DEPARTMENT OF CHEMICAL AND BIOLOGICAL ENGINEERING

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

The educational objectives for graduates from the chemical engineering baccalaureate (B.S.) program are to

1. advance their careers through demonstrated skill in engineering analysis, modeling and simulations, experimental methods, application of codes and standards, process implementation, product manufacturing, and design;
2. drive client and stakeholder satisfaction through ethical, sustainable, and safe work practices; effective project management; and optimal use of time, talents, and budgetary resources;
3. become acknowledged as an effective communicator within their field or industry through the creation of clear problem statements, informative technical reports, and useful participation in technical conferences or through knowledge-sharing technologies; and
4. prioritize life-long learning and advancement through entrepreneurship; activity in professional societies, organizations, and communities; innovation; pursuit of continuing education and graduate degrees; professional licenses or certifications; or other professional development activities.

The educational objectives for graduates from the biological engineering baccalaureate (B.S.) program include the following:

1. Learn and integrate: Graduates will be proficient engineering problem solvers capable of identifying, formulating, and solving engineering problems by applying their knowledge of mathematics, chemistry, physics, engineering, and appropriate processing, biochemical, biomedical, and environmental topics.
2. Think and create: Graduates will be effective engineers who can apply their skills to design systems, components, and processes to solve engineering problems for an ever-changing world.
3. Communicate: Graduates will be effective written and verbal communicators as well as productive team members.
4. Clarify purpose and perspective: Graduates will have a strong professional identity with a keen awareness of their professional and ethical responsibility, and they will practice lifelong learning.
5. Practice citizenship: Graduates will design for advancement and sustainability of their local, national, and global communities protecting human health and safety and practicing environmental stewardship.

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

Upon graduation, students will be able to

1. identify, formulate, and solve complex engineering problems by applying principles of engineering, sciences, and mathematics;
2. apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors;
3. communicate effectively with a range of audiences;
4. recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts;
5. function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives;
6. develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions; and
7. acquire and apply new knowledge as needed, using appropriate learning strategies.

Chemical Engineering Program

The Bachelor of Science in chemical engineering is accredited by the Engineering Accreditation Commission of ABET, https://www.abet.org, which 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 them 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, nanotechnology, and textiles. A chemical engineer can choose work in research and development, design and construction, operations, management, teaching, or technical sales.

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, a 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 U of I. 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. (thesis), M.Engr. (non-thesis), 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. 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 >4.5 in Analytical, >157 in Quantitative, and >153 in Verbal, as well as a TOEFL score of at least 550 (paper-based) or 79 (computer-based).

Biological Engineering Program

The Bachelor of Science (B.S.) in biological engineering is accredited by the Engineering Accreditation Commission of ABET (https://www.abet.org), which integrates engineering principles with biological systems to develop new technologies and solutions to address societal needs. For example, biological engineers improve environmental quality, engineer bacteria to produce value-added products, develop equipment to harvest and process food, and design/manufacture medical devices. Given the diversity of the biological engineering discipline, biological engineers find themselves working in a variety of fields including bioprocessing, bioenergy, environmental, food production, agricultural, pharmaceutical, and biomedical. This diverse expertise makes biological engineers exceptionally valuable in today's challenging world.

The Biological Engineering Program offers courses in biology, chemistry, mathematics, and physics that prepare students for more advanced courses in biotransport processes, bio-based products, bioenergy, biomedical engineering, bioprocessing, and sustainability. Much of our students' education takes place in labs: making discoveries about renewable energy in the advanced biofuel lab, designing controls and instruments in the power lab, analyzing medical images in the neurophysiology lab, and operating bioreactors in cell and tissue engineering lab.

The graduate program is offered in biological engineering with specialization in bio-based products, biofuels, biomaterials, bioprocessing, biotechnology, cell/tissue engineering, climate modeling, environmental impact assessment, gene/drug delivery, liquid plasma technology, nanotechnology, neural imaging, precision agriculture, wastewater treatment, and water management. The graduate degrees offered in biological engineering are Master of Science (M.S.) with a thesis, Master of Engineering (M.Engr.) with a non-thesis, and Doctor of Philosophy (Ph.D.). Prospective students should have the equivalent of a B.S. degree in engineering and science.

Majors

- Biological Engineering (B.S.) (https://catalog.uidaho.edu/colleges-related-units/engineering/chemical-biological-engineering/biological-engineering-bs/)
- Chemical Engineering (B.S.Ch.E.) (https://catalog.uidaho.edu/colleges-related-units/engineering/chemical-biological-engineering/chemical-engineering-bsche/)

Certificate

- Biomedical Engineering Undergraduate Certificate (https://catalog.uidaho.edu/colleges-related-units/engineering/chemical-biological-engineering/biomedical-engineering-undergraduate-certificate/)

Chemical and Biological Engineering Graduate Program

- Biological Engineering (M.Engr.) (https://catalog.uidaho.edu/colleges-related-units/engineering/chemical-biological-engineering/biological-engineering-mengr/)
- Biological Engineering (M.S.) (https://catalog.uidaho.edu/colleges-related-units/engineering/chemical-biological-engineering/biological-engineering-ms/)
- Biological Engineering (Ph.D.) (https://catalog.uidaho.edu/colleges-related-units/engineering/chemical-biological-engineering/biological-engineering-phd/)
- Chemical Engineering (M.Engr.) (https://catalog.uidaho.edu/colleges-related-units/engineering/chemical-biological-engineering/chemical-engineering-mengr/)
- Chemical Engineering (M.S.) (https://catalog.uidaho.edu/colleges-related-units/engineering/chemical-biological-engineering/chemical-engineering-ms/)
- Chemical Engineering (Ph.D.) (https://catalog.uidaho.edu/colleges-related-units/engineering/chemical-biological-engineering/chemical-engineering-phd/)