MECHANICAL ENGINEERING
Engineering the Way!

Degrees Offered

Master of Science (Mechanical Engineering)
Doctor of Philosophy (Mechanical Engineering)

Program Overview

The Mechanical Engineering Department offers the Master of Science and Doctor of Philosophy degrees in Mechanical Engineering. The program demands academic rigor and depth yet also addresses real-world engineering problems.

The department has four broad divisions of research activity that stem from the core fields of Mechanical Engineering:

- Biomechanics
- Robotics, Automation, and Design
- Solid Mechanics and Materials
- Thermal-Fluid Systems.

In many cases, individual research projects encompass more than one research area and elements from other disciplines.

Degree Requirements

The Master of Science degree in Mechanical Engineering (thesis or non-thesis option) requires 30 credit hours. Requirements for the M.S. are 24 credit hours of coursework and 6 credit hours of thesis research. The M.S. non-thesis option requires 30 credit hours of coursework.

The Ph.D. in Mechanical Engineering degree requires 72 credit hours of course work and research credits. A minimum of 42 credit hours of course work and 30 credit hours of research credit must be completed.

All graduate degrees require core courses from the Mechanical Engineering Department and technical electives which are courses in any technical field approved by your Advisor and/or Thesis Committee.

Find degree requirements and course lists at: [http://mechanical.mines.edu/MECH-graduate-programs](http://mechanical.mines.edu/MECH-graduate-programs)

Admission Requirements

The Mechanical Engineering Graduate Admissions and Recruiting Committee review applicants for admissions for the Fall and Spring semesters. Applicants must have a complete application submitted to the Graduate School by the posted deadlines to be considered for admission.

We strongly encourage you to meet the Fall admission priority deadline of December 15th if you are seeking funding. Fall admission decisions with funding decisions are typically determined by early February. Accepted applicants are invited to campus for a Graduate Visit Day in late February to mid-March.

Minimum Admissions Requirements

- a baccalaureate degree in engineering, computer science, a physical science, or mathematics with a minimum grade-point average of 3.0 or better on a 4.0 scale;
- Graduate Record Examination (Quantitative Reasoning) section score of 160 or higher. Applicants from an engineering program at CSM are not required to submit GRE scores;
- TOEFL score of 79 or higher or (550 or higher paper-based or 213 computer-based) for applicants whose native language is not English.

Financial Support

Funding is available to outstanding students through teaching assistantships (TAs), research assistantships (RAs), and a select number of fellowships. These contracts typically include full coverage of tuition, fees, health insurance, and a stipend. Federal Financial Aid in the form of student loans are also available to give graduate students additional funding beyond any assistantships and fellowships they might receive. Also visit the ME fellowship page for information about available external fellowships and grants.

Learn More
Mechanical Engineering [mechanical.mines.edu](http://mechanical.mines.edu)
Admissions: [mines.edu/graduate_admissions](http://mines.edu/graduate_admissions)
Financial Aid: [mines.edu/HowToPay_GS](http://mines.edu/HowToPay_GS)
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Research Divisions

**Biomechanics** focuses on the application of engineering principles to the musculoskeletal system and other connective tissues. Research activities include experimental, computational, and theoretical approaches with applications in the areas of rehabilitation engineering, computer-assisted surgery and medical robotics, patient-specific biomechanical modeling, intelligent prosthetics and implants, and bioinstrumentation. The Biomechanics group has strong research ties with other campus departments, the local medical community, and industry partners.

**Robotics, Automation, and Design** merges research from multiple areas of science and engineering. Topics include the design of robotic and automation system hardware and software, particularly for tasks that require some level of autonomy, intelligence, self-prognostics and decision making. Such capabilities are built upon integrated mechatronic systems that enable pro-active system responses to its environment and current state. These capabilities are applied in applications such as advanced robotics and manufacturing systems. Research in this division explores the science underlying the design process, implementation of mechanical and control systems to enable autonomy, and innovative computational analysis for automation, intelligence, and systems optimization.

One of the main challenges in robotics is the lack of a means to effective and natural human-robot interaction. Currently, the user must generate explicit service requests to control the robot's actions, which involves encumbering physical body movements and/or manipulation of an input device. The objective of our research is to develop intention-aware robots which will implicitly understand the user's intention in real time and proactively take the corresponding action at the right time.

**Solid Mechanics and Materials** develop novel computational and experimental solutions for problems in the mechanical behavior of advanced materials. Research in the division spans length scales from nanometer to kilometer, and includes investigations of microstructural effects on mechanical behavior, nanomechanics, granular mechanics, and continuum mechanics. Material-behavior models span length scales from the nano- and micro-scale, to the meso- and macro-scale. Much of the research is computational in nature using advanced computational methods such as molecular dynamics, finite-element, boundary-element and discrete-element methods. Strong ties exist between this group and the campus communities of applied mathematics, chemical engineering, materials science, metallurgy, and physics.

**Thermal-Fluid Systems** incorporates a wide array of multidisciplinary applications such as advanced energy conversion and storage, multi-phase fluid flows, materials processing, combustion, alternative fuels, and renewable energy. Research in thermal-fluid systems integrates the disciplines of thermodynamics, heat transfer, fluid mechanics, transport phenomena, chemical engineering, and materials science towards solving problems and making advances through experiments and computational modeling in the broad areas of energy conversion, fluid mechanics, and thermal transport. Research projects in this area specialize in some aspect of mechanical engineering but often have a strong interdisciplinary component in related fields such as Materials Science and Chemical Engineering.

Assistant Professor Xiaoli Zhang's Research Group

Assistant Professor Jason Porter's research group
Faculty

The Mechanical Engineering Department is led by Professor and Department Head Gregory Jackson. Our faculty consist of George R. Brown Distinguished Professor Robert Kee and three full Professors, five Associate Professors, eleven Assistant Professors and six Teaching Associate Professors. The ME Department also is home to several Emeritus, Research and Affiliate Professors.

Please visit [http://inside.mines.edu/MECH-People](http://inside.mines.edu/MECH-People) for faculty pictures, contact information, bio’s and research interest.

As department head, Prof. Jackson brings significant academic experience to the department. Before joining CSM in 2013, Jackson was a faculty member for 15 years at the University of Maryland in the Department of Mechanical Engineering and their campus-wide Energy Research Center.

Professor Kee holds the George R. Brown Distinguished chair. Dr. Kee’s research interests are primarily in modeling and simulation of chemically reacting fluid flow. Applications are generally in the area of clean energy, including fuel cells, photovoltaics, and advanced combustion.

Faculty Spotlights

Professor Stebner joined the CSM faculty in 2013. In addition to his full appointment in Mechanical Engineering, he is jointly appointed in Metallurgical and Materials Engineering and he also advises students through the multidisciplinary Materials Science program. He was a postdoctoral scholar of the Graduate Aerospace Laboratories at the California Institute of Technology (GALCIT) after earning his Ph.D. from Northwestern University and B.S. and M.S. degrees from The University of Akron. Concurrent to his PhD program, he held an appointment as a Lecturer of the Segal Design Institute at Northwestern University.

Professor Silverman earned her B.S.E. from Arizona State University and M.S.E. and Ph.D. from The University of Texas at Austin.

Her research program in musculoskeletal biomechanics centers on understanding muscle function to develop effective treatment and device interventions. Dr. Silverman uses experimental gait analysis and computational whole-body modeling techniques to identify functional roles of individual muscles in pathological movement. These tools are applied to various motions and populations with the ultimate goal of improving mobility for people with disabilities.