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 Montana State University Mechanical Engineering Program is accredited by the Engineering Accreditation Commission of ABET, http://www.abet.org (http://www.abet.org/).

The educational objectives for the Mechanical Engineering program are to prepare graduates who:

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	**Credits**	
	Fall	**Spring**
COMX 111US - Introduction to Public Speaking (formerly COM 110US) or CLS 101US - Knowledge and Community	3	
M 171Q - Calculus I	4	
EMEC 100 - Introduction to Mechanical Engineering	1	
EMEC 103 - CAE I-Engineering Graphics Communications	2	
PHSX 220 - Physics I with Calculus	4	
University Core Electives	3	
CHMY 141 - College Chemistry I & CHMY 142 - College Chemistry I Lab		4
WRIT 101W - College Writing I[1]		3
M 172 - Calculus II		4
PHSX 222 - Physics II with Calculus		4
University Core Electives		3
Year Total:	17	18
Sophomore Year	**Credits**	
	Fall	**Spring**
EGEN 201 - Engineering Mechanics-Statics	3	
EMEC 203 - CAE II-Mechanical Engineering Computations	2	
EMEC 250 - Mechanical Engineering Materials	3	
EMAT 252 - Materials Struct and Prop Lab	1	
M 273 - Multivariable Calculus	4	
University Core Electives	3	
EGEN 202 - Engineering Mechanics -- Dynamics		3
EGEN 205 - Mechanics of Materials		3
M 274 - Introduction to Differential Equation		4
ETME 215 - Manufacturing Processes		3
ETME 216 - Manufacturing Process Laboratory		1
EELE 250 - Circuits, Devices and Motors		4
Year Total:	16	18
Junior Year	**Credits**	
	Fall	**Spring**
EGEN 335 - Fluid Mechanics	3	
EMEC 303 - CAE III-- Systems Analysis	3	
EMEC 320 - Thermodynamics I	3	

EMEC 341 - Adv Mechanics of Materials	3	
EGEN 350 - Applied Engineering Data Analysis	2	
EMEC 321 - Thermodynamics II		3
EMEC 326 - Fundamentals of Heat Transfer		3
EMEC 342 - Mechanical Component Design		3
EMEC 360 - Measurement & Instrumentation		3
EMEC 361 - Measurement & Instrument Lab		1
EGEN 310R - Multidisciplinary Engineering Design		3
Year Total:	14	16
Senior Year	**Credits**	
	Fall	**Spring**
EGEN 330 - Business Fundamentals for Technical Professionals	3	
EMEC 445 - Mechanical Vibrations	3	
EMEC 489R - Mechanical Engineering Design Capstone I	2	
Professional Electives[2]	6	
EMEC 499R - Mechanical Engineering Design Capstone II		3
EGEN 488 - Fundamentals of Engineering Exam		0
Professional Electives[2]		6
Professional Elective - Take one of the following:		3
EMEC 405 - Finite Element Analysis		
EMEC 436 - Computational Fluid Dynamics		
University Core Electives		3
Year Total:	14	15
Total Program Credits:		**128**

Approved ME Professional Elective Courses

BCH 441	Biochemistry of Macromolecules	3
BIOB 425	Adv Cell & Molecular Biology *	3
EBIO 461	Principles of Biomedical Engineering	3
ECHM 424	Transport Analysis	3
EELE 321	Introduction To Feedback Controls	3
EELE 371	Microprocess HW and SW Systems *	4
EGEN 415	Advanced Mechanics of Solids	3
EGEN 435	Fluid Dynamics	3
EIND 313	Work Design and Analysis	3
EIND 410 & EIND 411	Interaction Design and Interaction Design Project	3
EIND 413	Ergonomics & Human Factors Engineering	3
EIND 425	Technology Entrepreneurship	3
EIND 434	Project Management for Engineers	3
EMAT 350	Engineering Materials	3
EMAT 460	Polymeric Materials	3
EMAT 461	Friction and Wear of Materials	3
EMAT 462	Manufacturing of Composites	3
EMAT 463	Composite Materials	3
EMAT 464	Biomedical Materials Engineering	3
EMEC 403	CAE IV--Design Integration	3
EMEC 405	Finite Element Analysis	3
EMEC 424	Cellular Mechanotransduction	3
EMEC 425	Advanced Thermal Systems	3
EMEC 426	Thermodynamics of Propulsion Systems	3
EMEC 430	Introduction to Combustion	3
EMEC 436	Computational Fluid Dynamics	3
EMEC 440	Biomechanics of Human Movement	3
EMEC 444	Mech Behavior of Materials	3
EMEC 447	Aircraft Structures	4
EMEC 462	System Dynamics and Control	3
EMEC 465	Bio-inspired Engineering	3
EMEC 466	Acoustics, Engineering and the Environment	3
EMEC 467	Micro-Electromechanical Systems	3
EMEC 490R	Undergraduate Research	1-3
EMEC 492	Independent Study	1-3
EMEC 498	Internship	1-3
ETME 410	Computerized Numerical Control and Computer-aided Manufacturing Technology	3
ETME 415	Design for Manufacturing and Tooling	3
ETME 422	Principles of HVAC I	3
ETME 430	Fluid Power Systems Design	3
ETME 470	Renewable Energy Applications	3
M 349	Techniques of Applied Mathematics II	3
M 441	Numerical Linear Algebra & Optimization *	3
M 442	Numerical Solution of Differential Equations *	3
M 450	Applied Mathematics I	3
M 451	Applied Mathematics II *	3
M 472	Introduction to Complex Analysis	3

1 Students exempt from MSU writing requirement must still complete a 3 credit writing intensive course. See MIE Writing Policy (http://www.montana.edu/mie/students/advising_forms/documents/Advising_Forms_All_Terms/Writing%20Exemption%20Policy%206-30-15.pdf).

2 See ME PE Policy (http://www.montana.edu/mie/students/mechanical_engineering_professional_electives_policy.html) for details.

* The courses have prerequisites outside of the normal ME prerequisite structure

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.