Chemical Engineering, B.S.E.

The undergraduate program in chemical engineering produces graduates who have a strong foundation of scientific and technical knowledge and are equipped with problem solving, teamwork, and communication skills that will serve them throughout their careers, consistent with the following educational objectives.

Educational Objectives

Within a few years of graduation, the program’s graduates will:

• attain careers as practicing chemical engineers in fields such as pharmaceuticals, microelectronics, chemicals, polymers/advanced materials, food processing, energy, biotechnology, and environmental engineering;
• attain advanced studies in disciplines such as chemical engineering, environmental engineering, medicine, law, and business; and
• assume professional leadership roles.

The undergraduate program in chemical engineering uses the following methods and strategies to achieve its educational objectives:

• foster a personalized, supportive environment for all students by taking advantage of the unique combination of a small college atmosphere in a major research university;
• enrich the undergraduate experience through cultural diversity and international opportunities or experiential learning;
• provide a solid foundation and understanding of the fundamental principles of mathematics, science, and engineering;
• provide students with experience in learning and applying tools (e.g., computer skills) to solve theoretical and open-ended chemical engineering problems;
• provide students with opportunities to participate in multidisciplinary teams and to develop and practice written and oral communication skills, both within the team and to a broader audience;
• provide students with opportunities to design and conduct chemical engineering experiments and to design systems, components, and chemical processes to meet specific needs and constraints; and
• provide a contemporary grounding in professional responsibility, including ethics, the global and societal impact of engineering decisions, and the need for lifelong learning.

Requirements

The Bachelor of Science in Engineering requires a minimum of 128 s.h. The major in chemical engineering provides a broad education at the leading edge of technology. It emphasizes fundamental concepts, problem solving, laboratory techniques, and communication skills. The biological sciences join physics, chemistry, and mathematics as foundation disciplines for chemical engineering.

All engineering students complete the B.S.E. core requirements, which include RHET:1030 Rhetoric; ENGR:1100 Introduction to Engineering Problem Solving and ENGR:1300 Introduction to Engineering Computing; and courses in chemistry, physics, engineering mathematics and fundamentals, and the general education component. For information about the B.S.E requirements, see Bachelor of Science in Engineering in the Catalog. Seminars do not count toward the 128 s.h. required for the degree.

The sophomore, junior, and senior years emphasize chemical engineering courses such as process calculations, fluid flow, chemical engineering thermodynamics, heat and mass transfer, separations, chemical reaction engineering, chemical process safety, chemical engineering laboratories, biochemical engineering, process dynamics and control, and process design. Experience in instrumentation, analysis, and design is obtained through an integrated laboratory program. Routine use is made of computer-based data analysis, simulation, and design.

Students are required to participate in at least one enriching activity, which may include a research experience, a cooperative education or internship experience, study abroad, completion of the Certificate in Technological Entrepreneurship, or other approved experiences.

Chemical engineering students may gain depth of knowledge related to a career path through their selection of science, engineering, and general education electives. Several preapproved elective focus areas may help students define potential careers.

Students must select elective focus area courses according to guidelines established by the Department of Chemical and Biochemical Engineering. See "Elective Focus Area" below.

Elective Focus Area

The elective focus area enables students to gain depth of knowledge in a career path. Students meet with their chemical engineering academic advisor to discuss career options and develop a plan for choosing electives based on their career interests. The department offers preapproved elective focus areas in biochemical engineering, pharmaceutics, chemical process engineering, polymers, energy and environment, oil and gas engineering, sustainability, pre-medicine, business, and entrepreneurship.

Students may prefer to develop an individualized elective focus area, which is subject to approval by the department’s curriculum committee. See Chemical Engineering Curriculum on the Department of Chemical and Biochemical Engineering website for detailed descriptions of preapproved elective focus areas, guidelines for tailored elective focus areas, and typical four-year study plans based on elective focus areas.

Combined Programs

B.S.E./M.S. in Chemical and Biochemical Engineering

The College of Engineering offers a combined Bachelor of Science in Engineering/Master of Science for chemical engineering undergraduate students who intend to earn a M.S. in chemical and biochemical engineering. B.S.E./M.S. students may count 12 s.h. of course work (typically advanced chemistry sequences and electives) toward both degrees. Once students complete the requirements for the bachelor’s degree, they are granted the B.S.E., and they typically complete the M.S. one year later.
To be admitted to the degree program, students must have a cumulative g.p.a. of at least 3.25, and submit a letter of application and statement of purpose to the chair of the Department of Chemical and Biochemical Engineering. Visit B.S./M.S. Programs on the department's website to learn more.

B.S.E./M.S. in Civil and Environmental Engineering
B.S. in Engineering students majoring in chemical engineering who are interested in earning a Master of Science in civil and environmental engineering may apply to the combined B.S.E./M.S. program offered by the College of Engineering. The combined program enables undergraduate students to begin work on the M.S. degree while completing their B.S.E. degree. Students admitted to the program may count 12 s.h. of course work toward both the B.S.E. and the M.S. degree requirements. They also may count an additional 3 s.h. toward the M.S. degree requirements before they have been awarded the B.S.E. degree. For more information, see the M.S. in civil and environmental engineering in the Catalog.

Academic Plans
Sample Plan of Study
Sample plans represent one way to complete a program of study. Actual course selection and sequence will vary and should be discussed with an academic advisor. For additional sample plans, see MyUI.

Chemical Engineering, B.S.E.

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Hours</th>
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</thead>
<tbody>
<tr>
<td>First Year</td>
<td></td>
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<tr>
<td>Fall</td>
<td></td>
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<tr>
<td>MATH:1550</td>
<td>Engineering Mathematics I: Single Variable Calculus</td>
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<td>ENGR:1100</td>
<td>Introduction to Engineering Problem Solving</td>
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<td>CHEM:1110</td>
<td>Principles of Chemistry I</td>
<td>4</td>
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<tr>
<td>RHET:1030</td>
<td>Rhetoric</td>
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<td>ENGR:1000</td>
<td>Engineering Success for First-Year Students</td>
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<td>CSI:1600</td>
<td>Success at Iowa</td>
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<td></td>
<td>Hours</td>
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<tr>
<td>Spring</td>
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<tr>
<td>MATH:1560</td>
<td>Engineering Mathematics II: Multivariable Calculus</td>
<td>4</td>
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<td>ENGR:1300</td>
<td>Introduction to Engineering Computing</td>
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<td>PHYS:1611</td>
<td>Introductory Physics I</td>
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<td>Engineering Mathematics III: Matrix Algebra</td>
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<td>CHEM:1120</td>
<td>Principles of Chemistry II</td>
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<tr>
<td>CBE:1000</td>
<td>CBE Departmental Seminar</td>
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<td></td>
<td>Hours</td>
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<td>Second Year</td>
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<tr>
<td>Fall</td>
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<tr>
<td>MATH:2560</td>
<td>Engineering Mathematics IV: Differential Equations</td>
<td>3</td>
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<tr>
<td>GE:</td>
<td>Engineering Be Creative</td>
<td>3</td>
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ENGR:2110 Engineering Fundamentals I: Statics 2
ENGR:2130 Engineering Fundamentals III: Thermodynamics 3
CHEM:2210 Organic Chemistry I or Organic Chemistry I for Majors 3
CHEM:2105 Process Calculations 3

Spring
CBE:3105 Chemical Engineering Thermodynamics 3
CBE:3109 Fluid Flow 2
CHEM:2220 Organic Chemistry II or Organic Chemistry II for Majors 3
CHEM:2420 Organic Chemistry Laboratory for Majors or Organic Chemistry Laboratory 3
STAT:2020 Probability and Statistics for the Engineering and Physical Sciences 3
CBE:3000 Professional Seminar: Chemical Engineering 1
GE: CLAS General Education Component 3

Third Year
Fall
CBE:3113 Heat and Mass Transfer 3
CBE:3125 Chemical Process Safety 3
CBE:3117 Separations 3
ENGR:2720 Materials Science 3
ENGR:2120 Engineering Fundamentals II: Electrical Circuits 3
CBE:3000 Professional Seminar: Chemical Engineering 1

Hours 16

Spring
CBE:3120 Chemical Reaction Engineering 3
CBE:3155 Chemical Reaction Engineering/ Separations Laboratory 2
CBE:5205 Elective Focus Area: Elective course 3
GE: Approved Course Subjects a 3
CBE:3000 Professional Seminar: Chemical Engineering 1

Hours 15

Fourth Year
Fall
CBE:4105 Process Dynamics and Control in Design 3
CBE:4109 Chemical Engineering Process Design I 2
CBE:3105 Chemical Engineering Thermodynamics 3
Advanced chemistry elective 3
Elective Focus Area: Elective course 3
Elective Focus Area: Elective course 3
CBE:3000  Professional Seminar: Chemical Engineering  1

Hours  18

Spring
CBE:4110  Chemical Engineering Process Design II  3

Advanced science elective  3
Elective Focus Area: Elective course  3
GE: Approved Course Subjects a  3
GE: Approved Course Subjects b  3
CBE:4195  Senior Enriching Activities Seminar  0

Degree Application: apply on MyUI before deadline (typically in February for spring, September for fall)

Hours  15
Total Hours  133

a  A full list of approved course subjects can be found on the College of Engineering General Education Component website.
b  Please see Academic Calendar, Office of the Registrar website for current degree application deadlines. Students should apply for a degree for the session in which all requirements will be met. For any questions on appropriate timing, contact your academic advisor. For more information visit http://commencement.uiowa.edu/

Career Advancement

Chemical and biochemical engineers work in a wide range of industries, including petroleum and specialty chemical production, polymer and plastic production, food processing, energy, microelectronics production, pharmaceutical production, biochemical processing, and environmental compliance. Potential jobs include production, process development, plant design and construction, and fundamental research. Many experienced chemical and biochemical engineers move through management ranks to high-level administrative positions. On average, 93-98 percent of graduates are employed in their field of study or pursuing advanced education within seven months of graduation.

The engineering profession is a foundation for a variety of careers in industry, medicine, law, government, and consulting. Engineering majors hold eight of the top ten spots on the list of top-paid majors for bachelor’s degree graduates, according to the National Association of Colleges and Employers (NACE).

Engineering Professional Development (EPD) develops and promotes experiential education and professional opportunities for students in the College of Engineering. Professional staff coordinate the college's co-op and internship program, engage in employer outreach, and provide opportunities for students to network with employers, including an engineering career fair each semester and other programming related to career development.

EPD also offers individual advising and class presentations on résumé and cover letter preparation, job and internship search strategies, interviewing skills, and job offer evaluation.