The chemical engineering program offers students a broad education built on fundamentals in science, mathematics, and engineering, which are then applied to a variety of contemporary problems using modern tools, such as computational software and computer-aided design. Chemical engineers have traditionally been employed in chemical, petrochemical, agricultural chemicals, pulp and paper, plastics, cosmetics, and textiles industries and in consulting and design firms. Today, chemical engineers also play an integral role in emerging biological and advanced materials fields, including nanotechnology. For example, chemical engineers are creating new materials needed for space exploration, alternate energy sources, and faster, self-powered computer chips. In biotechnology and bioengineering, chemical engineers are working to understand human diseases, developing new therapies and drug delivery systems, and producing new medicines through cell culture systems. Chemical engineers employ nanotechnology to revolutionize sensors, security systems, and medical diagnostics and treatments. In addition to creating important products, chemical engineers are also involved in protecting our environment by exploring ways to reduce acid rain and smog, to recycle and reduce wastes, to develop new sources of environmentally clean energy, and to design inherently safe, efficient, and “green” processes. The role of chemical engineers is to develop new products and to design the processes while reducing costs, increasing production, and improving the quality and safety of new products.

The educational objectives of the chemical engineering program are that all students will develop and apply: (1) a fundamental knowledge and understanding of the underlying science, mathematics, and engineering subjects needed to function effectively and efficiently in the many fields of chemical engineering practice; (2) an ability to identify problems, to identify, acquire, and critically analyze needed information and data, to draw appropriate conclusions, and to make decisions based on those conclusions; (3) interpersonal and communicative skills to function effectively in a diverse workplace and work confidently and effectively within intra- and interdisciplinary work groups; and (4) an ability to incorporate practice-based and information-based knowledge of contemporary societal issues and ethical and professional responsibilities as part of engineering solutions and business activities.

The faculty of the chemical engineering program is committed to providing a practice-oriented education through active learning and drawing connections between classroom learning and co-op experiences. The educational curriculum provides fundamentals in mathematics, physical sciences, and engineering science as well as real-world design and laboratory experiences. Through the University’s general education requirements, students gain awareness of the impact of engineering decisions in a broader societal and ethical context. Cooperative education offers students the opportunity to integrate practical workplace knowledge with classroom learning so the educational experiences are synergistic and deepen the learning process. The chemical engineering community encourages professional development through active participation and leadership in student organizations, professional societies, and departmental activities. As a result, the chemical engineering program prepares successful students for industrial careers, graduate programs, or professional medical, law, and business schools.

Through faculty expertise and scholarship, a rigorous set of academic courses, and real-world cooperative education experiences, the chemical engineering program seeks to enable students to identify and solve chemical engineering problems; understand, analyze, and design chemical processes; be proficient in the use of modern engineering tools; be proficient in oral and written communication of their work and ideas; become independent learners and workers; participate effectively in intradisciplinary and interdisciplinary groups; design and perform laboratory experiments to acquire data and evaluate theories; understand the environmental and safety impact of their work as chemical engineers; understand the global and societal impact of engineering problems and solutions; understand professional behavior, culture, expectations, and contemporary issues; conduct themselves in accordance with the highest ethical and professional standards; and be prepared for lifelong learning and continuing education.

The chemical engineering curriculum shown below is periodically evaluated and revised to ensure that graduates of the program are given every opportunity for future success as professional chemical engineers and are prepared for graduate or professional school.
BSCHE—Bachelor of Science in Chemical Engineering

MATHEMATICS/SCIENCE REQUIREMENT
Complete 55 semester hours in mathematics and science as indicated below.

Required Mathematics/Science
Complete each of the following courses with corresponding labs, as indicated:

- BIO U111 General Biology 1 4 SH
- with BIO U112 Lab for BIO U111 1 SH
- CHM U151 General Chemistry for Engineers 4 SH
- CHM U311 Organic Chemistry 1 4 SH
- with CHM U312 Lab for CHM U311 1 SH
- or CHM U315 Organic Chemistry 1 4 SH
  for Chemistry Majors
- with CHM U316 Lab for CHM U315 2 SH
- CHM U313 Organic Chemistry 2 4 SH
- with CHM U314 Lab for CHM U313 1 SH
- or CHM U317 Organic Chemistry 2 4 SH
  for Chemistry Majors
- with CHM U318 Lab for CHM U317 2 SH
- CHM U403 Physical Chemistry 2 4 SH
- with CHM U404 Lab for CHM U403 1 SH
- MTH U241 Calculus 1 for Science and Engineering 4 SH
- MTH U242 Calculus 2 for Science and Engineering 4 SH
- MTH U341 Calculus 3 for Science and Engineering 4 SH
- MTH U343 Differential Equations and Linear Algebra for Engineering 4 SH
- PHY U151 Physics for Engineering 1 4 SH
- with PHY U152 Lab for PHY U151 1 SH
- PHY U155 Physics for Engineering 2 4 SH
- with PHY U156 Lab for PHY U155 1 SH

Advanced Chemistry Elective
Complete one advanced chemistry elective from the following list:

- BIO U313 Plant Biology 4 SH
- BIO U323 Biochemistry 4 SH
- CHM U321 Analytical Chemistry 4 SH
- CHM U331 Bioanalytical Chemistry 4 SH
- CHM U421 Biophysical Chemistry 4 SH
- CHM U501 Inorganic Chemistry 4 SH
- CHM U637 Foundations of Spectroscopy 3 SH
- ENV U310 Earth Materials 4 SH
- ENV U410 Environmental Geochemistry 4 SH
- ENV U582 Groundwater Geochemistry 4 SH
- PSC U320 Biochemistry 4 SH
- PSC U412 Pharmaceutics 2 4 SH
- TOX U576 Experimental Toxicology 3 SH

Further Credit
1 semester hour from the following course counts toward the mathematics/science requirement:

- GE U111 Engineering Problem Solving and Computation 4 SH

ENGINEERING REQUIREMENT
Complete 50 semester hours in engineering as indicated below.

Required Engineering
Complete each of the following courses with corresponding labs, as indicated:

- CHE U308 Chemical Engineering Calculations 4 SH
- with CHE U309 Lab for CHE U308 1 SH
- CHE U310 Transport Processes and Operations 1 4 SH
- CHE U311 (pending approval)
- CHE U312 Transport Processes and Operations 2 4 SH
- CHE U313 (pending approval)
- CHE U320 Chemical Engineering Thermodynamics 1 4 SH
- CHE U322 Chemical Engineering Thermodynamics 2 4 SH
- CHE U330 (pending approval)
- CHE U510 Chemical Engineering Kinetics 4 SH
- CHE U512 Chemical Engineering Process Control 4 SH
- CHE U701 Chemical Process Design 1 4 SH
- with CHE U702 Lab for CHE U701 1 SH
- CHE U703 Chemical Process Design 2 3 SH
- with CHE U704 Lab for CHE U703 2 SH

Further Credit
3 semester hours from the following course count toward the engineering requirement:

- GE U110 Engineering Design 4 SH

2 semester hours from the following course count toward the engineering requirement:

- GE U111 Engineering Problem Solving and Computation 4 SH

GENERAL EDUCATION ELECTIVES

Arts/Humanities Level 1
Complete 4 semester hours from the NU Core arts/humanities level 1 domain, as described on page 42.

Social Science Level 1
Complete 4 semester hours from the NU Core social science level 1 domain, as described on page 42.

GENERAL ELECTIVES
Complete four 4-SH-equivalent academic, nonremedial, nonrepetitive courses.
OTHER REQUIRED COURSE WORK
Complete 13 semester hours as indicated below.

Writing
Complete the following two courses with a grade of C or higher in each course:
ENG U111 College Writing 4 SH
ENG U302 Advanced Writing 4 SH

Professional Development
Complete the following three courses:
GE U100 Introduction to the Study of Engineering 1 SH
CHE U300 Introduction to Engineering Co-op Education 1 SH
CHE U500 Professional Issues in Engineering 1 SH

Further Credit
1 semester hour from each of the following courses counts toward other required course work:
GE U110 Engineering Design 4 SH
GE U111 Engineering Problem Solving and Computation 4 SH

RESIDENCY REQUIREMENT
32 of the final 40 semester hours must be taken at Northeastern University.

MAJOR GPA REQUIREMENT
2.000 minimum GPA required in all CHE courses

NU CORE REQUIREMENTS
See page 42 for requirement list.

GENERAL ELECTIVES
Additional courses taken beyond college and major course requirements to satisfy graduation credit requirements.

COOPERATIVE EDUCATION

UNIVERSITY-WIDE REQUIREMENTS
139 total semester hours required
Minimum 2.000 GPA required

Minor in Biochemical Engineering

REQUIREMENTS FOR NON–CHEMICAL ENGINEERING MAJORS
Students with majors other than chemical engineering should complete the requirements below.

Required Breadth Courses
Complete the following five courses with corresponding labs, as indicated:
CHM U311 Organic Chemistry 1 4 SH
with CHM U312 Lab for CHM U311 1 SH
CHM U313 Organic Chemistry 2 4 SH
with CHM U314 Lab for CHM U313 1 SH
MTH U141 Calculus 1 4 SH
or MTH U241 Calculus 1 for Science and Engineering 4 SH
MTH U142 Calculus 2 4 SH
or MTH U242 Calculus 2 for Science and Engineering 4 SH
MTH U343 Differential Equations and Linear Algebra for Engineering 4 SH
or MTH U345 Ordinary Differential Equations 4 SH

Required Chemical Engineering Courses
Complete the following four courses with corresponding labs, as indicated:
CHE U308 Chemical Engineering Calculations 4 SH
with CHE U309 Lab for CHE U308 1 SH
CHE U310 Transport Processes and Operations 1 4 SH
CHE U312 Transport Processes and Operations 2 4 SH
CHE U630 Biochemical Engineering Fundamentals 4 SH

Capstone
Complete the following course with corresponding lab:
CHE U703 Chemical Process Design 2 3 SH
with CHE U704 Lab for CHE U703 2 SH

REQUIREMENTS FOR CHEMICAL ENGINEERING MAJORS
Chemical engineering majors should complete the requirements below.

Required Breadth Courses
Complete the following eight courses with corresponding labs, as indicated:
BIO U111 General Biology 1 4 SH
with BIO U112 Lab for BIO U111 1 SH
BIO U301 Genetics and Molecular Biology 4 SH
with BIO U302 Lab for BIO U301 1 SH
BIO U323 Biochemistry 4 SH
CHM U311 Organic Chemistry 1 4 SH
with CHM U312 Lab for CHM U311 1 SH
CHM U313 Organic Chemistry 2 4 SH
with CHM U314 Lab for CHM U313 1 SH
MTH U141 Calculus 1 4 SH
or MTH U241 Calculus 1 for Science and Engineering 4 SH
MTH U142 Calculus 2 4 SH
or MTH U242 Calculus 2 for Science and Engineering 4 SH
MTH U343 Differential Equations and Linear Algebra for Engineering 4 SH
or MTH U345 Ordinary Differential Equations 4 SH
### Required Chemical Engineering Courses

Complete the following four courses with corresponding labs, as indicated:

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>SH</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHE U308</td>
<td>Chemical Engineering Calculations</td>
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</tr>
<tr>
<td>with CHE U309</td>
<td>Lab for CHE U308</td>
<td>1</td>
</tr>
<tr>
<td>CHE U310</td>
<td>Transport Processes and Operations 1</td>
<td>4</td>
</tr>
<tr>
<td>CHE U312</td>
<td>Transport Processes and Operations 2</td>
<td>4</td>
</tr>
<tr>
<td>CHE U630</td>
<td>Biochemical Engineering Fundamentals</td>
<td>4</td>
</tr>
<tr>
<td>or CHE G223</td>
<td>Biochemical Engineering</td>
<td>4</td>
</tr>
</tbody>
</table>

### Capstone

Complete the following course with corresponding lab:

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>SH</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHE U703</td>
<td>Chemical Process Design 2</td>
<td>3</td>
</tr>
<tr>
<td>with CHE U704</td>
<td>Lab for CHE U703</td>
<td>2</td>
</tr>
</tbody>
</table>

### GPA REQUIREMENT

2.000 GPA required in the minor