S. in Psychology (with an emphasis on psychological science)
Program Requirements
The Master of Science program requires a minimum of 31 credit hours of graduate level coursework. The required coursework is designed to provide students with a general overview of specific content areas, as well as with research methods and statistics in psychology. Courses we typically require include:

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<td>PSYX 502</td>
<td>Advanced Design/Stat I</td>
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<td>PSYX 539</td>
<td>Physiological Processes</td>
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<td>PSYX 541</td>
<td>Cognitive Processes</td>
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<td>PSYX 543</td>
<td>Memory</td>
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<td>PSYX 544</td>
<td>Social Psychology</td>
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<td>PSYX 546</td>
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<td>PSYX 594</td>
<td>Seminar</td>
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Faculty Chair
Colleen Moore  
Professor - Chair

Professors
Michael Babcock  
Professor
Richard Block  
Professor
Wesley Lynch  
Professor
Colleen Moore  
Professor

Associate Professors
Ian Handley  
Associate Professor
Keith Hutchison  
Associate Professor
Michelle Meade  
Associate Professor
Jessi Smith  
Associate Professor

Assistant Professors
Rebecca Brooker  
Assistant Professor
Monica Skewes  
Assistant Professor
Matthew Vess  
Assistant Professor

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
Master of Nursing (MN) Graduate Degree (p. 356)
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. 357)
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. 365)
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 micro-system.
9. Assimilate and apply research-based information to design, implement and evaluate clients' plans of care.
10. Synthesize data, information and knowledge to evaluate 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.

**MN Degree 5 Semester Program of Study**

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<tr>
<th>Year 1</th>
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<td>NRSG 601 - Advanced Health Assessment</td>
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<tr>
<td>NRSG 604 - Evidence Based Practice I</td>
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<td>NRSG 606 - Statistical Applications (recommended)</td>
<td>2</td>
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<tr>
<td>NRSG 608 - Design H C Delivery Systems</td>
<td>3</td>
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<tr>
<td>NRSG 611 - Ethics, Law, and Policy for Advocacy in Healthcare</td>
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<td>NRSG 511 - Pathophysiology and Pharmacology for the Clinical Nurse Leader</td>
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<td>NRSG 575 - 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>Year Total:</td>
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</table>

**Total Program Credits:** 36

- **MN Degree (CNL): 34 credits (required)**
- **CNL Program Total: 34 credits (required)**

**Scholarship**

Each student completes a professional 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. An oral defense of the professional project is required for MN students.

**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.

**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>
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<tr>
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**Total Program Credits:** 76

**Total Clinical Hours:** 1125 (25 cr x 3 = 75 x 15 wks = 1125)

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### BSN to DNP (NP, Psych/Mental Health) 3-Year Program of Study

See [http://www.montana.edu/nursing/academic/fpmhnp.htm](http://www.montana.edu/nursing/academic/fpmhnp.htm) for the 4 Year Program of Study

### Year 1

<table>
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<tr>
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<th>Spring</th>
<th>Summer</th>
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<td>NRSG 601 - Advanced Health Assessment</td>
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### Year 2

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<td>NRSG 633 - Advanced Clinical III, Psych/Mental Health</td>
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### Year 3

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<td>NRSG 614 - Vulnerability and Health Care in Diverse Communities</td>
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<tr>
<td>NRSG 675 - Professional Paper and Project</td>
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### 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.
NRSG 634 -
NRSG 675 - Professional Paper and
Year Total: 9 3
Total Program Credits: 76
Total Clinical Hours: 1125 (25 cr x 3 = 75 x 15 wks = 1125)

Year 1

<table>
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<tr>
<th>Course</th>
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<tr>
<td>NRSG 604 - Evidence Based Practice I</td>
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<td>NRSG 606 - Statistical Applications</td>
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Year 2

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<td>NRSG 674 - DNP Scholarly Project Seminar (1 lec; 1 clinical lab)</td>
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<td>NRSG 611 - Program Planning &amp; Evaluation, Outcomes, &amp; Quality Improvement</td>
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<td>NRSG 612 - Ethics, Law, and Policy for Advocacy in Healthcare</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 675 - Professional Paper and Project (1 lec; 1 clinical lab)</td>
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Year 3

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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 (3 clinical lab)</td>
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<td>Year Total:</td>
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Total Program Credits: 41

Total Clinical Hours: 405 (9 cr x 3 = 27 x 15 wks = 405)

* Required for students with a Masters Degree (MN) from Montana State University and certified as a FNP or FPMHNP; transcriptions of graduates from other FNP, FPMHNP, and psychiatric CNS programs will be reviewed and programs of study developed individually.

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.

Extended University (online options)

Executive Director
Dr. Kim Obbink
128 EPS Building
406-994-6550 Email: kobbink@montana.edu

Extended University supports the land-grant mission of Montana State University by reaching beyond the traditional campus, classrooms, and academic programs to create unique learning environments and provide educational opportunities for individuals to meet their academic, professional, and lifelong learning goals.

MSU Extended University offers
- Development and delivery of flexible online and distance learning programs
- Outreach and engagement programs and support services
- Partnership opportunities for the University community and other constituents
- Credit and non-credit courses, certificates, and degrees beyond the traditional campus offerings

Divisions
- Montana State Online: Distance learning courses, programs, degrees and certificates; faculty/student support, research, and policy recommendations
- Office of Continuing Education: Continuing education and professional development; credit and non-credit courses and programs, including youth classes and camps
- Burns Technology Center: Innovative technologies for education and communications
- Outreach and Engagement: Partnerships with faculty members and departments to extend learning beyond the campus

Extended University works closely with campus colleges, departments and Montana’s K-12 and business communities to nurture and grow online and hybrid learning opportunities for enrolled MSU students and working professionals.

EU works closely with The Graduate School and MSU’s colleges to offer graduate-level credit courses, certifications, degrees and renewal units. EU also collaborates with other four-year institutions to provide interdisciplinary graduate programs.

Extended University’s NTEN (National Teachers Enhancement Network (http://btc.montana.edu/courses/aspx/ntenhome.aspx)) is one of the country’s most-established online programs for science teachers, having offered online graduate courses since 1993.

Admission

For most Extended University courses, applicants typically do not have to apply formally to Montana State University (as either a degree-seeking or non-degree-seeking student). If an applicant is only considering EU courses; they are considered an MSU Extended University student. In this status, an applicant can enroll directly in the course and receive MSU academic credits upon completion.
However, to take any other online courses or to enter a degree program (even if your coursework is primarily comprised of Extended University courses), an applicant would need to apply formally to MSU Graduate School for admission.

- Learn [http://www.montana.edu/wwldg/cat_app1&deadlines.html](http://www.montana.edu/wwldg/cat_app1&deadlines.html) about applying to MSU as a degree or non-degree seeking student [http://www.montana.edu/gradschool/admissions/apply.html](http://www.montana.edu/gradschool/admissions/apply.html)

**How do I register for a course?**

If the course is offered through Extended University, click on the linked course title and read the course description. If the applicant meets the prerequisites, follow the link to “Register Online,” where additional information will be asked as well as method of payment. Extended University accepts MasterCard, Visa, or personal check. Students who have previously enrolled at Montana State University may choose to pay using their MSU MyInfo [https://atlas.montana.edu:9000/pls/bsagent/twbkwbs.P_GenMenu?name=homepage](https://atlas.montana.edu:9000/pls/bsagent/twbkwbs.P_GenMenu?name=homepage) accounts. Once registered, the student will receive a confirmation email containing course start-up information.

If the course is offered through the Office of the Registrar, 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 advisor before proceeding. In most cases, students will register online with the MSU MyInfo [https://atlas.montana.edu:9000/pls/bsagent/twbkwbs.P_GenMenu?name=homepage](https://atlas.montana.edu:9000/pls/bsagent/twbkwbs.P_GenMenu?name=homepage) system. Once registered, the student will receive a confirmation email containing course start-up information.

**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](http://www.montana.edu/health/immunization.php) against certain diseases before registration. Students who are taking only courses at a distance through Extended University 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.

**Montana State Online - Graduate Programs**

- M.S. in Agricultural Education (p. 360)
- M. Ed in Curriculum and Instruction (p. 305)
- M. Ed in Educational Leadership (p. 309)
- M.S. in Family and Financial Planning (p. 314)
- M.S. in Land Resources and Environmental Sciences Online (p. 360)
- M.S. in Mathematics - Mathematics Education Option (p. 361)
- Nursing MN - Clinical Nurse Leader (p. 356)
- Nursing DNP - Doctor of Nursing Practice (p. 356)
- Professional Master of Science and Engineering Management (p. 374) (PMSEM)
- M.S. in Science Education (p. 372)

**Montana State Online - Graduate Certificates**

- Addiction Counseling (p. 364)
- Native American Studies (p. 364)
- Nursing Education (non-degree option) (p. 365)
- Professional Practice of Architecture (p. 365)
- School Library Media Graduate Endorsement (p. 290)
- Science and Engineering Management (p. 374)
- Science Teaching (p. 366)

**Montana State Online - Licensure**

- Northern Plains Transition to Teaching (NPTT) (p. 368)

**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), and Graduate Seminar (AGED 594). 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 |

**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)

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<td>ENTO 510</td>
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<td>LRES 507</td>
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<td>Biodiversity Methods</td>
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<td>LRES 521</td>
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<td>LRES 534</td>
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<td>LRES 540</td>
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<td>Ecol of Invasive Plants in GYE</td>
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<td>LRES 571</td>
<td>Landscape &amp; Ecosys Ecology</td>
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<td>Special Topics (Ecology of Invasive Plants in the GYE II)</td>
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<td>PSPP 546</td>
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</table>

**M.S. in Mathematics - Mathematics Education Option (MSMME)**

The MSMME program emphasizes the teaching and learning of high school mathematics. The program offers 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 during the academic year and attending at least two 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.

More information is available at [http://www.math.montana.edu/MSMME](http://www.math.montana.edu/MSMME)

**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 high school 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:**

- High school 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

• Middle school teachers who hold secondary mathematics certification

**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.

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**Program Requirements**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>M 518</td>
<td>Statistics For Teachers</td>
<td>3</td>
</tr>
<tr>
<td>M 524</td>
<td>Linear Algebra for Teachers</td>
<td>3</td>
</tr>
<tr>
<td>M 525</td>
<td>Analysis for Teachers</td>
<td>3</td>
</tr>
<tr>
<td>M 527</td>
<td>Geometry for Teachers</td>
<td>3</td>
</tr>
<tr>
<td>M 520</td>
<td>Standards-Based Math for Teachers</td>
<td>6</td>
</tr>
<tr>
<td>M 521</td>
<td>Mathematics Learning Theory for Teachers</td>
<td></td>
</tr>
<tr>
<td>M 528</td>
<td>Curriculum Design</td>
<td></td>
</tr>
<tr>
<td>M 529</td>
<td>Assessment Models and Issues</td>
<td></td>
</tr>
<tr>
<td>M 517</td>
<td>Advanced Mathematical Modeling for Teachers</td>
<td></td>
</tr>
<tr>
<td>M 523</td>
<td>Number Structure for Teachers</td>
<td></td>
</tr>
<tr>
<td>M 526</td>
<td>Discrete Mathematics for Teachers</td>
<td></td>
</tr>
<tr>
<td>M 577</td>
<td>Improving Mathematics Edu. Through Action Research</td>
<td></td>
</tr>
</tbody>
</table>

**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.

**Science and Engineering Mangement**

The 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**

- Bachelors degree in a science or engineering field
- 3.0 undergraduate GPA
- Official Transcripts from all post-secondary institutions
- 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
- Graduate School Application
- 2 letters of recommendation
- Narrative of goals and interest in obtaining PMSEM degree
- Resume

**Curriculum:**

**Required Coursework (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.

- MSEM 501 Leading Human & Fin Ent (Fall) 9
- MSEM 502 Leading the Tech Enterprise (Spring) 6

**Electives (15 credits)**

**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.

- ECIV 504 Construction Productivity 3
- ECIV 505 Quality Assure/Risk Management 3
- ECIV 506 Ad Construction Management 3
- ECIV 507 Law of the Construction Industry 3
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.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<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>
<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 575</td>
<td>Prof Paper &amp; Project</td>
<td>1-4</td>
</tr>
<tr>
<td>LRES 592</td>
<td>Independent Study</td>
<td>1-3</td>
</tr>
<tr>
<td>PSPP 546</td>
<td>Herbicide Physiology</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>
<th>Course Code</th>
<th>Course 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 592</td>
<td>Independent Study</td>
<td>3</td>
</tr>
<tr>
<td>ECIV 575</td>
<td>Research or Prof Paper/Project</td>
<td>3</td>
</tr>
<tr>
<td>ECIV 598</td>
<td>Internship</td>
<td>2</td>
</tr>
<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>
</tbody>
</table>

<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>
<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>

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 coursework in the certificate is online but elective courses may be either online or on campus.

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 3 credits of electives will be determined with an 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>
</tbody>
</table>

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 an 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 502</td>
<td>Leading the Tech Enterprise</td>
<td>6</td>
</tr>
</tbody>
</table>

Professional Practice of Architecture

The Professional Practice of Architecture graduate certificate is designed to build the next generation of leaders in the professional practice of architecture. Creative skills for managing people, projects and budgets can transform a talented individual into a leader in the profession. This 9 month, 15-credit online program will give the student the foundation of solid business skills while exploring creative and visionary ways to think about the contemporary practice of architecture. This certificate is online.

<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>
</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 (p. 359)
- Frequently Asked Questions (http://eu.montana.edu/online/faq) concerning online courses.
• College of Engineering (http://www.coe.montana.edu) (home page)
• Jake Jabs College of Business (http://www.montana.edu/cob) (home page)
• Is online learning right for you? Find out with our interactive quiz (http://eu.montana.edu/online/quiz).

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 on 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 (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>

Total Credits 12

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 530</td>
<td>Federal Law and Indian Policy (NASX 530 is required, three classes are elective.)</td>
<td>3</td>
</tr>
<tr>
<td>NASX 550</td>
<td>Native Am: Dispelling the Myth</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 Lit and the West</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, credits earned under the Graduate Certificate may be transferred to the MA program. The Master’s program is not wholly available online, requiring at least one semester 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

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 online application process (http://www.montana.edu/gradschool/apply) (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 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, and how the Graduate Certificate in NAS will help the applicant reach long range goals.
5. A current curriculum vita or resumé.

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

For More Information

About the Program
Contact Katelyn 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.
Montana State University  
2-179 Wilson Hall, Bozeman, MT 59717  
Attn: Francesca Pine

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 $835.50 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.

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.

Year 1

<table>
<thead>
<tr>
<th>Credits</th>
<th>Fall</th>
<th>Spring</th>
<th>Summer</th>
</tr>
</thead>
<tbody>
<tr>
<td>NRSG 503 - Curriculum Development*</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>or NRSG 504 - Assmnt and Eval of Education</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Year Total:</td>
<td>3</td>
<td></td>
<td></td>
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</tbody>
</table>

Year 2

<table>
<thead>
<tr>
<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>
</tr>
<tr>
<td>NRSG 502 - Effective Clinical Teaching</td>
<td></td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>NRSG 503 - Curriculum Development* or NRSG 504 - Assmnt and Eval of Education</td>
<td></td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Year Total:</td>
<td>2</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>

Total Program Credits: 10

* 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 students 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 9

Spring: January-March (10 week)*
ARCH 510 Leadership in Prof Practice 3
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

- 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.

Spring: March-May (8 weeks)*

ARCH 519 Synthesis of Arch Practice 3

*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. 360)
- 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).

Courses of Study

- Graduate Certificate in Science Teaching in Chemistry (p. 366)
- Graduate Certificate in Science Teaching in Earth Science (p. 367)
- Graduate Certificate in Science Teaching in Elementary School Science (p. 367)
- Graduate Certificate in Science Teaching in Life Science (p. 367)
- Graduate Certificate in Science Teaching in Physics (p. 368)

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 below list:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHMY 505</td>
<td>Critical Cncts 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>
</tbody>
</table>
Complete 12 credits selected from the below list:

**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>
</tr>
</thead>
<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 Mtn Geology</td>
<td>2</td>
</tr>
<tr>
<td>ERTH 591</td>
<td>Special Topics (Understanding Climate Change)</td>
<td>3</td>
</tr>
<tr>
<td>ERTH 591</td>
<td>Special Topics (Fundamentals of Oceanography)</td>
<td>3</td>
</tr>
<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>
</tr>
<tr>
<td>ERTH 591</td>
<td>Special Topics (Historical Geology for Educators)</td>
<td>3</td>
</tr>
<tr>
<td>ERTH 591</td>
<td>Special Topics (K-14 Earth System Science)</td>
<td>2</td>
</tr>
<tr>
<td>ERTH 591</td>
<td>Special Topics (Teaching Middle School Earth System Science)</td>
<td>3</td>
</tr>
<tr>
<td>ERTH 591</td>
<td>Special Topics (Weather and Climate for Teachers)</td>
<td>3</td>
</tr>
<tr>
<td>ERTH 594</td>
<td>Seminar (Field Geology &amp; Geology of Mt Everest &amp; the Himalaya)</td>
<td>1</td>
</tr>
<tr>
<td>GEO 521</td>
<td>Dinosaur Paleontology</td>
<td>2</td>
</tr>
<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>
</tr>
<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 Elementary School Science**

This certificate is designed to give K-8 teachers a basic understanding of a broad range of topics in physical science, life science and earth/space science. These courses are specially designed to help K-8 teachers integrate inquiry-based science into the classroom while improving their own science content knowledge.

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>BIOL 591</td>
<td>Special Topics (Plant Science: It Grows on You)</td>
<td>1</td>
</tr>
<tr>
<td>BIOL 591</td>
<td>Special Topics (Using Local Ecosystems to Implement Elementary Biology Activities)</td>
<td>3</td>
</tr>
<tr>
<td>EDCI 591</td>
<td>Special Topics (Symbiosis - Eat, Prey, Love)</td>
<td>1</td>
</tr>
<tr>
<td>ERTH 591</td>
<td>Special Topics (Elementary Weather)</td>
<td>1</td>
</tr>
<tr>
<td>ERTH 591</td>
<td>Special Topics (Landforms for Elementary Teachers)</td>
<td>1</td>
</tr>
<tr>
<td>ERTH 591</td>
<td>Special Topics (Teaching Middle School Earth System Science)</td>
<td>3</td>
</tr>
<tr>
<td>LRES 591</td>
<td>Special Topics (The Dirt on Soil Science)</td>
<td>1</td>
</tr>
<tr>
<td>NUTR 591</td>
<td>Special Topics (Food and Nutrition Across the Elementary Curriculum)</td>
<td>1</td>
</tr>
<tr>
<td>PHSX 591</td>
<td>Special Topics (Electric Circuits &amp; Magnetism)</td>
<td>2</td>
</tr>
<tr>
<td>PHSX 591</td>
<td>Special Topics (Elementary Space Science)</td>
<td>1</td>
</tr>
<tr>
<td>PHSX 591</td>
<td>Special Topics (The Science of Sound)</td>
<td>1</td>
</tr>
<tr>
<td>PHSX 591</td>
<td>Special Topics (The World of Forces)</td>
<td>1</td>
</tr>
<tr>
<td>PHSX 591</td>
<td>Special Topics (The World of Motion)</td>
<td>1</td>
</tr>
<tr>
<td>PHSX 591</td>
<td>Special Topics (Using Robotics in Lunar Exploration - Buy Materials)</td>
<td>1</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>
<td>2</td>
</tr>
<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 (Predator-Prey Ecology: Wolves and Elk in Yellowstone)</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>
</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:

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECIV 591</td>
<td>Special Topics (Snow and Avalanche Physics for Science Educators)</td>
<td>3</td>
</tr>
<tr>
<td>EELE 591</td>
<td>Special Topics (Solar Cell Basics for Science Teachers)</td>
<td>2</td>
</tr>
<tr>
<td>PHSX 401</td>
<td>Physics by Inquiry I</td>
<td>3</td>
</tr>
<tr>
<td>PHSX 402</td>
<td>Physics by Inquiry II</td>
<td>3</td>
</tr>
<tr>
<td>PHSX 403</td>
<td>Physics by Inquiry III</td>
<td>3</td>
</tr>
<tr>
<td>PHSX 405</td>
<td>Special Relativity Online</td>
<td>3</td>
</tr>
<tr>
<td>PHSX 511</td>
<td>Astronomy for Teachers</td>
<td>3</td>
</tr>
<tr>
<td>PHSX 512</td>
<td>General Relativity Online</td>
<td>3</td>
</tr>
<tr>
<td>PHSX 513</td>
<td>Quantum Mechanics Online</td>
<td>3</td>
</tr>
<tr>
<td>PHSX 514</td>
<td>Comparative Planetology Online</td>
<td>3</td>
</tr>
<tr>
<td>PHSX 582</td>
<td>Astrobiology for Teachers Online</td>
<td>3</td>
</tr>
<tr>
<td>PHSX 591</td>
<td>Special Topics (Physics of Renewable Energy)</td>
<td>3</td>
</tr>
<tr>
<td>PHSX 591</td>
<td>Special Topics (The Science of Sound)</td>
<td>1</td>
</tr>
<tr>
<td>PHSX 591</td>
<td>Special Topics (The World of Motion)</td>
<td>1</td>
</tr>
<tr>
<td>PHSX 591</td>
<td>Special Topics (Conceptual Physics)</td>
<td>3</td>
</tr>
<tr>
<td>PHSX 591</td>
<td>Special Topics (Electric Circuits &amp; Magnetism)</td>
<td>2</td>
</tr>
<tr>
<td>PHSX 591</td>
<td>Special Topics (Teaching Electricity and Magnetism Using Research-Based Curriculum)</td>
<td>2</td>
</tr>
<tr>
<td>PHSX 591</td>
<td>Special Topics (Teaching Mechanics Using Research-Based Curriculum)</td>
<td>2</td>
</tr>
</tbody>
</table>

### Northern Plains Transition To Teaching (NPTT)

**Contact Information**

P.O. Box 172940, 241 Reid Hall  
Bozeman, MT 59717-2940  
Tel: 406-994-5662 Fax: 406-994-7900 Email: nptt@montana.edu

The Northern Plains Transitions to Teaching (NPTT) Program at Montana State University is a graduate-level program designed to prepare candidates for the teaching profession at the secondary school level (middle school and high school only). Eligible candidates must have an earned baccalaureate degree in a teachable subject area (or a bachelor’s degree and the equivalent coursework in a teachable content area), must have a documented history of productive engagement in the workforce, and must have a demonstrated capacity and the willingness to engage in serious, concentrated study and preparation in order to move rapidly through this demanding, highly concentrated course of study. For more information, see this link for Frequently Asked Questions (http://www.montana.edu/nptt/faq/admissionsfaq.shtml).

### 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 for those candidates who are able to secure a paid teaching position in the second year (EDCI 598 - 3 cr.).
- **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 30 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/docs/apply/Directions%20for%20Completing%20the%20Online%20Application.pdf) for complete details on applying to NPTT.

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/docs/apply/Directions%20for%20Completing%20the%20TEPP%20form.pdf) (See Teachable Subjects here (http://www.montana.edu/nptt/about/teachable.shtml)).
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/docs/apply/CRIMINAL%20RECORDS%20CHECK%20Form.pdf) (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 $350 per credit ($1,050 for each three credit course). There are associated fees for registration, and there are reasonable textbook costs for each course. The total recommended budget for the cost of tuition for the masters program is $10,850-$12,600, depending on the practicum option chosen. In-state and out-of-state students pay the same amount per course.

Financial Assistance
Financial aid is available to NPTT students most (but not all) semesters. In order to qualify it is required that you file the FASFA form and follow MSU (http://catalog.montana.edu/graduate/education-health-human-development/northern-plains-trans-teaching-nptt/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 (3 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 Code</th>
<th>Course 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>Curr Design, Pedagogy, &amp; Assmt</td>
<td>3</td>
</tr>
<tr>
<td>EDCI 558</td>
<td>Internship: Methods of Teaching</td>
<td>3</td>
</tr>
<tr>
<td>EDCI 559</td>
<td>Internship: Equity, Special Needs, and Diversity</td>
<td>3</td>
</tr>
<tr>
<td>EDCI 555</td>
<td>Technology, Instructional Design, and Learner Success</td>
<td>3</td>
</tr>
<tr>
<td>EDCI 556</td>
<td>The Legal, Social, and Practical Basis of Schooling</td>
<td>3</td>
</tr>
<tr>
<td>EDCI 557</td>
<td>Brain Science, Educational Research, and Teaching</td>
<td>3</td>
</tr>
<tr>
<td>EDCI 540</td>
<td>Amer Indian Studies for Ed Students may choose between EDCI 540 and EDCI 591</td>
<td>3</td>
</tr>
<tr>
<td>EDCI 591</td>
<td>Special Topics (International Comparative Education) Students may choose between EDCI 540 and EDCI 591</td>
<td>3</td>
</tr>
<tr>
<td>EDCI 564</td>
<td>The Comprehensive Portfolio (Student Teachers Only)</td>
<td>3</td>
</tr>
<tr>
<td>EDCI 598</td>
<td>Internship</td>
<td>3 or 6</td>
</tr>
</tbody>
</table>

Total Credits 30-36

Interdisciplinary and Other Programs

Graduate Programs Available:

- Doctor of Philosophy in Ecology and Environmental Sciences (p. 278)
- IGERT: Geobiological Systems (p. 370)
- Master of Science in Environmental Engineering (http://www.coe.montana.edu/ce/enve/introduction.html)
IGERT Geobiological Systems Science

NSF-IGERT: Geobiological Systems

The interdisciplinary IGERT program in Geobiological Systems Science involves over 25 faculty at MSU in 7 different departments and 3 colleges, as well as additional national and international collaborators. Consequently, the following individuals can serve as initial contacts for questions, advice and additional information.

Dr. Bill Inskoep, IGERT Director. 
Thermal Biology Institute and Department of Land Resources and Environmental Sciences
Research Interests: Geomicrobiology, environmental genomics
Email: binskeep@montana.edu

Dr. Anne Camper, Associate Dean, College of Engineering Center for Biofilm Engineering
Research Interests: Waste-water treatment, biofilms
Email: anne_c@biofilm.montana.edu

Dr. John Peters, Director, Astrobiology and Life in Extreme Environments Program
Department of Chemistry and Biochemistry
Research Interests: Enzyme structure-function
Email: john.peters@chemistry.montana.edu

Dr. Brent Peyton, Director, Thermal Biology Institute Center for Biofilm Engineering
Department of Chemical and Biological Engineering
Research Interests: Biotreatment, bioenergy
Email: bpeyton@biofilm.montana.edu

Dr. John Priscu, Professor, Cold Regions Research
Department of Land Resources and Environmental Sciences
Research Interests: Polar microbiology
Email: jpriscu@montana.edu

Dr. Mark Skidmore, Associate Professor, Geology, Cold Regions Research
Department of Earth Sciences
Research Interests: Geomicrobiology, biogeochemistry
Email: skidmore@montana.edu

Dr. Phil Stewart, Director, Center for Biofilm Engineering
Research Interests: Biofilms
Email: phl_s@erc.montana.edu

Dr. Mark Young, Director, NSF EPSCoR Program
Department of Plant Sciences & Plant Pathology
Research Interests: Virology, Nanomaterials
Email: myoung@montana.edu

Program Description

The mission of the Integrative Graduate Education and Research Training (IGERT) program in Geobiological Systems Science is focused on the geomicrobiology of complex microbiological systems, and brings together expertise in hydrodynamics, geochemistry, microbial ecology, biochemistry and genomics. The primary goal of this Ph.D. program is to train students to use consistent and coherent interdisciplinary approaches in the study of microbial communities, and that lead to a more comprehensive understanding of the important interface between the biosphere and geosphere. This novel Ph.D. training program encompasses research scientists focused on the microbiology of extreme thermal, psychrophilic, or industrial biofilm communities.

Research and Training

The IGERT program in Geobiological Systems is both inter- and multi-disciplinary and involves faculty and Ph.D. students from the Colleges of Agriculture, Engineering, and Letters and Science. The primary research areas supported by and integrated within the IGERT program include the geomicrobiology of thermal, psychrophilic or anthropogenic systems. Graduates from this IGERT program will be well-prepared to address the complexity of microbial processes in any system, while maintaining significant disciplinary depth. The broader impacts of this graduate training program are extensive, and include partnerships with existing centers of excellence in Thermal Biology, Cold Regions Research, and Biofilm Engineering. Outreach is an integral part of the educational experience and graduate students in this program will participate and assist with important outreach activities including a formal K-12 science-teacher course, scientific workshops, industrial partner programs, training for Yellowstone National Park (YNP) interpretive staff, field trips for K-12 students, educational exhibits at the Museum of the Rockies and the Old Faithful Visitor Museum, mentoring Native American high school and undergraduate students, and development of digital libraries and web content in collaboration with the YNP Research Coordination Network. These broader impacts are synergistic in supporting the diverse educational goals of an IGERT program, and in further developing literacy in the geobiological sciences.

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. 373) students, and non-certificate 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. 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/drnp.html)

Assistant:
Kathy Weaver
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. Admission is rolling and 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 statistics and calculus 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 year-long application preparation for health professional school, if appropriate.
- Students who successfully complete program will receive degree during the spring graduation ceremony.

Recommended Courses:
**Molecular Medicine**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOH 405</td>
<td>Hematology</td>
<td>3</td>
</tr>
<tr>
<td>BIOH 422</td>
<td>Genes and Cancer</td>
<td>3</td>
</tr>
<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 543</td>
<td>Proteins</td>
<td>3</td>
</tr>
<tr>
<td>BIOB 410</td>
<td>Immunology</td>
<td>3</td>
</tr>
<tr>
<td>BIOB 438</td>
<td>Developmental Mechanisms</td>
<td>3</td>
</tr>
<tr>
<td>BIOB 524</td>
<td>Ethical Practice of Science</td>
<td>3</td>
</tr>
<tr>
<td>BIOO 412</td>
<td>Animal Physiology</td>
<td>3</td>
</tr>
<tr>
<td>BIOL 409</td>
<td>Advanced Human Torso Anatomy</td>
<td>4</td>
</tr>
<tr>
<td>BIOL 510</td>
<td>Topics in Neurobiology</td>
<td>3</td>
</tr>
<tr>
<td>BIOM 400</td>
<td>Medical Microbiology</td>
<td>3</td>
</tr>
<tr>
<td>BIOM 431</td>
<td>Medical Bacteriology</td>
<td>3</td>
</tr>
<tr>
<td>BIOM 435</td>
<td>Virology</td>
<td>3</td>
</tr>
<tr>
<td>BIOM 441</td>
<td>Eukaryotic Pathogens</td>
<td>4</td>
</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>
</tr>
<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>
</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>
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<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>HSTR 419</td>
<td>Modern Science</td>
<td>3</td>
</tr>
<tr>
<td>HSTR 417</td>
<td>Early Modern Science</td>
<td>3</td>
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</tbody>
</table>

**Community Health**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course 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>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 412IH</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>
</tr>
<tr>
<td>NRSG 418</td>
<td>Hlth Policy/Hlth Care Econ Cln</td>
<td>2</td>
</tr>
<tr>
<td>NRSG 550</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>NRSG 553</td>
<td></td>
<td>2</td>
</tr>
<tr>
<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>
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</table>

**International**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<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>
<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>
</tbody>
</table>
Health and Medicine

BIOB 524 Ethical Practice of Science 3
PSYX 477 Science of Psych Well-Being 3
PSYX 541 Cognitive Processes 3
PSYX 544 Social Psychology 3
NUTR 411 Nutrition for Sports/Exercise 3
NUTR 421 Macronutrient Metabolism 3
NUTR 422 Micronutrient Metabolism 3
NUTR 425 Medical Nutrition Therapy I 3
NUTR 511 Exercise Metabolism and Health 3
EIND 513 Human Factors in the Safety of Complex Systems 3
NRSG 550 3
ECNS 501 Microeconomic Theory 3
CHTH 435 Human Response To Stress 3
CHTH 440 Principles Of Epidemiology 3
HTH 455 The Ethic of Care 3
KIN 515 Exercise Performance and Nutr 3
CHTH 502 Theories and Models in Health 3
HEE 506 Exercise and Chronic Disease 3
KIN 545 Graduate Exercise Physiology 3

Master of Science in Science Education
403 Linfield 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/applying%20info.htm).

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.

Thirty semester credits are required for the degree. In addition to completing a group of core courses, students develop interdisciplinary combinations of science courses from offerings in biology, chemistry, earth science, microbiology, plant sciences, physics, engineering and other related areas. The remaining four credits may be additional science course and/or elective education 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 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>

Molecular Biosciences Program

Program Chair
Matthew Fields
113A Lewis Hall
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)
- Biologically Inspired 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)
- Biophysics (http://mbprogram.montana.edu/dept.asp?in_id=9)
- 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 of 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 Biologically Inspired 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:

<table>
<thead>
<tr>
<th>Fall Semester</th>
<th>Spring Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>MBSP 594</td>
<td>Molecular Biosc Prgm</td>
</tr>
<tr>
<td>MBSP 561</td>
<td>Molec Biosci Lab Rotation I</td>
</tr>
<tr>
<td>MBSP 562</td>
<td>Molec Biosci Lab Rotation II</td>
</tr>
<tr>
<td>Two courses from any of the approved courses in the eleven participating sciences departments</td>
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</tr>
<tr>
<td>MBSP 594</td>
<td>Molecular Biosc Prgm</td>
</tr>
<tr>
<td>MBSP 563</td>
<td>Molec Biosci Lab Rotation III</td>
</tr>
<tr>
<td>MBSP 564</td>
<td>Molec Biosci Lab Rotation IV</td>
</tr>
<tr>
<td>or MBSP 575</td>
<td>Mol BioSci Prgm Rsch Project</td>
</tr>
<tr>
<td>Two courses from any of the approved courses in the eleven participating sciences departments</td>
<td></td>
</tr>
</tbody>
</table>

Research Experience

Ph.D. students will gain research experience through their lab rotation, conference submissions, and attending conferences.

Research Facilities

Research Facilities vary on lab rotation selection.

Post Baccalaureate Pre-Medical Certificate

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 Application for Advanced Certificate and the Certificate Program of Study forms (http://www.montana.edu/gradschool/forms.html), the Certificate will be included on the students 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 Goals/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.
- The didactic portion of the Certificate program prepares students to apply to 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. 370) program during the glide year to further enhance their academic foundation prior to professional school matriculation.

Recommended Schedule of Courses

<table>
<thead>
<tr>
<th>Summer Sessions (2)</th>
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<tbody>
<tr>
<td>CHMY 141 College Chemistry I</td>
<td>4</td>
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<tr>
<td>CHMY 143 College Chemistry II</td>
<td>4</td>
</tr>
<tr>
<td>PHSX 205 College Physics I</td>
<td>4</td>
</tr>
<tr>
<td>PHSX 207 College Physics II</td>
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<table>
<thead>
<tr>
<th>Fall Semester</th>
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<tbody>
<tr>
<td>CHMY 321 Organic Chemistry I</td>
<td>4</td>
</tr>
<tr>
<td>BIOB 260 Cellular and Molecular Biology</td>
<td>4</td>
</tr>
<tr>
<td>STAT 216Q Introduction to Statistics</td>
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</tr>
<tr>
<td>Elective</td>
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</table>

<table>
<thead>
<tr>
<th>Spring Semester</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>CHMY 323 Organic Chemistry II</td>
<td>4</td>
</tr>
<tr>
<td>BIOB 375 General Genetics ( or)</td>
<td>3</td>
</tr>
<tr>
<td>BIOH 320 Biomedical Genetics</td>
<td>3</td>
</tr>
<tr>
<td>electives</td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Summer Session (1)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>BCH 380 Biochemistry</td>
<td>5</td>
</tr>
</tbody>
</table>

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 30.
• 3.0 undergraduate GPA

To apply to the program ill 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 Graduate School (Transcripts with degrees awarded from MSU are not required).
• 3 letters of recommendation
• Narrative of goals and interest in obtaining PMSEM degree
• Resume

### Curriculum

**Required Coursework (15 credits)**

<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 (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>Course 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</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@ce.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, multi-disciplinary efforts. Understanding is developed through targeted advanced coursework tailored to the student.

<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 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 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>
</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>
<th>Course Code</th>
<th>Course 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</td>
<td>3</td>
</tr>
<tr>
<td>ECIV 592</td>
<td>Independent Study</td>
<td>3</td>
</tr>
<tr>
<td>ECIV 598</td>
<td>Internship</td>
<td>2</td>
</tr>
<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>
<tr>
<td>LRES 565</td>
<td>Environmental Biophysics</td>
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<tr>
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<td>3</td>
</tr>
<tr>
<td>LRES 573</td>
<td>Remote Sensing Env Sci</td>
<td>3</td>
</tr>
<tr>
<td>LRES 575</td>
<td>Prof Paper &amp; Project</td>
<td>1-4</td>
</tr>
</tbody>
</table>
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 coursework in the certificate is online but elective courses may be either online or on campus.

### Certificates

**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 3 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>
</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 3 credits of electives will be determined with advisor 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 502</td>
<td>Leading the Tech Enterprise</td>
<td>6</td>
</tr>
</tbody>
</table>

**Professional Practice of Architecture Graduate Certificate**

The Professional Practice of Architecture Graduate Certificate is designed to build the next generation of leaders in the professional practice of architecture. Creative skills for managing people, projects and budgets can transform a talented individual into a leader in the profession. This 9 month, 15-credit online program will give you the foundation of solid business skills while you explore creative and visionary ways to think about the contemporary practice of architecture. This certificate is online.

<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

- 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).

### 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 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.

### 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 a related science or engineering field. The student’s academic record must provide evidence of a strong background 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 theory, experimental techniques, current challenges, and societal/economic impacts 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.

**WWAMI Medical Education Program**

**Director**
Martin Teintze, Ph.D.
310 Leon Johnson Hall
Email: mteintze@montana.edu
Home Page: www.montana.edu/wwwwwami

**Program Manager**
Ashley Siemer
308 Leon Johnson Hall
Tel: 406-994-4411, email: ashley.siemer@montana.edu

**Administrative Associate III**
Yan Su
309 Leon Johnson Hall
Tel: 406-994-4752, email: yan.su01@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
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, physiology, biochemistry and genetics. Aspects include the organization of the genome and units of heredity, properties of macromolecules, and cytotechnology. 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.

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: Summer Term

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.

Required Courses: Second Fall Semester

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/wwwwwami for the complete application, admissions, and program requirements.

Jake Jabs College of Business & Entrepreneurship

Dean
Kregg Ayres, Ph.D.
412 Reid Hall, Bozeman, MT 59717
406-994-4423

Program Director
Anne Christensen, Ph.D.
444 Reid Hall, Bozeman, MT 59717
406-994-2043 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/cat_admin_pol.html.

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 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

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). Students who wish to be considered for a scholarship should contact Halina Rickman in the Dean’s office at (406) 994-4423.

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 Code</th>
<th>Course 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

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/catalog.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 beginners and intermediate skill levels. Students will develop the skills, rules and terminology necessary to play recreational racquetball. Fee required.

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 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 wallyball 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.

ACT 128. Wallyball. 1 Credit. (1 Lab) F,S
Introduces wallyball skills, techniques, strategies, rules and scoring.

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,S
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) F,S,Su
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, footwork, 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. Pass/Fail.

ACT 173. Beg Fly Fishing/Hy Tying. 1 Credit. (1 Lab) On Demand
Basic skills and knowledge of fly fishing including casting, entomology, habitat, stream ethics, tackle, tactics, and strategy.
ACTG 101. Accounting Procedures I. 4 Credits. (4 Lec) F
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 covers the 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 205. Computerized Accounting. 3 Credits. (3 Lec) S
Offered by Gallatin College. PREREQUISITE: ACTG 101. This course will include the use of accounting information by managers to make operational and financial decisions in a business entity. Topics covered include selecting a financial entity, preparing and analyzing financial statements, product cost allocation, cost behavior, and budgeting. The planning, organizing, and controlling functions of management will be consistently addressed throughout the course.

ACTG 212. 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, preparing and analyzing financial statements, product cost allocation, cost behavior, and budgeting. The planning, organizing, and controlling functions of management will be consistently addressed throughout the 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 decision-making. 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.

ACTG 290R. Undergraduate Research. 1-6 Credits. (1-6 Ind; max unlimited) F,S
Directed undergraduate research/creative activity which may culminate in a written or other creative project. Course will address responsible conduct of research. May be repeated.

ACTG 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.

ACTG 292. Independent Study. 1-3 Credits. (1-3 Ind; 6 cr max)
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 312R. Acct Information Systems I. 3 Credits. (3 Lec) F
PREREQUISITE: ACTG 223 or consent of instructor. 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. Inter Fin Acct & Reporting I. 3 Credits. (3 Lec) F,S
PREREQUISITE: ACTG 223 and BMIS 211. 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 398. Undergraduate Research. 1-6 Credits. (1-6 Ind; max unlimited) F,S
Directed undergraduate research/creative activity which may culminate in a written or other creative project. Course will address responsible conduct of research. May be repeated.

ACTG 401. Principles of Federal Taxation-Individuals. 3 Credits. (3 Lec) F
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
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/management 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. Acct Information Systems II. 3 Credits. (3 Lec) On Demand
PREREQUISITE: Junior standing and completion of ACTG 321R or BMIS 311. 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 Ret) F,S
PREREQUISITE: ACTG 327. For business majors: formal admission to the College of Business. Cross-listed with BMIS 441. Analysis with emphasis on how managers' incentives and financial statement impacts 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; 12 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 Mgmt. 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 services 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)
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 526. Advanced Taxation. 3 Credits. (3 Lec) S
PREREQUISITE: ACTG 401 and admission to MPAC Program or consent of instructor. How tax laws affect Corporations, Partnerships, Limited Liability Companies, and other business entities. In addition, the tax laws applicable to estates and trusts, state taxes and multi-jurisdictional issues are explored. Tax reporting, tax planning, and tax research skills are emphasized.

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: BGEN 361 or equivalent and admission to MPAC Program. Analysis of legal issues for accounting students, including debtor/creditor law, bankruptcy, securities regulation, antitrust, employment regulation, uniform commercial code and real property. Course includes significant written work and oral presentations.

ACTG 529. Research in Accounting. 3 Credits. (3 Lec) F
PREREQUISITE: ACTG 328 and admission to MPAC Program. A project-oriented seminar that focuses on developing research tools for researching, developing and communicating defensible solutions to accounting issues and problems of the type likely to be encountered throughout a professional career in accounting.

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 401 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 535. 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. Consultation to assist low-income clients through the Volunteer Income Tax Assistance Program. Prepare Federal and State income tax returns. Preparation of income tax returns for low-income clients through the Volunteer Income Tax Assistance Program.

ACTG 536. Advanced Accounting. 3 Credits. (3 Lec) F
PREREQUISITE: ACTG 401 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 537. Advanced Auditing. 3 Credits. (3 Lec) F
PREREQUISITE: ACTG 411 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
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 Lab; 3 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/anches 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) F,S,Su
On Demand 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 292. Independent Seminar. 1-3 Credits. (1-3 Ind; 3 cr max) On Demand
Maximum 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 BIOL 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 394. Seminar. 1-2 Credits. (1-2 Sem; 3 cr max) F,S,Su
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: AGEC 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 AGEC 345 or BIIN 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 Lec; 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. Decision aid software, spreadsheets, database, telecommunication and financial records are emphasized. Application of computers to control, monitor, and calibrate devices in addition to aiding management decisions.

AGED 140US. Leadership Dev For Agriculture. 3 Credits. (2 Lec, 1 Lab) F,S,Su
Process of developing and managing individuals by providing leadership and guidance at all levels of personnel development. Self-concepts developed through situational leadership and management, principles of people management, goal setting, and belief systems. Collaborative learning and field experience utilized.
AGED 253. Ag Ed in Pub Schools. 3 Credits. (3 Lec) S
PREREQUISITE: AGED 140US and FCS 101IS. Establish a philosophy of agricultural education at the secondary, middle school, and elementary level. Instructional content in agricultural science, mechanics, and leadership will be identified. Principles needed in developing agricultural experiences associated with agricultural education will be presented.

AGED 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 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 292. Independent Study. 1-3 Credits. (1-3 Ind; 6 cr max) On Demand IND Maximum 6 cr. PREREQUISITE: Consent of instructor and approval of department head. Directed research and study on an individual basis.

AGED 294. 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 301. Rural Electrification. 3 Credits. (2 Lec. 1 Lab) S
This course will cover the basic wiring requirements for farm buildings and agricultural electrical motors. An emphasis is placed on application and troubleshooting. Alternative power generation methods are also discussed.

AGED 309. Philosophy and Programs in Extension. 3 Credits. (3 Lec) S alternate years to be offered odd years. Designed for students from any major who are interested in pursuing a career in the Cooperative Extension Service, community education, or other non-formal educational settings. The course focuses on land-grant and extension history, philosophies, and program areas; teaching methods, non-formal educational philosophies, instilling community change through education, basic program development and evaluation, and development of career preparation skills.

AGED 312R. Communicating Agriculture. 3 Credits. (3 Lec) F
PREREQUISITE: Lower level computer class or AGED 105 and WRIT 101W. Provides an overview of communications strategies associated with the agricultural and natural resources industries. Different types of communication skills will be emphasized including written, oral, digital media, and research. This course is open to all majors interested in learning practical communications techniques.

AGED 315. Electrical and Power Systems Operation. 3 Credits. (2 Lec. 3 Lab) F
PREREQUISITE: Junior standing. Provides students an opportunity to develop knowledge and skills related to the basic wiring requirements for agricultural buildings and electrical motors as well as the principles of engine operation, control, repair and maintenance. Agricultural Education.

AGED 333. Construction Technology. 3 Credits. (1 Lec, 2 Lab) F
Various construction systems that are used to construct structures on site. Includes all aspects of the construction industry such as basic planning, materials, estimating, building techniques, managing, and the actual construction of building projects.

AGED 353. Cooperative Business Principles and Practices. 3 Credits. (3 Lec) F
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.

AGED 397. Educational Methods in Ag. 1 Credit. (5 Lab) F
COREREQUISITE: Taken concurrently with EDU 497. Provides additional experience in planning, teaching, and evaluating lessons in agricultural education.

AGED 401. Agricultural Relations Issues and Research. 3 Credits. (3 Lec) S
PREREQUISITE: Senior standing in AGED. Must have completed an internship. This course will prepare students for future careers by researching agricultural issues and refining professional skills. Current issues in extension, leadership, and communications, as well as social science research methodologies, 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 490R. Undergraduate Research. 1-6 Credits. (1 Ind; 12 cr max) F,S,Su Max 12 cr. IND May be repeated. Directed undergraduate research/creative activity which may culminate in a research paper, journal article, or undergraduate thesis. Course will address responsible conduct of research.

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: Junior standing and as determined for each offering and 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 498. Internship. 2-8 Credits. (2-8 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 of Agricultural Education.

AGED 506. Research Methods. 3 Credits. (3 Lec) F
Principles and techniques of research appropriate for planning, conducting and reporting agricultural and extension education research.

AGED 507. Program Planning and Evaluation. 3 Credits. (3 Lec) S
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 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.

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 588R. 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 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.

AGED 590. Master's Thesis. 1-10 Credits. (1 Ind; 10 cr max) S,F,S
SU PREREQUISITE: Master's Standing.
AGSC 428. Sustainable Cropping Systems. 3 Credits. (3 Lec) S
PREREQUISITE: ENSC 245IN and either AGSC 341 or AGSC 342 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 an 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.

AGSC 441. Plant Breeding & Genetics. 3 Credits. (3 Lec) S alternate years, to be offered odd years.
PREREQUISITE: BIOL 375 or BIOL 377. The genetic principles and practices involved in plant breeding. Selection of plant breeding methods based on an understanding of a plant species genetics and reproductive mechanisms. The class includes hands on experience in plant breeding through a series of lab and greenhouse exercises.

AGSC 450. Plant Disease Control. 3 Credits. (3 Lec) S alternate years, to be offered odd years.
PREREQUISITE: BIOM 421 or consent of instructor. This course will provide comprehensive coverage of the concepts of integrated management of plant diseases. Concepts covered include regulatory, cultural, chemical, host plant resistance, and biological controls. Students will be introduced to epidemiology and weather-based predictive computer models for use in disease management programs.

AGSC 454. Agrostology. 3 Credits. (1 Lec, 2 Lab) F alternate years, to be offered odd years.
PREREQUISITE: BIOL 230. Determination, classification, evolution, and nomenclature of grasses and grass-like plants; morphological and ecological features; preparation of reference specimens.

AGSC 455. Molecular Plant-Microbe & Insect Interactions. 3 Credits. (3 Lec) S alternate years
PREREQUISITE: BIOL 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) S, F
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; 6 cr max) F
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) Su
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) Su
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, RVS, DRG), manual bookkeeping procedures, and medical records management.

AHMS 250. Advanced Medical Coding. 4 Credits. (3 Lec) S
PREREQUISITE: AHMS 160, AHMS 162 This course 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
Introduces students to major trends in American Studies and to major issues in American history, literature, and the arts.

AMST 202RA. The Arts in America. 3 Credits. (2 Lec) S
PREREQUISITE: WRIT 101W. 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. Culture of the American West. 3 Credits. (3 Lec) F
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 501. Methods in American Studies. 3 Credits. (3 Sem) F
PREREQUISITE: AMST 201. 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 502. Research in American Studies. 3 Credits. (3 Sem) 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) F
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 922. Independent Study. 1-4 Credits. (1-4 Ind; 8 cr max) F
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 922A. Independent Study. 1-10 Credits. (1-10 Ind; max unlimited) F,S,Su
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
PREREQUISITE: Doctoral standing. Presentation and discussion of dissertation research and design solutions to contemporary problems in American Society.

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) 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 carcases. Procedures include 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: BIBO 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: BIBO 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
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 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.

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 Lec) 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, BIBO 160, and CHMY 121N. 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 205 or consent of instructor. Advanced skills in rationing, U.S. grading standards, and carcass pricing.

ANSC 321. Physiology of Animal Reproduction. 4 Credits. (4 Lec) 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 322. Principles of Animal Breeding and Genetics. 3 Credits. (3 Lec) S
PREREQUISITE: ANSC 100, BIBO 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: BIBO 470, BIBO 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 a nutrition, health care, 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. Directed 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.
ANTY 101D. Anthropology and the Human Experience. 3 Credits. (3 Lec) F,S
Comparative 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, Apes, and Ancestors. 3 Credits. (3 Lec) S
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 215IS. Human Prehistory. 3 Credits. (3 Lec) F
Introduction to basic concepts and ideas about the biological and cultural evolution of
human species. Topics include primate ancestors, human origins, evolutionary theory,
genetics, archaeological interpretation, and cultural change from the earliest stone tools
to the rise of ancient civilization.

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 thought, everyday practice 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
The nature of culture through selected societies: symbolism and world view as related
to cultural dynamics and representational forms. A survey of social practices, linguistic
and cultural representations, exchange, identity, and the dynamics of power.

ANTY 242D. Contemporary Japan. 3 Credits. (3 Lec) On Demand
Introduction to major political, economic, social and cultural issues in contemporary
Japanese society. On-going legacy of WWII, re-emerging nationalism, and backlash
against ideas and institutions of “post-war democracy”. Citizen activism on these issues
in and outside Japan.

ANTY 252IS. Mysteries of the Past. 3 Credits. (3 Lec) F
Focuses on archaeological thinking and the use of the scientific method in archaeology.
Examines a variety of archaeological and pseudo archaeological claims from this
perspective.

ANTY 290R. Undergraduate Research. 1-6 Credits. (1-6 Ind; max unlimited) On Demand
PREREQUISITE: ANTY 101 or ANTY 225. Undergraduate experiences for non-
majors fulfilling their core research requirements. 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 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. Directed
research and study on an individual basis.

ANTY 313. Biological Anthropology. 3 Credits. (3 Lec) S 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 alternate years
To be offered odd years PREREQUISITE: Junior standing and consent of instructor.
Detailed study of human cranial and postcranial 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.

ANTY 327. Medical Anthropology. 3 Credits. (3 Lec)
On demand PREREQUISITE: Junior standing. ANTY 215, ANTY 225. Anthropological
research materials, their methodological treatment and theoretical
grounding as applied to health-related practices in local and trans cultural contexts.
Cultural constructions of diseases, intervention and treatment strategies, and the
analysis of health concerns associated with globalization and accelerated culture
growth.

ANTY 332. Native North America. 3 Credits. (3 Lec) S alternate years
To be offered odd years PREREQUISITE: Junior standing. ANTY 225. An
anthropological view of native North American cultures from the perspective of the
ethnographic present. Continental-wide diversity in native adaptations and life ways
are examined along lines of anthropologically-defined culture areas.

ANTY 336. Myth, Ritual and Religion. 3 Credits. (3 Lec) S alternate years
To be offered odd years 3 cr. LEC 3. PREREQUISITE: Junior standing, ANTY 225. Forms
of religious representation and practice in cultural and historical context; from
liminality and symbolic innovation to mythic charters and social transformations,
cosmological scenarios and ritual forms are explored in this course.

ANTY 337. Sex, Gender, Sexuality Japan. 3 Credits. (3 Lec) S
to be offered even years PREREQUISITE: ANTY 225 or SOCI 326 or HSTR 145.
Dominant constructions of sex, gender and sexuality in contemporary Japanese society,
and how such constructions are reinforced, contested or resisted by women in Japan.
Interaction with race, ethnicity, class and other social and historical factors (e.g.,
colonialism, globalization).

ANTY 338. Contemporary Pacific Societies. 3 Credits. (3 Lec) S alternate years
To be offered even years PREREQUISITE: Junior standing, ANTY 101 and ANTY
215. Current ethnological and theoretical considerations of creative cultural processes
in relation to classical adaptations and world views of Pacific Island peoples.

ANTY 343. Popular Culture - Japan. 3 Credits. (3 Lec) S
To be offered even years PREREQUISITE: ANTY 225 or SOCI 303 or HSTR 145.
Examines socio-historical and political meanings of mass/popular culture in our
day lives in personal, local and global contexts. Focus on materials originating
from or related to Japan including manga, anime, music, performance arts, food,
fashion, the internet, toys and television.

ANTY 350. Old World Prehistory. 3 Credits. (3 Lec) S alternate years
To be offered even years PREREQUISITE: Junior standing, ANTY 215. This course
provides an understanding of the origins and development of human culture in the
Old World (Africa, Europe, Asia, and Australia) over the past three million years. The
emphasis is on key theoretical and methodological developments in the archaeology
and paleoanthropology of the Old World.

ANTY 351. Archaeology of North America. 3 Credits. (3 Lec) F alternate years
To be offered odd years PREREQUISITE: Junior standing, ANTY 215. Prehistoric
cultural adaptations and developments in North America from the earliest
archaeological evidence through historic times; basic archaeological methods and
theory.

ANTY 355. Peoples and Prehistory. 3 Credits. (3 Lec) On Demand
PREREQUISITE: Junior standing, ANTY 215, ANTY 225. The study of ancient
and extant cultures of a selected world region with a comparative focus between the
archaeology and ethnography of ancient and extant societies. Explores theoretical
and methodological implications associated with the linkages between archaeology and
ethnography.

ANTY 356. Archaeology of Southwest Asia. 3 Credits. (3 Lec) F
Odd years PREREQUISITE: ANTY 215 and Junior Standing Examination of the
archaeology of Southwest Asia from the earliest traces of humanity through the
historical periods. An emphasis on key transitional developments including agricultural
origins and the rise of complex societies.

ANTY 357. Foragers of Sub-Saharan Africa. 3 Credits. (3 Lec) On Demand
PREREQUISITE: ANTY 215. Examination of the archaeology and ethnography of
ancient an extant forager peoples in Sub-Sahara Africa. Considers varying research
approaches and cross-cultural similarities and variability.

ANTY 425R. Social Organization. 3 Credits. (3 Sem) S alternate years
To be offered even years PREREQUISITE: Junior standing, ANTY 225. Senior
capstone course. An analysis of culturally relevant components of the social order in
small-scale and complex societies, and local constructs of personal and group identity.
Considers classical and recent approaches to interpersonal relationships and the
organization of social life.
ANTY 427. Anthropology of Gender. 3 Credits. (3 Lec) S alternate years to be offered odd years PREREQUISITES: ANTY 225 or WS 201 or consent of instructor. Examines contemporary anthropological approaches to the studies of gender, and discussion of contemporary issues and topics related to gender and sexuality across cultures. Topics include construction of femininity and masculinity, kinship and family, sexualities, religion, globalization and activism.

ANTY 428RS. Anthropological Theory. 3 Credits. (3 Lec) F alternate years to be offered even years PREREQUISITE: Junior standing, ANTY 225. Senior capstone course. An analysis of theories of anthropological science within their social context of development, exploration and critique of representative classics.

ANTY 441. Social Movements in Japan. 3 Credits. (3 Lec) S alternate years to be offered every other year PREREQUISITE: ANTY 225 or ANTY 242 or HSTR 145 or consent of instructor. Examine contemporary social movements and their historical antecedents in Japan. Discuss the claims and organizational strategies of various movements, such as conservative, religious, communist, feminist and queer movements, and the new virtual movement utilizing the internet.

ANTY 450. Archaeological Theory. 3 Credits. (3 Lec) S alternate years, odd years PREREQUISITE: ANTY 101, ANTY 215. Examination of current methodological and theoretical issues in archaeology and how they are applied to our understanding of the past.

ANTY 453. Zorarchaeology. 3 Credits. (2 Lec, 1 Lab) On Demand PREREQUISITE: Junior standing, ANTY 215. Hands-on approach to analysis of prehistoric archaeological materials. Typically focuses on a single technology (stone, ceramics, animal bone, etc.). Course emphasis will alternate between replicative/experimental studies, where students create implements by attempting to replicate prehistoric manufacturing techniques, and the methodological and theoretical basis underlying formal analysis of material remains.

ANTY 454. Lithic Technology. 3 Credits. (3 Lec) S PREREQUISITE: ANTY 101, ANTY 215, and Junior standing, or consent of instructor. This course examines prehistoric stone technology and the methodological and theoretical underpinnings of archaeological interpretation. The course material is conveyed through hands-on activities, individual analyses, and discussions of the theoretical foundations for archaeological interpretations.

ANTY 467. Archaeology Field School. 1-9 Credits. (1-9 Lec; 9 cr max) Su On demand PREREQUISITE: ANTY 101. A summer of archaeological field work at a location away from the University; training in excavation and laboratory methods. (Offered when funding available.)

ANTY 472. Descriptive Linguistics. 3 Credits. (3 Lec) F alternate years to be offered odd years PREREQUISITE: Junior standing, ANTY 225. Language as a subsystem of culture, fundamentals of linguistic analysis and the use of language in social contexts. Also explores relationships between perception and conception, thought and representation.

ANTY 473. Language & Culture. 3 Credits. (3 Lec) F alternate years to be offered odd years PREREQUISITE: Junior standing, ANTY 225. Language as a subsystem of culture, fundamentals of linguistic analysis and the use of language in social contexts. Also explores relationships between perception and conception, thought and representation.

ANTY 490R. Undergraduate Research and Instruction. 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.

ANTY 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.

ANTY 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 study on an individual basis.

ANTY 494. Seminar. 1-12 Credits. (1-12 Sem; 12 cr max) On Demand PREREQUISITE: ANTY 215 or ANTY 225 and Junior standing or consent of instructor. Topics offered at the upper division level which are not covered in regular courses. Students participate in preparing and presenting discussion material.

ANTY 495. Field Experience. 1-9 Credits. (1-9 Lec; 9 cr max) Su On demand PREREQUISITE: ANTY 101. A summer of archaeological field work at a location away from the University; training in excavation and laboratory methods. (Offered when funding available.)

ANTY 591. Special Topics. 1-4 Credits. (1-4 Lec) Reproduction, Medicine & Technology.

ANTY 592. Independent Study. 1-3 Credits. (1-3 Ind; 4 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.

ARAB - Arabic

ARAB 101. Elementary Modern Arabic I. 4 Credits. (4 Rct)
An elementary level course designed to facilitate students’ acquisition of basic proficiency in communication within culturally significant contexts. Students learn Modern Standard Arabic language skills in an environment integrating interactive video and classroom instruction.

ARAB 102D. Elementary Modern Arabic II. 4 Credits. (4 Rct)
PREREQUISITE: ARAB 101 or consent of instructor. This course builds upon the foundation established in 101. Greater emphasis is placed upon oral and written expression. Cultural issues are explored in an environment integrating interactive video and classroom instruction.

ARAB 201. Intermediate Modern Arabic I. 4 Credits. (4 Rct)
PREREQUISITE: ARAB 102 or equivalent, or a minimum three years of high school Arabic 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.

ARAB 202. Intermediate Modern Arabic II. 4 Credits. (4 Lec)
PREREQUISITE: ARAB 201 or equivalent, or placement interview. Continuation of ARAB 201. Students who successfully complete this course will have ‘survival skills’ for daily life in the Arab world, and will be ready for more advanced course work using authentic materials. Expansion of cultural knowledge.

ARAB 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.

ARCH - Architecture

ARCH 121A. 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,S,Su
PREREQUISITE: Consent of director. Restricted enrollment. Must be admitted into pre-environmental design program or be a landscape design major. 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. (2 Lab, 2 Studio) S,S,Su
PREREQUISITE: ARCH 151 or advanced placement based on approved portfolio; pre-environmental design and landscape design majors only. A continuation of the study of the design process introduction to architectonic principles and architectural graphic skills and further understanding of the creative process. Continued development of student's ability to make critical and analytical judgments.

ARCH 221. World Architecture: Modern to Contemporary. 3 Credits. (3 Lec) On Demand
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 professed by architects and thinkers of the 20th and early 21st centuries.

ARCH 223. Intro to Arch Theory. 3 Credits. (3 Lec) On Demand
Introduction to theoretical approaches advocated by architects, urban designers, planners and theorists throughout history. Emphasis is placed on theoretical positions, their advocacies and their impact on architecture.
ARCH 231CS. Issues in Sustainability. 3 Credits. (3 Lec) F
Introduction to concepts and practices intended to create more sustainable communities where present generations are accountable for the needs of future generations and the natural environment. The course will explore current multi-disciplinary practices in "ecological design".

ARCH 241. Building Construction I. 3 Credits. (1 Lec, 2 Sru) F
Introduction to the materials of construction and an overview of building construction systems. Emphasis upon an understanding of materials and systems as a means to effective and creative design utilization.

ARCH 253. Architectural Design I. 5 Credits. (1 Lec, 4 Lab) F
PREREQUISITE: ARCH 152 Formal admission into the environmental design program. PREREQUISITE: ARCH 243 Fundamentals in architectural techniques. Course utilizes observation and design studio supplemented by design drawing lecture/demonstrations sessions. Topics include freehand observation drawing and constructed multi-view, paraline, perspective and shade/shadow drawing leading towards the formal graphic presentation of architectural intentions.

ARCH 261. Architectural Graphics I. 3 Credits. (1 Lec, 2 Lab) F
PREREQUISITE: Formal admission into the environmental design program. COREQUISITE: ARCH 243 Fundamentals in architectural techniques. Course utilizes observation and design studio supplemented by design drawing lecture/demonstration sessions. Topics include freehand, perspective, and a horizontal and vertical drawing leading towards the formal graphic presentation of architectural intentions.

ARCH 262. Architectural Graphics II. 3 Credits. (1 Lec, 2 Lab) S
PREREQUISITE: ARCH 261. Admission into the environmental design program. COREQUISITE: ARCH 253 Basic techniques in architectural graphic expression. Course emphasizes observation and design studio supplemented by design drawing lecture/demonstration sessions. Topics include freehand, perspective, and shaded and shadow drawing techniques. Two and three-dimensional digital applications introduced. Notebook computer required.

ARCH 289R. Undergraduate Research and Instruction. 1-3 Credits. (1-3 Rct; max unlimited) F,S
Classroom instruction associated with directed undergraduate research/creative activity projects. May be repeated.

ARCH 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.

ARCH 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.

ARCH 292. Independent Study. 1-3 Credits. (1-3 Ind; 6 cr max) On Demand PREREQUISITE: Consent of instructor and approval of department head. Directed study and research on an individual basis.

ARCH 294. Seminar. 1-2 Credits. (1 Sem; 4 cr max) F,S,Su
PREREQUISITE: 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.

ARCH 322IA. World Architecture I. 3 Credits. (3 Lec) F
PREREQUISITE: Junior standing for non-majors, WRIT 101W. A survey of world architectural history from primitive developments to the Gothic.

ARCH 323IA. World Architecture II. 3 Credits. (3 Lec) S
PREREQUISITE: Junior standing for non-majors, WRIT 101W. A survey of world architectural history from the Renaissance to Industrial Revolution.

ARCH 331. Environmental Controls I. 4 Credits. (4 Lec) F
PREREQUISITE: M 151Q or M 171Q. Analysis of climate, passive design strategies, and heat flow fundamentals. Analysis and design of basic heating, ventilating, and air-conditioning systems. Analysis and design of water supply, sanitation and vertical transportation systems. Notebook computer required.

ARCH 332. Environmental Controls II. 4 Credits. (4 Lec) S
PREREQUISITE: M 151Q or M 171Q. ARCH 331. Analysis and design of architectural lighting systems, acoustics, electrical systems, fire protection, and signal systems. Notebook computer required.

ARCH 340. Building Construction II. 4 Credits. (2 Lec, 2 Lab) S
PREREQUISITE: ARCH 241, ARCH 244 and ARCH 331, ARCH 363 or permission of instructor. Development and integration of building materials and assemblies, construction costs and building systems into the construction documents, specifications and design of a small project. Building systems to be investigated include: structural environmental and enclosure, life safety and sustainability. Notebook computer required.

ARCH 342. Architectural Structures II. 4 Credits. (3 Lec, 1 Sru) F
PREREQUISITE: PHSX 205, M 151Q or M 171Q, formal admission into environmental design program. Introduction to structural design/analysis of horizontal and vertical members as applied to architectural works; basic statics, moment and shears of rigid bodies and architectural forms; strength concepts using stress and strain assessment; application of analytical and intuitive structural concepts in a design context.

ARCH 344. Architectural Structures III. 4 Credits. (3 Lec, 1 Sru) S
PREREQUISITE: ARCH 343, M 151Q or M 171Q. Understanding of design for structural elements in wood, steel, masonry, and concrete. Lateral considerations and calculations including wind, soil and seismic loads. Understanding of structural systems; building systems; diaphragms; connections; structural engineer-architect communications.

ARCH 355. Architectural Design III. 5 Credits. (1 Lec, 4 Lab) F
PREREQUISITE: ARCH 254. Further exploration of ecologically-sound design with emphasis on the integration of structures, building envelope systems, and building materials, including design for life safety and accessibility. Building scale and program complexity increases, utilizing long-span structural systems. Notebook computer required. Field trip required.

ARCH 356. Architectural Design IV. 5 Credits. (1 Lec, 4 Lab) S
PREREQUISITE: ARCH 355. Advanced architectural design projects integrating site analysis, programming, building systems, and contemporary design theory. Emphasis placed on the inclusive synthesis of conceptual processes, analysis preliminary design investigation, and design development. Notebook computer required.

ARCH 363. Architectural Graphics III. 3 Credits. (1 Lec, 2 Lab) F
PREREQUISITE: ARCH 262. COREQUISITE: ARCH 354. Advanced principles of computer-aided design and hand applications in architectural practice, including three-dimensional computer-aided design, hand and digital delineation, and presentation. Topics provide foundation for graphic applications in ARCH 354 design studio. Notebook computer required.

ARCH 413. Professional Practice. 3 Credits. (2 Lec, 1 Lab) F,S
PREREQUISITE: ARCH 356 Architecture as a process by which social, economic, and environmental ideas are realized. Topics include: marketing, business planning, project management, legal issues, delivery methods, technology, regulation, ethics, accessibility, interdisciplinary relations, community relations, client relations, and trends of practice. Notebook computer required.

ARCH 414. Architectural Study Abroad. 9 Credits. (6 Lec, 3 Ind; 5 Su)
PREREQUISITE: ARCH 355. COREQUISITE: ARCH 428. Structured study in foreign countries under the direction of an architecture faculty member to obtain an understanding of modern and historical architecture and the forces shaping them. Holistic study of urban environments combines design, urban design, architectural history, and pre-travel design and research. Itineraries include opportunities for additional destinations and independent travel.

ARCH 424. 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 the relate to their social, cultural, technical and economic context.

ARCH 425. 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 426. 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) S,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) S,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
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 464. Intermediate Computer Applications. 3 Credits. (2 Lab, 1 Snu) On Demand
PREREQUISITE: ARCH 263 or ARCH 363. Investigation of digital design, fabrication, modeling and drawing as applied to architectural practice. Lectures and products will explore the use of 2D and 3D applications to explore design and construction processes.

ARCH 465. Advanced Computer Application 1. 3 Credits. (2 Lab) On Demand
PREREQUISITE: ARCH 464, or consent of instructor. The investigation and application of advanced two-dimensional and three-dimensional digital application for design, modeling, and presentation techniques for architectural practice. Lectures and projects may include topics of three-dimensional modeling, animation, delineation, or digital fabrication.

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. 12 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. (5 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 historical 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) F
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.

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) On Demand
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 demonstration understanding and integration of environmental, structural, building envelope, building service, building materials and assembly systems in a comprehensive studio design project.

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 exploitation 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 LEC 2 system 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 Studio - 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 programmatically complex building.

ARCH 560. Masters Studio Project. 1-6 Credits. (1-6 Studio; 6 cr max) F
PREREQUISITE: ARCH 531 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
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.

ARCH 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 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.

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 techniques, including design of experiments and use of appropriate statistical procedures.

ARNR 508. Rangeland Ecological Theory and Application. 3 Credits. (3 Lec) F 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 every year.

PREREQUISITE: BCH 380 AND BIOL 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 every year.

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 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 advisor 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.

ARNR 690. Doctoral Thesis. 1-10 Credits. (1-10 Ind; 10 cr max) F,S,Su

PREREQUISITE: Doctoral standing.

ARTH - Art: Art History

ARTH 2401H. Exploring Artists on Film. 3 Credits. (3 Lec) F

Analyzes a variety of portrayals of art and artists throughout history in Hollywood and foreign feature films. Artists and their works will be studied in their historical context, and in terms of how history is mediated by fictional depiction in film.

ARTH 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.

ARTH 302. Survey of Ancient Art. 3 Credits. (3 Lec) F alternate years to be offered every year PREREQUISITE: ARTH 200. This course will examine the art and architecture of ancient civilizations surrounding the Aegean and Mediterranean seas. Beginning with the Aegean civilizations, the course will then examine the rise of the historical Greeks and will conclude with the Roman world.

ARTH 310. Ancient Art Mesoamerica. 3 Credits. (3 Lec) Su alternate years to be offered every year A comparative survey that will examine the art and architecture of selected cultures of Mesoamerica, Central America and South America, commonly grouped under the designation of New World civilizations. The material presented will focus on the Aztecs and Maya of Mesoamerica (southern Mexico and northern Central America) and the Incas of Central Andes of South America.

ARTH 312. History of Decorative Arts. 3 Credits. (3 Lec) S alternate years PREREQUISITE: ART 203. This course introduces students to the history of decorative arts in western Europe and the United States from the Renaissance through the early 20th Century. Emphasis will be placed on major media and stylistic trends. Attention will also be given to the use of objects in their original spatial environments.

ARTH 323. History of Printmaking. 3 Credits. (3 Lec) S alternate years to be offered odd years PREREQUISITE: ARTH 201. This course introduces students to the vocabulary, techniques and history of printmaking in the western world from the mid-fifteenth century to end of World War II.

ARTH 360. History of Asian Art and Architecture. 3 Credits. (3 Lec) S alternate years to be offered odd years PREREQUISITE: ARTH 200 or ARTH 201. The purpose of this course is to offer students a broad exposure to art and architecture produced in China, Japan, Southwestern Asia and India from the Neolithic period through the 20th century with special emphasis placed on Chinese developments.

ARTH 375. Roman, Etruscan, Greek. 3 Credits. (3 Lec) S

PREREQUISITE: ARTH 200. What role the exchange of cultural ideas had on the Italic Peninsula between 600BCE and 100BCE between Romans, Etruscans and Greeks are the focus of this course.

ARTH 400. Art and Architecture of Egypt. 3 Credits. (3 Lec) S alternate years to be offered every year PREREQUISITE: ARTH 200. This course is an exploration of the art and architecture of ancient Egypt and the Near East (Anatolia, Mesopotamia and Persia). Due to the nature of the surviving material, the emphasis will be on the ideas and attitudes of these civilizations about the relationship between humans and divinities, the cult of the ruler/king, and funerary cult and the afterlife.

ARTH 402. Greek Art and Architecture. 3 Credits. (3 Lec) F alternate years to be offered odd years PREREQUISITE: ARTH 200 and ARTH 201. This lecture-based course will present a survey of the art and architecture of ancient Greece from its origins in the Dark ages through the Hellenistic period. Study begins with the Bronze Age of antecedents of Hellenic art and ends with the wide-spread dissemination of Greek material culture after the death of Alexander the Great.

ARTH 406. Roman Art and Architecture. 3 Credits. (3 Lec) S

PREREQUISITE: ARTH 200. This course is a survey of the public and private art and architecture of Republican and Imperial Rome. The study encompasses both the Etruscan and Republican foundations-cultural, political and artistic-of Rome and then moves on to the period when emperors ruled and the borders of the empire at its height ranged from Britain to North Africa. The course is arranged as a chronological survey moving from the prehistory of the Italic peninsula to the reign of the emperor Constantine in the fourth century CE.

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 every year PREREQUISITE: ARTH 201. A study of painting, sculpture and architecture in Italy in the 15th century. Major artists include Donatello, Masaccio, Pietro 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 is a history of painting, sculpture, and architecture produced in Italy during the 17th century. Emphasis will be placed on major artistic and stylistic trends as well as the various social, political and religious contexts for viewing art.

ARTH 427. Baroque Art in Northern Europe. 3 Credits. (3 Lec) F alternate years to be offered odd years PREREQUISITE: ARTH 201. The purpose of this course is to offer 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. (Lec 3) S alternate 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 Neo-Classicism, 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 years to be offered odd years PREREQUISITES: ARTH 200 or ARTH 201 This course will examine American painting and sculpture from the time of European settlement to 1918 with special emphasis on political, social and cultural contexts.

ARTH 438. Beginnings of Modern Art. 3 Credits. (3 Lec) F alternate years to be offered even years PREREQUISITE: ARTH 201. From Post-Impressionism to World War I. Major artists include Gauguin, Van Gogh, Cezanne, Matisse, Picasso, and the German Expressionists.

ARTH 440. 20th Century Art. 3 Credits. (3 Lec) S PREREQUISITE: ARTH 201. Art from World War I to the present.

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.
ARTZ 231. Advanced problems in ceramics. (3 Std, 2 Rct; 15 cr max) F, S

ARTZ 251. Sculpture I. 4 Credits. (2 Lec, 3 Std; 15 cr max) F, S

ARTZ 261. 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 332. Intermediate Painting. 5 Credits. (2 Lec, 3 Std; 15 cr max) F
PREREQUISITE: ARTZ 271 and ARTZ 211. An intermediate course in which multiple original prints are made from hand-drawn images on lithographic limestone. Editioning in black and multicolor using crayon, tusche, transfer, and photo methods.

ARTZ 361. Metals III. 5 Credits. (2 Lec, 3 Std; 15 cr max) F
PREREQUISITE: ARTZ 361. Metals III. A course in which students 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 371. Intermediate Printmaking. 5 Credits. (3 Std, 2 Rct; 15 cr max) S
PREREQUISITE: ARTZ 271. An 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, vellum, etching, aquatint, and chine colle.

ARTZ 376. Intermediate Printmaking. Relief. 5 Credits. (2 Lec, 3 Std; 15 cr max) F
PREREQUISITE: ARTZ 271. An 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, vellum, etching, aquatint, and chine colle.

ARTZ 381. 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.

ARTZ 241. Guided Research - Drawing. 1-5 Credits. (1-5 Ind; 15 cr max) F, S, Su
PREREQUISITE: ARTZ 241. 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 411. Guided Research - Painting. 1-5 Credits. (1-5 Ind; 15 cr max) F, S
PREREQUISITE: ARTZ 241. 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 431. Guided Research - Ceramics. 1-5 Credits. (1-5 Ind; 15 cr max) F, S
PREREQUISITE: ARTZ 331. 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.

ARTZ 451. Guided Research - Sculpture. 1-5 Credits. (1-5 Ind; 15 cr max) F, S
PREREQUISITE: ARTZ 351. 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
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 Directed undergraduate research/creative activity which may culminate in a research paper, journal article, or undergraduate thesis. Course will address responsible conduct of research.

ARTZ 491. Special Topics. 1-5 Credits. (1-5 Lec; 6 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 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.

ARTZ 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.

ARTZ 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 submitted.

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.

ASTR 371. Solar System Astronomy. 4 Credits. (3 Lec, 1 Lab) F,S,Su On Demand PREREQUISITE: PHSX 205, PHSX 220, or PHSX 224. COREQUISITE: PHSX 207, PHSX 222, or PHSX 242. Covers the origin and evolution of our solar system, including detailed examinations of the sun, earth, moon, other planets, and satellites. Exciting new discoveries and emerging research results will be integrated into the course. The laboratory operates in a "project mode" and includes experiments with models that can be done indoors as well as with the use of telescopes.

ASTR 373. Stars, Galaxies, and the Universe. 4 Credits. (3 Lec, 1 Lab) F,S,Su On Demand Alternate years, to be offered odd years. PREREQUISITE: PHSX 205, PHSX 220, or PHSX 224, or the equivalent. COREQUISITE: PHSX 207, PHSX 222, or PHSX 242, or the equivalent. After reviewing basic classical astronomy on the properties, structure and evolution of stars and galaxies, the course will introduce some hot topics in frontiers of astronomy, such as pulsars, quasars, black holes, and fate of the universe.

AVFT - Aviation Flight Training

AVFT 121. Private Pilot - Fundamentals. 5 Credits. (5 Lec) F Introduction to basic flight principles. Course includes the principles of flight (basic aerodynamics), aircraft systems, performance, weight and balance, aviation physiology, federal air regulations, and flight publications.

AVFT 122. Private Pilot - Flights. 2 Credits. (2 Lab) F Students must enroll in this course while pursuing a private pilot's certificate from an approved flight school. Course credits will be awarded upon receipt of a copy of the student's private pilot certificate.

AVFT 123. Private Pilot - Basic Air Nav. 3 Credits. F Students must be co-enrolled in both AST-141 and AST-143 An introduction to air navigation procedures. Course includes basic meteorology, interpreting weather data, flight training, and navigation, and cross country flight planning.

AVFT 130. Meteorology for Aviation. 3 Credits. (3 Lec) F COREQUISITE: Generally students will be concurrently enrolled in AST 141 and AST 143. Provides a detailed introduction to the environmental factors that are critical to safe flight operations. Includes the following: thermal patterns, horizontal and vertical motion, moisture clouds, precipitation, air masses, fronts, cyclones, thunderstorms and aviation hazards. Also includes meteorological flight planning, use of weather information systems, and reports and charts used for weather reporting and forecasting.

AVFT 141. Advanced Navigation Systems. 3 Credits. (3 Lec) S PREREQUISITE: AST 143, or consent of instructor. Advanced navigation systems includes HSI, RMI, Loran, Doppler, VOR, NDB and GPS. Will include navigation theory, in-flight emergencies, electronic instrumentation, and advanced flight computing problems. Extensive use of in-class computer flight simulation will be exercised. Provides the radio navigation skills necessary for the instrument pilot.

AVFT 142. Instrument Flight. 2 Credits. (2 Lab) S,F PREREQUISITE: AST 142 Students must enroll in this course while pursuing the Instrument certificate at an approved flight school. Credits will be awarded upon receipt of a copy of the student's instrument rating.
AVFT 143. Instrument Ground. 3 Credits. (3 Lec) S
Prerequisite: AVFT 122. An introduction to flight under IFR conditions. Course includes basic instrument flying, flight instruments, IFR charts and approach plate, IFR regulations and procedures, ATC clearances and IFR flight planning. Completion of the course will prepare the student for the Instrument Knowledge Exam.

AVFT 150. Aviation Operations. 3 Credits. (3 Lec) S
An overview of general aviation operations, specifically the operation and management of the Fixed Base Operation (FBO). This course also covers current events and trends affecting the general aviation industry as a whole.

AVFT 171. Aircraft Systems for Pilots. 3 Credits. (3 Lec) S
Introduction to basic aircraft systems found on modern single and multi-engine reciprocating aircraft. Topics will include piston engines, electrical systems, hydraulic and pneumatic systems, radios and instruments, propellers, pressurization, maintenance requirements and documentation, and trouble shooting from the cockpit. In this course you will be introduced to the systems commonly found in the training aircraft you are now flying.

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 57.5 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
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 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 be enrolled in this course while pursuing their Certified Flight Instructor certificate. Credit for this 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) F,S,Su
PREREQUISITE: BIOL 160 or BIOL 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. 3 Credits. (3 Lec) F
PREREQUISITE: BIOL 160 or BIOL 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 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.

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 549. 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 Loc) S
PREREQUISITE: CHMY 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 Loc) F alternate years, to be offered odd years.

BCH 526. Adv Protein NMR Spectroscopy. 3 Credits. (3 Loc) F alternate years, to be offered even years.
PREREQUISITE: CHMY 325. 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.

BCH 543. Proteins. 3 Credits. (3 Loc) F alternate years, to be offered odd years.

BCH 544. Molecular Biology. 3 Credits. (3 Loc) F alternate years, to be offered even years.
PREREQUISITE: BCH 441, BIOL 425, BIOL 410 or comparable course. Recent advances in understanding and research methods using both eukaryotic and prokaryotic systems.

BCH 545. Advanced Physical Biochemistry. 3 Credits. (3 Loc) S alternate years, to be offered even years.
PREREQUISITE: CHMY 324 AND BCH 441. Theoretical presentation of the molecular structures and interactions occurring in proteins and nucleic acids. Discussion of spectroscopy techniques used to study bio molecular structures and function. Includes concepts in: Nuclear Magnetic Resonance, X-ray Diffraction, Ultraviolet Absorption, Fluorescence, Circular Dichroism, Vibrational Spectroscopy, molecular motion and transport properties including diffusion, sedimentation, and viscosity.

BCH 547. Bioinorganic Chemistry. 3 Credits. (3 Loc) F alternate years, to be offered odd years.
PREREQUISITE: CHMY 401 AND BCH 441. This course provides an introduction and overview of the field of bioinorganic chemistry, the chemistry of metals in biological systems, with a particular emphasis on metal trafficking, metal center assembly and metal clusters in biology.

BCH 550. X-ray Crystallography. 3 Credits. (3 Loc) S alternate years, to be offered even years.
PREREQUISITE: BCH 441 and BCH 442 or the equivalent and M 182M. This course focuses on theory and practice of molecular structure determined by x-ray crystallography. Topics include: crystalization of macromolecules, molecular structure determination from x-ray data, and evaluation of the quality of the resulting macromolecular models.

BCH 575. Professional Paper. 1-6 Credits. (1-6 Ind; 6 cr max) F,S
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.

BCH 590. Master's Thesis. 1-10 Credits. (1-10 Ind; max unlimited) F,S
PREREQUISITE: Master's standing.

BCH 591. Special Topics. 1-4 Credits. (1-4 loc; 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.

BCH 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.

BCH 594. Seminar. 1 Credit. (1 Sem; max unlimited) F,S
PREREQUISITE: Graduate standing or seniors by petition. Course prerequisites as determined 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.

BCH 689. Grad Research/Instruction. 1-3 Credits. (1-3 Lec; 3 cr max) F,S
PREREQUISITE: Graduate standing. COREQUISITE: BCH 590 or BCH 690. Classroom instruction associated with directed graduate research/creative activity projects.

BCH 690. Doctoral Thesis. 1-10 Credits. (1-10 Ind; max unlimited) F,S
PREREQUISITE: PhD standing.

BFIN - Business Finance

BFIN 205. Personal Finance. 3 Credits. (3 Loc) On Demand
PREREQUISITE: Completion of University Core mathematics course. Financial concepts as they apply to daily life. Basics of consumer credit, personal investment, insurance, and personal financial planning. This course may not substitute for any required business course.

BFIN 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 projects. Course will address responsible conduct of research. May be repeated.

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 Loc) F,S
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 Loc) 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 Loc) 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 in investments, both within the U.S. financial markets and globally.

BFIN 421. Real Estate and Investment Analysis. 3 Credits. (3 Loc) 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 Loc) F
PREREQUISITE: BFIN 322 and BFIN 357; For business majors: formal admission to the College of Business. In-depth extension of financial management topics introduced in BFIN 322. Topics include: risk, valuation, cost of capital, capital budgeting, capital structure, and payout policy.
BFIN 441. Advanced Analysis of Financial Statements. 3 Credits. (3 Rct) F,S
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 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 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 Sen; 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 105. Introduction to Business. 3 Credits. (2 Lec; 1 Rct) F
Offered by Gallatin College. This course provides an overview of business from a broad perspective. Topics covered include business ownership, free enterprise, management, human resources, marketing, finance, and accounting and data systems.

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 121Q, M 145Q, 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) S
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 Int’l 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
PREREQUISITE: 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.

BIOB - Biology-General

BIOB 100IN. Organism Function. 3 Credits. (3 Lec) F
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.

BIOB 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, 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 prokaroytes 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 143 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
PREREQUISITES: 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 requesting 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 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, BIOB 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, BIOB 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, BIOB 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, BIOB 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: PHL 312, PHL 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 Rct) S
PREREQUISITE: BIOB 260, BIOB 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 BIOB 375 or BIOB 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.
BIOE 103CS. Environmental Science and Society. 3 Credits. (3 Lec) F
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 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 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 405. Behavioral and Evolutionary Ecology. 3 Credits. (3 Lec) S
PREREQUISITE: BIOE 291; 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 406. Alpine Ecology. 3 Credits. (3 Lec) S
PREREQUISITE: BIOE 370: 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.

BIOE 416. Alpine Ecology. 3 Credits.
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 421. Yellowstone Wildlife Ecology. 3 Credits.
PREREQUISITE: BIOE 291; M 121Q or M 161Q or M 171Q; Recommended: STAT 216Q or BIOE 318. 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 422. Insect Ecology. 3 Credits. (3 Lec) S

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: Prior or concurrent registration in BIOE 428RN. Optional laboratory for BIOE 428RN. 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 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: BIOB 170, CHMY 121 or CHMY 141, and FHSX 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

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 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.

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 independent 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 499. Senior Thesis/Capstone. 2 Credits. (2 Sem) F,S
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 ecology of grasslands. Distance learning, class offered by internet connection. This course is designed for secondary school teachers enrolled in MSSE program and cannot be used in graduate programs in Biological Sciences.

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 biogeochemical 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) F
PREREQUISITE: BIOE 370. Demonstrating the impact of disturbance, demography, and ecophysiology 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&WL 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
PREREQUISITE: BIOE 370, BIOL 420, BIOL 420, STAT 216Q and STAT 217Q, or equivalents. RECOMMENDED: STAT 411 A broad survey of conservation biology, emphasizing approaches related to demography/population dynamics and evolution. Less extensively considers approaches related to community/ecosystem/ landscape ecology. Assignments include empirical field studies, mathematical models, using R for modeling and empirical analysis, reading primary literature, writing a research paper and presenting a research talk. Cross-listed with BIOE 440.

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 years to be offered even years.
PREREQUISITE: BIOE 370 or the equivalent. Students and instructor will write a scientific paper or 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 years, to be offered odd years.
PREREQUISITE: BIOE 370. Outlines the plant's Hutchinsonian niche through review of energy, material (water, nutrients and toxins) and mechanical (including animal) factors. Computer modeling of plant function in the environment is discussed.

BIOE 534. Vegetation Ecology. 3 Credits. (3 Lec) F
Alternate years to be offered odd years.
PREREQUISITE: BIOE 370. Considers the growth, competition, structure, function, distribution in time and space, 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 years, to be offered odd years.

PREREQUISITE: At least one undergraduate or graduate course in each of the following: ecology (e.g., M 171Q) and statistics (e.g., STAT 216Q) 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: BIOJ 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 BIOE 480.

BIOE 554. Foundations of Ecology & Mgmt. 1 Credit. (1 Rec) F
This course explores the origin, maturation, 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. The 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. 10 Credits. (1-10 Ind; max unlimited) F,S,Su PREREQUISITE: Master’s standing.

BIOE 691. 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.

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 112. Human Form and 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 PREREQUISITEs: BCH 380 or consent of instructor. 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 309. Human Neuroanatomy. 4 Credits. (3 Lec, 1 Lab) S,F
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: BIOH 260. Physiological integration 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: BIOH 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: BIOH 260 and BIOH 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: BIOJ 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: BIOJ 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 and BIOH 425. This course will focus on the molecular and cellular mechanisms 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 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 445. Intro Pharmacology. 3 Credits. (3 Lec) F
PREREQUISITE: BIOH 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 hematopoiesis; 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 affiliation 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 microcopy 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 I. 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 Lec) 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. 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 478. Clinic Immunohematology II. 2 Credits. (2 Lab) F
PREREQUISITE: Students must be accepted to the MMLS training program. Competence in performing testing and the ability to assess, interpret, and correlate hemolytic data with other patient information to recommended additional testing, diagnosis, and probable treatment option for the patient will be emphasized.

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 hemolytic 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.
BIOL 488. Clinical Immunohematology. 3 Credits. (3 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 489. Laboratory Management. 1 Credit. (1 Lab) S
PREREQUISITE: Students must be accepted to the MMLS training program. 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 542. Survey of Current Cell Signaling. 2 Credits. (2 Lec; 1 Lab) 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, and 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 Labs 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, heterologous expression, microscopy, RNA extraction, RT-PCR, gene expression analysis, protein extraction, protein expression analysis, and data quantification.

BIOM 405. Host-Associated Microbiomes. 4 Credits.
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 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.

BIOM 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.

BIOM 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.

BIOM 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 Lec) S
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 costs/benefits of biotechnology to society.

BIOM 250. Microbiology for Health Sciences: Infectious Diseases. 9 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
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.

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. COREQUISITE: CHMY 211 or CHMY 321. 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. (2 Lec) S
PREREQUISITE: BIOM 360. Recommended BIOM 410. 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: BIOM 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.

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 research paper, journal article, or undergraduate thesis. 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.
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 basis of knowledge for the rapidly expanding relevance 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 toxicity, disposition of toxicants, chemical carcinogens, target organ toxicity, clinical and environmental toxicology.

BIOM 430. Applied and Environmental Microbiology. 4 Credits. (5 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. Epidemiology and etiology of bacterial and viral diseases in humans with emphasis on biologic mechanisms; host defenses and responses to infections; Chemotherapy, prevention, and control of bacterial and viral diseases.

BIOM 432. Med Bacteriology Lab. 2 Credits. (2 Lab) S
PREREQUISITE: BIOM 360. COREQUISITE: BIOM 431. Laboratory methods designed to teach techniques used in culturing 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: BIOB 160 or BIOB 260 or BIOL 375 or BIOL 320 or BCH 380 or BCH 442 or BCH 444R 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: BCH 380 or equivalent. The study of medically important parasitic 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: Focuses on soil microbial ecology, emphasizing relevant aspects of: i) microbial metabolism, physiology and genetics; ii) plant-microbe interactions; and iii) biotransformations of inorganic or organic contaminants.

BIOM 455. Research Methods in Microbiology. 4 Credits. (3 Lec, 1 Lab) S
PREREQUISITE: BCH 380. Fundamentals of research methodology for undergraduate and graduate students in microbiology and related disciplines. Theory and application of techniques, reagents, and instrumentation will be emphasized in the lecture and laboratory. The emphasis in the course will be on recombinant DNA methodology, and the safe and effective use of radioisotopes.

BIOM 455R. Research Methds in Microbiology. 4 Credits. (3 Lec, 1 Lab)
PREREQUISITE: BCH 380. Fundamentals of research methodology for undergraduate and graduate students in microbiology and related disciplines. Theory and application of techniques, reagents, and instrumentation will be emphasized in the lecture and laboratory. The emphasis in the course will be on recombinant DNA methodology, and the safe and effective use of radioisotopes.

BIOM 490R. Undergraduate Research. 1-6 Credits. (1 Ind; 12 cr max) F,S,Su
PREREQUISITE: Senior 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.

BIOM 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.

BIOM 492. Independent Study. 1-3 Credits. (1 Ind; 6 cr max) On Demand
PREREQUISITE: Senior standing, consent of instructor, and approval of department head. Directed research and study on an individual basis.

BIOM 494. Seminar/Workshop. 1 Credit. (1 Sem; 4 cr max) F,S
PREREQUISITE: BIOM 360 and junior standing. 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. When taken in the senior year, this course fulfills the senior capstone course requirement.

BIOM 497. Educational Methods Microbiology. 2 Credits. (2 Lec) F,S,Su
PREREQUISITE: BIOM 431 and BIOM 432. Instruction and practice in effective teaching methods; practice in preparing laboratory materials, assisting a class and grading.

BIOM 523. Mycology for Graduates. 3 Credits. (2 Lec, 1 Lab) F alternate even years PREREQUISITE: Basic Biology Course or equivalent. This course is co-convened with BIOM 423. The course surveys the incredible diversity of fungi, including major groups with emphasis on structures and identification. The recent explosion of knowledge on fungi in research, medicine, agriculture, biotech begins with basic mycology.

BIOO - Biology-Organismal

BIOO 162CS. Insects and Human Society. 3 Credits. (2 Lec, 1 Lab) S
Ways in which research and advances in technology in the areas of insect biology and management have influenced people's lives throughout the world. Focus will be on insects as major factors affecting the areas of the world where humans live, crops and animals humans produce, and general quality of life on the planet. Interactions of insects and human cultures, technologically oriented and indigenous, non-technology based cultures, and concepts of pest management will also be explored. Students generate and test hypothesis and evaluate sources of scientific information on these topics.

BIOO 220. General Botany. 3 Credits. (3 Lec) F
PREREQUISITE: BIOB 170. This course will provide a thorough overview of the fundamentals of plant and fungal biology from evolutionary, ecological, and physiological perspectives.

BIOO 230. Identification of Seed Plants. 4 Credits. (2 Lec, 2 Lab) S
PREREQUISITE: BIOB 170IN. Identification of conifers, trees and shrubs, and herbaceous seed plants; determination by use of manuals; vocabulary, classification and nomenclature; and preparation and collection of seed plant specimens.

BIOO 262IN. Introduction to Entomology. 3 Credits. (2 Lec, 1 Lab) F
PREREQUISITE: One of the following: BIOL 100IN, or BIOB 170IN. General biology of insects including principles of morphology, physiology, behavior, ecology, and control. Includes identification of major orders and common families.

BIOO 310. Comparative Vertebrate Anatomy. 4 Credits. (2 Lec, 2 Lab) F
PREREQUISITE: BIOB 170 or BIOB 258. A comparative study of organ systems of vertebrates. Laboratory utilizes representative vertebrate types.

BIOO 412. Animal Physiology. 3 Credits. (3 Lec) F
PREREQUISITE: BIOB 160 or BIOB 260, and one of the following: CHMY 211, CHMY 321, or CHMY 123. General homeostatic physiology of animals with emphasis on mammals. Selected body systems are covered with major emphasis on the integration of body processes.

BIOO 415. Ichthyology. 3 Credits. (2 Lec, 1 Lab) S
and situations. and labor relations. Once complete, this course will provide comprehensive, best-
employee development, compensation and benefits, safety and health, and employee
for strategic planning, ethical and legal responsibilities, recruitment and staffing plans,
This course focuses on subject areas of the Human Resource function within a business
executives or those interested in learning more about the Human Resource profession.
BMGT 215. Human Resource Management. 3 Credits.

basic building blocks of conceptualizing and starting a business.
opportunities. Through student-driven projects, participants will move through the
experience that is grounded in collaborations and dynamic problem-solving
communications.


BIOO 470. Ornithology. 3 Credits. (2 Lec, 1 Lab) S

BIOO 475. Mammalogy. 3 Credits. (2 Lec, 1 Lab) F
PREREQUISITE: BIOO 310; may be taken concurrently. Evolution, functional biology, distribution, and classification of mammals. Labs cover taxonomy and identification of representative forms with a focus on Montana species.

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) F
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 comprehensive, best-practice techniques for managing Human Resource within real-world environments and situations.

BMGT 240IS. Business Research Methods. 3 Credits. (3 Ret) 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 requiring 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
PREREQUISITE: BMGT 335 and RGEN 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 335; 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. (3 Lec) F
PREREQUISITE: BMGT 322 or EIND 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 qualitative and quantitative 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 355, 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: Senior or graduate 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 BGEN 194US. 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 the various issues 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 463. 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: BGEN 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.

BMGT 475R. Management Experience. 3 Credits. (3 Lec) F,S
PREREQUISITE: Senior standing or consent of instructor; for business majors: formal admission to the College of Business. Teams do major project such as substantive community service project, research paper, small business experience case, business plan, or strategic analysis. Practical experience with project and/or team management where performance is measured by delivered product. No credit for previous experience.

BMGT 490R. 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.

BMGT 491. Special Topics. 1-4 Credits.

BMGT 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 research and study on an individual basis. Not to be used as a substitute for a required course.

BMGT 494. Seminar. 1-3 Credits. (1-3 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.

BMGT 498. Internship. 2-12 Credits. (2-12 Ind) On Demand
PREREQUISITE: Junior standing, 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.

BMGT 591. Special Topics. 1-4 Credits. (1 Sem; 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.

BMGT 592. Independent Study. 1-3 Credits. (1 Ind; 6 cr max) On Demand
PREREQUISITE: Junior standing, consent of instructor, approval of Associate Dean and Dean of Graduate Studies. Directed research and study on an individual basis.

BMIS - Business: Mgmt Info Systems

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.
BMKT 415. Mgmt of Information Technology. 3 Credits. (Lec) On Demand
PREREQUISITE: BMIS 405, BMIS 412, and BMGT 335. 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.

BMKT 414. Data-driven Business Web Serv. 3 Credits. (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.

BMKT 412. Design of E-Commerce Sites. 3 Credits. (Lec) On Demand
PREREQUISITE: BMIS 311. For business majors: formal admission to the College of Business. Students 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.

BMKT 413. Contemporary Support Systems. 3 Credits. (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.

BMKT 325. Principles of Marketing. 3 Credits. (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 222. Customer Service and Marketing. 3 Credits. (Lec) 3 F
Offered by Gallatin College. This course will provide the foundation for understanding the components of successful customer service. Students will understand the vital importance of great customer service to the ongoing success of a business and the culture necessary to support an offering.

BMKT 240. Advertising. 3 Credits. (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. (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. (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 Ind; 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. (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 marketplace. 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. (Lec) F,S
PREREQUISITE: STAT 217Q or BMGT 240B, 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. (Lec) F
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.

BMKT 420. Integrated Online Marketing. 3 Credits. (Lec) F,S
PREREQUISITE: BMKT 325 and junior standing. For business majors: formal admission to the College of Business. 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 IDRO, 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. (Lec) F
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.

BMKT 441. International Marketing. 3 Credits. (Lec) S
PREREQUISITE: BMKT 325 and BGEN 242D. For business majors: formal admission to the College of Business. International economic, financial, cultural, political, and legal environment; 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. (Lec) F
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. (Lec) F
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. (Lec) On Demand
PREREQUISITE: BMKT 325 and approval of instructor. For business majors: formal admission to the College of Business. Student 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 and promoting goods, and establishing primary demand for a new product.

BMKT 490R. 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. (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. (Lec) 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.
May be repeated. Department Undeclared.

BREN 499. Senior Capstone: Marketing Management. 3 Credits. (3 Lec) F,S
PREREQUISITE: Senior standing, BREN 337, BREN 342R, BREN 343, and
BREN 436. For business majors: formal admission to the College of Business. BREN
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.

BREN 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.

BREN 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 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
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.

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.

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.

CHIN 201D. Elementary Chinese I. 4 Credits. (4 Rct)
PREREQUISITE: CHIN 101. 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 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 211D. Chinese Culture & Civilization. 3 Credits. (3 Lec)
PREREQUISITE: 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 dynastic chronology. Class is offered in
English.

CHIN 320H. History of Chinese Cinema. 3 Credits. (3 Lec) F
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 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 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 fission 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.

CAPP - Computer Applications

CAPP 120. Introduction to Computers. 3 Credits. (3 Lec) F,S,Su
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.

PREREQUISITE: Sophomore standing and WRIT 101W. Working collaboratively,
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.

PREREQUISITE: Freshman or sophomore standing and consent of
instructor. An individualized assignment arranged with an agency, business, or other
organization to provide guided experience in the field.

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.

PREREQUISITE: Senior standing, BREN 337, BREN 342R, BREN 343, and
BREN 436. For business majors: formal admission to the College of Business. BREN
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.

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.

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.

PREREQUISITE: Admission to graduate program. Directed graduate
research and study of architectural, urban design or historic preservation issues on an
individual basis.

PREREQUISITE: Graduate standing, consent of instructor, approval of
Associate Dean and Dean of Graduate Studies. Directed research and study on an
individual basis.

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.

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.

PREREQUISITE: Sophomore standing and WRIT 101W. Working collaboratively,
students in this course will foster developing solutions for mental health and for
educating the community through scholarship and creativity.

PREREQUISITE: Sophomore standing and WRIT 101W. Working collaboratively,
students in this course will foster developing solutions for mental health and for
educating the community through scholarship and creativity.

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.

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.

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. Undeclared.

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. Undeclared.

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. Undeclared.

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.
CHMY 121IN. Introduction of General Chemistry. 4 Credits. (3 Lec, 1 Lab) F,S,Su
PREREQUISITE: C- or above in M 906 or M 907 or placement in a Math Level 3 (ACT 25 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 121IQ 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: 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: High school chemistry and physics, high school algebra, and some additional mathematics. 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 153. Honors College Chemistry II. 4 Credits. (3 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
For the new student. Integration into the department and its research and educational program. Scientific communication and chemical literature searching skills.

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
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 Cnse. 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) 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, RBU, 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,Su
PREREQUISITE: CHMY 145 or CHMY 153. The first of a two-semester professional sequence in organic chemistry. In-depth coverage of nomenclature, 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,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.

CHMY 491. Special Topics/Experient 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 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 format, 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 325. 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 reach 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 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. Reactant Chemistry. 3 Credits. (3 Lec) S
PREREQUISITE: CHMY 417. A thorough study of synthetic processes, methodologies and reagents.

CHMY 540. Organic Synthesis. 3 Credits. (3 Lec)
PREREQUISITE: CHMY 533 and CHMY 555. 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 321, CHMY 323 and CHMY 553. Application of organometallic chemistry to organic transformations.

CHMY 554. Organometallic Chemistry. 3 Credits. (3 Lec) S 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 Thermodynamic. 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 or equivalent. Group theory with applications, semi-empirical and a b 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 credits. 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 Ind; 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 subtitled. 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 or help.

CHMY 590. Master's Thesis. 1-10 Credits. (1 Ind; max unlimited) F,S
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. COREQUISITE: 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
PREREQUISITE: PSYX 1005 or SOCI 101S. 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, CHTH 440, 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
PREREQUISITE: Junior standing. Analysis of human response to stress in relation to a variety of biopsychosocial 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, 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) F
PREREQUISITE: Junior standing, consent of instructor and approval of department head. Directed research and study on an individual basis.

CHTH 495. Pract Experience in Aging. 3 Credits. (3 Lec) F,S,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) F
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.
CLEP 256. American National Government. 1-16 Credits.
CLEP 255. Survey of American History. 1-16 Credits.
CLEP 253. Educational Psychology. 1-16 Credits.
CLEP 252. Microeconomic Principles. 1-16 Credits.
CLEP 250H. American Mass Culture. 1-16 Credits.
CLEP 174. Agricultural Phys & Systems. 1-16 Credits.
CLEP 171. General Psychology. 1-16 Credits.
CLEP 170. Plant Science in Agr. 1-16 Credits.
CLEP 169. Elementary Spanish. 1-16 Credits.
CLEP 168. Elementary Spanish. 1-16 Credits.
CLEP 167. Elementary Spanish. 1-16 Credits.
CLEP 166. Elementary German. 1-16 Credits.
CLEP 164. Elementary German. 1-16 Credits.
CLEP 163. Elementary French. 1-16 Credits.
CLEP 162. Elementary French. 1-16 Credits.
CLEP 161. Elementary French. 1-16 Credits.
CLEP 159. Trigonometry. 1-16 Credits.
CLEP 158. Biological Organization. 1-16 Credits.
CLEP 157. History Western Civilization. 1-16 Credits.
CLEP 156. History Western Civilization. 1-16 Credits.
CLEP 155. Basic Apparel Concepts. 1-16 Credits.
CLEP 154. Critical Approach to Lit. 1-16 Credits.
CLEP 153W. College Writing I. 1-16 Credits.
CLEP 152. Biology of Organisms. 1-16 Credits.
CLEP 151. Animal Science in Agriculture. 1-16 Credits.
CLEP 150. Molecular & Cellular Biology. 1-16 Credits.
CLEP 141. West Civil Fr Rev-Present. 1-16 Credits.
CLEP 140. Human Development I. 1-16 Credits.

CLEP - College Level Exam

CLEP 261. Intermediate French. 1-16 Credits.
CLEP 262. French Language & Culture. 1-16 Credits.
CLEP 264. Intermediate French. 1-16 Credits.
CLEP 265. German Lang & Cult. 1-16 Credits.
CLEP 267. Intermediate Spanish. 1-16 Credits.
CLEP 268. Spanish Lang & Cult. 1-16 Credits.
CLEP 280. Psychiatric Nursing. 1-16 Credits.
CLEP 311. Physiological Nurs Concepts. 1-16 Credits.
CLEP 312. Psychiatric Nursing. 1-16 Credits.
CLEP 313. Medical Surgical Nursing II. 1-16 Credits.
CLEP 314. Family Child Nursing I. 1-16 Credits.
CLEP 315. Family Child Nursing II. 1-16 Credits.
CLEP 318. Medical Surgical Nursing I. 1-16 Credits.

CLS - College of Letters & Science

CLS 101US. Knowledge and Community. 3 Credits. (3 Sem) F,S
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
Small seminar-style classes. Introduction to university study and the excitement of intellectual inquiry with additional engaged community component. Readings in humanities, social securities, and natural sciences. Emphasis on critical thinking, effective communication, and active learning.

CLS 201US. Knowledge and Community. 3 Credits. (3 Sem) F,S
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 280R. Undergrad Resch/Instruction. 1-3 Credits. (1-3 Rct; 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 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 Resch/Instruction. 1-3 Credits. (1 Rct; 4 cr max) F,S,S
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,S
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
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
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) S
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
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 395 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
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 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 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 292. Independent Study. 3 Credits. (3 Ind.) S
PREREQUISITE: Consent of Instructor.

COM - Communications

COM 000. COM* COURSES ARE NOW "COMX" 0 Credits. S
-- All "COM" courses are now listed under the "COMX" subject code. COM 110U 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 basic elements 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.

CRWR - Creative Writing

CRWR 340. Intermediate Creative Writing Workshop. 3 Credits. (3 Rec) F,S
PREREQUISITE: 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, HTML editors 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) 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
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 215 CS. Social & Ethical Issues in CS. 3 Credits. (2 Lec, 1 Rec) F
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
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 290B. 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. Independent Study. 1-3 Credits. (1-4 Ind; 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 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 266 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 Linux/Unix 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 252. 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) F odd years.
PREREQUISITE: CSCI 232. 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 EEE 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 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 varied system design and analysis problems. Cross-listed with I&ME 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. 1-3 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.

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. Concurrent control, homogenous 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 odd 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. Example 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 452. 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
PREREQUISITES: CSCI 466 or (EELE 445 and EELE 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, with emphasis on 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 575. Computational Research Topics. 3 Credits. (3 Lec; 9 cr max) S odd years.
Max 9 cr. PREREQUISITE: To be determined based on actual topic offered. Focus on a current research topic such as structured probabilistic models and explore the topic using a project-oriented format.

CSCI 580. Master's 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.

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. 2 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.
DDSN - Drafting Design

DDSN 101. CAD 1A, 2 Credits. (2 Lec) F,S
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 1B, is equivalent to DDSN 118 CAD 1.

DDSN 102. CAD 1B, 2 Credits. (2 Lec) F,S
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 design a professional looking and effective résumé, understand their strengths and weaknesses, talents, and aptitudes, know how to properly apply for 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 1. 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: CSTM 173, equivalent work experience or equivalent instruction.

DDSN 186. CAD II, 3 Credits. (3 Lec) F,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 exposure 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/height 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) F,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 designing techniques 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,S
PREREQUISITE: DDSN 118 and 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) S
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 112, 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 cell biology. This interdisciplinary course brings together topics from both engineering and molecular biology to understand the mechanics by which cells respond to loading. Topics selected from: musculoskeletal, circulatory, lymphatic, chondrocyte, leucocyte, and cancer cell mechanotransduction.
ECHM - Chemical Engineering

ECHM 100. Intro to Chemical Engrg. 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.

ECHM 201. Elementary Principles of Chemical and Biological Engineering I. 3 Credits. (3 Lec) F,S

ECHM 205CS. Energy and Sustainability. 3 Credits. (3 Lec) F,S
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 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.

ECHM 307. Chem Engin Thermodynamics I. 3 Credits. (3 Lec) F

ECHM 321. 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 Heat Transfer Operations. 3 Credits. (3 Lec) F

ECHM 323. 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 274Q. Application of the chemical kinetics of homogeneous and heterogeneous reactions to the design of chemical processing equipment.

ECHM 405. Sustainable Energy. 3 Credits. (3 Lec)
PREREQUISITE: EMAT 251 and either 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 407. Chem Engin Thermodynamics II. 2 Credits. (2 Lec) F

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. 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 442. Chem Engin Laboratory I. 3 Credits. (1 Lec, 2 Lab) F

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 274Q. 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 274Q. 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
Maximum 6 cr. PREREQUISITE: Consent of instructor and approval of the Associate Dean. Directed research and study on an individual basis.

ECHM 493. Internship. 1-12 Credits. (1-12 Ind; 12 cr max) F,S,Su

ECHM 510. Reaction Engineering/Modeling. 3 Credits. (3 Lec) S alternate years, to be offered odd years.

ECHM 533. Transport Phenomena. 3 Credits. (3 Lec) S

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 535. Viscous Fluid Dynamics. 3 Credits. (3 Lec) On Demand
ECHM 575. Research or Prof Paper/Project. 1-4 Credits. (1-4 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 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 Sem; 6 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, consent of instructor, approval
of department head and Dean of Graduate Studies. Directed research and study on an
individual basis.

ECHM 594. Seminar. 1 Credit. (4 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. CHBE Grad Internship. 1-3 Credits. (1-3 Ind; 6 cr max) F,S,Su
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 220CS. 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 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 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 DDSN 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, DDSN 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
PREREQUISITE: EGEN 205. Study of loading on structures. Study of structural
systems and systems modeling. Analysis of determinate and indeterminate structures.
Introduction to matrix methods. Introduction to structural analysis software.
Introduction to design approaches and philosophies.

ECIV 315. Structures II. 3 Credits. (2 Lec, 1 Lab) F,S
PREREQUISITE: ECIV 312. Structural design of steel and reinforced concrete
members used in buildings and bridges. Theory and application of design codes.
Laboratory experience utilizing construction materials.

ECIV 320. Geotechnical Engineering. 3 Credits. (2 Lec, 1 Lab) F,S
PREREQUISITE: EGEN 205. The treatment of soil as an engineering material.
Fundamental soil mechanics principles and introductory solutions to geotechnical
engineering problems. Basic soil mechanics laboratory tests and procedures.

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 Rct) 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 302 or ECIV 320.
COREQUISITE: ECIV 307. Construction equipment operating characteristics,
economics, and production rate estimation. Heavy construction methods 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. (3 Lec) F,S
PREREQUISITE: EGEN 489R required. Professional ethics, social responsibility,
policy, and leadership.

ECIV 415. Design of Masonry Structures. 3 Credits. (3 Lec) S
PREREQUISITE: EGEN 350 or STAT 332. Design of structural steel
members and systems.

ECIV 415. Design of Masonry Structures. 3 Credits. (3 Lec) S
PREREQUISITE: EGEN 350 or STAT 332. Design of structural steel
members and systems.

ECIV 416. Design of Wood and Timber Structures. 3 Credits. (3 Lec) F
PREREQUISITE: EGEN 350 or STAT 332. Design of structural steel
members and systems.

ECIV 420. Earth and Foundation Engr. 3 Credits. (3 Lec) S
PREREQUISITE: EGEN 315. Application of soil mechanics principles to the
eering 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
PREREQUISITE: EGEN 315. Application of lateral earth pressures and design of
 retaining structures and braced excavations. Stability analysis of natural and engineered
slopes. Analysis and design of embankments and dams.

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. (3 Lec) On Demand
PREREQUISITE: ECIV 350, and EGEN 350 or STAT 332. Design, implementation and management of public transit systems including corridor, 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 GE 450. Students enrolled in CE 450 will not be able to take CE 550 and have in count toward degree requirements.

ECIV 451. Highway Pavements. 3 Credits. (2 Lec, 1 Lab) S alternate years, to be offered every even year.
PREREQUISITE: ECIV 320, ECIV 350. Design of highway pavements including drainage and base/subbase/substrate preparation. Laboratory in bituminous materials.

ECIV 452. Traffic Engineering and ITS. 3 Credits. (2 Lec, 1 Lab) F, alternate years to be offered odd 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 454. Transportation Planning. 3 Credits. (2 Lec, 1 Lab) S, alternate years, to be offered odd 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 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 484. Reinforced Concrete Design. 3 Credits. (3 Lec) F alternate years, to be offered every even year.
PREREQUISITE: ECIV 315. Design of reinforced concrete members and systems.

ECIV 489R. Civil Engineering Design I. 2 Credits. (1 Rct, 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. Development 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 identified, 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 Rct, 1 Lab) F,S

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 as well as enlightened leadership and advanced management concepts. Productivity improvement data collection, analysis, and solutions to include the construction work force and cost.

ECIV 505. Quality Assurance/Risk Management. 3 Credits. (3 Lec) Su
PREREQUISITE: Either EGEN 350, EIND 354 or STAT 332 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
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
PREREQUISITE: EGEN 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 every even years.

ECIV 512. Structural Dynamics. 2 Credits. (2 Lec) F alternate years, to be offered every even year.
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 3 cr. LEC 3 PREREQUISITE: ECIV 484. Behavior of reinforced concrete members, frames, and shear wall systems. Significance of behavior in design of reinforced concrete structures.

ECIV 514. Behavior of Steel Structures. 3 Credits. (3 Lec) S alternate years, to be offered even 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 finite 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 finite 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 Eng. 3 Credits. (2 Lec, 1 Lab) F alternate years, to be offered every even years.
LeC 2, Lab 1 PREREQUISITE: ECIV 520. 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 524. Advanced Soil Mechanics. 3 Credits. (3 Lec) F alternate years, to be offered odd years.
LeC 3: PREREQUISITE: ECIV 520. Topics leading to an advanced understanding of the engineering behavior of soils with an emphasis on settlement and shear strength.

ECIV 529. Groundwater Contamination. 3 Credits. (3 Lec) S
LeC 3: PREREQUISITE: EENV 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) F alternate years, to be offered even years.
ECIV 554. Transportation Safety. 3 Credits. (3 Lec) S alternate years, to be offered odd years. An introduction to the safety and economic aspects of highway systems. 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. 3 Credits. (2 Lec, 1 Lab) S
Even Years PREREQUISITE: EGEN 350 or EIND 354 or permission of instructor. This course introduces students to the principles and practice of survey data collection and analysis. The survey portion focuses on survey methods and sampling techniques. Sampling and survey techniques are crucial to collecting quality data and lays a solid foundation for robust data analysis. The analysis portion centers on various statistical models and tools, with an emphasis on identifying and applying appropriate models for different types of data. Students will also gain hands-on experience with statistical models and optimization methods that are critical in data-driven decision making.

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 standing. 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.

ECIV 589. Graduate Consultation. 1-3 Credits. (3 Ind; 3 cr max) 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 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. Course prerequisites as determined for each offering. Credits awarded only if completed with a grade of C- or better. Courses may be offered at the graduate level as determined by the supervising faculty. Course will address responsible conduct of research.

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 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.

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 132. Econ & the Environment. 3 Credits. (3 Lec) S
On demand PREREQUISITE: ECNS101. This course includes topics on renewable (fisheries, wildlife, surface water use) and non-renewable (oil, natural gas, minerals) natural resource issues, environmental resources (public lands, resource preservation), pollution control issues, and the global environment (including climate change, biodiversity and population).

ECNS 202. Principles of Macroeconomics. 3 Credits. (3 Lec) F,S,Su PREREQUISITE: ECNS 101. COREQUISITE: M 121. Topics include inflation, unemployment, interest rates, money, and the impact of government surpluses or deficits. Government policies of growth, employment, income distribution, and international trade are examined.

ECNS 204IS. Microeconomics. 3 Credits. (3 Lec) F,S
SU PREREQUISITE: ECNS 101, M 121. Consumer theory and the theory of the firm are utilized to show how independent decisions by consumers and firms interact in markets to determine the price and output of goods and services.

ECNS 206. Study Principles of Macroeconomics. 1 Credit. (1 Lec) F,S
COREQUISITE: ECNS 202. Optional directed study in a small group setting for ECNS 202 students. Students meet weekly in small groups to review ECNS 202 concepts, gain additional practice with economic problems, and complete in-class problem sets.

ECNS 251IS. Honors Economics. 4 Credits. (4 Sem) S
Economic principles are introduced and applied to a wide range of contemporary and historical problems including legal, environmental, resource, health, taxation, poverty, economic development, and macroeconomic policy issues.

ECNS 290R. Undergraduate Research. 1-8 Credits. (1-8 Ind; 8 cr max) F,S,Su PREREQUISITE: ECNS 101 and approval 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.

ECNS 291. Special Topics. 1-4 Credits. (1-4 Lec; 12 cr max) On Demand PREREQUISITE: Dependent on the offering. Courses not required in any curriculum for which there is a particular one-time need, or given on a triad basis to determine acceptability and demand before requesting regular course number.

ECNS 292. Independent Study. 1-3 Credits. (1-3 Ind; 6 cr max) F,S,Su PREREQUISITE: Consent of instructor and approval of department head. Directed research and study on an individual basis.

ECNS 301. Intermediate Micro with Calc. 3 Credits. (3 Lec) F,S
PREREQUISITE: ECNS 204 or ECNS 251, M 161 or M 171. A study of microeconomic theory and selected applications with emphasis on theory of consumer behavior and theory of the firm. A major objective of the course is to prepare students for additional upper-division courses in economics.

ECNS 303. Intermediate Macro with Calc. 3 Credits. (3 Lec) F,S
PREREQUISITE: ECNS 202 and ECNS 204 or ECNS 251; M 161 or M 171. The economic theory of economy-wide aggregates such as national income, levels of employment, income distribution; the determinants of the performance of entire economies: nations, groups of nations, and the world.

ECNS 305R. Peer Leadership in Economics. 3 Credits. (3 Lec) F
PREREQUISITE: ECNS 301 and by consent of instructor. Teaches leadership through peer instruction of ECNS 101 students. Students lead economics study labs, study and implement effective economics pedagogical techniques analyze and communicate to others regarding economic problem solving, and conduct research on economics pedagogy.

ECNS 309. Managerial Economics. 3 Credits. (3 Lec) F
PREREQUISITE: ECNS 204 or ECNS 251, M 161 or M 171. An integration of various principles and concepts from different areas of economics. These are combined with several tools of analysis and related to problems of economic decision making and policy formulation at the firm level.

ECNS 311. Intermediate Microeconomics with Economics Education Applications. 3 Credits. (3 Lec) On Demand PREREQUISITE: ECNS 202 and ECNS 204 or consent of instructor. A study of microeconomic theory with selected applications in the area of the economics of education and emphasis on the theory of the behavior of consumers, firms, nonprofit organizations and government agencies, and welfare economics. Applications will address issues such as the labor market for primary and secondary school teachers, the effects of voucher programs on the quality of public and private education, and the returns to primary and secondary education.

ECNS 312. Labor Economics. 3 Credits. (3 Lec) S
PREREQUISITE: ECNS 204 or ECNS 251. Economics of labor markets, wage determination, and human capital. The theoretical framework of labor market analysis is presented, along with empirical research results and descriptive aspects of current labor issues.
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 204 or ECNS 251 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) S
PREREQUISITE: ECNS 301. Offers students the opportunity to use training in price theory by focusing on issues concerned with public policy toward business. The subject matter should appeal to students in pre-law and business as well as economics majors.

ECNS 432R. Benefit-Cost Analysis. 3 Credits. (3 Lec) S
PREREQUISITE: ECNS 301. Senior capstone course. Applied welfare economics and methods and criteria for evaluating benefits and costs of public policies and investment. Applications include environmental and natural resource issues.

ECNS 461. Financial Econometrics. 3 Credits. (3 Lec) F
PREREQUISITE: ECNS 251, EIND 354. Introduce important concepts in econometrics with an emphasis on probability theory, mathematical statistics, matrix algebra, and application of these concepts to developing econometric analyses. The SAS statistical software will be to develop empirical analyses of financial markets data.

ECNS 490R. Undergraduate Research. 1-8 Credits. (1-8 Ind; 8 cr max) F,S
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 before 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
1 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. Economic 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 systems 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 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.

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 dependent on the offering. Topics offered at the graduate 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
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 502. 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 multifactored ANOVA, multiple comparison techniques, ANCOVA, multiple regression, and factor analysis in their solution are 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. Foundation 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 Ed Rsch. 3 Credits. (3 Lec) F,S,Su PREREQUISITE: Graduate standing. Students are introduced to systematic scientific inquiry, its purpose in an educational environment, the different approaches to conducting educational research, and the major components of an educational research study. Emphasis will be placed on the development of logical and impartial methodology and the importance of clarity and precision. This course will cover the literature of educational research and its application in the classroom. The course will be organized around a project in which students will work in small groups to develop a research proposal.

EDCI 507. Qualitative Educational Rsch. 3 Credits. (3 Lec) S On Demand PREREQUISITE: 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 the use of interviews, observations, and document analysis will be introduced. Students will plan and complete a qualitative research project. Course will address responsible conduct of research.

EDCI 508. Adv Educational Psychology. 3 Credits. (3 Lec) S PREREQUISITE: 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 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) Su alternate years PREREQUISITE: Graduate standing. Advanced study in language arts pedagogy. Special attention is given to the writing process.

EDCI 513. 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.

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) S alternate years, to be offered odd years 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 BATE 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 531. Contemp Issues in Ed. 3 Credits. (3 Lec) Su This course is designed to establish the necessary social, technical, and research, foundation 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) S 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) Su alternate years, to be offered even years 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) Su 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 empirical 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. American Indian Studies for Educators. 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. Amer 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 Ed. 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. Phil Issues in Ed. 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 alternate years, to be offered even years. 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. Schi Library Media Specialist. 3 Credits. (3 Lec) F alternate years, to be offered odd years. PREREQUISITE: EGU 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 547. Info Inquiry & Ed Change. 3 Credits. (3 Lec) F alternate years, to be offered odd years. PREREQUISITE: EGU 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. Mgmt of Information/Resources. 3 Credits. (3 Lec) S alternate years, to be offered even years. PREREQUISITE: EGU 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 BATE Library Media program students.

EDCI 549. Applications of Literature for Children and Young Adults. 3 Credits. (3 Lec) S alternate years, to be offered odd years. PREREQUISITE: EGU 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 emphasis on critical selection and analysis, 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. Carr Design, Pedagogy,& Asmt. 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 about learning and teaching, and data-driven decision making. 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 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 data-driven decision making. 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 or 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,M,S PREREQUISITE: Graduation 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,F,Su PREREQUISITE: Consent of instructor and approval of department head. An internship course restricted to OPI teacher certification students.

EDCI 588. Professional Development. 1-3 Credits. (1-3 Ind; 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,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,S,F,Su PREREQUISITE: Master’s standing, Restricted Entry: Requires contract with major advisor. May be repeated.

EDCI 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.

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 594. Seminar. 1 Credit. (1 Sem; 4 cr max) On Demand PREREQUISITE: Graduate standing and 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.

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 607. Quantitative Educational Rslch. 3 Credits. (3 Lec) F, On Demand PREREQUISITE: EDCI 502, EDCI 506, 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.

EDCI 608. Advanced Educational Rslch. 3 Credits. (3 Lec) F,S PREREQUISITE: EDCI 502, EDCI 507, EDCI 607. Doctoral 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.

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 through Adolescent Development. 3 Credits. (3 Lec) F,S This course focuses on the development of children in early childhood, middle childhood and adolescence. Cognitive, physical, social, and emotional domains are examined in addition to developmental processes related to culture, gender, SES, ethnicity and education. Theory, research and application for practitioners are emphasized.

EDEC 253. Health and Movement in Early Childhood. 3 Credits. (2 Lec, 1 Lab) S PREREQUISITE: EDEC 271. This course will focus on 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 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 Lec, 1-2 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 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 planning and preparing learning environments for young children. Developmentally appropriate practices, including play, and promoting positive guidance. Strategies for teacher-child and family-school relationships, nurturing 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 in the context of tribal communities and other at-risk populations.

EDEC 385. Integrated Curriculum Early Childhood Education. 4 Credits. (3 Lec, 1 Lab) S PREREQUISITE: EDEC 350. Observation, reflection, and analysis of various early childhood education curricula including Montessori, Reggio Emilia, and Waldorf. Curriculum planning, implementation, and evaluation. Laboratory experience in an early childhood classroom is required.

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 PREREQUISITEx: EDEC 350. Development of language and literacy from birth to age 8 utilizing an integrated approach to family, school, and community. Theoretical and foundational perspectives of language development, literacy environments, and emergent literacy skills among young children.

EDEC 490R. Undergraduate Research ECE. 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.

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. EC Advanced Practicum. 3-6 Credits. (3-6 Lab; 6 cr max) S,Su on demand Max 6 cr. PREREQUISITE: Senior standing in major and student teacher 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.

EDEL - 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.

EDEL 533. Impmvnt of Math Instruction. 3 Credits. (3 Lec) F PREREQUISITE: EDU 397, EDU 495. Explore ways to design and teach mathematics lessons to K-8 students using appropriate knowledge from mathematics education, learning theory, development psychology, and modern technology.

EDLD - Education Leadership

EDLD 501. Found Adult Education. 3 Credits. (3 Lec) On Demand PREREQUISITE: Graduate standing. A survey of the field and profession of adult education as part of lifelong learning. Professionalism in adult education is approached through the study of: related adult education; historical and philosophical foundations; providers and programs; issues and trends.

EDLD 505. Hist & Phil of Amer Higher Ed. 3 Credits. (3 Lec) On Demand PREREQUISITE: Graduate standing. This course is an in-depth past-to-present study of the historical and philosophical development of American higher education set against the backgrounds of political, social, economic, cultural, and intellectual landscapes.

EDLD 507. Fndtns of Educational Ldrshp. 3 Credits. (3 Lec) Su, On Demand 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) Su, On Demand
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 will professional development and legal requirements of school and staff accountability.

EDLD 509. Issues/Trends in High Ed. 3 Credits. (3 Lec) On Demand
PREREQUISITE: Graduate standing. An in-depth and contemporary exploration of critical issues, trends, and forces facing and influencing higher education with an emphasis on current issues. The theme is addressing the ways in which institutions respond to these issues.

EDLD 510. Org & Adm of Higher Ed. 3 Credits. (3 Lec) On Demand
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 511. Planning Program Assessment. 3 Credits. (3 Lec) On Demand
PREREQUISITE: EDLD 506 and graduate standing or consent of instructor. This course, students learn about the literature, models, standards, strategies, and skills to plan and implement an assessment or program evaluation of educational programs, services and administration. Students evaluate literature and conduct an original assessment project.

EDLD 512. Fin Adm in High Ed. 3 Credits. (3 Lec) On Demand
PREREQUISITE: Graduate standing. 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 and levels of funding on students and an institution's financial status.

EDLD 513. Resource & Prog Mgmt. 3 Credits. (3 Lec) On Demand
PREREQUISITE: Graduate standing. 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, and budgeting.

EDLD 515. Planned Change. 3 Credits. (3 Lec) S, On Demand
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) Su, On Demand
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) Su & On Demand
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 528. College Students. 3 Credits. (3 Lec) On Demand
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 529. Postsecond Dist Delivered Educ. 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 530. College Teaching. 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 Fndtns/Col Studns. 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 student 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 & Policy in High Ed. 3 Credits. (3 Lec) On Demand
PREREQUISITE: Graduate standing. Analysis and interpretation of landmark legislation affecting American higher education since 1960 and 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, and relations with state and federal governments.

EDLD 534. Data Driven Decisions. 3 Credits. (3 Lec) S, On Demand
PREREQUISITE: Graduate standing. The 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. Students will examine philosophical, organizational and programmatic aspects of post-secondary student services and the ethical and legal dimensions of student professional practice.

EDLD 537. Inst Resch & Assessment. 3 Credits. (3 Lec) On Demand
PREREQUISITE: Graduate standing. Students will explore the roles of instructional research and assessment in higher education identifying appropriate measures for academic and administrative assessment, internal and external data sources, analytic techniques, and the communication of information to academic and administrative decision makers.

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, designs, 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) F,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
Su COREQUISITES: EDLD 507 and EDLD 515 Students will examine issues, challenges, and processes of leading instruction in elementary and secondary schools. The 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 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 state. The course is a that offers students the opportunity for guided field experience as a principal or superintendent in K-12 schools.

EDLD 575. Prof Paper & Project. 1-4 Credits. (1 Ind; 6 cr max) F,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 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.
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 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.
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: OPI Interns must have EDLD 507, EDLD 508, EDLD 532. 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 610. Leadership and Organizational Theory. 3 Credits. (3 Lec) F, On Demand
PREREQUISITE: MA in Educational Leadership, or Principal’s Certification, EDLD 507.
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. The development of a shared vision and strategic plan will
be emphasized.
EDLD 613, Indigenous Methodologies in Educational Research. 3 Credits. (3 Sem)
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.
EDLD 620. The School Superintendent. 3 Credits. (3 Lec) On Demand
PREREQUISITE: Principal’s Certification, or concurrent enrollment in EDLD 520.
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 630, Supervision & Instruct Leadership. 3 Credits. (3 Lec) Su, alternate years.
PREREQUISITE: MA in Educational Leadership or Principal’s Certification, and
EDLD 508. 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 643. Leading Social Justice. 3 Credits. (3 Lec) Su
PREREQUISITE: Students must be at doctoral level. EDLD 520 or EDLD 543 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. Personnel Mgmt in Education. 3 Credits. (3 Lec) F, On Demand
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
On Demand
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 their 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 501. 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: Graduate 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
dpaper, 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: EDSP 160 or EDU 222S or EDU 228S, and junior standing.
Categories of exceptionality and implications for educators. Historical, societal, familial
and educational attitudes; 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, 1 Lab) F,S
PREREQUISITE: EDSP 306 and EDSP 307 and senior standing. Knowledge,
application and interpretation of data in formal and informal assessment instruments;
formal report writing; psychometrics; CSE, IEP, IFSP, 504, FBA parental 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
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 204LA. 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,S

Human growth and psychological development of school age students, to include physical, cognitive, and psychosocial development within an educational, familial, and societal context. An examination of theory and research related to the development, learning and motivation of school age students. Implications for effective classroom teaching will be identified throughout the course.

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, a 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/Experimental 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 requesting a regular course number.

EDU 292. Independent Study. 1-3 Credits. (1 Ind; 3 cr max) 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 330. Emergent Literacy. 3 Credits. (3 Lec) F,S,S

Alternate years to be offered even years. PREREQUISITE: EDU 331, 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 Environ. 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 and curriculum, 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,S

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 21 century skills.
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 Adtls. 3 Credits. (3 Lec) F,S

EDU 438. Lec, Amynt, Diagnos and Inst. 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. Adv Educ Technology. 3 Credits. (2 Lec, 1 Lab) F
Hands on experiences in the production of advanced instructional media materials. Emphasis on exploration 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) F
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
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 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.

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) F,S,Su
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. (3 Lec; 16 Ind; 16 cr max) F,S,Su
Max 8 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-6, 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 experience teachers and MSU field supervisor.

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) 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). 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 and 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 in secondary schools. Includes practicum experience. METHODS 5-12 SCIENCE: PREREQUISITE: EDU 382, 20 or more credits in subject area, and good standing in the Teacher Education Program. COREQUISITE: EDU 395 (for teaching majors in this subject). Focuses on methods of planning (including lesson/unit), teaching, 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.

EELE - Electrical Engineering

EELE 101. Intro Electrical Fundamentals. 3 Credits. (1 Lec, 1 Lab) F,S
PREREQUISITE: M 151 or equivalent. Lecture/laboratory. Development of fundamental concepts in electrical engineering. Topics include the characteristics of electric circuits, 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 172. COREQUISITE: PHSX 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 121, M 135, or M 145, 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
PREREQUISITE: M 166 or M 172 and PHSX 207 or PHSX 222. Introduction for non-majors to electrical circuit principles, voltage and current laws, frequency response; introduction to electronic circuits including operational amplifiers, and power electronics; introduction to electromechanical energy conversion devices, DC and AC machines.

EELE 261. Intro To Logic Circuits. 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 290B. 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 273. 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: PHSX 222, M 273. 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 166 or M 171 and PHSX 207 or PHSX 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.

EELE 367. Logic Design. 4 Credits. (3 Lec, 1 Lab) S
PREREQUISITE: EELE 262 and EELE 371. Advanced combinational and sequential logic design. Hardware descriptive language (HDL) programming knowledge. Laboratory experience implementing advanced logic designs using FPGAs.

EELE 371. Microprocess HW and SW Systems. 4 Credits. (3 Lec, 1 Lab) F
PREREQUISITE: EELE 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.

EELE 394. Multidisciplinary Seminars. 1 Credit. (1 Sem) 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.

EELE 407. Intro To Microfabrication. 3 Credits. (2 Lec, 1 Lab) F
PREREQUISITE: Junior standing and PHSX 222 or PHSX 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.

EELE 408. Photovoltaic Systems. 3 Credits. (2 Lec, 1 Lab) S
PREREQUISITE: PHSX 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.

EELE 409. EE Material Science. 3 Credits. (3 Lec) F
PREREQUISITE: EELE 317. Basic material properties of dielectrics, magnetic materials, conductors, and semiconductors. Practical applications of materials to semiconductor devices.

EELE 411. Advanced Analog Electronics. 3 Credits. (3 Lec) S
PREREQUISITE: EELE 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.

EELE 414. Intro to VLSI Design. 3 Credits. (3 Lec) F
PREREQUISITE: EELE 262, EELE 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.

EELE 417. Acoustics/Audio Engineering. 3 Credits. (3 Lec) F alternate years to be offered even years PREREQUISITE: PHSX 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 422. Intro to Modern Control. 3 Credits. (3 Lec) F

EELE 432. Applied Electromagnetics. 3 Credits. (3 Lec) S
PREREQUISITE: EELE 334 or PHSX 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.

EELE 445. Telecommunication Systems. 4 Credits. (3 Lec, 1 Lab) F
PREREQUISITE: EELE 308, EELE 317. Introduction to analog and digital communication systems with lab. Topics include signals in communications; noise characteristics; 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.
ELEE 447. Mobile Wireless Communications. 3 Credits. (3 Lec) F
PREREQUISITE: ELEE 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.

ELEE 451. Power Electronics. 3 Credits. (2 Lec, 1 Lab) S alternate years to be offered even years PREREQUISITE: EEE 317, EEE 321, EEE 355. Introduction to solid-state power devices; topologies, operating principles, modeling and control, and design of basic power converters; magnetic design; applications of power converters in renewable energy source power systems, electric and hybrid electric vehicles, and other residential, commercial, and industrial systems; laboratory experience with basic power converters.

ELEE 454. Power Systems Analysis. 3 Credits. (3 Lec) F
PREREQUISITE: EEE 355. Power system components, transmission system design, power flow studies, automatic generation control, symmetrical components, faulted power systems, protection, introduction to transient stability.

ELEE 455. Alternative Energy Power Gen. 3 Credits. (3 Lec) S, alternate years to be offered even years PREREQUISITE: EEE 355 or equivalent. 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.

ELEE 456. Power Sys Protection & Ctl. 3 Credits. (3 Lec) S, alternate years to be offered even years PREREQUISITE: EEE 454 or equivalent. Continuation of ELEE 454. Symmetrical and unsymmetrical fault analysis, system protection, introduction to load frequency control, voltage control, economic dispatch, and introduction to power system stability.

ELEE 461. Digital System Design. 3 Credits. (3 Lec) S, alternate years to be offered even years PREREQUISITE: EEE 308 and EEE 334 and EEE 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).

ELEE 465. Microcontroller Applications. 4 Credits. (2 Lec, 2 Lab) S
PREREQUISITE: EEE 371. Lecture/laboratory exposure to micro controller hardware and software applications, serial and parallel I/O, timing, interrupts LCDs, keyboards, A to D conversion, and a project realizing a real time control problem.

ELEE 466. Comp Computer Architecture. 4 Credits. (3 Lec, 1 Lab) S
PREREQUISITE: EEE 475. Design of custom CPU's and embedded systems using FPGAs, emphasizing computational tasks such as audio and video processing, design and development of custom instruction sets. Engineering tradeoffs among fixed-point, floating point, and compressed representations of numerical data.

ELEE 475. Hardw/Softw Eng Embedded Sys. 3 Credits. (2 Lec, 1 Lab) F
PREREQUISITE: EEE 367 and CSCI 112. Topics in embedded system design, real-time operating systems, high level language programming of embedded systems, software and hardware tradeoffs, and laboratory experience with embedded systems.

ELEE 477. Digital Signal Processing. 4 Credits. (3 Lec, 1 Lab) S
PREREQUISITE: EEE 308. Analysis and design of discrete-time systems, including frequency response, sampling and reconstruction of continuous signals. Analysis, design, and applications of FIR and IIR digital filters. Properties and applications of the discrete Fourier transform. Laboratory experience implementing off-line and real time digital signal processing algorithms.

ELEE 481. Optical Design. 3 Credits. (3 Lec) S alternate years PREREQUISITE: EEE 482 or PHSX 327. Optical design using geometric optics and computer ray-tracing software. Introduces ray and wave front aberrations, control of aberrations in optical systems, design for system requirements, and analytic tools including the moducation transfer function.

ELEE 482. Electro-Optical Systems. 3 Credits. (2 Lec, 1 Lab) F
PREREQUISITE: EEE 334 or PHSX 423 or equivalent. Provides an overview of electro-optic systems and components. Lectures cover ray optics, scalar wave optics, laser and Gaussian beam optics, optical polarization and polarization devices, light sources, detectors, and electro-optic and acoustic-optic photonic devices. Laboratory experiments introduce basic photonic instrumentation and measurement techniques.

ELEE 484. Laser Engineering. 3 Credits. (3 Lec) S alternate years to be offered even years PREREQUISITE: PHSX 222. The laser engineering course provides a basic understanding of the design and operational principles of lasers. Discussions of design and operation of several types of lasers will be covered including solid state lasers, gas lasers, and semiconductor lasers.

ELEE 487. Prof. Ethics & Engr Practices. 1 Credit. (1 Lec) S
PREREQUISITE: Junior standing. Engineers from industry and others give presentations on professionalism, ethics, and engineering practices. Included are specific well-known, historical engineering ethics cases and professional practices of engineering, intellectual property issues, and new developments.

ELEE 488R. Electric Engineering Design I. 2 Credits. (2 Sem) F,S
PREREQUISITE: EEE 317 and ENGR 310. 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.

ELEE 489R. Electric Engr Design II. 3 Credits. (3 Sem) F,S
PREREQUISITE: EEE 488R. The second of a two course 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.

ELEE 490R. Undergraduate 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.

ELEE 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.

ELEE 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.

ELEE 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.

ELEE 499R. Capstone: Electrical Engr Design. 3 Credits. (2 Lab) F,S
PREREQUISITE: ENGR 310. Senior capstone course. A design project culminates with the actual construction and demonstration of the design. 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.

ELEE 503. Advanced Analog Circuit Design. 3 Credits. (3 Lec) F alternate years to be offered odd years PREREQUISITE: EEE 317. Solid state device models, p- and n-type charge carriers, single and multiple stage amplifier design, current sources, operation amplification design, frequency response, feedback and feed forward amplifier analysis, noise and distortion in electronics.

ELEE 505. MEMS Sensors and Actuators. 3 Credits. (2 Lec, 1 Lab) S alternate years to be offered odd years PREREQUISITE: EEE 409. Micro fabrication of mechanical and electrical devices. Theory of various mechanical transducers and physical sensors including optical MEMS, RF MEMS, and Bio/Chemical MEMS.

ELEE 517. Acoustics/Audio Engineering. 3 Credits. (3 Lec) F alternate years to be offered even years PREREQUISITE: PHSX 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.

ELEE 522. Adaptive Control. 3 Credits. (3 Lec) S alternate years to be offered even years PREREQUISITE: EEE 422. On-line parameter estimation, self tuning regulators, model reference adaptive controls. Robust control.

ELEE 525. System Identification. 3 Credits. (3 Lab) F alternate years to be offered odd years PREREQUISITE: EEE 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.

ELEE 526. Sequential State Estimation. 3 Credits. (3 Lec) F alternate years to be offered even years PREREQUISITE: EEE 422. Sequential state estimation, with emphasis on Kalman filtering and smoothing. Continuous and discrete time.
ELE 528. Advanced Controls and Signals. 3 Credits. (3 Lec; 6 cr max) On Demand
Max 6 cr. PREREQUISITE: ELE 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.

ELE 533. Antenna Engineering. 3 Credits. (3 Lec) F alternate years to be offered even years PREREQUISITE: ELE 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.

ELE 538. Adv Top Electromagn & Optics. 3 Credits. (3 Lec; 6 cr max) -- Advanced topics in applied electromagnetics and optics, chosen to represent current research in this field.

ELE 541. Advanced Communication Theory. 3 Credits. (3 Lec) F alternate years to be offered even years PREREQUISITE: ELE 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.

ELE 543. Advanced Telecom Systems. 3 Credits. (3 Lec) F alternate years to be offered odd years PREREQUISITE: ELE 445. Digital and analog switching systems, packet and circuit telecommunication transmission networking and media selection (fiber optics, cable, microwave and satellite), network configuration, network technologies, equipment selection, system design examples and project.

ELE 547. Ad Hoc Wireless Sensor Network. 3 Credits. (3 Lec) S alternate years to be offered even years PREREQUISITE: ELE 447 and ELE 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.

ELE 548. Advanced Communication Systems. 3 Credits. (3 Sem; 6 cr max) S alternate years to be offered odd years Max 6 cr. PREREQUISITE: E453 or equivalent. Reading and discussion of original source material on advanced communications systems topics including digital communications systems, optical technologies and systems, packet networks, IP networking, wireless systems, ad hoc networks.

ELE 552. Power System Analysis/Control. 3 Credits. (3 Lec) On Demand PREREQUISITE: ELE 454. Representation of power system elements, fast-decoupled power flow, optimal power flow, voltage control, load-frequency control, control of active and reactive power flow, application of FACTS devices in power flow control, electrical faults and contingency calculations, transient stability, dynamic stability.

ELE 555. Alt Energy Dist Gen Systems. 3 Credits. (3 Lec) S alternate years to be offered even years PREREQUISITE: ELE 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.

ELE 556. Advanced Power Electronics. 3 Credits. (3 Lec) F alternate years to be offered odd years PREREQUISITE: ELE 451. Mathematical modeling of switching power converters, advanced power converter topologies, design constraints and control methods, design-oriented analysis techniques for applications in electromechanical systems, power systems, transportation systems, etc.

ELE 558. Advanced - Electrical Power. 3 Credits. (3 Lec; 6 cr max) On Demand Max 6 cr. PREREQUISITE: ELE 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.

ELE 561. Digital System Design. 3 Credits. (3 Lec) S, alternate years to be offered even years PREREQUISITE: ELE 308 and ELE 394 and ELE 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.

ELE 565. Parallel Processing. 3 Credits. (3 Lec) F alternate years to be offered odd years PREREQUISITE: ELE 466. Architecture and applications of parallel processors, major design issues, fault tolerant computing, performance measures of parallel systems, and issues in concurrent programming.

ELE 575. Research/Prof Paper/Project. 3-6 Credits. (3-6 Ind; 6 cr max) F,S,Su
IND 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.

ELE 577. Adv Digital Signal Processing. 3 Credits. (3 Lec) S alternate years to be offered odd years PREREQUISITE: ELE 477. Advanced topics in digital signal processing. Review of LT1 discrete-time systems; signal and coefficient quantization; sample rate conversion and multirate filter structures; time-varying and adaptive systems; fast algorithms; system implementation alternatives; DSP applications in current research.

ELE 578. Speech Signal Processing. 3 Credits. (3 Lec) F alternate years to be offered even years PREREQUISITE: ELE 477. Digital signal processing techniques that are used to analyze, code, and manipulate speech signals will be covered. Topics include modification, coding, enhancement, and recognition of speech signals.

ELE 581. Fourier Optics/Imaging Theory. 3 Credits. (3 Lec) F alternate years to be offered odd years PREREQUISITE: ELE 334 or consent of instructor. Optical propagation and diffraction using scalar wave approach and Fourier Theory of imaging. Introduces concepts of pupil function, point and line spread function and optical transfer function, image formation with coherent and incoherent light, holography and diffractive optical elements.

ELE 582. Optical Design. 3 Credits. (3 Lec) S alternate years to be offered odd years PREREQUISITE: ELE 482 or PHSX 327. Optical design using geometric optics and computer ray tracing software. Introduces ray and wave front aberrations, control of aberrations in optical systems, designing for system requirements, and analytic tools including the modulation transfer function for describing the imaging and beam-conditioning properties of typical optical systems, including lenses, mirrors, cameras, and telescopes.

ELE 583. Remote Sensing Systems. 3 Credits. (3 Lec) S alternate years to be offered even years PREREQUISITE: ELE 334 or PHSX 423 or equivalent. Design, analysis, and calibration of electromagnetic remote sensing systems. Combines an introduction to atmospheric radiative transfer and wave propagation principles with detailed coverage of radiometry and optical detectors to analyze remote sensing systems. The course considers the full electromagnetic spectrum, but emphasizes optical systems at ultraviolet, visible, and infrared wavelengths, including cameras, spectrometers, radiometers, polarimeters, multispectral and hyperspectral imagers, laser radars, etc.

ELE 589. Graduate Consultation. 1-3 Credits. (1-3 Ind; 3 cr max) F,S,Su
TUT Maximum 3 cr. PREREQUISITE: Master’s standing and approval of the Dean of Graduate Studies. The 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.

ELE 590. Masters’ Thesis. 1-10 Credits. (1-10 Ind; max unlimited) F,S,Su
PREREQUISITE: Master’s standing.

ELE 591. Special Topics. 1-4 Credits. (1-4 Ind; 12 cr max) -- Special Topics.

ELE 592. Independent Study. 1-6 Credits. (1-6 Ind; 6 cr max) -- Independent study for electrical engineering students.

ELE 598. Internship. 1-12 Credits. (1-2 Ind) 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.

ELE 690. Doctoral Thesis. 1-10 Credits. (1-10 Ind; max unlimited) F,S,Su
PREREQUISITE: Doctoral standing.

EENV - Environmental Engineering

EENV 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.

EENV 340. Princ of Envir Engineering. 3 Credits. (3 Lec) F,S
Lec 3 PREREQUISITE: CHMY 143 or CHMY 153. COREQUISITE: EGEN 335. Fundamentals of environmental engineering with emphasis on water and wastewater.

EENV 432. Advanced Engineering Hydrology. 3 Credits. (3 Lec) S
Lec 3 PREREQUISITE: ECIV 331 and ECIV 332. Hydrology emphasizing engineering design. Topics include modern techniques for flow estimation, flood routing and sediment yield; design of conveyance structures; and water project development.
EENV 434. Groundwater Supply/Remediation. 3 Credits. (3 Lec) S
Lec 3 PREREQUISITE: EGEN 335. Contemporary groundwater topics including water supply, contaminant transport, and remediation technologies.

EENV 440. Water Chemistry for Envir Engr. 3 Credits. (3 Lec) F
Lec 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 441. Natural Treatment Systems. 3 Credits. (3 Lec) F
Lec 3 PREREQUISITE: EGEN 335, CHMY 141 and EGEN 324 or equivalent. Fundamentals of air quality management with emphasis on the design of processes and equipment for controlling gaseous and particulate emissions.

EENV 445. Hazardous Waste Treatment. 3 Credits. (3 Lec) F alternate years, to be offered odd years.

EENV 447. Hazardous Waste Management. 3 Credits. (3 Lec) S
Lec 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 499R. 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 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.

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. (3 Lec) F
Alternate years, to be offered odd years. Lec 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. (3 Lec) F
Lec 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. (2 Lec) F

EENV 562. Water Treatment Process/Design. 3 Credits. (3 Lec) S

EENV 563. Wastewater Treat Proc/Design. 3 Credits. (3 Lec) S

EENV 565. Chem Sens/Instr Envir Biotech. 2 Credits. (2 Lec) S alternate years, to be offered even years.
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 it 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 adviser 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. (1-3 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.

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. (2 Ind) 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 600. 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 COREQUISE: 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 Rct) 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.

EGEN - General Engineering

EGEN 102. Intro to Engineer Comp Apps. 2 Credits. (2 Lec) S
COREQUISE: 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 125CS. 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
PREREQUISITE: EGEN 201 or EGEN 221 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 Mls (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
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
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 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.

EGEN 292. Independent Study. 1-3 Credits. (1 Ind; 4 cr max) On Demand
PREREQUISITE: Consent of instructor and approval of department head. Directed research and study on an individual basis.

EGEN 301R. Multidisciplinary Engineering Design. 3 Credits. (3 Lec) F,S
PREREQUISITE: Standing in 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
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
PREREQUISITE: Junior standing, M 171Q or M 165Q, 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 331. Applied Mechanics of Fluids. 3 Credits. (3 Lec) F,S
LEC 3 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
PREREQUISITE: EGEN 202, EGEN 205. Introduction to modern fluid mechanics.

EGEN 350. Applied Data Analysis. 2 Credits. (2 Lec) F,S,Su
PREREQUISITE: 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 3 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 3 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,Su
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 498R. 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
PREREQUISITE: EGEN 505 or instructor approval. Numerical methods used to solve common engineering research problems. Solutions to nonlinear equations. Optimization methods.

EGEN 541. Thy Magnetic Resonance Imag 1. 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.
EIND 411. Interaction Design Project. 1 Credit. (1 Ret) 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: Junior standing; EIND 313 for IMSE majors, or consent of instructor. Applications of ergonomics and human factors engineering. Topics include principles 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: EIND 313 or equivalent, and EIND 354 or equivalent. Discrete simulation modeling methodology; random number generation, 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: Junior standing. 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,S
Prerequisite: EIND 313. Fundamental principles of planning, estimating, budgeting, scheduling, implementing, evaluating, and controlling engineering and research projects. Common engineering management concerns such as labor scheduling, human resource management, and related governmental compliance also explored.

EIND 442. FacanMat Hndlg Sys Dsgn. 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. Eng 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
Prerequisite: EIND 313 or consent of instructor. Statistical analysis for managerial decision-making as applied to engineering problems. Single and multi-factor 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
Prerequisite: EIND 313 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 quantitative 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. Nonlinear and integer programming algorithms. Stochastic models including advanced queueing and general markov processes.

EIND 468. Managerial Forecasting & Decision Analysis. 3 Credits. (3 Lec) F
Prerequisite: EIND 354. Time series analysis through classical approaches; auto-regression, smoothing models, and advanced time series models. Technical applications emphasized. Includes investigations into forecast and dependent data. Approaches designed for managers to test real applications for making decisions.
**EIND 477. Quality Assurance. 3 Credits. (3 Lec) S**
PREREQUISITE: EIND 354 or EGEN 350 or consent of instructor. Statistical and non-statistical aspects of quality assurance assessment. Includes classical SPC and process improvement via control charts. Also includes product and process design through planned experimentation and simple experimental designs (ANOVA). Limited use of case studies. A design project or course capstone paper demonstrating significant elements of the course is required.

**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. Industr Engin 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
PREREQUISITE: NURS 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 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 Bio mechanics. 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 bio mechanics and bio instrumentation 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 364. Theory, methods and applications pertinent to decision making for multi-attribute objects or problems. Special emphasis is given to multi-attribute utility theory, goal programming, and multi-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 300 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 580. Graduation 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 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 or director. Directed research and study on an individual basis.

**EIND 598. Internship. 1-12 Credits.** (1-12 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
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
PREREQUISITE: 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 Elem Anal 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 Structure and Prop Lab. 1 Credit. (1 Lab) F
S PREREQUISITE: WRIT 101W, CHMY 121N or CHMY 141. COREQUISITE: EMAT 250; M 172Q for ME majors; M 166Q 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. Department of Mechanical & Industrial Engineering.

EMAT 350. Engineering Materials. 3 Credits. (3 Lec) S

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: EMAT 252 and EMEC 342 or instructor approval. Introduction to elastic and elastoplastic deformation, microfracture, 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) F, alternate years
PREREQUISITE: EMAT 341, EMAT 320, and EMAT 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, odd years.
PREREQUISITE: EMAT 251 or EMAT 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, odd 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: EMAT 251, 252, 350. Advanced treatment of ceramic materials, 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, even years
PREREQUISITE: EMAT 463. Advanced treatment of composite materials, including constituent properties, interfaces, micromechanics, microscopic behavior, modes and mechanisms of failure.

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,Su on demand PREREQUISITE: ME, MET, or IE majors only. COREQUISITE: M 171Q for ME and IE 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: EMEC 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) On Demand
PREREQUISITE: WRIT 101W, and CHMY 121N or CHMY 141. COREQUISITE: M 172Q for ME majors; M 166Q 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: EMAT 250, 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
PREREQUISITE: EGEN 335, EMEC 320. COREQUISITE: Concurrent enrollment in or prior completion of EMEC 303. Mechanisms of energy transport due to a temperature difference in materials. Conduction, convection, and radiation formulations.
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, PHSX 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 Lab, 2 Lec) F
PREREQUISITE: 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
PREREQUISITE: 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, EMEC 326. Study of thermodynamics, heat transfer, and fluid mechanics analysis for applications to thermal systems.

EMEC 444. Mech Behavior of Materials. 3 Credits. (3 Lec) F, even 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, visco elasticity, 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,S
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 Rct) F,S
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) F
on demand PREREQUISITE: EGEN 355, 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) F,S
PREREQUISITE: Senior standing; ELE 250 and EGEN 205; or consent of instructor. Introduction to sensors and actuators and their working principles. MEMS (micro-electromechanical 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 310R, ME majors only. COREQUISITE: Concurrent enrollment in or prior completion of EMEC 321, EMEC 326, EMEC 342, EMEC 360, 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 cr.) F,S
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.) S,S,F
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 cr.) S,S,F
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. (3 Lec; 3 cr. max) F,S,S,F
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. 1-12 Credits. (1-12 cr.) F,S
PREREQUISITE: Junior standing 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. Mechanical Engineering Design Capstone II. 3 Credits. (1 Lec; 1 Rct, 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 525. Conduction Heat Transfer. 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 529. Bio-inspired Engineering. 3 Credits. (3 Lec) F
PREREQUISITE: EMEC 321, EMEC 326, EMEC 342, EMEC 360, EMEC 445. 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 instructor approval. Numerical solutions of fluid flows, discretization methods, solution algorithms, aspects of turbulent flows.

EMEC 545. Advanced Mechanical Vibrations. 3 Credits. (3 Lec) On Demand PREREQUISITE: EMEC 445. Advanced topics in mechanical vibrations. Multidegree of freedom systems, continuous systems, generalized coordinates. Introduction to nonlinear vibrations.

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, magnetorheology, and biominimicking.

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/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,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 the discussion material.

EMEC 598. Internship. 1-12 Credits. (1-13 Ind) F,S,Su 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,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.

ENGL 339. Teaching Writing in Secondary School. 3 Credits. (3 Reo) S PREREQUISITE: WRIT 101 and LIT 201 and LING 338. COREQUISITE: ENGL 445. 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 Lec) Pr COREQUISITE: WRIT 101 and LIT 201 and LING 338. 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 literary and literature pedagogies.

ENGL 450. Rhetoric and Composition. 3 Credits. (3 Lec) F PREREQUISITE: WRIT 201 or WRIT 221. Intensive study in composition/rhetorical theory, with attention to writing pedagogy.

ENGL 461R. Issues in English Education. 3 Credits. (3 Reo) F PREREQUISITE: EDSD 457, 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 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 530. Writing Theory and Practice. 3 Credits. (3 Sem; 6 cr max) F,S,Su 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,Su 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 12 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 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 591. Special Topics. 1-4 Credits. (1-4 Lec; 12 cr max) On Demand Max 12 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.

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. (1-4 Ind; 12 cr max) On Demand Max 12 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 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. (1-4 Ind; 12 cr max) On Demand Max 12 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) F,S,Su Max credits unlimited. 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. 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.
ENGR - Engineering

ENGR 610. Rch & Methds 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. Lnd Res 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) 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 Ind; 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 Int; 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, alternate years to be offered odd years. PREREQUISITE: BIOB 170 and BIOE 370. Principles of risk analysis, including risk assessment, perception, communication, and management. Emphasis on human toxicology, ecotoxicology, dose-response relationships, exposure analysis, environmental fate, and deterministic and probabilistic risk assessment.

ENSC 410R. Biodiversity Methods. 3 Credits. (2 Lec, 1 Lab) F
PREREQUISITE: NRSRM 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 management. 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 BIOE 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
PREREQUISITE: ENSC 110, ENSC 245 (or equivalent understanding.) Introduction to watershed hydrology. The course will examine how rainfall and snowmelt become streamflow, evapotranspiration, and groundwater with an emphasis on hydrological processes. Discussion will revolve around state of the science, linkages to other disciplines, and management implications. Topical areas include: water balances, snow hydrology, hydrogeology, hyporheic zones, riparian zones, runoff process, and biogeochemical budgets. Department Land Resources & Environmental Sciences.

ENSC 445. Watershed Analysis. 3 Credits. (3 Lec) S
PREREQUISITE: ENSC 444 and STAT 216 or BIOE 318 or permission of instructor. 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.

ENSC 448. Stream Restoration Ecology. 3 Credits. (2 Lec, 1 Lab) F
PREREQUISITE: BIOB 170, and either NRSRM 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/range are 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
3 cr. LEC 3 PREREQUISITE: BIOB 170, and either NRSRM 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 466. Computational Techniques Environmental Science. 1 Credit. S
1 cr. LAB 1. PREREQUISITE: BIOL 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: BIOL 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, 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.

ENSC 468. Ecosystem Biogeochem. 3 Credits. (3 Lec) S
PREREQUISITE: ENSC 353. Introduction to the study of biogeochemistry and ecosystem
effects 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.

ENSC 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.

ENSC 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.

ENSC 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.

ENSC 498. Internship. 2-4 Credits. (2 Ind; 12 cr max) F,S
2 cr. Major 12 cr. IND May be repeated. Maximum 12 cr. PREREQUISITE: Public or Service
Major 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.

ENSC 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 to
be offered odd years 3 cr. LEC 3. PREREQUISITE: BIOE 262 and STAT 411
or STAT 412. Physiological ecology of insects. Influence of biotic and abiotic factors
on insect population 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. PREREQUISITE: BIOE 262N and one of the following: BIOE 340, BIOE 412, BIOE 413, BIOE 433, BIOE 465, ENTO 514, or ENTO 525. The course focuses on a systems physiology approach, emphasizing the principles of insect physiology and insect physiological ecology. 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 525. Insect Morphology. 2 Credits. (1 Lec, 1 Lab) S alternate years, to be
offered even years. PREREQUISITE: ENTO 204 and one of the following: BIOL 310, BIOL 420,
ENTO 401, ENTO 432, ENTO 510, ENTO 514, ENTO 516, or ENTO 520. The principles of insect morphology and the evolutionary principles behind the diversity of form and function of the major insect and arthropod groups.

ENTO 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.

ENTO 592. Independent Study. 1-3 Credits. (1 Ind; 6 cr max) On Demand
1 - 3 cr. 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.

ENTO 594. Seminar. 1 Credit. (1 Sem; 4 cr max) F,S
1 cr. 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.

EXVE - Environmental Engineering

EXVE 470. Independent Study. 1-3 Credits. (1 Ind; 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.

EQUH - Equine Horsemanship

EQUH 110. Western Equitation. 2 Credits. (2 Lab) F,S
Western equitation techniques including introductory training techniques.

EQUH 114. Beginning English Equitation. 2 Credits. (1 Lab) F,S
Beginning English equitation technique, including horse behavior, horse handling,
equipment and basic horse anatomy.

EQUH 207. Interned English Equitation. 2 Credits. (1 Lab) S
Beginning English equitation technique, including horse behavior, horse handling,
equipment and basic horse anatomy.

EQUH 210. Interned Western Equitation. 2 Credits. (1 Lab) F,S
PREREQUISITE: EQUH 110 or permission of instructor. Students will learn
advanced movements and maneuvers such as collection, roll-backs, turn-arounds, and
lead changes. Students must have secure seat and hands. Training methods for the
green horse and tuning techniques for the older broke horse will be covered.

EQUH 253. Starting Colts. 2 Credits. (2 Lab) F
PREREQUISITE: EQUH 210 and consent of instructor. Principles and techniques of
breaking and training young horses.

EQUH 256. Developing The Young Horse. 2 Credits. (1 Lab) S
PREREQUISITE: EQUH 210 and consent of instructor. Advanced techniques and
training for reining, cutting, or working cow horses. For experienced riders.

EQUH 314. Equestrian Instruction Methods. 2 Credits. (1 Lec, 1 Lab; 2 cr max) F
PREREQUISITE: EQUH 210, EQUH 210, or consent of instructor. The object of
this course is to develop competent riding instructors who can communicate effectively
and motivate students to higher riding skills.

EQUS - Equine Sciences

EQUS 206. Equine Ethology: Understanding Horse Behavior. 3 Credits. (3 Lec) F
PREREQUISITE: ANSC 100. Equine Ethology is a course designed to teach students
the science of horse behavior from an evolutionary, biologic, physiologic and genetic
perspective. This course provides students a foundation for more sensitive and
informed care, management and handling.

EQUS 233. Horse Science Management Lab. 2 Credits. (2 Lab) F
PREREQUISITE: ANSC 100. Laboratory designed to familiarize students with
approved management practices for horse enterprises.

EQUS 200R. 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.

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.

ENVE - Environmental Engineering

ENVE 470. Independent Study. 1-3 Credits. (1 Ind; 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.
EQU 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.

EQU 327. Equine Lameness. 3 Credits. (3 Lec) F
PREREQUISITE: ANSC 100, ANSC 265/266, and EQU 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 shoewing principles for sound and lame horses.

EQU 346. Equine Reproductive Management. 4 Credits. (3 Lec, 1 Lab) S
PREREQUISITE: ANSC 100, ANSC 265/266, ANSC 321, ANSC 322, and EQU 233. This course is designed to familiarize students with the reproduction in horses. Students will be instructed on the appropriate methods for management of the stallion, mare and foal. The curriculum will also include equipment and facilities use, as well as management of a breeding facility.

EQU 347. Equine Form to Function. 3 Credits. (2 Lec, 1 Lab) S
PREREQUISITE: ANSC 100, ANSC 265, ANSC 266, EQU 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.

EQU 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.

EQU 424. Equine Exercise Physiology. 3 Credits. (3 Lec) S
PREREQUISITE: ANSC 265/266, ANSC 320, EQU 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.

EQU 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.

EQU 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. May be repeated.

EQU 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.

EQU 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.

EQU 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 201IN. 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 systems.

ERTH 202CS. 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. Recitation sections and field trips provide additional hands-on experiences.

ERTH 303. Weather and Climate. 3 Credits. (3 Lec) F
PREREQUISITE: ERTH 101N. 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 101N; 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 metamorphosis 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
PREREQUISITE: ERTH 101N 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, pluvial 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,S
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,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.

ERTH 505. Geomicrobiology. 3 Credits. (3 Sem) S alternate years, to be offered even years.

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.
ERTH 512. Mtn. & Plus Riparian Proc. 2 Credits. (2 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. (1 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. (2 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 Paleoecology. 3 Credits. (3 Sem) F alternate years, to be offered 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. (3 Sem) F alternate years, to be offered odd years.
PREREQUISITE: ERTH 101IN or BIOB 170IN or equivalent. Course examines important themes in paleoecology. Topics change on a yearly basis addressing needs and interests of current students. It is intended for students with an interest in ecology, palaeontology and environmental history.

ERTH 584. Quaternary Envir. of Western US. 3 Credits. (3 Sem) F, alternate years, to be offered even years.
PREREQUISITE: ERTH 101 or BIOB 170 or equivalent. This graduate course examines current research and recent developments in Quaternary paleomagnetism 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. (1 Sem) F, to be offered even years. Discussion of recent developments in paleontology, palaeoecology, 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 on 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 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.

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. (3 Lec) F
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 690. Dissertation Research. 1-10 Credits. (1-10 Ind; max unlimited) F,S,S
PREREQUISITE: Doctoral candidate standing.

ERTH 694. Doctoral Seminar. 1-3 Credits. (1-3 Sem; 6 cr max) F,S,S
PREREQUISITE: Doctoral candidate standing.

ESOF 322. Software Engineering. 3 Credits. (3 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. (3 Lec) S even years
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. (3 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 290R. Undergraduate Research. 1-6 Credits. (1-6 Ind; max unlimited) F,S
Directed undergraduate research/creative activity which may culminate in a written report 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. (3 Lec, 1 Lab) F
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 204. AppD Analysis for Const Techn. 1 Credit. (1 Lec) F,S
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
Directed undergraduate research/creative activity which may culminate in a written report or other creative project. Course will address responsible conduct of research. May be repeated.

ETCC 310. Concrete Technology. 3 Credits. (2 Lec, 1 Lab) S
PREREQUISITE: M 171Q or M 181Q. Properties of concrete constituents, mechanical and service properties of concrete, mix design, field practices. Concrete reinforcing requirements and analysis of concrete members.

ETCC 412. Structural Elements. 3 Credits. (3 Lec) F
PREREQUISITE: M 171Q or M 181Q. Properties of concrete constituents, mechanical and service properties of concrete, mix design, field practices. Concrete reinforcing requirements and analysis of concrete members.

ETCC 409R. 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. 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
PREREQUISITE: EGEN 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 (CQE)
administered by the American Institute of Constructors (AIC).

ETME - Engr, 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: 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
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 Rec; 1 Lab) F
S PREREQUISITE: ETME 203 or equivalent, EGEN 208, EGEN 324.
COREQUISITE: 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; on demand PREREQUISITE: ETME 203 or equivalent, or TE 230 for non-
majors, or instructor approval. COREQUISITE: ETME 216. Introduction to modern
machining technology and the key principles of industrial safety, material properties
related to machining practices, design, and specifications. Semi-precision and precision
lay-out 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; on demand PREREQUISITE: EMEC 103 or equivalent, or TE 230 for non-
majors, or instructor approval. COREQUISITE: ETME 216. Introduction to
modern science of joining technology, as well as a detailed examination of metallurgy
and materials properties as related to joining processes. Welding specification and
symbols are introduced as well as 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, as well as destructive
and non-destructive testing, are included in laboratory. In addition to commonly
used welding techniques, this course will 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) F
on demand COREQUISITE: ETME 208, ETME 202. Introduction to
mechanisms and mechanism elements used in the design and synthesis of mechanical
designs.

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 fits 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; on demand PREREQUISITE: EELE 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
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&M) 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 350; 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: EMCE 320 or EGEN 324, ETME 321, or EMCE 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/seletion 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, ETME 321, 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: EHSX 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 EMCE 360
and EMCE 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) On Demand
PREREQUISITE: ETME 360 or EMCE 360, EMCE 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 EMCE 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 EMCE 360, EMCE 361, ETME 340 or EMCE
341; ETME 321 or EMCE 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 Rct) F
S PREREQUISITE: ETME 303, EGEN 310, for MET majors only with senior
standing. COREQUISITE: ETME 360, EGEN 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 director. 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 Ret, 1 Lab) F,S
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 101S. Indiv and Fam 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 developmental, and family theories, current research, and
practical applications for practitioners, teachers, and parents.

FCS 138. Swy of Fam Fin and Cons Issue. 3 Credits. (3 Lec) F
If you need to make dollars 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) S 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) S 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
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) S
PREREQUISITE: FCS 101S 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,
career development; and the demographic and economic consequences of an aging
population.

FCS 263. Relationships and Fam Systems. 3 Credits. (3 Lec) F
S 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: FCS 101S 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,
career development; and the demographic and economic consequences of an aging
population.

FCS 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.

FCS 291. Special Topics. 1-4 Credits. (1-4 Ind) Lec, 1-2 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.
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, 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 339. Theor Skills for Helping Relat. 3 Credits. (3 Lec) F,S
PREREQUISITE: Junior standing in Health and Human Development major or consent of instructor. An introduction to various family, consumer science, and counseling theories, skills, and modalities. An overview of the helping profession. 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. Prepare 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 Sem. 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 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.

FCS 455R. Program Plan and Admin in FCS. 3 Credits. (3 Lec) F
PREREQUISITE: FCS 371 and senior standing. Knowledge and skills necessary for establishing and administering various human service programs including early childhood, youth, family, 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 460. Parenting. 3 Credits. (3 Lec) S
Su, On Demand PREREQUISITES: 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 464. Gndr, Rce, Cls, Fam Diver. 3 Credits. (3 Lec) S
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
PREREQUISITE: FCS 263, FCS 371 or equivalent, senior standing or permission of instructor. An in-depth review of current 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,Su
Maximum 6 cr 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 course materials.

FCS 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. All students must receive department permission prior to registration.

FCS 572. Professional Practicum. 2-6 Credits. (2-6 Lab; 9 cr max) F,S
Max 9 cr. PREREQUISITE: EDEC 555, HDCC 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,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,S,Su
Max 3 cr. PREREQUISITE: Master’s standing 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.

FCS 590. Master’s Thesis. 1-10 Credits. (1-10 Ind; max unlimited) F,S
Max credits unlimited. PREREQUISITE: Master’s standing. Directed graduate research/creative activity.

FCS 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. 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.

FCS 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.

FCS 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 that are not covered in regular courses. Students participate in preparing and presenting discussion material.

FCS 598. Internship. 1-12 Credits. (1-12 Ind; 12 cr max) F,S,Su
Max 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.
FILM - Film & Photography

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 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 Prodctn I. 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: 1960's to the Present. 3 Credits.

FILM 212. Aesthetics Production II. 4 Credits. (4 Lab) F
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: FILM100IH, 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
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 Rct) 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 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
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. (1 Ind; 12 cr max) F,S
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
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
PREREQUISITE: Any 300 level film studies course or permission of instructor. Course examines a specific topic in film studies. Students interested in topics 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
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
PREREQUISITE: 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,Su PREREQUISITE: Consent of School Director. An individualized assignment arranged with an outside agency, business, or other organization to provide guided experience in the field. School of Film and Photography.

FILM 499. Senior Production. 5 Credits. (5 Sem; 10 cr max) F,S,Su 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 Approach 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 533. 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. 1-3 Credits. (1-3 Lab; 6 cr max) F,S,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 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 Rct) F,S,Su PREREQUISITE: Previous study of French. An accelerated version of FRCH101 and FRCH102D 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 201 or equivalent, 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 305. Histoire Civilisation. 3 Credits. (3 Lec) S alternate years, to be offered every even years. PREREQUISITE: FRCH 229 Survey of French culture from the middle ages to modern era; focus on historical, artistic, literary, and social developments. Taught in French.

FRCH 306IH. 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 220 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 220 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 Ret) F alternate years, to be offered even years. PREREQUISITE: FRCH 201 Intensive conversation coupled with a practical study of French phonetics and contrasting 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 Ret) S PREREQUISITE: FRCH 220. 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 Ret) F alternate years, to be offered odd years. PREREQUISITE: FRCH 220 Survey of French Literature. Taught in French.

FRCH 450. Seminar: French Literature and Culture. 3 Credits. (3 Ret) 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 497R. Education Methods. 1-2 Credits. (1 Ret; 4 cr max) F,S,Su PREREQUISITE: WRIT 101W or consent of instructor. COREQUISITE: FRCH 449. 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 PREREQUISITE: Directed undergraduate research/creative activity which may culminate in a research paper, journal article, or graduate thesis. May be repeated.

GDSN - Graphic Design

GDSN 223. Design Principles. 4 Credits. (0 Lec, 2 Lab, 2 Stu) 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 MTA 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 prints.

GDSN 361. Tetons Digital. 3 Credits. (3 Lec) Su PREREQUISITE: GDSN 224, ARTZ 211, or MTA 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. Using modern screenprinting technology as a communication medium. Including the preparation of screens, mixing pigments, and printing.


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,Su 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.
**GEO - Geology**

**GEO 103CS. Intro to Environmental Geology. 4 Credits.** (3 Lec, 1 Lab) S
Application of geological principles to topical problems in environmental and resource geology. Topics include analysis of environmental issues such as earthquake disaster preparedness, landslides, 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/air/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
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 withdrawal and contamination issues, volcanic and coastal hazards, and the response of landscapes and people to resource development (minerals/air/water/energy). Laboratories will be used to analyze and debate data relevant to environmental problems from a geologic perspective.

**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. Vertebrate 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) F alternate years, to be offered odd years.
PREREQUISITE: GEO 211 and BIOC 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 trip fee 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 BIOC 170IN. This course trace 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 BIOC 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, iontasy, 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 211 and BIOC 170IN. 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 - Geology**

**GEO 539. Special Topics. 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.

**GEO 699. Senior Portfolio. 5 Credits.** (3 Lab, 2 Stu) S
PREREQUISITE: GDSN 499. Senior capstone course. Directed undergraduate research/creative activity which culminates in a professional portfolio. Graphic design students must take this course in the spring.

**GDSN - Graphic Design**

**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 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 level not covered in regular courses. Students participate in preparing and presenting discussion material.

GEO 497. Geology Instruction. 1-2 Credits. 
(1-2 Lec; 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: GEOL 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 a 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 312 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 information and hands-on experience in field techniques used in vertebrate paleontology, including interpretation of sedimentary environments and taphonomy.

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 experience 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 531. History of tectonic theory: modern view of plate tectonics processes; Precambrian tectonics; case studies of Phanerzoic orogenic belts; neotectonic; 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 magnetic products, and provide the necessary background to perform research in volcanology.

GEO 542. Comparative Osteology. 3 Credits. 
(3 Sem) On Demand.
PREREQUISITE: BHO 310, BIL 504. Fossil bone histology and comparative osteology including encochondral ossification, epiphysial osteotomy, 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
Prerequisites: 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) F,S
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, plant distribution, and water resources.

**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 428. 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 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.

**GEO 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.

**GEO 594. Seminar. 3 Credit.** (3 Sem) 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.

**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 121D. Human Geography. 3 Credits.** (3 Lec) F,GPHY 121D. Human Geography. 3 Credits. (3 Lec) F,S,Su 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. 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 F,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 GIS, GPS and remote sensing software. GPHY 284. Intro to GIS Science & Cartog. 3 Credits. (2 Lec, 1 Lab) S,F,GPHY 284. Intro to GIS Science & Cartog. 3 Credits. (2 Lec, 1 Lab) S,F 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,GPHY 290R. Undergraduate Research. 1-6 Credits. (1-6 Ind; max unlimited) F,S 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 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.

**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 American cultural landscape evolution; origins and diffusions of American culture traits; evolution of American culture regions.

**GPHY 326. 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 329. 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,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 ArcGIS ArcGIS software. Students must be proficient with the latest version of ArcGIS.

**GPHY 358. GPS Mapping Serv Learning. 1 Credit.** (1 Rct) F,GPHY 358. GPS Mapping Serv Learning. 1 Credit. (1 Rct) 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); AGAM 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) S,F,GPHY 384. Adv GIS and Spatial Analysis. 3 Credits. (2 Lec, 1 Lab) S,F,GPHY 384. Adv GIS and Spatial Analysis. 3 Credits. (2 Lec, 1 Lab) S,F Advanced data model concepts in the context of spatial analysis. Spatial overlay analysis and synthesis in vector and raster. Error and Uncertainty. Data modeling and database design principles to support analysis and modeling applications.

**GPHY 402. Water and Society. 3 Credits.** (3 Lec) F,GPHY 402. Water and Society. 3 Credits. (3 Lec) F,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 PREREQUISITE: GPHY 121D or BIOB 1701N. Factors affecting the geography of plants and animals in space and time.

**GPHY 425. Geographical 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.
PHY 429R. Applied Remote Sensing. 3 Credits. (2 Lec, 1 Lab) S
PREREQUISITE: GPHY 426 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.

PHY 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 North American regions from the colonial era to 1900.

PHY 441R. Mountain Geography. 4 Credits. (2 Lec, 2 Lab) F alternate years, to be offered odd years.
PREREQUISITE: ERTH 101IN and ERTH 303, STAT 216Q, Junior standing, COREQUISITE: ERTH 303. Local, regional, and global importance of mountains. Geomorphology, climatology, and hydrology of mountain environments, and their relationship to human activities.

PHY 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.

PHY 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.

PHY 457. Adv GPS Mapping for GIS. 3 Credits. (3 Lec; 6 cr max) 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 photos pixel link, and mobile GIS are some of the topics explored. Course includes topic research and presentation, and service-learning project work.

PHY 461. Tourism Planning. 3 Credits. (3 Lec; 6 cr max) On Demand
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.

PHY 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) 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.

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 220. 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 220 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) 5 alternate years, to be offered every year.
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 220. 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 220 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 every year.
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 responsible 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: PCS 263, or 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
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. Sidst 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. Cnd 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: 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: Graduate standing in counseling program. The following information will be covered in relation to group counseling: theories, research, developmental stages, therapeutic factors, leaderhip 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: 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: Graduate standing, in the counseling program or consent of the instructor and HDCO 510. 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 preventative 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) Su
PREREQUISITE: EDU 421, 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 organization and 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.

HDCO 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 subdivided. May be repeated.

HDCO 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.

HDCO 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.

HDCO 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.

HDCO 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.

HDCO 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.
HDCO 598. Internship. 2-12 Credits. (2-12 Ind; 12 cr max) F,S,Su Max 12 cr. PREREQUISITE: HDCO 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 Develop Family Fin Plan

HDFP 510. Fundamentals of Family Financial Planning. 3 Credits. (3 Lec) F,S,Su 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,Su PREREQUISITE: Graduate standing. The course covers risk management concepts, tools, and strategies for individuals and families, as well as ethical consideration. 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,S,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,Su 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,Su 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,Su 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 I. 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 cities, 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,Su 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 masters 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 from 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 Ind; 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 Ind; 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.

HDHL - Human Development Health

HEE - Health Enhancement

HEE 195. Paraprofessional Experience I. 1 Credit. (1 Lab) S COREQUISITE: 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,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.

HEE 305. Methods of Teaching Movement Expl. 3 Credits. (3 Lec, 1 Lab) S COREQUISITE: 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 HE. 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 HE. 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.
### 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 and paper 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 are 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 museums 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-Present. 3 Credits.** (3 Lec; 6 cr max) S
Max 6 cr. 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.** (Sem) On Demand
Max 6 cr. Advanced readings and discussion in the history of science, technology, and society. May be repeated.

**HIST 507. Historical Writing. 3 Credits.** (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.** (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.** (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.** (Sem) 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 use 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 Lec; 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 131. Freshman Research Symposium. 1 Credit. (1 Lee) 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 202H. 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 202H 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 202H 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. 1-4 Credits. (1 Sem; 12 cr max) On Demand
PREREQUISITE/CO-REQUISITE: Restricted entrance; HONR 201US and HONR 202H or HONR 301US. 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.
HONR 292. Independent Study. 1-3 Credits. (1 Ind; 6 cr max) On Demand
Max 6 cr. PREREQUISITE/CO-REQUISITE: Restricted entrance; HONR 201US and HONR 202H 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 202H 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 Resch/Thesis. 1-6 Credits. (1-Ind; 12 cr max) F,S,Su
PREREQUISITE: Restricted entrance; HONR 201US and HONR 202H 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 202H 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 202H 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 202H 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 202H 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 202H 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 202H 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 494IN. Honors Seminar in Nat Sciences. 4 Credits. (4 Sem; max unlimited) On Demand
PREREQUISITE: HONR 201US and HONR 202H 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 494IS. Honors Seminar in Soc Sciences. 4 Credits. (4 Sem; max unlimited) On Demand
PREREQUISITE: HONR 201US and HONR 202H 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 202H 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 202H 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 202H 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 494RS. Honors Seminar in Soc Sciences. 4 Credits. (4 Sem; max unlimited) On Demand
PREREQUISITE: HONR 201US and HONR 202H 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.

HORT - Horticulture & Landscape Des
HORT 105. Miracle Growing. 3 Credits. (3 Lee) 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. Calmulates in a presentation at the Horticulture Open House.
HORT 131. Landscape Des/Hist/Theory. 3 Credits. (3 Lee) 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: DDSN 101, DDSN 114 (may be taken as a co-requisite), 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: BIOB 170IN (may be used as a corequisite). Identification, culture and 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: BIOB 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 121IN or CHMY 141 and BIOB 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 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 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: BIOB 170IN, Quantitative Reasoning Core, and HORT 105. Turfgrass propagation, fertilization, establishment, and maintenance. Recognition and adaptations 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 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: BIOB 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: BIOB 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 343. Comm Plant Production. 3 Credits. (3 Lec) S PREREQUISITE: HORT 105, HORT 245. Focus on greenhouse and nursery design and operation, including environmental control, growing media, irrigation, and fertilization of field and container grown ornamental crops. Retail and wholesale marketing strategies will be explored. Sustainable practices will be emphasized.

HORT 345. Market Gardening. 3 Credits. (3 Lec) Su PREREQUISITE: HORT 105. Focus is on the production of quality vegetable, herb and flower products for sale through local, regional or non-traditional marketing avenues. Special attention is made to present and analyze sustainable food crop production systems.

HORT 410. Horticulture Recitation. 1 Credit. (1 Rec) S PREREQUISITE: Senior standing and consent of instructor. This course synthesizes and reinforces a broad range of concepts covered throughout the Environmental Horticulture curriculum and applies this knowledge within new contexts. At the end of the semester students take the Certified Plant Professional exam.

HORT 432. Advanced Landscape Design. 4 Credits. (1 Lec, 3 Stu) F 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 440. Urban Planning and Design. 4 Credits. (1 Lec, 2 Lab) F PREREQUISITE: HORT 331, HORT 335, and HORT 336 (HORT 335 and HORT 336 may be taken as co-requisites). Studio explores the challenges and opportunities of developing a vibrant, sustainable community and region. Topics include city form, green networks, and urban ecological design. Studio projects focus on master planning of communities and public spaces like corridors, streets, and green space systems.

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, for majors only. First semester of a two-semester project for seniors majoring in Horticulture Science. This capstone course allows students to pursue a contemporary issue or problem in horticulture within a team research project.

HORT 486R. Horticulture Capstone II. 2 Credits. (2 Lec) S PREREQUISITE: majors only and senior standing. Second semester of a two-semester project for seniors majoring in Horticulture Science. This capstone course allows students to pursue a contemporary issue or problem in horticulture within a team research project.

HORT 490R. Undergraduate Research. 1-4 Credits. (1-4 Ind; 12 cr max) F,S,Su PREREQUISITE: Junior or Senior standing and approval of instructor. Undergraduate research which may culminate in a research paper, journal article, or undergraduate thesis. Course will address responsible conduct of research.

HORT 491. Special Topics. 1-4 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.

HORT 492. Independent Study. 1-3 Credits. (1-3 Ind; 6 cr max) F,S,Su PREREQUISITE: Senior standing, consent of instructor and approval of department head. Directed research and study on an individual basis.
the rise of feminism. Women to achieve civil rights and social reform, the problems of working women, and intimacy, politics and the law, paid and unpaid work, art and culture.

PREREQUISITE: HSTA 101 or HSTA 102. History of women in America from 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. PREREQUISITE: HSTA 101 or HSTA 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. PREREQUISITE: HSTA 101 or HSTA 102. History of women in America from colonial times to the present. Analysis 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 101IH. American History I. 4 Credits. (3 Lec) F,S,Su An examination of the colonial world of the Americas and the development of the United States as a nation.

HSTA 102IH. American History II. 4 Credits. (3 Lec) F,S An examination of the United States after the Civil War through the 20th Century.

HSTA 160D. Introduction to the Am West. 4 Credits. (3 Lec) -- The American West examines the conquest settlement and development of territory west of the Mississippi River.

HSTA 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.

HSTA 298. American History Internship. 1-12 Credits. (1-12 Int; 12 cr max) On Demand 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 in the field.

HSTA 311. Early America. 3 Credits. (3 Lec) PREREQUISITE: HSTA 101. The development of the British American colonies and the establishment of the United States after 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.

HSTA 316. American Civil War Era. 3 Credits. (3 Lec) PREREQUISITE: HSTR 101 or HSTR 102. Political, economic, and social developments leading to sectional division. Breakdown of political accommodation, Civil War, and Reconstruction.

HSTA 318. Origins of Modern America: From the Civil War to WWII. 3 Credits.

HSTA 320. Birth of Modern US: 1865-1945. 3 Credits. (3 Lec) F PREREQUISITE: HSTR 101 or HSTR 102. This course explores the social, economic, and political development of the US from 1877 to 1940, such as the rise of big business, urbanization, the Great Depression, and the New Deal.

HSTA 322. Am History: WWII to Present. 3 Credits. (3 Lec) S PREREQUISITE: HSTA 101 or HSTA 102. Political, cultural, and economic history of the U.S. since the end of World War II.

HSTA 406. McCarthy/Ike/Truman. 3 Credits. (3 Lec) S PREREQUISITE: HSTA 101 or HSTA 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: HSTA 101 or HSTA 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: HSTA 101 or HSTA 102. History of women in America from colonial times to the present. Analysis 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) S, alternate years, to be offered even years. PREREQUISITE: HSTA 101 or HSTA 102. This course examines the history of the production, consumption, and cultural meaning of food in America. In 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 1600-1700. 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,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 Lec; 12 cr max) F,S,S,Su PREREQUISITE: Junior standing, 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.

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 102H. 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 1660s 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 global history, special attention is given 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 209CS. 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 maquiladoras.

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 modern 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 288RH. Sci,Envir,Tech,Soc: Common Exp. 3 Credits. (3 Sem) S
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.

HSTR 322. 19th Century Europe. 3 Credits. (3 Lec)
PREREQUISITE: HSTR 101 or HSTR 102. A comparative and transnational approach to the history of modern Europe from the French Revolution to the First World War.

HSTR 324. 20th Century Europe. 3 Credits. (3 Lec)
PREREQUISITE: HSTR 101 or HSTR 102. Events and forces in 20th century Europe from World War I to the present. The rise of fascism, communism, and the interwar crisis along with post-World War II developments.

HSTR 330. History of Mexico. 3 Credits. (3 Lec)
PREREQUISITE: Take one of the following: HSTA 101, HSTA 102 or HSTR 130D. This course examines the historical processes that resulted in the creation of Modern Mexico.

HSTR 340. Age of the Shoguns. 3 Credits. (3 Lec)
PREREQUISITE: HSTR 140D or HSTR 145D. Explores the political, cultural, and diplomatic issues involved in the development of the Tokugawa state and the emergence of modern Japanese identity.

HSTR 342. Japan's Long 19th Century. 3 Credits. (3 Lec)
PREREQUISITE: HSTR 140D or HSTR 145D. Investigates the revolutionary changes that Japan underwent between the 1770's and 1910 and the emergence of modern Japanese nationalism.

HSTR 345. Modern China. 3 Credits. (3 Lec) F
PREREQUISITE: HSTR 160, HSTR 102 or HSTR 140. Social, political, and economic history of the People's Republic of China.

HSTR 346. Modern India. 3 Credits. (3 Lec) S
PREREQUISITE: HSTR 160, HSTR 102 or HSTR 140. Social, economic, political, and intellectual history of India during the 19th and 20th centuries.

HSTR 350. Modern Britain. 3 Credits. (3 Lec)
PREREQUISITE: HSTR 160 or HSTR 102. The emergence and fall of Britain as a world power. Topics of study may include industrialization, the slow emergence of democracy in Britain, the role of the family in Victorian Britain, and the impact of the empire within Britain.

HSTR 353. Modern France. 3 Credits. (3 Lec)
PREREQUISITE: HSTR 160, HSTR 101IH or HSTR 102. A survey of French history from 1750 to the present, focusing on revolutions, the emergence of modern French culture, dynamics between Paris and provincial France, and the experience of war.

HSTR 359. Russia to 1917. 3 Credits. (3 Lec)
PREREQUISITE: HSTR 101IH or HSTR 102. Examines the emergence and development of the Russian Empire with a focus upon the nineteenth and early twentieth centuries.

HSTR 362. Modern Germany. 3 Credits. (3 Lec)
PREREQUISITE: HSTR 101IH or HSTR 102. An in-depth look at the economic, social, and political developments of modern Germany.

HSTR 366. Middle East/20th Century. 3 Credits. (3 Lec) On Demand
PREREQUISITE: One of the following: HSTR 101IH, HSTR 102, HSTR 135D or PSCI 230. Investigates major diplomatic, economic, cultural, and religious themes from the Middle East in the 20th century. Students will choose topics and countries of interest for specific, instructor-guided research.

HSTR 372. The World at War. 3 Credits. (3 Lec) F, alternate years, to be offered every even years.
PREREQUISITE: HSTR 101IH, or HSTR 102, or HSTA 101, or HSTA 102, or HSTA 160. The First World War examined through political, military, technological, and social history, in the contexts of the early decades of the 20th century and consequences up to the present.

HSTR 375. Eurasian Borderlands. 3 Credits. (3 Lec) F, alternate years, to be offered every even years.
PREREQUISITE: HSTR 101IH, or HSTR 102, or HSTR 135. Provides a comparative and thematic approach to a series of issues related to the theme of cross-cultural contact. Draws on scholarly literature pertaining to the Balkans, the Middle East, and the former Soviet Union to examine imperialism, national and religious identity, human mobility, and genocide.
HSTR 452. European Intellectual History. 3 Credits. (3 Lec) PREREQUISITE: HSTA 101IH or HSTR 102. This course examines the relationship between gender and technology in comparative cultural, social, and historical perspective.

HSTR 417. Early Modern Science. 3 Credits. (3 Lec) PREREQUISITE: HSTA 101, HSTR 101IH, HSTR 102, or HSTR 282. The Scientific Revolution in Europe. Topics of study may include the relationships between religion and science, science and gender, and technological change and the structure of society.

HSTR 419. Modern Science. 3 Credits. (3 Lec) PREREQUISITE: HSTR 102 or HSTA 102. The emergence of modern science in Europe and America from the Scientific Revolution to the Atomic Age. Special emphasis will be given to the cultural, political, and economic rise of science and technology within society.

HSTR 423. European Intellectual History. 3 Credits. (3 Lec) PREREQUISITE: HSTR 101IH or HSTR 102. The ideologies and major thinkers who have influenced European history from the French Revolution to the present day.

HSTR 425. Mapping the World. 3 Credits. (3 Sem) S to be offered alternate odd years PREREQUISITE: HSTR 101IH or HSTR 102IH or HSTA 101IH. This course explores the role of map-making in global history from the 1600's through the present. Class discussions will focus on the role of cartographic images in modern state formation, maritime exploration, nation building, colonial conquest, and urban social geography.

HSTR 430. Latin Amer Soc History. 3 Credits. (3 Lec) PREREQUISITE: HSTR 130, HSTA 101 or HSTR 102. Social history of Latin America from colonial times to the present.

HSTR 431. Race in Latin America. 3 Credits. (3 Lec) PREREQUISITE: HSTR 130, HSTA 101 or HSTR 102. This course explores the history of race relations in Latin America, focusing on the traditional links between “race” and power. Topics may include examinations of Indigenous, African, and European cultures/ethnicities, from the Conquest to the present day.

HSTR 432. Colonial Latin America. 3 Credits. (3 Sem) PREREQUISITE: HSTR 130 or consent of the instructor. This seminar-style course examines the colonial period in Latin America. Important themes include cross-cultural contact and conflict, the development of a colonial economy, religious and cultural change, institutional and political history, and the organization of colonial society.

HSTR 433. Latin American Perspectives. 3 Credits. (3 Lec) S PREREQUISITE: HSTR 160, HSTR 102, HSTR 130 or consent of the instructor. This course approaches historical developments, literature, and construction of identity in twentieth-century Latin America. Taught in English with Spanish reading/writing option. Focus will vary by instructor.

HSTR 434. Gender in Latin America. 3 Credits. (3 Lec) PREREQUISITE: Background in Latin American and/or Women’s Studies. An exploration of the ways in which transformations in the historical construction of gender and sexuality shaped and were shaped by broader processes of socioeconomic, political, and cultural change in Latin American history.

HSTR 435. Latin America: Human Rights. 3 Credits. (3 Lec) F,S Alternate Years, starting 2015 PREREQUISITE: ANY HSTA 1xx or HSTR 1xx course seeks deeper understanding of phenomenon of violence in modern world by examining case studies from Latin America. Topics include military dictatorships, revolutions, foreign interventions, drug cartels, and street gangs.

HSTR 436. Armed Conflict Mod Lat Am. 3 Credits. (3 Lec) S PREREQUISITE: HSTR 130 or HSTR 102 and junior standing or consent of instructor. Considers the roots and outcomes of different armed conflicts in modern Latin America, including foreign intervention, revolutionary conflict, state violence, and extralegal violence.

HSTR 443. Gender in Asia. 3 Credits. (3 Lec) PREREQUISITE: HSTR 160, HSTR 101IH, HSTR 102, HSTR 140, or HSTR 145. Analysis of gender relations, the family, the struggle by women in Asia to achieve civil rights and social reform, the problems of working women and various alternatives to western feminism. Focus on the 19th and 20th centuries.

HSTR 444. Gender in Japan. 3 Credits. (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 Mountaineering. 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) F,S alternate years. PREREQUISITE: Any lower division HSTR (non-American) course. This course examines the intersection 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. Sea Captions: Hist Methodology. 3 Credits. (3 Sem) S,F PREREQUISITE: Senior standing and consent of instructor. Must register in History Department Office. Senior capstone course. History majors practice sound research and study methods, using appropriate bibliographical tools and in light of contemporary historiography.
HTH - Health

HTH 220. Human Sexuality. 3 Credits. (3 Lec) F,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. (3 Lec) F,S,Su On Demand
PREREQUISITE: FCS 101, PSYX 100 or SOCI 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.

I&ME - Industrial & Management Engr

I&ME 344. Concurrent Engineering. 3 Credits. (3 Lec) On Demand
PREREQUISITE: Engineering or Technology Junior or Senior standing. The business environment, process management, design process, manufacturability, life cycle designs, quality, compressing the design-to-market cycle, process integration, coordination and communication, world class design, manufacturing, and marketing.

ICS - Intercultural Studies

ICS 291. Special Topics. 1-4 Credits. (1-12 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.

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 structures, construction techniques, and building materials. It 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
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 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 or 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 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.
IMID - Immunology Infectious Diseases

IMID 290R. Undergraduate Research. 1-6 Credits. (1-6 Ind; 12 cr max) On Demand
PREREQUISITE: Sophomore standing. Directed undergraduate research. Course will address responsible conduct of research.

IMID 291. Special Topics. 1-3 Credits. (1-3 Ind; 12 cr max) On Demand
Max 6 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 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.
PREREQUISITE: IBID series or consent of instructor. Principles and techniques involved in biochemical analysis of proteins.

IMID 475. Preventive Veterinary Internship. 2-4 Credits.
(2-4 Ind; 4 cr max) F, 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. Preventive Veterinary Internship. 2-4 Credits.
(2-4 Ind; 4 cr max) F, 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 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.

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: Junior standing, consent of instructor, and approval of department head. Directed research and study on an individual basis.

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)
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.

IMS 501. Exper Immunology/Pathology. 3 Credits.
(3 Lec) S alternate years to be offered even years
PREREQUISITE: BIOL 410. Recent advances in and history of immunoschemistry, immunogenetics. Immunopathology, molecular and cellular immunology. Cross-listed with Microbiology 525.

IMS 505. Eukaryotic Gene Regulation. 3 Credits.
(3 Lec) S alternate years to be offered odd years
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.

IMS 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. Student 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.

IMS 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. Student 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.

IMS 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. Student 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. An independent scientific project with a IMID research laboratory.

IMS 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.

IMS 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.

IMS 590. Master's Thesis. 1-10 Credits.
(1-10 Ind; max unlimited) F, S, Su
PREREQUISITE: Master's standing.

IMS 591. Special Topics. 1-4 Credits.
(1-4 Ind; 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.

IMS 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.

IMS 594. Seminar. 1 Credit.
(1 Sem; 4 cr max) F, S
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.

IMS 690. 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 Rct)**
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 Rct) S**
PREREQUISITE: JPNS101 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 Rct) S**
PREREQUISITE: JPNS102D 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 Rct) S**
PREREQUISITE: JPNS201D 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 Rct) 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 310. Classical Japanese Literature. 3 Credits. (3 Rct) On Demand**
PREREQUISITE: WRIT 101W or consent of instructor. Study of poetry, drama, and narrative from earliest times to mid-nineteenth century. All readings and discussions in English. No knowledge of Japanese necessary.

**JPNS 321. Modern Japanese Literature. 3 Credits. (3 Rct) 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 340. Japanese Adv Reading & Grammar. 3 Credits. (3 Rct) On Demand**
PREREQUISITE: JPNS 202 or placement interview with instructor. Review and further development of grammar and vocabulary skills necessary for improved reading proficiency in Japanese. Topics for study address Japanese culture and society through manga/cartoons, newspapers, magazines, correspondence, and short essays, with some translation and comparison with English.

**JPNS 361IH. Japanese Text and Cinema. 3 Credits. (3 Rct) On Demand**
PREREQUISITE: WRIT 101W or consent of instructor. Study of Japanese women and images of women in Japanese culture from earliest times to the present. Representations of and by women, minorities, foreigners and outcastes—all those regarded as "other" in relation to mainstream Japanese culture. 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.

**JPNS 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.

**KIN - Kinesiology**

**KIN 105. Found 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. Hist Anatomy & Physiology. 3 Credits. (3 Lec) F,S**
On Demand
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. Identifies 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) F,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 common observations and practices from the physiological viewpoint.

**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) F,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 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 440R. Sport Psychology. 3 Credits. (3 Lec) F**
PREREQUISITE: COA 205 and FCS 371 or consent of instructor. The application of basic principles of sport psychology for teachers and coaches, with specific emphasis on motivation, anxiety, and arousal, and selected groups of athletes.

**KIN 490R. Undergraduate Research. 1-6 Credits. (1-6 Ind; 12 cr max)**
-- Directed undergraduate research which may culminate in a research paper, journal article, or undergraduate thesis. Course will address responsible conduct of research.

**KIN 491. Special Topics. 3 Credits. (1-4 Lec; 12 cr max) On Demand**
Max 12 cr. 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.

**KIN 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.
KIN 498. Internship. 1-12 Credits. (1-12 Ind; 12 cr max) F,S,Su Max 12 cr. PREREQUISITE: Consent of instructor. An individualized assignment with a professional agency to provide a guided field experience.

KIN 515. Exercise Performance and Nutri. 3 Credits. (3 Lec) F alternate years offered odd years. PREREQUISITE: Knowledge in areas of anatomy and physiology, upper division courses in one or combination of: exercise physiology, biochemistry, or nutrition. This class covers selected topics in exercise physiology, nutrition, and metabolism related to physiological function and performance. The use of nutritional supplements during exercise and the environmental influences on physiological function and metabolism will be addressed.

KIN 525. Neuromechanics of Human Movement. 3 Credits. (3 Lec) S alternate years offered even years. PREREQUISITE: Graduate standing; undergraduate exercise physiology. This course defines and explains a conceptual mechanistic-driven model that explains the basis for maximizing human performance. The instructor relies heavily on readings from the current research literature and student participation to understand the plethora of topics covered.

KIN 575. Professional Paper and Project. 1-6 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.

KIN 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 and Dean of the Graduate School. Courses offered on an 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.

KIN 589. Graduate Consultation. 1-3 Credits. (1 Ind; 3 cr max) F,S,Su PREREQUISITE: Master’s standing 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.

KIN 590. Master’s Thesis. 1-10 Credits. (1 Ind; max unlimited) F,S,Su PREREQUISITE: Master’s standing. Directed graduate research/creative activity. May be repeated.

KIN 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.

KIN 592. Independent Study. 1-3 Credits. (1 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.

KIN 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 that are not covered in regular courses. Students participate in preparing and presenting discussion material.

KIN 598. Internship. 2-12 Credits. (2 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.

LAC - Licensed Addiction Counselor

LAC 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.

LAC 501. Chemical Dependency Counseling. 3 Credits. (3 Lec) S offered on-line. PREREQUISITE: Admittance 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: Admittance 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. 3 Credits. (3 Lec) F offered on-line. PREREQUISITE: Admittance 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 (ACAREP, 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: Admittance 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) F offered on-line. PREREQUISITE: Admittance 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.

LIBR - Library

LIBR 289R. Undergrad Resrch/Instruction. 1-3 Credits. (1-3 Rct; max unlimited) F,S,Su Class 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 PREREQUISITE: 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 210H. Intro to Language/Linguistics. 3 Credits. (3 Lec) F,S This course 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 This course focuses on the 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 PREREQUISITE: WRIT 101. Explores the various roles language has in secondary English pedagogy and policy. Special attention given to issues related to language diversity, language and identity, disclosure analysis, and socio-political functions of language.

LIT - Literature

LIT 110H. Introduction to Literature. 3 Credits. (3 Rct) F,S This course introduces students to the basic concepts in Western literature, including characters, themes, symbols, and the primary literary devices 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,F,Su PREREQUISITE: Restricted to English majors and English literature minors. This course provides an overview of English literature, with a focus on the historical and cultural context of the major literary periods.

LIT 214D. Regional Literature. 3 Credits. (3 Rct) F PREREQUISITE: Consent of instructor. This course provides an in-depth study of American literature, focusing on specific regions and cultural traditions.

LIT 233. Classical Foundations of Literature. 3 Credits. (3 Rct) F,S This course provides an introduction to the literature of the ancient world, including Greek and Roman literature.

LIT 240. The Bible as Literature. 3 Credits. (3 Rct) F,S This course examines the Bible as a literary text and its influence on subsequent literature.

LIT 285D. Mythologies. 3 Credits. (3 Rct) F,S,F,Su This course explores the mythology of various cultures and its influence on literature.

LIT 291. Special Topics. 1-4 Credits. (1-4 Ind; 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,F,S This course introduces students to the principles and methods of literary criticism.

LIT 308. Multicultural Literature. 3 Credits. (3 Lec) S PREREQUISITE: 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) F,S,Su Max 12 cr. PREREQUISITE: LIT 201. Intensive studies in early American literature, with attention to development of a distinct national literature and culture.

LIT 311. 19th Century American Literature. 3 Credits. (3 Lec) F,S,Su Max 12 cr. PREREQUISITE: LIT 201. Intensive studies in selected literary works by 19th-century American writers, with attention to historical context, particularly America's evolving national culture.

LIT 324. British Literature of the 16th and 17th Centuries. 3 Credits. (3 Lec) F,S,F,Su Max 12 cr. PREREQUISITE: LIT 201. Intensive studies in selected literary works by writers of the Restoration period and 18th-century England, with attention to historical and cultural contexts.

LIT 325. British Literature of the Restoration/18th Century. 3 Credits. (3 Lec) F,S,F,Su Max 12 cr. PREREQUISITE: LIT 201. Intensive studies in selected literary works by writers of the Restoration period and 18th-century England, with attention to historical and cultural contexts.

LIT 326. British Literature of the 19th Century to the Present. 3 Credits. (3 Lec) F,S,F,Su Max 12 cr. PREREQUISITE: LIT 201. 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,S,F,Su PREREQUISITE: LIT 201. A study of the relationship between women and literature, with some attention to feminist approaches to critical interpretation.

LIT 382. Literature for Children and Adolescents. 3 Credits. (3 Lec) F,S,Su Max 12 cr. 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 Authors/s. 3 Credits. (3 Lec) F,S,F,Su Max 12 cr. PREREQUISITE: LIT 201 and at least one other literature course. Intensive study in the works, biography, and criticism of a particular author.

LIT 437. Studies in Literary Genres. 3 Credits. (3 Rct) F,S,Su Max 12 cr. PREREQUISITE: LIT 201 and at least one other literature 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) F,S,Su Max 12 cr. PREREQUISITE: LIT 201 and at least one other literature 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 440. Studies in World Literature. 3 Credits. (3 Lec) F,S,Su Max 12 cr. PREREQUISITE: LIT 201 and at least one other literature 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) F,S,Su PREREQUISITE: LIT 201 and at least one other literature 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 490B. Undergraduate Research. 1-6 Credits. (1 Ind; 6 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.

LIT 492. Independent Study. 1-3 Credits. (1 Ind; 6 cr max) F,S,Su -- Independent study of literature.

LIT 494RH. Seminar: Research Issues. 3 Credits. (3 Rct) F,S,F,Su 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 507. Environmental Risk Assessment. 3 Credits. (3 Lec) F alternate years to be offered odd years 3 cr. LEC 3 PREREQUISITE: BIOC 170, BIOC 370, STAT 401. Principles of risk analysis, including risk assessment, perception, communication, and management. Emphasis on human toxicology, ecotoxicology, dose-response relationships, exposure analysis, environmental fate, and deterministic and probabilistic risk assessment. Case studies will include examples from pesticides, biotechnology, and invasive species.

LRES 510. Biodiversity Methods. 3 Credits. (2 Lec, 1 Lab) F PREREQUISITE: BIOC 262 and STAT 411 or STAT 412. 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.

LRES 511. Environmental Data Management. 2 Credits. (2 Lec) S alternate years to be offered even years PREREQUISITE: Graduate standing. Introduces graduate students in the natural sciences to concepts of designing data models and creation of associated databases. Database development project during the course is intended to facilitate proper management of data for each student’s graduate research project.

LRES 515. Microbial Ecology. 3 Credits. (3 Lec) S alternate years, to be offered odd years. PREREQUISITE: BIOM 415. Critical review of literature on the distribution and activity of microorganisms in natural microbial communities based on microbial adaption and physical, chemical and biological features of the microenvironment. A critical discussion of literature and approaches.

LRES 521. Holistics Forest & Management. 3 Credits. (3 Lec) S PREREQUISITE: Graduate standing. Students will be able to use holistic, systems thinking approaches and Holistic Management process, for problem solving and decision making for complex issues in natural resource management, policy, ethics, research. Students will apply holistic and reductionist thought to their lives.

LRES 525. Applied Remote Sensing. 3 Credits. (2 Lec, 1 Lab) S 3 cr. LEC 2 LAB 1 PREREQUISITE: GPHY 426 or consent of instructor. Applications of remote sensing for graduate students, 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.

LRES 528. Soil Crop Systems. 1 Credit. (1 Rec) F alternate years to be offered odd years 1 cr. REC 1 PREREQUISITE: Any graduate student or undergraduate student with approval from the 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 cropping systems. The course will use a student-lead discussion format to highlight issues and principles in a series of papers that the class will read. The course will emphasize the practical interaction among agronomy, ecology, economics, and sociology to create an awareness of the interdisciplinary issues associated with sustainability in agriculture.

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 a 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 an 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 3 The course examines major natural resource 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 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 540. Ecology Plants & Community. 3 Credits. (3 Rct) F PREREQUISITES: General biology (BIOC 160), and general ecology (BIOC 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 data modeling, native species and restoration. Quantitative measures for assessing populations and communities will be addressed.

LRES 543. Agroecology/App Water Law. 3 Credits. (2 Lec, 1 Lab) S alternate years to be offered even years 3 cr. LEC 2 LAB 1 PREREQUISITE: BIOC 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 approaches. Reviews 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 country 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 BIOC 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 and data analysis methods. Reviews 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/Environ Microbiology. 3 Credits. (3 Lab) S alternate years to be offered even years 3 cr. LEC 3 PREREQUISITE: Graduate standing or consent of instructor. Advanced laboratory course. Microorganisms are targeted for isolation and characterization, emphasizing those not normally encountered in general microbiology laboratory. Biogeochemical cycling, contaminant biodegradation, extremophiles, and plant-microbe interactions are typical topics investigated. Students employ classic and novel cultivation approaches, identifying microbes based morphology, physiology, and phylogeny. Cross-listed with MB 552.

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. Aquous 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 aquatic 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 2 cr. LEC 1 RCT/DIS 1 PREREQUISITE: B.S. Science/Science Education; Enrollment limited to M.S. Science Education Graduate Program A survey of the ecology of important organisms common in thermal habitats of Yellowstone National Park including a review of different life forms (protozoa and eukaryotes) and their modes of metabolism, and the physical, and chemical habitats that define their environment. Course includes lecture, laboratory, and field components. Students will be asked to design curricula for K-12 audiences.
LRES 558. Isotope Biogeochemistry. 2 Credits. (1 Lec) S alternate years to be offered even years PREREQUISITE: Consent of instructor. Fundamental and applications of isotope systems useful in the environmental sciences, including light elements such as carbon, mid-mass elements such as iron, and heavy elements such as uranium. Measurement techniques will be discussed, and application to student inspired questions explored.

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; BIOO 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 diversity/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 drastically 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 of ecosystems 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 565. Environmental Biophysics. 3 Credits. (2 Lec, 1 Lab) S 3 cr. LEC 2 LAB 1 PREREQUISITE: BIOC 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, GPHY 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 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 589. Graduate Consultation. 3 Credits. (3 Ind) F,S,Su 3 cr. TUT PREREQUISITE: Master's standing, consent of instructor 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.

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. 1-6 Credits. (1 Lec; 1 Lab; 1-4 cr max) On Demand 1 cr. 1-6 cr. Maximum 6 cr. PREREQUISITE: Graduate standing or senior 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 Core) 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 Credit. (1 Sem; 3 cr max) F,S,Su Max 3 cr. 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 course 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 Sem) S PREREQUISITE: Junior standing & "Q" core course. This course examines 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 PREREQUISITE: Consensus of instructor. 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. (5 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 Lec) 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
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 arranged 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 Lec) F,S,Su
Offered by Gallatin College. PREREQUISITE: M 065 or M 085 or Math Placement Test within the past 12 months. This instructor-taught course imparts development 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 within the past 12 months. A flexibly-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 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, Apothecary and Metric systems and conversions; dosage calculations; and dimensional analysis. Offered by Gallatin College.

M 121Q. College Algebra. 3 Credits. (3 Lec) F,S,Su
PREREQUISITE: M 096, M 097 or Math Placement 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 within the past 12 months of 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, number systems, and problem solving.

M 133Q. Geometry & Measure K-8 Teachers. 3 Credits.
PREREQUISITE: M 121Q. This is a theoretical and practical exploration of the geometry and measurement concepts relevant to prospective elementary and middle school teachers, including synthetic, transformational, and coordinate geometry, constructions, congruence and similarity, and square roots. This course is equivalent to M 132.

M 134Q. Geometry & Measure K-8 Teachers. 3 Credits.
PREREQUISITE: M 121Q. This is a theoretical and practical exploration of the geometry and measurement concepts relevant to prospective elementary and middle school teachers, including synthetic, transformational, and coordinate geometry, constructions, congruence and similarity, and square roots. This course is equivalent to M 132.

M 145Q. Math for the Liberal Arts. 3 Credits. (3 Lec) F,S,Su
PREREQUISITE: M 088, M 096, M 097 or Math Placement Test within the past 12 months. Basic skills in applicable mathematics including linear, quadratic and exponential models; financial mathematics, trigonometry and some elementary statistics.
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 an 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
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
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,Su
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.

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
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
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 Ind; 12 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 even years.
PREREQUISITE: M 273Q 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 even years.
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 424. 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 PREREQUISITE: 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, integer 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 WKB 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 to 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’-Bendixson 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 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.

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. 1-2 Credits. (1-2 Ind; 2 cr max) F,S 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. Focus on the use of modeling to solve real-world problems. 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 student 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 reframing on standards 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. Focus 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 matrix 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. Explorations 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. (3 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, and 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. Calculator, 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, to be offered odd years. PREREQUISITE: M 503 and M 505 or consent of instructor. An introduction to: manifolds and their atlases, fiber bundles, vector fields, tensor 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 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 561. Methods of Applied Mathematics II. 3 Credits. (3 Lec) S alternate years, to be offered odd years. PREREQUISITE: M 560. Calculus of variations, Hamilton’s principle, asymptotic and perturbation methods, transform techniques and scattering theory. Partial differential equations, Green’s functions, separation of variables and transform methods.

M 570. Individual Problems. 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 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 resulting, and summarize results. Findings are presented orally to peers and faculty.

M 580. Special Topics. 1-4 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 442. 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 even years.
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 subtitled. 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 even years.
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. (1-10 Ind; max unlimited) 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 145.

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 210. 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 to senior years 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 to senior years 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 weapon systems employed by the United States Air Forces. It also presents the basics of their integration and employment at the operations level.

MAS 281. Leadership & Fitness. 2 Credits. (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 a 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, 4 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 followership 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 followership 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.

MB - Microbiology

MB 515. Microbial Ecology. 3 Credits. (3 Lec) S alternate years, to be offered odd years. PREREQUISITE: BIOM 415. Critical review of literature on the distribution and activity of microorganisms in natural microbial communities based on microbial adaption and physical, chemical and biological features of the microenvironment. A critical discussion of literature and approaches. Cross-listed with LRES 515.

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 every year. PREREQUISITE: BIOB 410. Recent advances in immunoochemistry, immunogenetics, immunopathology, molecular and cellular immunology. Cross-listed with VTM 501.

MB 527. Toxicology. 3 Credits. (3 Lec) S PREREQUISITES: CHMY 141 and CHMY 143 and BIOB 160. CO-REQUISITE: BCH 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 every odd year. 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: BCH 380, BCH 441, BCH 442, or BCH 444R. 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 Lec) Su PREREQUISITE: BS in Biology or equivalent degree. COREQUISITE: Graduate standing or petition approval from the Vice Provost of Graduate Education. Explore microbiology, prokaryotes, microorganisms, viruses and systems. 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 climatology, is designed to discover where 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 every odd year. 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 morphologically, 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 a 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 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.

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 catalog.

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 690. 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.
MCH - Machining & Manufacturing Tech

MCH 103. Intro to Computer Aided Manufacturing Lvl I 1 Credit. (2 Lec) F
This is an online course run through the Immers 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
PREREQUISITES: 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 230. Tooling and Fixtures in CNC. 2 Credits. (2 Lec) S
PREREQUISITES: MCH 234. CO-REQUISITE: MCH 235. MCH 230, Tooling and Fixtures in CNC, 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 effects on machining. Work holding and its effect on part density, geometric stability 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 I 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 Lab) S
PREREQUISITE: MCH 231. MCH 232, CNC Lathe Operation Level II, reinforces student’s understanding of CNC Lather operation and programming developed in MCH 231. Concepts to be covered include program planning (setup sheets, tool setup, offsets) metrology, program trouble shooting and intro to bar pulling.

MCH 234. CNC Milling Operations Level I. 3 Credits. (2 Lec) F
CO-REQUISITES: MCH 231 CNC Turning Operations Level I 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.

MBSP - Molecular Biosciences Program

MBSP 561. MoDec BioSci Lab Rotatn 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 project. Extensive bench research time will be required to obtain meaningful results.

MBSP 562. MoDec BioSci Lab Rotatn II 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 project. Extensive bench research time will be required to obtain meaningful results.

MBSP 563. MoDec BioSci Lab Rotatn 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. MoDec BioSci Lab Rotatn 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 574. Mol BioSci Pgm Rch Project. 1 Credit. (1 Lab) F,S,Su
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 write (or program) data analysis toolkits on their computer. Programming is needed 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
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 BioSci Pgm Sem. 1 Credit. (1 Sem) F,S
This course will fulfill the seminar requirement of the first year Molecular Biosciences Program (MBSP) doctoral fellows. The fellows (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) S
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; BIOL 256 and BIOL 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; BIOL 256 and BIOL 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, interview 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 2014, "Rural Health Care Delivery" was offered as MDS 560.

Meds 506. Spanish for Health Professionals. 1 Credit. (1 Lec) S
PREREQUISITE: WWAMI medical student. A mixed-level course for beginning to advanced learners of the Spanish language with a focus to communicate in a medical setting. Objectives include learning the essential skills to converse with Spanish-speaking patients, understand important cultural considerations, conduct patient interviews in Spanish focusing on different medical problems, and set a foundation for further learning of Spanish in the healthcare context. This course was previously offered, up to Spring 2015, as MDS 562, Spanish Health Professionals. This course is not equivalent to MEDS 502, Intro Primary & Continuity Care, beginning Fall 2015, WWAMI.

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. (1 Sem; 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 Rec) 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 MDS 510 Micro Anatomy (Histology), last offered Fall 2014, WWAMI.

Meds 520. Invaders & Defenders. 8 Credits. (4 Lec, 1 Lab, 3 Rec) F
PREREQUISITE: WWAMI Medical Student. This course will involve integrated content in immune system, microbiology, 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, MDS 520 was “Molecular & Cellular Basis of Disease”; this course is not equivalent to earlier MDS 520 courses. WWAMI.

Meds 530. Circulatory System. 13 Credits. (5 Lec, 2 Lab, 6 Rec) S
PREREQUISITES: 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 Rec) S
PREREQUISITE: WWAMI Medical Student. This course familiarizes students with the basic pathophysiological 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. Prior to Fall 2015, MDS 540 was “Clinical Practicum.” Beginning Summer 2015, Clinical Practicum is MDS 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, MDS 541 was MDS 540.

Meds 550. Endergetics & Homeostasis. 8 Credits. (4 Lec, 1 Lab, 3 Rec) 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 Rec) 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. Lifestyles & 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 100H. 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: FRCH 325 or FRCH 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 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 298R. Undergrad Bach/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 299R. 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 490R. Undergrad Bach/Instruction. 1-2 Credits. (1-2 Rct; 4 cr max) F,S,Su
Max 4 cr. COREQUISITE: MOR 490. Classroom instruction associated with directed undergraduate research/creative activity projects. May be repeated.
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 officer development, 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) S
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) S
F 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 for understanding officer development, leadership and Army values. This class also addresses “life skills” including fitness and time management. Laboratory component is required.
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 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.

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 performance 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.

MSLE - Master of Science Education

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 (and 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.

MTA - Media & Theatre Arts

MTA 291H, 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.

MTA 348, Interdisciplinary Projects II. 3 Credits. (5 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,Su 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.

MTA 516, Production Field Techniques II. 2 Credits. (2 Rct) 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.
MTSI 552. Adv Production Practices I. 4-6 Credits. (1-6 Lab; 6 cr max) F,S
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
are effectively initiated and funding fully secured. With approval of advisor and
graduate committee, production sequence may begin.

MTSI 553. Adv Production Practices II. 4-6 Credits. (4 Rec; 6 cr max) S
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.

MTSI 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.

MTSI 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.

MISTS - 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
Theory and practice of experimental materials characterization examining Thermal
Analysis, Mechanical Behavior, X-ray Diffraction, and Magnetometry.

MTSI 552. Adv Material Character II. 3 Credits. (3 Lec) S
Theory and practices of experimental materials characterization examining Optical/Electron Microscopy, Bulk and Surface Analysis, mass Spectroscopy and
Chromatography.

MTSI 594. Seminar. 1 Credit. (1 Lec; 1 cr max) F,S

MUSE - Music-Education

MUSE 123, Techniques Voice. 1 Credit. (1 Lab) F
PREREQUISITE: Music Major or consent of instructor. 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
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: MTEC Major status. 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
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 291. Special Topics. 1-6 Credits. (1 Ind; 12 cr max) On Demand
MUSI 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) S
PREREQUISITE: 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 383, Assessment in Music Education. 3 Credits. (3 Rec) F,S,Su
3 cr. RCT 3 PREREQUISITE: EDU 2222A or EDU 2223A. 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)
PREREQUISITE: 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 major; 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: Chl Mthds & Lit 5-12. 3 Credits. (3 Lec) F
PREREQUISITE: MUSI 336, MUSE 497ML. 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 497ML. Methods: Inst Mthds & 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 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 subitled. 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: Graduating 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 noted 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 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
PREREQUISITE: 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 130LA. 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 135. Keyboard Skills I. 1 Credit. (1 Lab) F
PREREQUISITE: Placement audition and music major. COREQUISITE: MUSI 105. Study of keyboard technique and technique, creative activities, sight reading, and piano repertoire. For music majors.

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.
**PREREQUISITE: MUSI 161.** Continued instruction in techniques of chord and tunefulness of MUSI 260. Intermediate Guitar. 1 Credit.

**PREREQUISITE: MUSI 240.** COREQUISITE: MUSI 206. Continued development of aural and vocal skills that deal with tonal and temporal relationships.


**MUSI 281.** Diction: English, Italian. 2 Credits. (2 Lec) S


**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 295. Applied Music II. 1 Credit.** (2 Sht; 3 cr max) F,S,Su

**1 cr.** STU/Max 3 cr. 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.

**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

**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

**PREREQUISITES: Previous choral experience is recommended, but not required. COREQUISITE: Must be able to match pitch. Students will explore Handel’s Hallelujah Chorus as well as other major choruses from the Messiah through choral preparation, performance and historical lecture.

**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

**Max 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 even years.

**PREREQUISITE: MUSI 295.** Study of repertoire and principles of accompaniment in all style periods. Laboratory experiences include accompanying instrumentalists and vocalists.
MUSI 362. Chmbr 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 MUD 560, or successful audition. Students enroll 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 years, to be offered odd 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 395. Applied Music III. 1-2 Credits. (1-2 Lab; 6 cr max) F,S,Su
Max 3 cr. PREREQUISITE: MUSI 295 and successful audition. Continued study of techniques of performance and interpretation to develop musical ability, expression, accuracy, and stylistic awareness in student’s performance area. May be repeated.

MUSI 407. Counterpoint. 3 Credits. (3 Lec) S alternate years, to be offered even years. 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. MU Chamber Orchestra. 1 Credit. (1 Lab) S
PREREQUISITE: Audition or Consent of Instructor. A small 20-30 member audioned 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 ensemble vocal 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 even years.
PREREQUISITE: MUSI 430. Study of historical keyboard instruments and literature from the 1600s to the present.

MUSI 438. Instrmntl Studio Pedgogy & 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. Orchestra. 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 336 and MUSI 231 or MUSI 252. 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) Su
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 495. Applied Music IV. 1-2 Credits. (1-2 Lab; 6 cr max) F,S,Su
Max 3 cr. PREREQUISITE: MUSI 395 and successful audition. Continued study of techniques of performance and interpretation to develop musical ability, expressivity, accuracy, and stylistic awareness in student’s performance area. May be repeated.

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) Su alternate years, to be offered even years.
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 515. Contemp Direct Music. 2 Credits. (2 Lec)
On demand PREREQUISITE: MUSI 302. In-depth investigation of musical styles prevalent in western music between 1975-present.

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 Rec) F,S,Su
PREREQUISITE: MUSI 335 or MUSI 336. 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 560. Formal recital to include works from different eras.

MUSI 595. Applied Music. 1 Credit. (1 Lab) F,S,Su
1-2 cr. STU 1-2 May be repeated; Maximum 3 cr. 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 theater.

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 386. 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 process in advanced compositions. Emphasizes 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 499. 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/Orchestration 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 546. 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 105D. Intro Native Amer Studies. 3 Credits. (3 Lec) 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 Contemp Soc. 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 Indian Cult, Hist, Cur Issu. 3 Credits. (3 Lec) S
3 cr. LEC 3 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.

NASX 239. Native North American History through Art and Material Culture. 3 Credits. (3 Lec) F
3 The aesthetic, cultural, and symbolic meanings of traditional and contemporary American Indian art: Plains, Southwestern, Northwest Coast, and Inuit art and artists.

NASX 253. Indigenous Lit & the West. 3 Credits. (3 Sem) 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 mythos while placing Indigenous perspectives and literature at the center of our discussions.

NASX 280IS. NA Studies Rrch Theors/Mthds. 3 Credits. (3 Sem) S
3 PREREQUISITE: NASX 105. This course critically examines the theoretical and methodological underpinnings, emphasizing indigenous paradigms and practices. Students are expected to think analytically, participate in discussion, and do original research.

NASX 290R. Undergraduate Research. 1-8 Credits. (1-8 Ind; 8 cr max) F,S,Su
PREREQUISITE: Consent of department head. Directed undergraduate research/creative activity. Course will address responsible conduct of research.

NASX 291. Special Topics. 1-4 Credits. (1-4 Lec; 12 cr max) 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 before requesting a regular course number.

NASX 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.
NASX 304. Native American Belief & Phil. 3 Credits. (3 Lec) F,S
3 PREREQUISITE: Junior standing. An in-depth analysis of specific contemporary and historic, tribal, and pan-Indian beliefs. Basic elements of Native American religions are defined from the perspective of the practitioner's understanding of their contributions to distinct cosmologies. The legal protection of Native American religions frames the analysis.

NASX 310. Native Cultures of N America. 3 Credits. (3 Lec) S alternate years to be offered odd years PREREQUISITE: Junior standing. Histories and cultures of representative Native peoples of North America; impact of European discovery, conquest and colonization; political, social, and economic developments from pre-Colombian to present times including contemporary issues facing the indigenous peoples of the Americas.

NASX 340. Native American Literature. 3 Credits. (3 Lec) F,S
3 PREREQUISITE: Junior standing and WRIT 101 W. Traditional and contemporary Native American literature including oral narratives, folktales, poetry, short stories, essays, and the novel. Methods of literary analysis will be explored to assist students in determining the meaning and function of the various genres.

NASX 360. Native American and Cinema. 3 Credits. (1 Lec) F alternate years to be offered odd years Analysis of images and representations of American Indians in feature, independent, and tele-films based in a cultural studies approach to film and film production. Considerable attention is given to Indigenous aesthetics.

NASX 405. Gndr Iss In Native Amer Studes. 3 Credits. (3 Lec) F alternate years to be offered even years PREREQUISITE: Previous course in NAS and junior standing, or permission of instructor. Compare and contrast the social construction of gender in Native American cultures and Euro-Americans. Explore role of women, men and "two-spirits" gender of early North American Indigenous societies. Analyze the impact of European colonization on traditional roles and examine contemporary gender issues.

NASX 415. Native Food Systems. 3 Credits. (1 Lec) F alternate years will be offered even years PREREQUISITE: NASX 105 or NASX 232 and upper division standing. This course engages indigenous practices and beliefs, focusing particularly on the food systems of the Native Americans, and using comparative data from across time and place. Of specific interest are dynamic connections between Native foods and the health of people and place, both traditionally and in societies affected by colonization and rapid cultural change.

NASX 430. American Indian Education. 3 Credits. (3 Lec) S alternate years will be offered even years PREREQUISITE: Junior standing, NASX 232. Historical development and contemporary directions in American Indian education, values and assumptions inherent in programs devised at the state and federal levels and their results, the cultural basis of Indian education, and selected materials appropriate to the various educational levels.

NASX 490. Montana Indian Literature. 3 Credits. (3 Sem) S alternate years to be offered odd years PREREQUISITE: Junior standing, or consent of instructor. Examination of literature written by and about Native American peoples in Montana. Emphasis on the changing status (function and value) of such writing and on social and political analyses of texts and writers, including Earling, McNickle, Mourning Dove, and Welch.


NASX 515. Native American Food Systems. 3 Credits. (3 Lec) F alternate years to be offered odd years PREREQUISITE: Historical introduction to Native American studies. This course is a Graduate introduction to Native American studies.

NASX 540. Theoretical Positions in NAS. 3 Credits. (3 Lec) F On Demand PREREQUISITE: Graduate standing. A critical survey of the interdisciplinary foundations of federal relationships with Indian Tribes.

NASX 550. Indigenous & Comparative Sacred Ecologies. 3 Credits. (3 Lec) S alternate years to be offered even years 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 591. Special Topics. 1-4 Credits. (1-4 Lec) F,S,Su On Demand PREREQUISITE: Course 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.

NASX 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.

NASX 494. Seminar. 1 Credit. (1 Sem; 4 cr max) F,S,Su
COREQUISITE: NASX 490. Classroom instruction associated with directed undergraduate research/creative activity projects.

NASX 498. Internship/Cooperative Educ. 2-12 Credits. (2-12 Ind; 12 cr max) On Demand
An individualized assignment arranged with an agency, business or other organization to provide guided experience in the field.

NASX 505. Proseminar Native Amer Studies. 3 Credits. (3 Sem) F
This course is a Graduate introduction to Native American Studies.

NASX 515. Native Food Systems. 3 Credits. (3 Sem) F
This course engages indigenous practices and beliefs, focusing particularly on the food systems of the Native Americans, and using comparative data from across time and place. Of specific interest are dynamic connections between Native foods and the health of people and place, both traditionally and in societies affected by colonization and rapid cultural change.

NASX 520. Fem/Gender Theories IN NAS. 3 Credits. (3 Lec) On Demand PREREQUISITE: Graduate standing. This course is intended to explore gender issues in Native American Studies. It will critically explore the problems and points of conflict between Native American women’s gender concerns and Euroamerican feminist theories.

NASX 521. Tribal Govt: Yesterday & Today. 3 Credits. (3 Lec) On Demand PREREQUISITE: Graduate standing. The course examines the complexities of Indian federal governments’ organization, their histories, and the unique relationship between the Federal government and American Indian tribes. The course highlights several models of both traditional and contemporary tribal governance systems.

NASX 523. Am Indians/Minority in High Ed. 3 Credits. (3 Lec) On Demand PREREQUISITE: Graduate standing. The course will develop and build the students' understanding of the historical and current situation of American Indians and other minorities in the U.S. higher education. It will also focus on the unique place of tribal colleges in the U.S. higher education.

NASX 524. Contemp Iss in Am Indian Stud. 3 Credits. (3 Lec) F
To be offered even years PREREQUISITE: Graduate standing. The course is intended to develop and refine the students’ knowledge of the historical background of American Indian issues and how history now affects the contemporary issues facing American Indians.

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 colonization 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 American 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) F
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 Mthd. 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 master’s project.
NASX 550. Native Am: Dispelling the Myth. 3 Credits. (3 Lec) S
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) F
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) F
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 Paleolithic 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 Lit 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 mythos while placing Indigenous perspectives and literature at the center of our discussions.

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,S,Su
1-6 cr. 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 and his or her major adviser 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
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.

NRSN - Nursing

NRSN 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.

NRSN 200. Foundatns Ethd Nrsng Recitats. 2 Credits. (1 Lec, 1 Rct) F,S,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.

NRSN 225. Fundtns Pnlng Prvdng Cln Cns. 4 Credits. (2 Lec, 2 Lab) F,S,Su
PREREQUISITES: BIoh 201, BIoh 211, FCS 1015, and BIOM 250. COREQUISITES: NRSN 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.

NRSN 238. Hlth Asmnt Across Lifespan. 4 Credits. (2 Lec, 2 Lab) F,S,Su
PREREQUISITES: BIoh 201 and BIoh 211. COREQUISITES: NRSN 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.

NRSN 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.

NRSN 258. Principles of Pathophysiology. 3 Credits. (3 Lec) F,S,Su
3 cr. LEC 3 PREREQUISITES: BIoh 201, BIoh 211, CHMY 2121N, and CHMY 1123. This course provides an introduction to the abnormal functioning of human cells, tissues, and organ systems, and the physiological adaptations that occur. Commonly encountered age-related variations are addressed. The influences of environment, genetics, nutrition, and culture are emphasized. Current research that explains the changes that accompany a particular syndrome or disease is considered.

NRSN 290R. Undergraduate Research. 1-6 Credits. (1-6 Ind; 6 cr max) On Demand
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.

NRSN 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.

NRSN 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.

NRSN 294. Workshop/Seminar. 1-4 Credits. (1 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.

NRSN 336. Nursing Pharmacotherapeutics. 3 Credits. (2 Lec, 1 Lab) F,S,Su
PREREQUISITES: CHMY 121, CHMY 123, NUTR 221, NRSN 258, and NRSN 238. The focus of this course is to examine pharmacotherapeutics in nursing practice. Clinical application of pharmacological and pathophysiological principles are integrated. Physical, psychological, social and cultural factors; age related variations; and alternative therapies are highlighted.

NRSN 341. Psychosocial Nursing Concepts. 3 Credits. (2 Lec, 1 Lab) F,S,Su
PREREQUISITES: PSYX 100, SOCI 101, NRSN 115, NRSN 220, NRSN 225, NRSN 258 and NRSN 238. This course explores selected psychosocial concepts and theories basic to nursing practice with clients in a variety of settings. Topics include family theory, palliative care, crisis theory, anxiety, loss, grief & other human responses; and related psychosocial nursing strategies.

NRSN 346. Nurs Care of Childbearing Family. 5 Credits. (2 Lec, 3 Lab) F,S
SU PREREQUISITES: NRSN 341, NRSN 352 and NRSN 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 childbearing 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 356, 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 Nursing. 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. Health Policy/Health Care Econ Clin. 2 Credits. (1 Lec) F,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 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 perspective is highlighted.

NRSG 437. Psychiatric Nursing. 6 Credits. (3 Lec, 3 Lab) F,S
PREREQUISITES: NRSG 341 and NRSG 377 or 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) F,S
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. Care 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. 2-6 Credits.
NRSG 477. Pop Based Nursing Care in Comm. 6 Credits.
NRSG 478. Nursing Leadership/Management. 6 Credits.
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 increase competence and confidence in previously learned clinical skills. The student works 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. Assmnt 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 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
PREREQUISITE: 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 Adult. 1 Credit. (1 Lec) S
PREREQUISITE: NRSG 517 or consent of instructor. Addresses pharmacological intervention in managing common health care problems of childbearing families. Students will apply knowledge of medication management of commonly encountered pediatric and women’s health care concerns.
NRSG 519. Pharm for Middle Aged Adults. 1 Credit. (1 Lec) Su
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 aged 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 Nrg IV. 6 Credits. (1 Lec, 3.33 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 550 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, developmental, sociocultural and spiritual primary health care needs of midlife 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) 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 cooperate in the design of activities.

NRSG 575. 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.

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. (1-4 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.

NRSG 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.

NRSG 594. Seminar. 1 Credit. (1 Sem; 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 578 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 216Q or equivalent Builds on basic understanding of quantitative methods and results 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 enhance healthcare quality management and reducing health risk through medical error elimination.

NRSG 609. Adv Practicing Nsg Ldrsp. 2 Credits. (2 Lec) S
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) S
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 nurse 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 within 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
PREREQUISITES: 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. Focuses on pharmacologic effects and clinical use of selected drug classifications for the treatment and management of acute and chronic illnesses. Ethical and legal responsibilities, pharmacologic mechanisms, contraindications, complementary alternative medicine and patient education will be addressed.

NRSG 621. Advanced Clinical I-FIL. 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 childbearing and childrearing 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 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 neuropsychology and pathophysiology 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 674. DNP Scholarly Project Seminar. 2 Credits. (1 Lec, 1 Lab) F
PREREQUISITES: NRSG 601, 602, 604 COREQUISITES: NRSG 603 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,Su
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 local to the global 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
COREQUISITE: NRSM 101 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) 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) 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. BICO 230, and either AGSC 454 or BICO 435. 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

NRSM 355. 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. 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.

NRSM 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.

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; 4 cr max) On Demand
PREREQUISITE: Junior standing, consent of instructor and approval of department head. Directed research and study on an individual basis. 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 practices.

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 preparation, preservation, 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
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) F
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, NUTR 226, and NUTR 227 or consent of instructor. Principles of quantity food procurement, production, and presentation. Emphasizes food safety and sanitation principles and organizational management for food and nutrition professionals.

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, practices, and policies. Major service-learning project completed for a public or private agency.

NUTR 395. Pract: Quan 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
PREREQUISITE: NUTR 221CS, NUTR 321 junior standing or consent of instructor. Theory and application of the nutritional assessment process: Anthropometric, biochemical, clinical, dietary, and medical charting. Utilizes computerized dietary analysis and other laboratory procedures. Principles and application of counseling skills.

NUTR 411. Nutrition for Sports/Exercise. 3 Credits. (3 Lec) F,S
PREREQUISITE: NUTR 221CS and KIN 221, or BIOH 201/211 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) 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.

NUTR 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.

NUTR 494. Seminar. 1 Credit. (1 Sem; 4 cr max) F
PREREQUISITE: Senior standing, Preparation of an application for a dietetic 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 426. 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
Prerequisite: Any year 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 524. Adolescent Nutrition. 2 Credits. (2 Lec) S
This is an online course designed to provide teachers strategies for incorporating nutrition education into their curriculum. Course participants explore nutrition science relevant to adolescent health, gain exposure to quality education resources and investigate school wellness issues and strategies.

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/Prol 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) On Demand
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 110HI. 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 212RH. Morality and Society. 3 Credits. (3 Lec)
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 256Q. Logic. 3 Credits. (3 Lec) F,S
PREREQUISITE: Core or Level 4 math placement. Modern forms of valid inference with applications.

PHL 242CS. Soc/Ethical Scnc & 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 commonalties 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: PHIL 101H or PHIL 110H, and PHL 236Q. The most basic questions human beings raise 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: PHIL 101H or PHL 110H, and PHL 236Q. 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, experimentation, and the distribution of scarce medical resources.

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. Philosophic 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:Ancient/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 of 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 303. Early History of Photography. 3 Credits. (3 Lec) S
alternare even years PREREQUISITE: WRIT 101 W. 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 101 W. 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. School of Film and Photography.


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) S
On demand 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 responsibility 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.

PHOT 494. Seminar/Workshop. 1-4 Credits. (1-4 Sem; 12 cr max) PREREQUISITE: PHOT 255 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
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 in physics.

PHSX 103IN. The Physics of How Things Work. 3 Credits. (3 Lec) F
An introduction to some of the exciting ideas, developments, problems, and experiments of modern day physics.

PHSX 201N. Physics by Inquiry. 3 Credits. (3 Lec) F,S
An in-depth exploration of basic physics principles. Scientific model building and proportional reasoning skills will be developed in the context of properties of matter, observational astronomy, and DC electric circuits. For pre-service elementary teachers.

PHSX 205. College Physics I. 4 Credits. (3 Lec, 1 Lab) F,S,Su PREREQUISITE: High school trigonometry or M 151 Q. 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 205, PHSX 220, or PHSX 242.

PHSX 200. Research Programs in Physics. 1 Credit. (1 Lec) F
An introduction to some of the exciting ideas, developments, problems, and experiments of modern day physics.

PHSX 201N. Physics by Inquiry. 3 Credits. (3 Lec) F,S
An in-depth exploration of basic physics principles. Scientific model building and proportional reasoning skills will be developed in the context of properties of matter, observational astronomy, and DC electric circuits. For pre-service elementary teachers.

PHSX 205. College Physics I. 4 Credits. (3 Lec, 1 Lab) F,S,Su PREREQUISITE: High school trigonometry or M 151 Q. 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 205, PHSX 220, or PHSX 242.

PHSX 220. Physics I (w/ calculus). 4 Credits. (3 Lec, 1 Lab) F,S
PREREQUISITE: 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
PREREQUISITE: PHSX 205 or PHSX 220. Second semester of sequence. Topics include simple harmonic motion; electric forces and fields; dc 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 320. Physics I (w/ calculus). 4 Credits. (3 Lec, 1 Lab) F,S
PREREQUISITE: 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
PREREQUISITE: PHSX 205 or PHSX 220. Second semester of sequence. Topics include simple harmonic motion; electric forces and fields; dc 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 244. Physics III. 4 Credits. (3 Lec, 1 Lab) F
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 220 or PHSX 224; M 171Q or M 181Q COREQUISITE: 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. 2 Credits. (1 Lec, 1 Lab) F
COREQUISITES: PHSX 222 or PHSX 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. 1-6 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. (1-2 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 requesting a regular course number.

PHSX 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 study on an individual basis.

PHSX 301. Intro Theoretical Physics. 3 Credits. (3 Lec) S
PREREQUISITE: 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 320. Classical Mechanics. 4 Credits. (4 Lec) F
PREREQUISITE: PHSX 224 and PHSX 301. Principles of Newtonian, Lagrangian,
and Hamiltonian mechanics including single particle motion, systems of particles, rigid
tbody motion, moving coordinate systems, and small oscillations.

PHSX 331. Meth of Computational Physics. 1 Credit. (1 Lec) F
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 alternate years
PREREQUISITE: offered odd years (2011 for last time) 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
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,
Schrödinger equation, particles in potentials, spin, the atom; Introduction to nuclear
and particle physics.

PHSX 401. Physics by Inquiry I. 3 Credits. (3 Lab) Su
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 elementary physics. For middle school and high school teachers.

PHSX 403. Physics by Inquiry III. 3 Credits. (3 Lab) Su
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 elementary physics. For middle school and high school teachers.

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
of teaching experience. This online course addresses the question: In what ways does
nature behave differently at high relative speeds than at low speeds? Designed for
practicing high school physics teachers. Assignments and discussions use electronic
computer conferencing and interactive visual software.

PHSX 423. Electricity and Magnetism I. 3 Credits. (3 Lec) F
PREREQUISITE: PHSX 301 or M 348. Electrostatic fields, dielectric materials,
magnetic fields, materials, and Maxwell's equations.

PHSX 425. Electricity and Magnetism II. 3 Credits. (3 Lec) F
PREREQUISITE: PHSX 343 and PHSX 423. Propagation of electromagnetic waves,
radiation, and general wave phenomena.

PHSX 427. Advanced Optics. 3 Credits. (3 Lec) S alternate years, to be offered even
years PREREQUISITE: PHSX 224 and M 274 or M 284. Emphasis is on new
developments in optics triggered by the laser. Provides a good foundation in wave
optics, nonlinear optics, integrated optics, and spectroscopy.

PHSX 435. Astrophysics. 3 Credits. (3 Lec) S alternate years, to be offered even years.
PREREQUISITE: PHSX 320, PHSX 343, and PHSX 423. A survey covering basic
problems in modern astrophysics such as stellar structure and evolution, solar physics,
compact objects, quasars, and cosmology.

PHSX 437. Laser Applications. 3 Credits. (3 Lec) F alternate years
PREREQUISITE: PHSX 222. A survey of laser types and their
properties and applications for scientists and engineers who wish to use lasers in
research or technology. Many demonstrations will be used to illustrate the principles.

PHSX 441. Solid State Physics. 3 Credits. (3 Lec) F alternate years, to be offered odd
years. PREREQUISITE: PHSX 224. A treatment of the classification and electronic
structure of solids. Properties of conductors, superconductors, insulators, and
semiconductors will be discussed. This course is strongly recommended for students
intending to study physics in graduate school.

PHSX 442. Novel Mat for Physics/Engineer. 3 Credits. (3 Lec) S alternate years, to be
offered even years. PREREQUISITE: Knowledge of introductory solid state physics; PHSX 441 or
consent of instructor. Provides basic physical knowledge of advanced natural/artificial
materials; ferroelectrics, superconductors, nanorubes, superlattices, photonics materials,
materials with giant magnetoresistance and negative susceptibilities, molecular
magnets, and biomaterials.

PHSX 444. Advanced Physics Lab. 4 Credits. (4 Lab; 8 cr max) F,S
PREREQUISITE: offered odd years, to be offered even years.
Max 8 cr (May not duplicate F or S semesters, 4 cr F, 4 cr S only) PREREQUISITE: PHSX
262 and PHSX 343. COREQUISITE: PHSX 461. Introduction to methods,
instrumentation, and data acquisition techniques used in modern physics research.
Different experiments are offered in the two semesters. For students desiring a strong
experimental exposure, taking both courses is recommended. Experiments in the fall
semester are typically in the optical area and include interferometers, fiber optics,
spectral measurement, polarization, and laser optics. Experiments in spring semester
are typically in solid state physics and particle spectroscopy.

PHSX 446. Thermodynamics & Stat Mech. 3 Credits. (3 Lec) S
PREREQUISITE: PHSX 301. Statistical physics and thermodynamics and their
applications to physical phenomena. This course is strongly recommended for students
intending to study physics in graduate school.

PHSX 451. Elementary Particle Physics. 3 Credits. (3 Lec) S
PREREQUISITE: PHSX 343. A survey of elementary particle physics, beginning
with an historical viewpoint and leading up to today’s remarkably successful “Standard
Model” of quarks, leptons, and gauge bosons.

PHSX 461. Quantum Mechanics I. 3 Credits. (3 Lec) F
PREREQUISITE: PHSX 343. The wave function, the Schrödinger equation in 1-D,
formalism and Dirac notation, and 3-D effects including the hydrogen atom.

PHSX 462. Quantum Mechanics II. 3 Credits. (3 Lec) S
PREREQUISITE: PHSX 461. Identical particles, time independent perturbation theory,
time dependent perturbation theory, and the variational principle.
PHSX 490R. Undergraduate Research. 1-6 Credits. (1 Ind; 12 cr max) F,S,Su Max 6 cr. PREREQUISITE: Junior standing and signed consent of instructor/ research advisor and academic advisor. 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 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.

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 499R. 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 511. Astronomy for Teachers. 3 Credits. (3 Ret) 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 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 512. General Relativity Online. 3 Credits. (3 Lec) S alternate years, to be offered even years. PREREQUISITE: PHSX 222 or PHSX 242; M 183Q; PHSX 405; Bachelor’s degree and one year teaching experience. 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 513. Quantum Mechanics Online. 3 Credits. (3 Lec) S alternate years, to be offered even years. 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 Lab; 6 cr max) F,S,Su PREREQUISITE: PHSX 216, PHSX 423, or 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 523. General Relativity I. 3 Credits. (3 Lec) F alternate years, to be offered even years. 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 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 even years. 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 even years. PREREQUISITE: PHSX 425, PHSX 462, PHSX 466, and PHSX 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 plasmas and plasma relevant to astrophysical plasmas such as the solar corona. Topics covered include: magnetostatics, 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 even years.
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
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.

PHSX 590. Master's Thesis. 1-10 Credits. (1 Ind; max unlimited) F,S
Max credits unlimited. PREREQUISITE: Master's standing.

PHSX 591. Special Topics. 1-4 Credits. (1 Lec; 12 cr max) F,S
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.

PHSX 592. Independent Study. 1-3 Credits. (1-3 Ind; 6 cr max) F,S
Max credits unlimited. PREREQUISITE: 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) F
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) F,S
Max credits unlimited. 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,S
Max credits unlimited. PREREQUISITE: Doctoral standing.

PSCI - Political Science

PSCI 200. Introduction to Conducting Political Inquiry. 3 Credits. (3 Lec) F
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 210IS. Introduction to American Government. 3 Credits. (3 Lec) F,S,S
3 cr. LEC 3 Examines the major institutions of national government and politics. Special emphasis on the constitution and other political rules of the game as shapers of public consciousness and government policy.

PSCI 214IS. Principles of Political Science. 3 Credits. (3 Lec) F
3 cr. LEC 3 Major concepts and values of democracy in the United States including the founding, power, behavioral concepts, and sense of community.

PSCI 220. Intro to Comparative Politics. 3 Credits. (3 Lec) F
Introduction to the comparative study of different types of governmental regimes, political systems, and political cultures throughout the world and the sources and consequences of these differences.

PSCI 230D. Introduction to International Relations. 3 Credits. (3 Lec) F
3 cr. LEC 3 A survey of the major global issues and the means nation-states use to resolve them. The students will explore the concepts of sovereignty, the elements of power, and the global trends of regionalism and internationalism.

PSCI 240. Introduction to Public Administration. 3 Credits. (3 Lec) S
3 cr. LEC 3 PREREQUISITE: PSCI 210. Implementation of public policy in American government. Topics include but are not limited to: bureaucratic politics, decision making, budgeting, personnel management, ethics, organization theory, and organization behavior.

PSCI 291. 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 for requesting a regular course number.

PSCI 302. Media & Politics. 3 Credits. (3 Lec) F alternates even years 3 cr. LEC 3 PREREQUISITE: PSCI 200, 210IS, 214IS, 240. Explores role of the media in the political process with special emphasis on various print media, television, film, and cyberspace.

PSCI 306. Legislative Process. 3 Credits. (3 Lec) S alternate years 3 cr. LEC 3 PREREQUISITE: PSCI 200, 210IS, 214IS, 260. Examines legislative decision-making in a constitutional, political, and comparative context. Special emphasis on how institutional rules and relationships shape the making of public policy at both the Congressional and state legislative level.

PSCI 310. Applied Political Analysis. 3 Credits. (3 Lec) F
3 cr. LEC 3 PREREQUISITE: PSCI 200, 210IS, Quantitative Core Course. Provides an introduction to methods and techniques in quantitative political statistics. Topics covered range from levels of measurement and descriptive statistics to logistic regression, using political science data sets and examples.

PSCI 323. Modern Political Thought. 3 Credits. (3 Lec) S
3 cr. LEC 3 PREREQUISITE: PSCI 200, 210IS, 214IS, 240. Examines issues of power, authority, legitimacy, community and freedom in the work of Machiavelli, Hobbes, Locke, Rousseau, Mill, Marx, and Nietzsche, among others. Recommended prerequisite for PSCI 354 (Contemporary Political Thought) and PSCI 455 (Politics & Virtue).

PSCI 331. International Relations Theory. 3 Credits. (3 Lec) F alternates even years 3 cr. LEC 3 PREREQUISITE: PSCI 210D. Junior or Senior standing required. Overview of the realism versus rationalism debate during the first half of the twentieth century. Followed by theories formulated in the postwar period to study causes of war/conflict, problems of interdependence, and recent developments such as the end of the Cold War, global democratization, growing ethnic conflict, and a more active United Nations.

PSCI 337. Model United Nations. 3 Credits. (3 Lec) S
PREREQUISITE: Consent of instructor. This course introduces students to the workings of the global organization that is the United Nations. Students gain an understanding of international negotiations that unfold in the U.N. setting in the context of current international issues and events.

PSCI 341. Political Parties and Elections. 3 Credits. (3 Lec) F alternates even years 3 cr. LEC 3 PREREQUISITE: PSCI 200, 210IS, 214IS, 240. Examines the structure and function of political parties, interest groups, and the mass media in the electoral process. Special emphasis on electoral rules and citizen participation from a comparative democratic perspective.

PSCI 346. American Presidency. 3 Credits. (3 Lec) F alternates even years 3 cr. LEC 3 PREREQUISITE: PSCI 200, 210IS, 214IS, 240. The American presidency as a government institution. Examination of the legal, political, administrative, and policy making roles of the president. Emphasis on recent issues of responsiveness to national needs and public accountability.

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, Althusser, Butler, de Beauvoir, Kuhn, Rorty, Rawls, Chomsky.

PSCI 360. Social Science Research Methods. 3 Credits. (3 Lec) F
Provides an introduction to methods and techniques in quantitative political statistics. Topics covered range from levels of measurement and descriptive statistics to logistic regression, using political science data sets and examples.
PSCI 356. Classical Political Thought. 3 Credits. (3 Lec) S
3 cr. LEC 3 PREREQUISITE: 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: PSCI 230D, Junior standing. 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 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)
-- Congressional Campaign.

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 policy and strategic processes of public policy development and implementation. 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 will be offered odd years 3 cr. LEC 3 PREREQUISITE: Junior standing and PSCI 210ES. Explores 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 490R. 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) 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,S
3 cr. SEM PREREQUISITE: Senior standing, PSCI 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 & Administration. 3 Credits. (3 Lec) F
Alternate even years. PREREQUISITE: PSCI 554. This course exposes students, using the most current theoretical and empirical literature, to the essential competencies need for management and leadership roles in public and non-profit organizations.

PSCI 551. Research Methods for Public Administrators. 3 Credits. (3 Lec) S
PREREQUISITE: PSCI 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 Lec) S
Alternate years. PSCI 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: PSCI 551 Students will get an introduction to qualitative and quantitative data collection, management, and analysis techniques. 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) F
Alternate odd years. PREREQUISITE: PSCI 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: PSCI 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) F
Alternate even years. PREREQUISITE: PSCI 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 odd years. PREREQUISITE: PSCI 554 and Graduate standing. A survey of methods of program evaluation and policy analysis for public programs. Qualitative and quantitative 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: PSCI 554 and Graduate standing. The 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: PSCI 571 Research Methods I and PSCI 553 Research Methods II. 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
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.

PSCI 592. Independent Study. 1-3 Credits. (1 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.

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 Genetic 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-link 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 every 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 Plnts 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 555. Plant Pathogen Interaction. 3 Credits. (3 Lec) S
PREREQUISITE: BIOL 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. (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 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.

PSPP 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.

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 100IS. Intro to Psychology. 4 Credits. (3 Lec, 1 Lab) F,S,Su
Introduction to methods and approaches to psychology including exploration of problems in physiological psychology, learning, memory and information processing, abnormal behavior, and social psychology; with selected individual study of other areas related to the student’s interests.

PSYX 110IS. Honors Intro to Psychology. 4 Credits. (3 Lec, 1 Lab) F
PREREQUISITES: Honors 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 145 (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
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. (5 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 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.

PSYX 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.

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 1000S. 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

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. Indust & 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 225. 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 Analysts 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,S,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 cataloged 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,S PREREQUISITE: PSYX 490 (minimum 3 cr) or PSYX 491. Senior capstone course. Written and oral presentation of senior thesis work.

PSYX 501. Adv Rach 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 I. 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 designs, methodological issues, hypothesis testing, basic (e.g., t-tests, ANOVA) and advanced statistical tests (e.g., factorial ANOVAs, ANCOVA, and Multiple Regression).

PSYX 510. Topics in Psychological Science. 3 Credits. (2 Lec; 1 Rec) F,S,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, neuroanatomy and neuropharmacology. 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. 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) F 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 Ind; 6 cr max) F,S,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 580. 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,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 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,F,S PREREQUISITE: PSYX 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 is 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,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,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,S,F,S 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 the 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.
course covers basic guidelines for Energy Auditors in Single Family Homes as well as math basics, building assessment strategies, and work order procedures.

PREREQUISITE: RBPF 100. This course provides an overview of various options for Energy Audit and Building Performance Software concentrating on evaluating homes and gathered required data for input.

PREREQUISITE: RBPF 100. This course provides an overview of 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, films, literary and visual studies.

This course explores the intersection of religion with literary and other disciplines: anthropology, art historical, and/or literary approaches.

This course will focus on issues in which political events and conflict have had their effects on religion or in interpretations of religion.

This course examines such persons from different disciplinary perspectives.

This course provides an 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.

This course covers basic guidelines for multiple 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.

This course is 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.

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-- The sacred texts and the historical forms of religious thought and practice in the traditions of India.

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-- The history and roots and of varieties of concepts of the divine in various religious traditions.

-- 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 de-mythologized or literal worldview. We will apply critical theories of myth and of metaphor to topics such as the monster or the trickster, and to themes such as cosmogony or metamorphosis.

-- 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 nor a testing ground for faith.

-- Religion in America and America as religion: an examination of figures, texts, movements, and material culture in creating America's religious and cultural landscapes.

-- 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, films, literary and visual studies.

-- Religion and gender: an examination of figures, texts, movements, and material culture in creating America's religious and cultural landscapes.

-- The sacred texts and historical forms of religious thought and practice in the traditions of India.

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-- 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 de-mythologized or literal worldview. We will apply critical theories of myth and of metaphor to topics such as the monster or the trickster, and to themes such as cosmogony or metamorphosis.
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 trans-temporal.

RLST 498R. 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 Sem; 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. (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)
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, 1 Ind) 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 farmers’ 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, and NUTR 322, or permission of instructor. 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 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 consent 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) S
PREREQUISITE: SOCI 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.

SOCI 221IS. Criminal Justice System. 3 Credits. (3 Lec) On Demand
This course is an overview of the institutions that comprise our justice system. The emphasis is on criminal justice and the sources of crime but topics relevant to the broader study of the law and justice included.

SOCI 290SR. Undergraduate Research. 1-6 Credits. (1-6 Ind; max unlimited)
Directed undergraduate research which may culminate in a written work or other creative project. Course will address responsible conduct of research. May be repeated.

SOCI 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.

SOCI 303. Society and the Individual. 3 Credits. (3 Lec)
PREREQUISITE: SOCI 101IS. Social behavior of the individual in the group, linguistic behavior, social perception, motivation and learning, and self-focus on symbolic interaction.

SOCI 307. Soc of Childhood & Adolescence. 3 Credits. (3 Lec)
PREREQUISITE: SOCI 101IS. Examination of cultural and societal forces influencing development among children and adolescents from a sociological perspective.

SOCI 311. Criminology. 3 Credits. (3 Lec)
PREREQUISITE: SOCI 101IS. Discussion of major theories of crime and delinquency with special attention to systems of adult and juvenile deterrence.

SOCI 313. Princ of Crim Law & Procedure. 3 Credits. (3 Lec)
PREREQUISITE: SOCI 101IS. This course introduces the student to fundamental American legal principles as developed in criminal law. In addition, the student will gain a basic understanding of key issues in the application and development of contemporary legal procedures.

SOCI 313R. Sociological Research Methods. 3 Credits. (3 Lec) S
PREREQUISITE: SOCI 101IS and SOCI 202. Introduction to research methods in sociology with emphasis given to defining variables, hypothesis formation, and development of strategies used to test hypotheses. Student research project.

SOCI 320. Sociology of Religion. 3 Credits. (3 Lec)

SOCI 325. Social Stratification. 3 Credits. (3 Lec)

SOCI 326. Sociology of Gender. 3 Credits. (3 Lec)
PREREQUISITE: SOCI 101IS. Examines the social and biological bases of gender; how gender is constructed through socialization, social interaction and institutional processes, and the social, cultural and economic consequences of gender differences for men and women.

SOCI 327. Sociology of Deviance. 3 Credits. (3 Lec)
PREREQUISITE: SOCI 101IS. This course examines how particular attributes or behaviors are defined as deviant, the social consequences of formal and informal deviant designations, and the construction and imposition of norms, values, and rules.

SOCI 332. Sociology of the Family. 3 Credits. (3 Lec)
PREREQUISITE: SOCI 101IS. The family as a structural and functional unit in social life and organization, as a unit of social control; its status, change, and associated problems.

SOCI 333. Sociology of Education. 3 Credits. (3 Lec)
PREREQUISITE: SOCI 101IS. This course will focus on the relationship between education and society including the role of education in structuring socialization; racial, ethnic, gender and class stratification; human capital development; economic, political and labor market opportunities; and the political system.

SOCI 335. Juvenile Justice System. 3 Credits. (3 Lec) S
PREREQUISITE: SOCI 101IS or SOCI 221. An analysis of the juvenile justice system in the United States, including the historical development of policies and practices. The role of various social agencies in defining, preventing, and responding to delinquency will also be considered, primarily from a sociological perspective.

SOCI 340. 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 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) S
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
PREREQUISITE: 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 101IS. 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
PREREQUISITE: SOCI 101IS 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 101IS. Application of analytical tools to the analysis of sociological data.

SOCI 434. Sociology of Human Sexuality. 3 Credits. (3 Lec)
PREREQUISITE: SOCI 101IS. 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 101IS. 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 101IS. This course addresses the problem of social inequality by examining the contradictory ways in which the law may be used 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 101IS. 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 101IS. 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 101IS. 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 101IS. 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 101IS, 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 101IS, 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 101IS, 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) S
PREREQUISITE: Senior standing, and SOCI 101I 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.) S
PREREQUISITE: SPN101 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 210D. Intermediate Spanish I. 3 Credits. (3 Rtc) S
PREREQUISITE: SPN201 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 220D. Intermediate Spanish II. 3 Credits. (3 Rtc) S
PREREQUISITE: SPN201 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.
PREREQUISITE: Spanish 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) On Demand Lec/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.

SPNS 296. Experience I. Am 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 320. Spanish Culture & Civilization. 3 Credits. (3 Lec) F PREREQUISITE: SPNS 220. 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 Roman times through the Baroque 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: PREREQUISITE: SPNS 220. 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 220. 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 335H. Travel in Latin Am Lit & Film. 3 Credits. (3 Rct) Su PREREQUISITE: SPNS 220 or Junior standing. The course examines travel in Latin America 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. Spanish Literature 1. 3 Credits. (3 Lec) F PREREQUISITE: SPNS 220. 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. Spanish Literature 2. 3 Credits. (3 Lec) S PREREQUISITE: SPNS 220. 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 the tenets of the most influential literary movements and write papers 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 220 for majors and minors or; Junior standing for non-majors. Examines the history and culture of Latino communities in the US. It centers on the largest Hispanic populations found in the US today: Mexican, Dominican, Puerto Rican, and Cuban. Taught in Spanish.

SPNS 351. US Latino Literature. 3 Credits. (3 Lec) F PREREQUISITE: SPNS 220. 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 352H. US Latino Text and 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 and 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 220 In this course, students read poetry from several Latin American countries and Spain. Students learn how to discern 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) S 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,S,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 401. Don Quijote. 3 Credits. On Demand Alternate Years, starting 2015 - PREREQUISITE: SPNS 220 Don Quijote is often considered to be the first novel. In this course, students will study the historical context in which the novel arose and/or identify the universal themes and issues that the novel explores and how they relate to modern society.

SPNS 416. Latin America: Culture and Revolution. 3 Credits. (3 Rct) F PREREQUISITE: SPNS 220. 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. Caribbean Studies. 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 class/gender/race dynamics, religion, etc. In English.

SPNS 600. Contemporary Spain & Nations. 3 Credits. (3 Lec) F PREREQUISITE: SPNS 220. This course explores current issues and trends 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.
Emphasizes ideas rather than specific techniques. Focuses on real examples of the use of permutation tests, Wilcoxon and Mann-Whitney tests, Kruskal-Wallis and Friedman's tests. PREREQUISITE: One of the following: STAT 217Q, STAT 332, or STAT 401.

Clinical trials, epidemiologic investigations, and cause-effect studies. PREREQUISITE: STAT 411. Continuation of STAT 411/STAT 511 to cover principles of experimental design, multi-factor ANOVA, Poisson log-linear regression, and introductions to multivariate and time series analyses, with an emphasis on statistical thinking, appropriate inference, interpretation of results, and writing. Co-convened with STAT 511.

Advanced construction and route surveys, joint, marginal, and conditional distributions; conditional expectations; applications; interpretation, and writing. Co-convened with STAT 512.

Directed undergraduate research. Course will address responsible conduct of research. SRVY 290R. Undergraduate Research. 1-8 Credits. (1-8 Ind; 8 cr max) F,S,Su PREREQUISITE: Consent of department head. Directed undergraduate research.

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.

Principles of experimental design, multi-factor ANOVA, Poisson log-linear regression, and introductions to multivariate and time series analyses, with an emphasis on statistical thinking, appropriate inference, interpretation of results, and writing. Co-convened with STAT 511.

SPNS 370R. Seminar: Hispanic Literature. 3 Credits. (3 Sem) F
PREREQUISITE: Senior standing. Senior capstone course. 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,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.

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,S,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.

SPNS 588. Professional Development. 3 Credits. (0-3 Lec) On Demand 1 - 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.
STAT 436. Introduction to Time Series Analysis. 3 Credits. (3 Lec) F alternate years, to be offered even years.
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 437. Introduction to Applied Multivariate Analysis. 3 Credits. (3 Lec) S alternate years, to be offered odd years.
PREREQUISITE: STAT 412/STAT 512 or consent of instructor. Classic multivariate methods, including but not limited to principal component analysis, canonical correlation analysis, factor analysis, discrimination and classification methods, cluster analysis, and other topics may depend on instructor.

STAT 439. Introduction to Categorical Data Analysis. 3 Credits. (3 Lec) S alternate years, to be offered even years.

STAT 441. Experimental Design. 3 Credits. (3 Lec) S
PREREQUISITE: STAT 411/STAT 511 and M 221 or M 333 or M 441 or consent of instructor. 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 block designs, designs with nested effects, and split plot designs. Co-convened with STAT 541.

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, to be 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 stat 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 501. Intermediate Probability and Statistics. 3 Credits. (3 Lec) F
PREREQUISITE: STAT 422 or consent of instructor. Families of probability distributions, distributions of functions of random variables, limiting distributions, order statistics. Cross-listed with M 501.

STAT 502. Intermediate Mathematical Statistics. 3 Credits. (3 Lec) S

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; queuing 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 process 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, extrabinomial 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 coverage 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 550. Advanced Mathematical Statistics. 3 Credits. (3 Lec) S alternate years, to be offered even years.
PREREQUISITE: STAT 502 or M 502 and either M 384, M 505, or M 547. Sufficiency, completeness, ancillary statistics, invariance, likelihood-based inference, large sample theory, Edgeworth and saddlepoint approximations.

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.

STAT 576. Internship. 2-12 Credits. (2-12 L; max cr unlimited) 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.

STAT 578. Response Surface Methodology. 3 Credits. (3 Lec) S alternate years, to be offered odd years.
PREREQUISITE: STAT 541 or STAT 505. Diagnostics; fractional-factorial designs; method of steepest ascent; canonical analysis; response optimization; ridge analysis; response surface design including central composite designs, orthogonal designs, rotatable designs, and optimal designs; mixture designs.

STAT 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 coursework (and thesis, if on a thesis plan) but who need additional faculty or staff time.

STAT 590. Master’s Thesis. 1-10 Credits. (1-10 Ind; max cr unlimited) F,S,Su
PREREQUISITE: Master’s standing.

STAT 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.

STAT 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 Graduate Studies. Directed research and study on an individual basis.

STAT 594. Seminar. 1 Credit. (1 Sem; 1-3 cr max) F,S,Su
PREREQUISITE: Consent of Instructor. Self-selected, self-directed interdisciplinary subject matter. Co-convened with EDU 497 (Methods: Ag and Tech Ed). Provides additional organization subject matter materials and laboratory resources to promote the development of standard based curricula.

STAT 689. Doc 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.

STAT 690. Doctoral Thesis. 1-10 Credits. (1-10 Ind; max unlimited) F,S,Su
PREREQUISITE: Doctoral standing.

TASK 127. Business Office Procedures. 3 Credits. (3 Lec) S
This course is designed to prepare students for performing various administrative and office functions in the contemporary business environment. Topics to be covered include the use of Microsoft Outlook, records management and filing systems, processing mail, handling credit and collections, managing and troubleshooting computer systems, and ten-key typing skills.

TE - Technology Education

TE 101. Intro to Technology Ed. 1 Credit. (1 Lec) F
Introduction to the rationale, principles, concepts, and philosophy of technology education. An overview of the Technology Education paradigm is provided through a variety of class activities.

TE 207. Materials and Processes. 4 Credits. (2 Lec, 2 Lab) On Demand
Exploration of technical competencies engineering, applications, processes, tools and equipment as they are employed by industry in the application of materials including but not limited to wood, metal, and composite materials.

TE 250CS. Technology and Society. 3 Credits. (1 Lec, 2 Lab) F,S,Su
Closely linked to the various sciences, technology has developed out of human need to solve real problems of society and to advance science. An exploration and examination of major technological periods, inventions, and innovations that have altered the course of humanity and their impact on the civilization process will lead to a perspective on technological literacy. This course will introduce students to the study of technology, not so much as a method for “doing technology,” but as an impetus for social and cultural change related to technology.

TE 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.

TE 294. Seminar. 1 Credit. (1 Sem; 4 cr max) F,S,Su
Max 4 cr. Topics offered at the lower division level which are not covered in regular courses.

TE 330. 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 331. Electronic Communication Technology. 4 Credits. (2 Lec, 2 Lab) S
Students explore the technical and technological concepts of communication systems and sub-systems including audio/video production and web-based applications.

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 360. Technology Practicum. 3 Credits. (3 Lab) F,S,Su
PREREQUISITE: Consent of Instructor. Self-selected, self-directed interdisciplinary field experience arranged with and supervised by an academic advisor. This practicum will pertain to the transfer of technological literacy in a variety of settings.

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 230 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 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.
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 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.

TE 494. Seminar. 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 not covered in regular courses. Students participate in preparing and presenting discussion material.

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,S
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 every even year.
PREREQUISITE: TE 250 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 creation of 3D solid models.

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. (4 Sem) F,S,Su
PREREQUISITE: THTR 212, FILM 251, and FILM 254. An exploration of the aesthetics and practice of creating a live theatrical performance. Students will work in teams to produce one act parts 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 Ind; 12 cr max) F,S,Su
Max 1-4 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,S
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
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 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 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
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 Sem) F,S,Su
-- Special Topics in University College.

UC 498. 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.

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 & Critics:Knowledge. 4 Credits. (4 Sem) F,S
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 & Critics:Imagination. 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. Honors students completing this course are exempt from the IH requirements in the core.

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.
thinking and writing skills, and encourage independent creativity/research.

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 Critics II. 4 Credits. (4 Sem) F,S
PREREQUISITE: Restricted enrollment; 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 argumentation, 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.

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, critical thinking, 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, critical thinking, and oral argument, leading to comprehensive examinations. May be repeated.

UH 490R. Undergrad Resch/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 report, 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; 6 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. (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 494H. Honors Seminar. 4 Credits. (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 494IN. Honors Seminar. 4 Credits. (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 494S. Honors Seminar. 4 Credits. (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 494SR. Honors Seminar. 4 Credits. (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.

UNIV - University

UNIV 125CS. Microbes in the Environment. 3 Credits. (3 Lec) F
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 Rct) 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. ED, SOC, Issues, Digital Age. 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 Lec) F,S
PREREQUISITE: Sophomore standing or consent of instructor. Provide students who are unsure of a major/career path, or those who want to make the most of their undergraduate education, with knowledge and skills to prepare themselves for the “world of work”.

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 Rct) 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 660. 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
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: Consent of instructor and approval of the Director of University Studies. Directed study on an individual basis.

US 494. AdvoCat Seminar. 1 Credit. (1 Sem; max unlimited) F,S
PREREQUISITE: Sophomore standing and consent of instructor. As student ambassadors on campus, AdvoCats 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 201IH. 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) S
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 454. The Study of Men & Masculinity. 3 Credits. (3 Lec) S
PREREQUISITES: WGSS 201 or PSYN 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 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 Timely 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 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 170IN 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 guzzlers, 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) On Demand
PREREQUISITE: 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 employed 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 BIOB 318, BIOE 370, WILD 301, and Fish and Wildlife Ecology and Management Major 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. For Fish and Wildlife Ecology and Management Majors.

WILD 420. Range & Wildlife Policy and Planning. 3 Credits. (3 Lec) S
PREREQUISITE: BIOE 103 or NRSM 110 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 planning. Animal & Range Sciences.

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
PREREQUISITE: 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 constraints will be emphasized with consideration of other natural resource demands.

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 undergradate 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 intern program by instructor and the department head. An individualized assignment arranged with an agency, business, or other organization to 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 theories 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: BICO 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) S alternate years to be offered even years 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 interdisciplinary 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 graduation committee.

WILD 591. Special Topics. 1-3 Credits. (1-3 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.

WLDG - Welding Technology
WLDG 103. Welding Fund for Comst Trades. 2 Credits. (2 Lab) F
Prerequisites: CSTD 135, CSTD 145, CSTD 161, CSTD 171 Corequisites: CSTD 230, CSTD 260 This course is specifically designed to teach students the basic welding methods that a carpenter might face (i.e. steel studs). Students will cover basic welding processes used in the trade applications.

WLDG 104. Technical Mathematics. 3 Credits. (3 Lec) F
Prerequisites: WLDG 110, WLDG 111, WLDG 205 Corequisites: WLDG 106, WLDG 122, WLDG 205 This course provides an introduction to basic fabrication of structural steel in accordance with industry standards.

WLDG 110. Welding Theory I. 1 Credit. (1 Lec) F
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 semiautomated cutting principles, and terminology.

WLDG 111. Welding Theory 1 Practical. 3 Credits. (1 Lec, 2 Lab) F
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.

WLDG 121. Welding Theory II Practical. 3 Credits. (3 Lec) F
Corequisites: 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 122. Welding Theory III Practical. 3 Credits. (3 Lec) S
Prerequisites: WLDG 110, WLDG 111, WLDG 121 Corequisites: WLDG 120. This course covers Gas Metal Arc Welding (GMAW), Shielded Metal Arc Welding (SMAW), and Flux Core 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 095. Developmental Writing. 4 Credits. (4 Lec) F,S
Offered by Gallatin College. Developmental Writing introduces students to critical reading practices within the processes which 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 in the discovery and written expression of ideas, stressing organization, support, audience awareness, clarity, and persuasive presentation. Taught around a particular topic or theme varying with each offering.

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 and giving oral presentations. Letters of application and resumes are also covered.

WRIT 201. College Writing II. 3 Credits. (3 Lec) F,S

WRIT 205. Intro to Writing Studies. 3 Credits. (3 Sem) F
PREREQUISITE: WRIT 101W or equivalent, and English Writing Majors. Overviews the Writing Option and the field of Writing Studies, its areas and methods of inquiry, and questions and issues of interest to writers 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
Maximum 6 cr. PREREQUISITE: Consent of instructor and approval of department head. Directed research and study on an individual basis.

WRIT 326. Advanced Composition. 3 Credits. (3 Lec) F
PREREQUISITE: WRIT 101 or equivalent. Advanced composition with attention to research writing, academic standards of evidence, logic, and development of style.

WRIT 371. Digital Rhetorics and Multimodal Writing. 3 Credits. (3 Rct; F,S)
Alternate years
To be offered odd years 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
To be offered even years PREREQUISITES: WRIT 101 and one IS, RS, RN, or CS Core course; and by enrollment in the English major or Writing minor, or by 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 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.
WRIT 429. Professional Writing. 3 Credits. (3 Lec) S alternate years, to be offered odd years. Intended for students who already have considerable skill and experience in expository writing. Focuses on professional writing designed to be read by the general public or a specialized audience.

WRIT 490R. Undergraduate Research. 1-6 Credits. (1 Ind; 6 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.

WRIT 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 chair. Directed research and study on an individual basis. May not be used in lieu of another required course in the English curriculum.

WRIT 494RH. Seminar: Writing Research and Publications. 3 Credits. (3 Sem) F,S PREREQUISITE: Senior standing and consent of instructor. Senior capstone course for writing majors. Integration and assessment of students’ cumulative experiences as English writing majors. Offered alternately as Research in Writing and Rhetoric, emphasizing expository writing and scholarly practice; Critique and Publication, emphasizing creative writing. Restricted entry.

WRIT 498. Internship. 1-12 Credits. (1-12 Ind; 12 cr max) On Demand PREREQUISITE: Junior standing, consent of instructor and approval of department chair. An individual assignment arranged with an agency, business or other organization to provide guided experience in the field.

WS - Women's Studies

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

Aamot, Kirk
Associate Professor, Music
B.A. - St Olaf College (1992)
M.A. - University of Minnesota (1996)
M.A. - University of Colorado-Boulder (2001)

Abdel fattah, Nabil
Associate Teaching Professor, Modern Languages Literature
B.A. - Tanta University (1979)
M.A. - Indiana University (1983)
Ph.D. - Univ of Texas-Austin (1990)

Ackerman, Kimberly Lynn
Instructor, Nursing - Billings
B.A. - Carroll College (2000)
M.N. - Montana State University (2006)

Acton, Loren W

Adams, Dean
Assistant Professor, Art
M.F.A. - University of Iowa (1995)

Adams, Edward
Professor, Civil Engineering
B.A. - Mount Saint Marys College (1972)
B.S. - Montana State Univ-Bozeman (1979)
http://www.coe.montana.edu/ce/faculty/AdamsEd.html

Agindotan, Bright
Extension, Plant Sciences Plant Pathology

Agostinho, Alessandra

Agruss, David Ian
Assistant Professor, English
B.A. - Wesleyan University (1991)
M.A. - Cornell University (2000)
Ph.D. - Cornell University (2007)
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Ahmed, Selena
Assistant Professor, Health Human Development
B.A. - Columbia University (2001)
M.S. - University of Kent - Canterbury (2004)
M.A. - Tufts University (2013)
Ph.D. - City University of New York (2011)

Ahn, Angella
Assistant Professor, Music

Ahlens, Susan Lynne
Clinical Professor, Nursing - Billings
B.S.N. - Ohio State University (1976)
M.S.N. - University of Toledo (Formerly Medical College of Ohio) (1986)
Ph.D. - Wayne State University (2001)

Aig, Dennis Ira
Professor, Film Photography
B.A. - Queens College of the City University of New York (1971)
M.A. - Ohio State University (1973)
Ph.D. - Ohio State University (1983)

Akin, Michelle
Research Engineer, Civil Engineering
B.S. - Humboldt State University (2004)
M.S. - Montana State University (2006)

Al Kaisy, Ahmed
Professor, Civil Engineering
http://www.coe.montana.edu/ce/faculty/Ahmed.html

Albert, Stephen

Albin, Debbie Jean
Extension, Health Human Development
http://www.montanagrandparents.org

Allen, Barbara L.
Extension
B.S. - Montana State University (1999)

Allen, Jill Marie
Postdoctoral Research Associate, Psychology
Ph.D. - University of Nebraska (2013)
M.A. - Montana State University (2009)
B.A. - Wartburg College (2007)

Allen, Sarah
Instructor, CLS, Honors College

Allen, Thomas

Aleemus, Terry Lee
Clinical Instructor, Nursing - Billings
M.P.H. - Univ of California-Los Angeles (1994)
B.A. - University of Oklahoma (1973)

Alzheimer, Tim
Associate Teaching Professor, College of Business
M.S. - Montana State Univ-Bozeman (1993)
B.S. - Montana State Univ-Northern (1980)

Amende, Kevin
Assistant Professor, Mechanical Industrial Engineering
M.S. - Montana State Univ-Bozeman (2009)
B.S. - Montana State Univ-Bozeman (2001)
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Amendola, Roberta
Assistant Professor, Mechanical Industrial Engineering
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Ament, Robert

Amin, Ruhul
Professor, Mechanical Industrial Engineering
Ph.D. - University of Tennessee (1989)
M.S. - University of Tennessee (1983)
B.S. - Univ Engineering Technology (1977)
<table>
<thead>
<tr>
<th>Name</th>
<th>Title</th>
<th>Department/Field</th>
<th>Education</th>
<th>Website</th>
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</table>
| Ammons, Mary Cloud       | Assistant Research Professor | Chemistry Biochemistry                | Ph.D. - Montana State Univ-Bozeman (2007)  
B.A. - University of Colorado-Boulder (2000) |                               |
| Anacker, Melody          | Instructor                   | Health Human Development              | M.S. - Montana State University (1987)  
B.S. - University of Montana (1976)                                    |                               |
| Andersen, Katelyn        | Extension Agent              |                                       | M.S. - University of Wyoming (2006)  
B.S. - University of Wyoming (2004)                                      |                               |
| Anderson, Christina Zapffe| Associate Professor          | Film Photography                      | M.F.A. - Clemson University (2005)  
B.A. - Montana State University (2000)  
B.A. - University of Minnesota (1979)  
http://christinaZanderson.com |                               |
| Anderson, Dwight Mark    | Assistant Professor          | Agricultural Economics Economics      | Ph.D. - University of Washington (2011)  
B.S. - Montana State Univ-Bozeman (2005)                                  |                               |
| Anderson, Jennifer       | Extension Agent              |                                       | M.S. - University of Wyoming (2006)  
B.S. - University of Wyoming (2004)                                      |                               |
| Anderson, Kellee         | Extension Agent              |                                       | M.S. - University of Wyoming (2006)  
B.S. - University of Wyoming (2004)                                      |                               |
| Anderson, Ryan           | Associate Professor          | Chemical Biological Engineering       | Ph.D. - University of British Columbia (2012)  
B.A. - Bucknell University (2007)                                           | http://www.chbe.montana.edu/Staff/faculty_anderson.html |
| Anderson-McNamee, Jona Kathleen | Associate Professor      |                                       | M.Ed. - University of Great Falls (2004)  
| Andree, Sharon           | Assistant Teaching Professor | Nursing - Missoula/Kalispell         | M.S. - Tulane University (1967)  
B.S.N. - Idaho State University (1964)                                     |                               |
| Andrus, Shelley Louise   | Instructor                   | Nursing - Great Falls                 | M.S.N. - University of Phoenix (2007)  
B.S.N. - Montana State University (1993)                                   |                               |
| Antas, Linda             | Assistant Professor          | Music                                 | D.M.A. - University of Washington (2002)  
M.M. - U of Illinois at Urbana-Chmpgn (1996)  
Other - U of Illinois at Urbana-Chmpgn (1994)                                   | http://www.lindaantas.com |
| Antonioli, John T.       | Instructor                   | Mathematical Sciences                 | Ph.D. - University of Victoria (2013)  
M.S. - Montana State University (2008)  
B.A. - Alfred University (1987)  
A.A.S. - Suffolk County Comm College (1985)                                 |                               |
| Arnold, Bob Franklin     | Professor                    | Film Photography                      | Ph.D. - University of Iowa (1994)  
M.A. - University of Iowa (1980)  
B.F.A. - University of Illinois-Chicago (1977)                           |                               |
| Arnold, Shannon          | Associate Professor          | Agricultural Education               | Ph.D. - University of Florida (2007)  
M.S. - Texas AM University-Commerce (2003)  
B.S. - Texas AM Univ-College Station (1997)                                 |                               |
| Arthur-Sellegren, Jean   | Instructor                   | English                               | M.F.A. - University of Montana (1987)  
B.A. - University of Oregon (1982)                                          |                               |
| Artis, Brandy L.         | Instructor                   | Nursing - Bozeman                     | M.Ed. - North Dakota State University (2009)  
B.S. - University of North Dakota (2006)                                    |                               |
| Ashe, Carrie             | Extension                    |                                       | M.S. - Montana State Univ-Bozeman (1994)  
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<td>Parkinson, Hilary</td>
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