The Department of Mechanical and Industrial Engineering offers two accredited programs leading to a Bachelor of Science in industrial engineering or a Bachelor of Science in mechanical engineering. In addition, the department offers the following minors: (a) minor in industrial engineering, (b) minor in mechanical engineering, and (c) minor in biomechanical engineering.

Our mission is to educate persons for professional and technical excellence; to perform research to advance the science and practice of engineering; to engage in service activities that advance the department, the University, and the profession; and to instill in ourselves and our students habits and attitudes that promote ethical behavior, professional responsibility, and careers that advance the well-being of society.

The goal is for graduates from our undergraduate programs to demonstrate technical excellence in their chosen fields, anticipate and respond to societal changes, and develop careers with depth and flexibility, while retaining a professional and intellectual thrust throughout.

Specifically, we have established the following educational objectives for our undergraduate programs:

1a. Mechanical engineers will show proficiency in the analysis, modeling, and design of thermal and mechanical systems.
1b. Industrial engineers will show proficiency in the design, analysis, optimization, and improvement of integrated systems that include people, materials, information, equipment, and energy.

2. Graduates will successfully integrate their academic preparation with engineering practice.
3. Graduates will effectively utilize management skills to design projects and/or programs, to lead their implementation, and to present technical information, as appropriate to their field.

4. Graduates will engage in continuing education for professional development and career planning, including success in graduate education and research for those who choose to do so.

Industrial Engineering

Industrial engineering involves the design and analysis of systems that include people, equipment, and materials and their interactions and performance in the workplace. The industrial engineer collects this information and evaluates alternatives to make decisions that best advance the goals of the enterprise.

The program in industrial engineering offers students a base of traditional engineering courses, such as work design, human-machine systems, probability, statistics, and engineering economy, while emphasizing such contemporary areas as digital simulation, computer information and database systems, quality assurance, logistics and supply chain management, operations research, and facilities planning.

Industrial engineers work in manufacturing firms, hospitals, banks, public utilities, transportation, government agencies, insurance companies, and construction firms. Among the projects they undertake are design and implementation of a computer-integrated manufacturing system, facilities planning for a variety of industries, design of a robotics system in a manufacturing environment, long-range corporate planning, development and implementation of a quality-control system, simulation analyses to improve processes and make operational decisions, design of workstations to enhance worker safety and productivity, and development of computer systems for information control.

More than 90 percent of department undergraduate students take advantage of the cooperative education program. Cooperative education assignments generally increase in level of responsibility as students gain theoretical and technical knowledge through their academic work. A sophomore might begin as a computer analyst evaluating the performance of a manufacturing system and progress to designing manufacturing engineering workstations by the senior year.

BSIE—Bachelor of Science in Industrial Engineering

MATHEMATICS/SCIENCE REQUIREMENT

Complete 39 semester hours in mathematics and science as indicated below.

Required Mathematics/Science

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

- CHM U151 General Chemistry for Engineers 4 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

Further Credit
3 semester hours from the following course count toward the mathematics/science requirement:
MIM U412  Engineering Probability and Statistics 4 SH
2 semester hours from each of the following courses count toward the mathematics/science requirement:
MIM U515  Operations Research 4 SH
MIM U520  Stochastic Modeling 4 SH
1 semester hour from each of the following courses counts toward the mathematics/science requirement:
GE U111  Engineering Problem Solving and Computation 4 SH
MIM U512  Engineering Economy 4 SH

ENGINEERING REQUIREMENT
Complete 61 semester hours in engineering as indicated below.

Required Engineering
Complete each of the following courses with corresponding labs as indicated:
MIM U310  Introduction to Industrial Engineering 4 SH
MIM U420  Computers and Information Systems 4 SH
MIM U425  Engineering Database Systems 4 SH
MIM U510  Digital Simulation Techniques 4 SH
MIM U516  Quality Assurance 4 SH
MIM U522  Human Machine Systems 4 SH
with MIM U523  Lab for MIM U522 1 SH
MIM U525  Logistics and Supply Chain Management 4 SH
MIM U530  Manufacturing Systems and Techniques 4 SH
with MIM U531  Lab for MIM U530 1 SH
MIM U701  Capstone Design 1 1 SH
MIM U702  Capstone Design 2 5 SH

Engineering Elective 1
Complete 4 semester hours from one of the following departments: CHE, CIV, ECE, or MIM.

Engineering Elective 2
Complete 4 semester hours from one of the following departments: CHE, CIV, ECE, or MIM.

Further Credit
3 semester hours from each of the following courses count toward the engineering requirement:
GE U110  Engineering Design 4 SH
MIM U512  Engineering Economy 4 SH

2 semester hours from each of the following courses count toward the engineering requirement:
GE U111  Engineering Problem Solving and Computation 4 SH
MIM U515  Operations Research 4 SH
MIM U520  Stochastic Modeling 4 SH
1 semester hour from the following course counts toward the engineering requirement:
MIM U412  Engineering Probability and Statistics 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 in the Technical Professions

Professional Development
Complete the following three courses:
GE U100  Introduction to the Study of Engineering 1 SH
MIM U300  Introduction to Engineering Co-op Education 1 SH
MIM 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 MIM 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
137 total semester hours required
Minimum 2.000 GPA required

Minor in Industrial Engineering

REQUIRED COURSES
Complete the following three courses:
MIM U310 Introduction to Industrial Engineering 4 SH
MIM U412 Engineering Probability and Statistics 4 SH
or equivalent
MIM U515 Operations Research 4 SH

TECHNICAL ELECTIVE
Complete one course from the following list (see mechanical and industrial engineering academic advisor for additional electives):
MIM U420 Computers and Information Systems 4 SH
MIM U425 Engineering Database Systems 4 SH
MIM U510 Digital Simulation Techniques 4 SH
MIM U512 Engineering Economy 4 SH
MIM U516 Quality Assurance 4 SH
MIM U520 Stochastic Modeling 4 SH
MIM U522 Human Machine Systems 4 SH
MIM U525 Logistics and Supply Chain Management 4 SH
MIM U530 Manufacturing Systems and Techniques 4 SH

GPA REQUIREMENT
2.000 GPA required in the minor

Mechanical Engineering
Mechanical engineering involves the design, development, and manufacture of machinery and devices to transmit power or to convert energy from thermal to mechanical form in order to power the modern world and its machines. Its current practice has been heavily influenced by recent advances in computer hardware and software.

Mechanical engineers use computers to formulate preliminary and final designs of systems or devices, to perform calculations that predict the behavior of the design, and to collect and analyze performance data from system testing or operation.

Traditionally, mechanical engineers have designed and tested devices, such as heating and air-conditioning systems, machine tools, internal-combustion engines, and steam power plants. Today they also play primary roles in the development of new technologies in a variety of fields—energy conversion, solar energy utilization, environmental control, prosthetics, transportation, manufacturing, and new-materials development.

The curriculum in mechanical engineering focuses on three areas: applied mechanics, thermofluids engineering, and materials science. Applied mechanics is the study of the motion and deformation of structural elements acted on by forces in devices that range from rotating industrial dynamos to dentists’ drills. Thermofluids engineering deals with the motion of fluids and the transfer of energy, as in the cooling of electronic components or the design of gas turbine engines. Materials science is concerned with the relationship between the structure and properties of materials and with the control of structure, through processing, to achieve the desired properties. Practical applications are in the development of composite materials and in metallurgical process industries.

Courses in each area form the foundation for advanced analytical and creative design courses that culminate in a two-semester capstone design project. Faculty encourages students throughout the curriculum to use computer-aided design tools and high-performance computer workstations.

More than 90 percent of department undergraduate students take advantage of the cooperative education program. Cooperative education assignments increase in responsibility and technical challenge as students progress through the program. Initial positions may involve computer-intensive CAD/CAM assignments or programming tasks, while more advanced jobs will place students in charge of quality-control systems and performance testing of equipment.

BSME—Bachelor of Science in Mechanical Engineering

MATHEMATICS/SCIENCE REQUIREMENT
Complete 36 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
MTH U241 Calculus 1 for Science and Engineering 4 SH
MTH U242 Calculus 2 for Science and Engineering 4 SH
MTH U243 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

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 68 semester hours in engineering as indicated below.

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

ECE U210 Electrical Engineering 4 SH
with ECE U211 Lab for ECE U210 1 SH
MIM U340 Introduction to Material Science 4 SH
with MIM U341 Lab for MIM U340 1 SH
MIM U350 Engineering Mechanics and Design 4 SH
MIM U355 Mechanics of Materials 4 SH
with MIM U356 Lab for MIM U355 1 SH
MIM U380 Thermodynamics 4 SH
MIM U455 Dynamics and Vibrations 4 SH
with MIM U456 Lab for MIM U455 1 SH
MIM U475 Fluid Mechanics 4 SH
MIM U505 Measurement and Analysis with Thermal Science Application 4 SH
with MIM U506 Lab for MIM U505 1 SH
MIM U508 Mechanical Engineering Computation and Design 4 SH
MIM U550 Mechanical Engineering Design 4 SH
MIM U555 System Analysis and Control 4 SH
MIM U570 Thermal Systems Analysis and Design 4 SH
MIM U701 Capstone Design 1 1 SH
MIM U702 Capstone Design 2 5 SH

Mechanical and Industrial Engineering Technical Elective
Complete one technical elective from the MIM 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 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 in the Technical Professions 4 SH

Professional Development
Complete the following three courses:

GE U100 Introduction to the Study of Engineering 1 SH
MIM U300 Introduction to Engineering Co-op Education 1 SH
MIM 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 MIM 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
141 total semester hours required
Minimum 2.000 GPA required

Minor in Mechanical Engineering

REQUIRED COURSES
Complete the following two courses:

MIM U350 Engineering Mechanics and Design 4 SH
MIM U380 Thermodynamics 4 SH

MECHANICAL ENGINEERING TECHNICAL ELECTIVES
Complete two courses from the following list:

MIM U340 Introduction to Material Science 4 SH
MIM U355 Mechanics of Materials 4 SH
MIM U455 Dynamics and Vibrations 4 SH
MIM U475  Fluid Mechanics  4 SH
MIM U508  Mechanical Engineering Computation and Design  4 SH
MIM U550  Mechanical Engineering Design  4 SH
MIM U555  System Analysis and Control  4 SH
MIM U570  Thermal Systems Analysis and Design  4 SH

GPA REQUIREMENT
2.000 GPA required in the minor

Minor in Biomechanical Engineering

REQUIRED BIOLOGY
Complete the following two courses with corresponding labs:
BIO U111  General Biology I  4 SH
with BIO U112  Lab for BIO U111  1 SH
BIO U117  Integrated Anatomy and Physiology I  4 SH
with BIO U118  Lab for BIO U117  1 SH

REQUIRED MECHANICAL ENGINEERING
Complete the following three courses with a biomedical engineering component:
MIM U665  Musculoskeletal Biomechanics  4 SH
MIM U701  Capstone Design 1  1 SH
MIM U702  Capstone Design 2  5 SH

TECHNICAL ELECTIVE
Complete one technical elective from the following list
(additional electives may be approved by your academic advisor):
CHE U630  Biochemical Engineering Fundamentals  4 SH
MIM U520  Stochastic Modeling  4 SH
MIM U522  Human Machine Systems  4 SH
MIM U640  Mechanical Behavior and Processing of Materials  4 SH
MIM U650  Advanced Mechanics of Materials  4 SH
MIM U655  Dynamics and Mechanical Vibration  4 SH
PHY U621  Biological Physics I  4 SH

GPA REQUIREMENT
2.000 GPA required in the minor