The mission of the College of Engineering is to provide a teaching, learning, and research environment that results in the highest-quality education for our students. Consistent with our goal of providing the highest-quality, practice-oriented program, the College of Engineering prepares students to contribute to the accumulation and application of technical knowledge. The college helps students master the fundamental mathematical and scientific principles underlying a particular branch of engineering; develop and demonstrate competence in analysis and design appropriate to an engineering specialization; reason clearly and communicate effectively; and recognize the need to continue professional development.

Through laboratory exercises, senior design projects, professional association activities, and cooperative work assignments, students put theory into practice and clarify their professional goals.

The college offers a Bachelor of Science degree with specializations in chemical, civil, computer, electrical, industrial, and mechanical engineering. The five-year Bachelor of Science degree program, which includes eighteen months of cooperative education work experience, is the standard and most popular program. Four-year programs with and without co-op experience are also available.

The college encourages students to study the arts, sciences, business, and other areas outside of engineering, for they provide an awareness of the social, economic, political, aesthetic, and philosophical influences that shape the world in which graduates will practice their professions. Students may complete a minor in areas such as business, computer science, biomedical engineering, math, or music. In many cases, the minor can be completed without course overloads.

In addition to a full array of University services, special advising and other support services (including tutoring) are provided. Students may qualify to participate in honors sections of many courses. Active student chapters of many national professional engineering organizations and honor societies are supported by the college as an enriching addition to academic studies and co-op experience.

The Bachelor of Science degree programs with specification in chemical, civil, electrical, industrial, and mechanical engineering are accredited by the Accreditation Commission of ABET (formerly, the Engineering Accreditation Board for Engineering and Technology).
Bachelor of Science/Master of Science Joint-Degree Program
The Departments of Electrical and Computer Engineering and Mechanical and Industrial Engineering offer programs leading to both the bachelor’s and master’s degrees in five years. All students begin with the common first-year engineering program. Upon successful completion, students may petition to enter the BS/MS Program. Degree candidates must maintain a 3.200 cumulative grade-point average, carry extra courses, and reduce the number of cooperative education semesters to complete the course requirements.

Academic Standards
The faculty of the College of Engineering has set the following minimum academic standards, which students must meet to continue their programs of study in good standing:

Academic Progression Standards
It is expected that full-time engineering students enroll in four courses with appropriate labs and successfully complete at least 12 semester hours each academic semester with an acceptable grade-point average as noted below. Part-time engineering students are expected to complete two courses per semester with appropriate labs. Any exceptions to the course load requirement must be approved by the student’s academic adviser, in writing, prior to the start of each semester.

Grade-Point Average (GPA) Requirements for Graduation
A minimum cumulative GPA requirement of 2.000 in major (department) courses and a minimum cumulative GPA requirement of 2.000 overall is required for graduation.

Criteria for Academic Probation
Full-time students in the College of Engineering will be placed on academic probation effective for the following academic semester for any of the reasons noted below:

First-year Students:
• Not maintaining an overall cumulative GPA of at least 1.800 or not earning at least 24 semester hours at the end of the two semesters of the first-year curriculum, or
• Not earning at least 12 semester hours in the second academic semester.

Upperclass and Transfer Students:
• Not earning at least 12 semester hours in the semester just completed, or
• Not maintaining an overall cumulative GPA of at least 2.000 at the end of each academic semester, or
• Not maintaining a GPA of at least 2.000 in major at the end of the fourth academic semester of the curriculum and at the end of each academic semester thereafter, or
• Not maintaining satisfactory progress through the curriculum by:

– Accumulating three outstanding course deficiencies (grades of F, I, W, NE, U, *, or missing grades), or
– Earning a current semester GPA of 1.600 or lower, or
– Not following a program of study approved by the student’s academic adviser.

A notation of the academic probation action will appear on the internal record but not on the permanent transcript.

Criteria for Academic Dismissal
Students who remain on probation after two academic semesters may be dismissed from the University. Notation of this academic dismissal action will appear on the permanent transcript.

Graduation Requirements
The college reserves the right to amend programs, courses, and degree requirements to fulfill its educational responsibility to respond to relevant changes in the field. Students must complete all of the requirements in the degree program in which they are candidates. Degree requirements are based upon the year of graduation, determined by the date of entry or reentry into the College of Engineering. Degree requirements and the year of graduation for a degree candidate who fails to make normal academic progress will be subject to review and possible change.

College of Engineering Arts, Humanities, and Social Sciences Electives
Each College of Engineering degree program references the following arts, humanities, and social sciences electives:

HISTORICAL PERSPECTIVE ELECTIVE
Complete any course from the HST department or any course from the following list:
- AFR U312 Black History of Boston 4 SH
- AFR U350 History of Blacks in the Media and the Press 4 SH
- ASL U350 Deaf History and Culture 4 SH
- ECN U293 European Economic History 4 SH
- ECN U470 American Economic History 4 SH
- INT U305 Maritime History of New England 4 SH

SOCIAL/CULTURAL PERSPECTIVE ELECTIVE
Complete any course from the AFR, ASL, LNA, LNC, LNE, LNF, LNG, LNH, LNI, LNJ, LNL, LNM, LNR, LNS, or SOA departments or any course from the following list:
- ARC U223 American Architecture 4 SH
- ART U310 Nineteenth-Century Art 4 SH
- ART U320 American Art 4 SH
- ECN U240 Economics of Crime 4 SH
- ECN U270 Economic Status of Ethnic Minorities 4 SH
- ENG U226 Backgrounds in English and American Literature 4 SH
- ENG U409 The Modern Novel 4 SH
- ENG U425 Literature and Law 4 SH
- ENG U427 The Literature of Science 4 SH
ENG U454 History of English 4 SH
ENG U520 American Novels 2 4 SH
ENG U611 Shakespeare 4 SH
ENG U671 Multietnic Literature of the U.S. 4 SH
ENG U687 Modern Poetry 4 SH
ENG U688 Contemporary Poetry 4 SH
GEO U112 Environmental Geology 4 SH
GEO U510 Environmental Planning 4 SH
HRM U201 Organizational Behavior 4 SH
HST U110 Introduction to World History 4 SH
HST U204 Third World Women 4 SH
HST U242 Women in America 4 SH
HST U261 The Modern Caribbean 4 SH
HST U270 Ancient Greece 4 SH
HST U337 African-American History before 1900 4 SH
HST U344 U.S. Urban History 4 SH
HST U345 Environmental History of North America 4 SH
HST U346 Cultural History of the U.S. 4 SH
HST U370 Renaissance to Enlightenment 4 SH
HST U376 The British Empire 4 SH
HST U391 Colonialism/Imperialism 4 SH
HST U392 Islamic Nationalism 4 SH
HST U393 Latin America in Boston 4 SH
HST U475 The Culture of Europe 4 SH
INT U240 War and Conflict in the Nuclear Age 4 SH
MTH U201 History of Mathematics 4 SH
MUS U103 Music as a Social Expression 4 SH
MUS U121 Medieval and Renaissance Music 4 SH
PHL U135 Philosophical Problems of Law and Justice 4 SH
PHL U145 Technology and Human Values 4 SH
PHL U150 Understanding the Bible 4 SH
PHL U160 Philosophical Problems of Economic Justice 4 SH
PHL U165 Moral and Social Problems in Health Care 4 SH
PHL U180 Environmental Ethics 4 SH
POL U307 Public Policy and Administration 4 SH
POL U375 Gender and Politics 4 SH
POL U380 Latino Politics in the United States 4 SH
POL U390 Science, Technology, and Public Policy 4 SH
POL U415 Ethnic Conflict in Comparative Politics 4 SH
POL U420 War and Political Violence 4 SH
POL U425 U.S. Foreign Policy 4 SH
POL U435 Politics in Western Europe 4 SH
POL U440 Politics in Northern Ireland 4 SH
POL U445 Politics in Central and Eastern Europe 4 SH
POL U450 Government and Politics in Russia 4 SH
POL U460 Government and Politics in Africa 4 SH
POL U465 Government and Politics in the Middle East 4 SH
POL U470 Arab-Israeli Conflict 4 SH
POL U475 Government and Politics in Latin America 4 SH
POL U480 Government and Politics in Japan 4 SH
POL U485 Government and Politics in China 4 SH
POL U487 Politics of Developing Nations 4 SH
SOC U121 Evolution and Society 4 SH
SOC U215 Sociology of Work and Leisure 4 SH
SOC U246 Sociology of Work 4 SH
SOC U250 Sociology of Human Service Organizations 4 SH
SOC U485 Environment, Technology, and Society 4 SH
SOC U528 Computers and Society 4 SH
SOCIAL SCIENCES/HUMANITIES ELECTIVE
Complete any course from the ARC, CJ, ECN, ENG, MUS, PHL, POL, PSY, SOC, or THE departments. Note: The following courses are not acceptable: CJ U382, ECN U350, ENG U101, ENG U110, ENG U111, ENG U112, ENG U302, POL U400, PSY U320, PSY U321, SOC U210, Theatre and Society 4 SH

INTERDISCIPLINARY MINOR

Materials Science and Engineering
The study of materials science and engineering has spurred breakthroughs in applications ranging from artificial limbs and organs, to space travel vehicles, to personal MP3 players. For example, the discovery of buckyballs and carbon nanotubes has led to the development of an unprecedented reduction in size of prototype electronic components and points the way to tomorrow’s electronic technologies. Porous nanostructures of biocompatible materials are studied for targeted drug delivery within the body. The integration of polymers and semiconductors is used to create efficient, usable solar cells to reduce our dependence on fossil fuels. There are many more examples of both existing technologies and current research areas involving materials science and engineering that impact everyday life both today and in the future.

The minor in materials science and engineering is open to all students of the College of Engineering whose science and technical interests involve the design, processing, and optimization of engineering materials. Since the materials interests may vary across the engineering disciplines, the minor is composed of an interdisciplinary selection of courses that offer a high degree of flexibility to the student. The fundamental goals of the program are to offer the students a broad
interdisciplinary program that includes a basic background in the relevant aspects of materials science and the engineering applications of materials. The objectives are to serve the needs of the chemical, civil, electrical, and mechanical engineering departments in providing a vehicle to expose students to materials science and engineering. Particular focus areas include: electronic materials and processing for device applications; strength, wear, and corrosion-resistant coatings; molecular-level design of thin films and nanostructures; polymers and biomedical applications; and steels, concretes, and space-based structures.

**Minor in Materials Science and Engineering**

**REQUIRED COURSES**

Complete the following course:

- MIM U340 Introduction to Material Science 4 SH

and complete one additional course with corresponding lab as indicated from the following list:

- CIV U260 Civil Engineering Materials 3 SH  
  with CIV U261 Materials and Measurements Lab 2 SH
- ECE U392 Electronic Materials 4 SH

**ELECTIVES AND CAPSTONE DESIGN**

Complete two courses from the following disciplines and complete 4 semester hours of capstone design (or complete 4 semester hours of elective courses in place of the capstone design project):

- **Electrical and Computer Engineering**
  - ECE U606 Integrated Circuit Fabrication 4 SH
  - ECE U608 Nanotechnology in Engineering 4 SH

- **Chemical Engineering**
  - CHE U364 Biomaterials 4 SH (pending approval)
  - CHE U608 Nanotechnology in Engineering 4 SH
  - CHE U634 Nanomaterials: Thin Films and Structures 4 SH

- **Mechanical and Industrial Engineering**
  - MIM U640 Mechanical Behavior and Processing of Materials 4 SH
  - MIM U645 Environmental Issues in Manufacturing and Product Use 4 SH

- **Chemistry and Chemical Biology**
  - CHM U501 Inorganic Chemistry 4 SH
  - CHM U687 Principles of Solid State Chemistry 3 SH

- **Physics**
  - PHY U614 Condensed Matter Physics 4 SH

- **Capstone Design**
  - CHE U703 Chemical Process Design 2 3 SH  
  - with CHE U704 Lab for CHE U703 2 SH
  - CIV U769 Senior Design Project 5 SH
  - ECE U790 Electrical and Computer Engineering Capstone 1 4 SH
  - MIM U702 Capstone Design 2 5 SH

**GPA REQUIREMENT**

2.000 GPA required in the minor

**CHEMICAL ENGINEERING**

www.coe.neu.edu/Depts/CHE/chemical/chemeng.html

**ALBERT SACC0 JR., PHD**

Acting Chair, George A. Snell Professor of Engineering, and College of Engineering Distinguished Professor

**PROFESSORS**

Gilda A. Barabino, PhD
Ronald J. Willey, PhD, PE

**DIPIETRO ASSISTANT PROFESSORS**

Carolyn W. T. Lee-Parsons, PhD
Katherine S. Ziemer, PhD

**ASSISTANT PROFESSORS**

Daniel D. Burkey, PhD
Rebecca L. Carrier, PhD
Shashi K. Murthy, PhD

**LECTURER**

Eric J. Thorgerson, PhD

**ASSOCIATE PROFESSORS EMERITI**

Ralph A. Buonopane, PhD
Bernard M. Goodwin, ScD
Richard R. Stewart, PhD

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 material fields. 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 using 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 faculty of the chemical engineering program is committed to providing a practice-oriented education through an academic environment that encourages active learning and that draws connections between co-op experiences and classroom theory. A professional component includes thorough groundwork in mathematics, physical sciences, and engineering science as well as real-world design and laboratory experiences. This component prepares students to apply rigorous chemical engineering principles to a variety of contemporary problems.

A liberal arts component is included to provide students with the general education skills necessary to identify the impact of engineering decisions in a broad societal context. The cooperative education component provides an integrated educational experience that enables students to gain practical workplace knowledge, which is supported by an academic curriculum designed to integrate theoretical concepts and practical applications. This combination of academic and cooperative education opportunities enables students to gain more knowledge, with increasing challenges and responsibilities, while progressing toward fully professional careers in chemical engineering.

As a result, the chemical engineering program also prepares students for graduate school, medical school, law school, or business school.

Through faculty expertise and scholarship, a rigorous set of academic courses, and real-world cooperative education experiences, the chemical engineering program enables 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; 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. See pages 294–296 for course descriptions.

**BSCH—Bachelor of Science in Chemical Engineering**

**MATHEMATICS/SCIENCE REQUIREMENT**
Complete 49 semester hours in mathematics and science as indicated below.

**Required Mathematics/Science**
Complete each of the following courses:

<table>
<thead>
<tr>
<th>Course</th>
<th>Description</th>
<th>SH</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHM U151</td>
<td>General Chemistry for Engineers</td>
<td>4</td>
</tr>
<tr>
<td>CHM U311</td>
<td>Organic Chemistry 1</td>
<td>4</td>
</tr>
<tr>
<td>with CHM U312 Lab for CHM U311</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>MTH U241</td>
<td>Calculus 1 for Science and Engineering</td>
<td>4</td>
</tr>
<tr>
<td>MTH U242</td>
<td>Calculus 2 for Science and Engineering</td>
<td>4</td>
</tr>
<tr>
<td>MTH U343</td>
<td>Differential Equations and Linear Algebra for Engineering</td>
<td>4</td>
</tr>
<tr>
<td>PHY U151</td>
<td>Physics for Engineering</td>
<td>4</td>
</tr>
<tr>
<td>with PHY U152 Lab for PHY U151</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>PHY U155</td>
<td>Physics for Engineering 2</td>
<td>4</td>
</tr>
<tr>
<td>with PHY U156 Lab for PHY U155</td>
<td></td>
<td>1</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Course</th>
<th>Description</th>
<th>SH</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIO U313</td>
<td>Plant Biology</td>
<td>4</td>
</tr>
<tr>
<td>BIO U323</td>
<td>Biochemistry</td>
<td>4</td>
</tr>
<tr>
<td>CHM U321</td>
<td>Analytical Chemistry</td>
<td>4</td>
</tr>
<tr>
<td>CHM U331</td>
<td>Bioanalytical Chemistry</td>
<td>4</td>
</tr>
<tr>
<td>CHM U501</td>
<td>Inorganic Chemistry</td>
<td>4</td>
</tr>
<tr>
<td>GEO U310</td>
<td>Earth Materials</td>
<td>4</td>
</tr>
<tr>
<td>GEO U410</td>
<td>Environmental Geochemistry</td>
<td>4</td>
</tr>
<tr>
<td>GEO U582</td>
<td>Groundwater Geochemistry</td>
<td>4</td>
</tr>
<tr>
<td>PSC U320</td>
<td>Biochemistry</td>
<td>4</td>
</tr>
<tr>
<td>PSC U412</td>
<td>Pharmaceutics 2</td>
<td>4</td>
</tr>
<tr>
<td>TOX U576</td>
<td>Experimental Toxicology</td>
<td>3</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Course</th>
<th>Description</th>
<th>SH</th>
</tr>
</thead>
<tbody>
<tr>
<td>GE U111</td>
<td>Engineering Problem Solving and Computation</td>
<td>4</td>
</tr>
</tbody>
</table>

**ENGINEERING REQUIREMENT**
Complete 53 semester hours in engineering as indicated below.

**Required Engineering**
Complete each of the following courses:

<table>
<thead>
<tr>
<th>Course</th>
<th>Description</th>
<th>SH</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHE U308</td>
<td>Chemical Engineering Calculations</td>
<td>4</td>
</tr>
<tr>
<td>with CHE U309 Lab for CHE U308</td>
<td></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 U320</td>
<td>Chemical Engineering Thermodynamics 1</td>
<td>4</td>
</tr>
<tr>
<td>CHE U322</td>
<td>Chemical Engineering Thermodynamics 2</td>
<td>4</td>
</tr>
<tr>
<td>CHE U510</td>
<td>Chemical Engineering Kinetics</td>
<td>4</td>
</tr>
<tr>
<td>CHE U512</td>
<td>Chemical Engineering Process Control</td>
<td>4</td>
</tr>
<tr>
<td>CHE U520</td>
<td>Unit Operations and Separation Processes</td>
<td>3</td>
</tr>
<tr>
<td>with CHE U521 Lab for CHE U520</td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>CHE U701</td>
<td>Chemical Process Design 1</td>
<td>4</td>
</tr>
<tr>
<td>with CHE U702 Lab for CHE U701</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>CHE U703</td>
<td>Chemical Process Design 2</td>
<td>3</td>
</tr>
<tr>
<td>with CHE U704 Lab for CHE U703</td>
<td></td>
<td>2</td>
</tr>
</tbody>
</table>

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**Academic Programs**
**Chemical Engineering Elective**

Complete 4 semester hours from the Chemical Engineering department.

**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  4 SH

**RESTRICTED ELECTIVES**

Complete 4 semester hours from the “Historical Perspective Elective” list in the “College of Engineering Arts, Humanities, and Social Sciences Electives” on page 228.

Complete 4 semester hours from the “Social/Cultural Perspective Elective” list in the “College of Engineering Arts, Humanities, and Social Sciences Electives” on page 228.

**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 both courses:

- ENG U111  College Writing  4 SH
- ENG U302  Advanced Writing in the Technical Professions  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 your final 40 semester hours must be taken at Northeastern University.

**MAJOR GPA REQUIREMENT**

2.000 minimum GPA required in the major

**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**

**REQUIRED BREADTH COURSES**

Complete the following five courses with corresponding labs as indicated:

- 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
- 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

Chemical engineering majors should also complete the following three 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

**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 and corresponding lab:

- CHE U703  Chemical Process Design 2  3 SH
- with CHE U704  Lab for CHE U703  2 SH

**GPA REQUIREMENT**

2.000 GPA required in the minor

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**CIVIL AND ENVIRONMENTAL ENGINEERING**

[www.coe.neu.edu/Depts/civil](http://www.coe.neu.edu/Depts/civil)

Peter G. Furth, PhD
Professor and Chair

CAMP, DRESSTER & McKEE, INC. PROFESSOR OF ENGINEERING

Vladimir Novotny, PhD
Civil engineers judiciously apply their knowledge of mathematics and physical sciences to improve and protect the environment and to provide facilities and structures for community living, industry, and transportation. Civil engineering encompasses several disciplines, including structural engineering, environmental engineering, transportation planning and engineering, and geotechnical engineering. Civil engineers supervise the construction of bridges, tunnels, buildings, dams, and aqueducts. They also plan, design, construct, and manage highways, railroads, canals, and airports; regulate rivers and control floods; and design and build systems for water distribution, wastewater treatment, waste disposal, and environmental remediation.

The civil engineering program has four educational objectives. The first is that our students gain an understanding of the natural and cultural world. Mathematics, physics, and chemistry are the foundation of civil engineering. Such a foundation enables students to properly understand and apply engineering principles, and makes the Northeastern education one that can keep pace with the advances in this dynamic field. Likewise, it is important for students to understand the historical and cultural context in which engineering takes place and to understand the social and environmental impacts of engineering projects.

The second objective is that our students become technically prepared for engineering practice. Students acquire a common base of knowledge in the engineering sciences, including mechanics and environmental science. In more advanced courses, students learn to analyze and design building frames and bridges, water and wastewater treatment systems, highways and traffic systems, hydraulic systems, earth dams, building foundations, and construction management systems. Our program is designed to give students proficiency in at least four areas of civil engineering.

The third program objective is that our students develop skills in critical thinking, communication, information literacy, and aesthetics. These subjects are integrated into courses throughout the program. Particular emphasis is placed on the importance of effective writing and public speaking.

The fourth program objective is that our students develop a personal and professional ethic—that is, an understanding of the profession, its ethical codes, history, contemporary issues, and the need for lifelong learning. Course work, cooperative education, and participation in the activities of the award-winning student chapter of the American Society of Civil Engineers help students meet this goal.

The civil engineering program provides students with a broad education appropriate for a variety of career choices and lifelong learning. Experience tells us that civil engineering graduates will enter almost every field imaginable. The knowledge and skills acquired—understanding science, critical thinking, effective communication, and understanding the social context, among them—form an excellent foundation for a host of careers, as well as for a fulfilling life outside the world of work. The civil engineering program has been designed with four general electives that permit students to explore or acquire further depth in other fields of interest. Students can use these electives to earn a minor in business, architectural history, music, computer science, or any number of other fields.

The co-op program parallels the academic program in level of responsibility and sophistication. A beginning job might involve layout at a construction site or laboratory testing; in senior-level co-op assignments, students are often working alongside engineers on design teams. See pages 304–307 for course descriptions.

BSCE—Bachelor of Science in Civil Engineering

MATHEMATICS/SCIENCE REQUIREMENT
Complete 34 semester hours in mathematics and science as indicated below.

Required Mathematics/Science
Complete each of the following courses:

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>SH</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHM U151</td>
<td>General Chemistry for Engineers</td>
<td>4</td>
</tr>
<tr>
<td>MTH U241</td>
<td>Calculus 1 for Science and Engineering</td>
<td>4</td>
</tr>
<tr>
<td>MTH U242</td>
<td>Calculus 2 for Science and Engineering</td>
<td>4</td>
</tr>
<tr>
<td>MTH U341</td>
<td>Calculus 3 for Science and Engineering</td>
<td>4</td>
</tr>
<tr>
<td>MTH U343</td>
<td>Differential Equations and Linear Algebra</td>
<td>4</td>
</tr>
<tr>
<td>PHY U151</td>
<td>Physics for Engineering 1</td>
<td>4</td>
</tr>
<tr>
<td>PHY U152</td>
<td>Lab for PHY U151</td>
<td>1</td>
</tr>
<tr>
<td>PHY U155</td>
<td>Physics for Engineering 2</td>
<td>4</td>
</tr>
<tr>
<td>PHY U156</td>
<td>Lab for PHY U155</td>
<td>1</td>
</tr>
</tbody>
</table>

Further Credit
3 semester hours from the following course count toward the mathematics/science requirement:

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>SH</th>
</tr>
</thead>
<tbody>
<tr>
<td>CIV U464</td>
<td>Probability and Engineering Economy</td>
<td>4</td>
</tr>
</tbody>
</table>
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 56 semester hours in engineering as indicated below.

Required Engineering
Complete each of the following courses:

- CIV U221 Statics and Strength of Materials 4 SH
- CIV U260 Civil Engineering Materials 3 SH
- CIV U261 Materials and Measurements Lab 2 SH
- CIV U320 Structural Analysis 1 4 SH
- CIV U324 Reinforced Concrete Design 4 SH
- CIV U331 Fluid Mechanics 4 SH
- CIV U334 Environmental Engineering 4 SH
- CIV U340 Soil Mechanics 4 SH
- CIV U341 Lab for CIV U340 1 SH
- CIV U769 Senior Design Project 5 SH

Civil Engineering Project Elective
Complete 4 semester hours from the following list:

- CIV U536 Hydrologic Engineering 4 SH
- CIV U554 Highway Engineering 4 SH

Civil Engineering Technical Electives
Complete 11 semester hours from the following list:

- CIV U425 Steel Design 4 SH
- CIV U522 Structural Analysis 2 4 SH
- CIV U534 Environmental Engineering 4 SH
- CIV U536 Hydrologic Engineering 4 SH
- CIV U542 Foundation Engineering 4 SH
- CIV U545 Geoenvironmental Engineering 4 SH
- CIV U553 Transport Analysis and Planning 4 SH
- CIV U554 Highway Engineering 4 SH
- CIV U556 Traffic Engineering 4 SH
- CIV U575 Construction Management 3 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

1 semester hour from the following course counts toward the engineering requirement:

CIV U464 Probability and Engineering Economy 4 SH for Civil Engineering

RESTRICTED ELECTIVES
Complete 4 semester hours from the “Historical Perspective Elective” list in the “College of Engineering Arts, Humanities, and Social Sciences Electives” on page 228.

1 semester hour from the following course counts toward the mathematics/science 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

1 semester hour from the following course counts toward the engineering requirement:

CIV U464 Probability and Engineering Economy 4 SH for Civil Engineering

GENERAL ELECTIVES
Complete 4 semester hours from the “Social/Cultural Perspective Elective” list in the “College of Engineering Arts, Humanities, and Social Sciences Electives” on page 228.

OTHER REQUIRED COURSE WORK
Complete 21 semester hours as indicated below.

Writing
Complete the following two courses with a grade of C or higher in both courses:

ENG U111 College Writing 4 SH
ENG U302 Advanced Writing in the Technical Professions 4 SH

Micro- or Macroeconomics
Complete one of the following courses:

ECN U115 Principles of Macroeconomics 4 SH
ECN U116 Principles of Microeconomics 4 SH

Mathematics/Science Elective
Complete 4 semester hours from one of the following departments: BIO, CHM, GEO, MIM, MTH, or PHY.

Professional Development
Complete the following three courses:

GE U100 Introduction to the Study of Engineering 1 SH
CIV U300 Introduction to Engineering Co-op Education 1 SH
CIV 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 your final 40 semester hours must be taken at Northeastern University.

MAJOR GPA REQUIREMENT
2.000 minimum GPA required in the major

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

COOPERATIVE EDUCATION

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