

College of Engineering

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

- Department of Chemical & Biological Engineering (<http://catalog.montana.edu/undergraduate/engineering/chemical-biological-engineering>)
 - BS Biological Engineering
 - BS Chemical Engineering
- Department of Civil Engineering (<http://catalog.montana.edu/undergraduate/engineering/civil-engineering>)
 - BS Civil Engineering
 - Bio-Resources Engineering Option
 - Civil Engineering Option
 - BS Construction Engineering Technology
- Department of Computer Science (<http://catalog.montana.edu/undergraduate/engineering/computer-science>)
 - BS Computer Science
- Department of Electrical & Computer Engineering (<http://catalog.montana.edu/undergraduate/engineering/electrical-computer-engineering>)
 - BS Computer Engineering
 - BS Electrical Engineering
- Department of Mechanical & Industrial Engineering (<http://catalog.montana.edu/undergraduate/engineering/mechanical-industrial-engineering>)
 - BS Financial Engineering
 - BS Industrial & Management Systems Engineering
 - BS Mechanical Engineering
 - BS Mechanical Engineering Technology

The College of Engineering offers several minors:

- Aerospace (<http://catalog.montana.edu/undergraduate/engineering/mechanical-industrial-engineering/aerospace-minor>)
- Building Energy Systems (<http://catalog.montana.edu/undergraduate/engineering/mechanical-industrial-engineering/building-energy-systems-minor>)
- Computer Science (<http://catalog.montana.edu/undergraduate/engineering/computer-science/computer-science-minor-nonteaching>)
- Computer Engineering (<http://catalog.montana.edu/undergraduate/engineering/electrical-computer-engineering/computer-engineering/computer-engineering-nonteaching-minor>)
- Electrical Engineering (<http://catalog.montana.edu/undergraduate/engineering/electrical-computer-engineering/electrical-engineering/electrical-engineering-nonteaching-minor>)
- Engineering Management (<http://catalog.montana.edu/undergraduate/engineering/mechanical-industrial-engineering/eims-minor>)
- Financial Engineering (<http://catalog.montana.edu/undergraduate/engineering/mechanical-industrial-engineering/financial-engineering-minor>)
- Materials (<http://catalog.montana.edu/undergraduate/engineering/mechanical-industrial-engineering/materials-minor>)
- Mechatronics (<http://catalog.montana.edu/undergraduate/engineering/mechanical-industrial-engineering/mechatronics-minor>)
- Military Studies: Air Force ROTC (<http://catalog.montana.edu/undergraduate/engineering/military-science-airforce-rotc>) and Army ROTC (<http://catalog.montana.edu/undergraduate/engineering/military-science-army-rotc>)

The College of Engineering provides administrative support for the Reserve Officers' Training Corps (ROTC) programs in the Air Force and Army. A complete description of each individual degree program is provided later in this section under the heading of the appropriate department. The following is a highlight of the mission, goals, and objectives of the College of Engineering and applies to all of its programs.

College Mission

The College of Engineering will serve the State of Montana and the nation by:

- Fostering lifelong learning
- Integrating learning and discovery
- Developing and sharing technical expertise
- Empowering students to be tomorrow's leaders

College Vision

The College of Engineering at Montana State University will be an outstanding collaborative community that achieves excellence in learning, innovation, discovery, and knowledge transfer. To realize this vision, the college will

- Leverage shared interests and talents among faculty and students in order to create knowledge across disciplinary lines.
- Effectively and efficiently balance breadth with depth in undergraduate education in order to prepare students for the global workforce.
- Be a leader in innovation and discovery in our identified focus areas.
- Successfully integrate research and innovation into the learning experience of both undergraduate and graduate students.

- Be recognized for the level of knowledge transfer to industry, governments, and citizens in the state of Montana.

College Core Values

Members of the MSU College of Engineering community approach all of their work with the following deeply held core values:

- *Life-long learning.* The college is a community that believes in and fosters life-long learning in all of its members—undergraduate students, graduate students, faculty, and staff. Life-long learning also extends beyond the college community to state and national constituencies.
- *Knowledge Discovery.* At the heart of the college community's activities are knowledge discovery and dissemination and the creativity that accompanies these activities. We believe that knowledge discovery informs and enriches the life-long learning of the entire college community.
- *Collaboration.* We believe that collaboration and collegiality both inside and outside of our college community enrich all college activities.
- *Inclusiveness.* The college is a community that welcomes and encourages diverse points of view and backgrounds, believing that this inclusiveness enriches our creative learning environment.
- *Professionalism.* The College of Engineering community approaches all activities with a high degree of professionalism, working with integrity, honesty, and commitment to excellence.

College Goals

The goals of the College of the Engineering are as follows:

- Prepare the MSU COE community to engage effectively with the global community.
- Build on growing college synergy and increase cross-disciplinary activities at every level of the COE community, including not only faculty research and creative activity, but also the student experience.
- Establish the college as a leader in the state and national technological community.

Engineering Program Educational Objectives, Assessment, and FE Exam Requirement

ABET, Inc., the recognized accreditor for college and university programs in applied science, computing, engineering, and technology, has established standards and criteria for the accreditation of undergraduate computing, engineering and engineering technology programs. Individual programs have program educational objectives that are consistent with ABET and with the needs of the program's constituents.

Assessment of program objectives is a dynamic and ongoing process. One assessment strategy is to examine the results of the Fundamentals of Engineering (FE) examination. The FE exam is a nationally normalized test that is required of graduating engineering seniors at MSU. Students are required to enroll in EGEN 488 (Fund of Engineering Exam) during their last semester, register for the exam on the NCEES website, take the FE Exam, and make an honest and serious effort to pass 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.

Becoming a Registered Professional Engineer

Requirements to become a registered professional engineer are established by each state, and typically include provisions that address education and experience, direct demonstration of competence through prescribed examinations, and confirmation of personal and professional integrity by references. Generally, graduation from an accredited engineering degree program satisfies the educational requirement. Such graduation, coupled with passing the Fundamentals of Engineering Exam, and positive character references results in award of Engineer-in-Training status. Following accumulation of appropriate experience working under the supervision of a professional engineer (often for four years), an Engineer-in-Training can apply to take the professional engineer's exam, and subsequently apply for full professional registration. In this process, a degree from the ABET accredited engineering programs at MSU typically satisfies the educational requirements for professional licensure. MSU engineering students are required to take the Fundamentals of Engineering (FE) Exam as part of their degree program, which is the first of the two nationally standardized exams required in seeking licensure.

Student Performance and Retention

Students admitted to MSU will automatically be eligible for admission to College of Engineering (COE) programs. The College of Engineering is committed to retaining each admitted student within the COE and MSU, and to helping them achieve their fullest academic potential.

Students are required by Board of Regents policy to achieve a C- or better grade in each class used to satisfy the COE Bachelor of Science degree requirements. If repeating a course is necessary in order to meet this requirement, students are expected to repeat the course successfully (C- or better) prior to taking a follow-on course for which the repeated course is a prerequisite.

Accreditation

The following engineering programs are specifically accredited by the Engineering Accreditation Commission of ABET, <http://www.abet.org>:

- Chemical Engineering
- Civil Engineering
- Computer Engineering
- Electrical Engineering
- Industrial & Management Systems Engineering
- Mechanical Engineering

The Biological Engineering degree went through the accreditation review process in 2016 and will receive its formal accreditation in 2017.

The following engineering technology programs are accredited by the Technology Accreditation Commission of ABET, <http://www.abet.org>:

- Construction Engineering Technology
- Mechanical Engineering Technology

The Computer Science program is accredited by the Computing Accreditation Commission of ABET, <http://www.abet.org>.

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:

- \$93.00 per semester for Freshmen (flat rate).
- \$133.00 per semester for Sophomores through graduate level (flat rate).
- \$52.80 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 EMPower program seeks to enhance outreach, recruitment and retention to increase the number of Native Americans who graduate from MSU with Engineering or Computer Science degrees. Our vision is to become firmly established as the premier institution of choice for Native American students in engineering, engineering technology and computer science in the northern Rockies and the northern Great Plains regions

and to be a successful partner with Native American communities in developing the future workforce.

Font Notice

This document should contain certain fonts with restrictive licenses. For this draft, substitutions were made using less legally restrictive fonts. Specifically:

Times was used instead of Adobe Garamond Pro.

The editor may contact Leepfrog for a draft with the correct fonts in place.