DEPARTMENT OF CHEMICAL AND MATERIALS ENGINEERING


Chemical Engineering Program

The Chemical Engineering Program is an ABET accredited program that combines the science of chemistry with the discipline of engineering in order to solve problems and to increase process efficiency. One of the most attractive aspects of a chemical engineering future is the variety of work available. The Chemical Engineering Program is a blend of physics, chemistry, and mathematics; thus, a chemical engineer possesses a versatility that gives him or her many opportunities for employment in fields such as energy systems, pulp and paper, environmental engineering, food products, nuclear power, petroleum and petrochemicals, semiconductors, synthetic fuels, radioisotope applications, plastics and polymers, pharmaceuticals, education, biomedical engineering, computer applications, alternate energy sources, steel, nano-technology and textiles. A chemical engineer can choose work in: research and development, design and construction, operations, management, teaching, or technical sales.

The mission of the Chemical Engineering Program is to provide quality educational programs firmly based in fundamental concepts and to perform and publish outstanding chemical engineering research. The goals of the Chemical Engineering Program are

1. to prepare students with a broad-based education grounded in chemical engineering fundamentals,
2. to maintain an environment that promotes effective student/faculty involvement in teaching, research, and mentoring,
3. to promote an active interaction with regional industries, and
4. to graduate students capable of independent life-long learning.

In addition, the educational objective of the Department of Chemical and Materials Engineering is to prepare students who

1. are well grounded in the fundamentals of chemical engineering,
2. can understand, analyze, and design efficient processes,
3. are proficient in the oral and written communication of their work and ideas,
4. are able to work in multidisciplinary teams in conjunction with their design, formulation of problems, and conducting of experiments,
5. understand the safety and environmental consequences of their work, and
6. are instilled with a sense of social responsibility, ethics, and a commitment to life-long learning.

Progress towards these goals and objectives is assessed by student performance on the nationally administered Fundamentals in Engineering Examination, performance at international design competitions, exit interviews with graduating students, and surveys of graduated students and their employers.

The faculty of the Chemical Engineering Program is dedicated to excellence in teaching. It is the faculty’s goal to provide the students with a strong, well-rounded background for immediate entry into the industrial workforce or for graduate study. This background includes the theoretical aspects of chemical engineering as well as practical work experiences. Thus, much of the equipment that is installed in Chemical Engineering laboratories is on the scale of pilot plant equipment. Because much of the equipment is made of glass, students are able to see at a glance what processes occur and where the streams are flowing. The department has a two-story distillation column, a gas absorber, two-stage evaporator, two types of chemical reactors, a catalytic reactor, liquid extraction equipment, membrane-based gas separation, three scanning probe microscopes, three vibrational spectroscopy instruments, multiple gas chromatographs, process control labs, and supporting analytical equipment all used by undergraduate students. Proof that the program’s goals are being achieved is in the job-placement statistics for chemical engineers from UI. Most receive job offers before graduation and many graduates now hold high-level technical and management positions in industry, government, and academia.

Students entering the graduate program in Chemical Engineering can work towards an M.S., M. Engr., or Ph.D. degree. The department has available a number of fellowships and assistantships for students, from industry and alumni, UI graduate assistantships, and externally-funded research assistantships. Entering graduate students must normally hold a B.S. in Chemical Engineering. The graduate program also includes provisions for study leading to an M.S. in Chemical Engineering for students who have a B.S. degree in a related field. Students will be required to register as undergraduates for as many semesters as needed to meet prerequisites to courses required for the M.S. (Ch.E.) degree.

Graduate studies in this program are highly diversified in order to accommodate the needs of most students who have a good basic background in the physical sciences, mathematics, and engineering. Areas of expertise include chemical reaction engineering, simulation, optimization and process design especially for energy systems, pulp and paper, food applications, hazardous waste characterization and bioremediation, membranes, nanoscience, fluid mechanics, biochemical engineering, and mass transfer. The graduate program in chemical engineering requires the GRE with scores of: Analytical >4.5, Quantitative >157 and Verbal >153, as well as a TOEFL score of at least 550 (paper based) or 79 (computer based).

Materials Science and Engineering Program

The educational objectives of the Materials Science and Engineering Program are to educate graduates who will

1. use their mathematics and science background to formulate and solve engineering problems,
2. remain current in modern technology and in tools of engineering practice,
3. demonstrate an understanding of current economic and societal issues associated with engineering projects and their impacts,
4. be able to communicate effectively with engineers and non-engineers while working independently or on teams to develop engineering solutions,
5. demonstrate an understanding of their professional and ethical responsibilities as engineers and uphold their responsibility to the public and occupational health and safety,
6. demonstrate the importance of life-long learning and continued professional growth.
Our Materials Science and Engineering Program is an ABET accredited program with an educational mission to produce graduates equipped to begin competitive and productive careers in their engineering professions; they define and solve materials science and engineering problems to meet desired needs and produce societal benefits; while understanding the importance of working responsibly, acting ethically and pursuing professional growth.

Although the program emphasizes economics and technology, engineering training also includes environmental, ethical, and safety concerns. As technological and engineering fields, these professional disciplines offer tremendous opportunities for the person who wishes to become involved in the application of materials science and engineering, often in sophisticated designs, to the preservation and enhancement of our society. The program provides technical training to prepare our graduates for productive and rewarding engineering careers.

Laboratory facilities for Materials Science and Engineering include: state-of-the-art magnetic, thin-film, electrical and optical materials characterization, semiconductor processes including thin-film sputtering and deposition, inductively-coupled plasma processing, electron cyclotron resonance plasma dry etching, mechanical alloying, vacuum arc furnaces, combustion synthesis, clean room, electron beam lithography, ion beam technology, electro-chemistry, computer chip and bio-chip design, micro-electromechanical systems (MEMS), nanomaterials, nano-devices and other modern technologies including optical, electron and atomic force microscopies, x-ray diffraction, differential scanning calorimetry and thermogravimetric analysis, etc. These laboratories provide an understanding of nanoscale technology, magnetic, electronic, bio-active, ceramic, polymeric, metallic and intermetallic materials.

Our faculty has proven their qualifications by their credentials in national and international professional societies. They are well known by their publications, research, and contract work. Most students find employment in the summer or on a cooperative basis, so that they can become more intimately involved in the disciplines that they are studying. Exposure to the department faculty members provides students with a one-to-one interaction and an expertise that enables them to be truly competitive when they enter the real world.

The program is designed to take advantage of the other excellent facilities of the university and other engineering disciplines. The program of study also includes involvement with practical aspects of professional practice by exposure to regional industries and research groups through field trips, guest speakers, study problems, and work time during the summer.

A minor in Materials Science and Engineering is offered that integrates with majors in chemical or mechanical engineering along with other engineering and science disciplines. This minor allows the graduate to combine expertise in materials with another technical discipline.

A minor in Metallurgical Engineering is offered that integrates with majors in either chemical or materials engineering, and allows the graduate to specialize in the minerals processing area of metal materials, fabrication, and research.

The program offers the Master of Science (M.S.) and the Doctor of Philosophy (Ph.D.) degrees in Materials Science and Engineering. These programs include a mix of theoretical and practical study most appropriate to each student. Studies include topics on nanotechnology, electronic materials, alternative energy materials (nuclear, solar, etc.), and advanced materials processing techniques, as well as traditional areas, such as corrosion, welding, powder metallurgy, etc. Some students prefer to work on applied problems presented by regional industry or research establishments, generally with funding from outside sources. Studies can be tailored to individual interests. The graduate program in MSE requires a TOEFL score of at least 550 (paper based) or 79 (computer based).

These advanced studies are financed by research grants, industry sponsors, or departmental funding. They are designed to train the individual in research methods and investigative procedures that will later enhance his or her ability in industrial or research environments or in teaching. The master's program involves both class work and research, the latter being designed to familiarize the student with research methods. In the doctoral program, the student is expected to break new ground and advance the field scientifically and to maintain the competitive technological lead enjoyed in the U.S. for so many years. The master's program generally requires 12 to 24 months beyond the B.S. degree and the doctoral program entails at least three years beyond the B.S. degree.

Most students find employment in the summer or on a cooperative basis, so that they can become more intimately involved in the processes that they are studying. The total program enables the person to leave the university with confidence, either as a baccalaureate student or at the master's or doctoral level, with the capability of a truly competent professional. Materials and metallurgical engineers have a wide variety of career options. They range all the way from primary metals/ceramics/polymer production through advanced materials industries. There are opportunities in technological areas with names and processes not even dreamed of just a few decades ago: plasma extractive processing, ceramic powder synthesis, bio-corrosion, magnetic recording media, and electron microscopy. The materials produced are transformed into the products we use in our daily lives, such as our cars, home appliances, farm equipment, and electrical and electronic equipment. Everything we touch, with the exception of agricultural or forestry products, has had its origin as a mineral in the earth. Materials engineers and scientists develop new products to fit specific demands, such as materials to withstand high stress, high temperature environments, or the extreme cold, radiation and vacuum of outer space. Some of our graduates are also employed as engineering consultants or by government agencies.

### Majors

- Chemical Engineering (B.S.Ch.E.) ([https://catalog.uidaho.edu/colleges-related-units/engineering/chemical-materials-engineering/chemical-engineering-bsche](https://catalog.uidaho.edu/colleges-related-units/engineering/chemical-materials-engineering/chemical-engineering-bsche))

### Minors


### Chemical and Materials Engineering Graduate Program

Candidates must fulfill the requirements of the College of Graduate Studies and of the Department of Chemical and Materials Engineering.
See the College of Graduate Studies (https://catalog.uidaho.edu/colleges-related-units/graduate-studies) section for the general requirements applicable to each degree.

- Chemical Engineering (M.S.) (https://catalog.uidaho.edu/colleges-related-units/engineering/chemical-materials-engineering/chemical-engineering-ms)
- Chemical Engineering (M.Engr.) (https://catalog.uidaho.edu/colleges-related-units/engineering/chemical-materials-engineering/chemical-engineering-mengr)
- Chemical Engineering (Ph.D.) (https://catalog.uidaho.edu/colleges-related-units/engineering/chemical-materials-engineering/chemical-engineering-phd)
- Materials Science and Engineering (M.S.) (https://catalog.uidaho.edu/colleges-related-units/engineering/chemical-materials-engineering/materials-science-engineering-ms)
- Metallurgical Engineering (M.S.) (https://catalog.uidaho.edu/colleges-related-units/engineering/chemical-materials-engineering/metallurgical-engineering-ms)
- Metallurgy (M.S.) (https://catalog.uidaho.edu/colleges-related-units/engineering/chemical-materials-engineering/metallurgy-ms)