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. Students integrate the knowledge acquired in these courses in a two-semester capstone design project.

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:

- CHEM 1151 General Chemistry for Engineers 4 SH
- or CHEM 1211 General Chemistry 1 4 SH
- or CHEM 1214 General Chemistry 2 4 SH
- MATH 1341 Calculus 1 for Science and Engineering 4 SH
- MATH 1342 Calculus 2 for Science and Engineering 4 SH
- MATH 2321 Calculus 3 for Science and Engineering 4 SH
- MATH 2341 Differential Equations and Linear Algebra for Engineering 4 SH
**PHYS 1151**  Physics for Engineering 1  4 SH  
with **PHYS 1152**  Lab for PHYS 1151  1 SH  
**PHYS 1155**  Physics for Engineering 2  4 SH  
with **PHYS 1156**  Lab for PHYS 1155  1 SH  

**Further Credit**  
3 semester hours from the following course count toward the mathematics/science requirement:  
**IE 3412**  Engineering Probability and Statistics  4 SH  
2 semester hours from each of the following courses count toward the mathematics/science requirement:  
**IE 4515**  Operations Research  4 SH  
**IE 4520**  Stochastic Modeling  4 SH  
1 semester hour from each of the following courses counts toward the mathematics/science requirement:  
**GE 1111**  Engineering Problem Solving and Computation  4 SH  
**IE 4512**  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:  
**IE 2310**  Introduction to Industrial Engineering  4 SH  
**IE 3420**  Computers and Information Systems  4 SH  
**IE 3425**  Engineering Database Systems  4 SH  
**IE 4510**  Digital Simulation Techniques  4 SH  
**IE 4516**  Quality Assurance  4 SH  
**IE 4522**  Human Machine Systems  4 SH  
with **IE 4523**  Lab for IE 4522  1 SH  
**IE 4525**  Logistics and Supply Chain Management  4 SH  
**IE 4530**  Manufacturing Systems and Techniques  4 SH  
with **IE 4531**  Lab for IE 4530  1 SH  
**MEIE 4701**  Capstone Design 1  1 SH  
**MEIE 4702**  Capstone Design 2  5 SH  

**Engineering Electives**  
Complete 8 semester hours of engineering electives in the following subjects: CHME, CIVE, EECE, IE, ME, and MEIE.  

**Further Credit**  
3 semester hours from each of the following courses count toward the engineering requirement:  
**GE 1110**  Engineering Design  4 SH  
**IE 4512**  Engineering Economy  4 SH  
2 semester hours from each of the following courses count toward the engineering requirement:  
**GE 1111**  Engineering Problem Solving and Computation  4 SH  
**IE 4515**  Operations Research  4 SH  
**IE 4520**  Stochastic Modeling  4 SH  
1 semester hour from the following course counts toward the engineering requirement:  
**IE 3412**  Engineering Probability and Statistics  4 SH  

**PROFESSIONAL DEVELOPMENT REQUIREMENT**  
Complete 5 semester hours in professional development as indicated below.  

**Professional development**  
Complete the following three courses:  
**GE 1000**  Introduction to the Study of Engineering  1 SH  
**MEIE 2000**  Introduction to Engineering Co-op Education  1 SH  
**MEIE 3000**  Professional Issues in Engineering  1 SH  

**Further Credit**  
1 semester hour from each of the following courses counts toward the professional development requirement:  
**GE 1110**  Engineering Design  4 SH  
**GE 1111**  Engineering Problem Solving and Computation  4 SH  

**ADDITIONAL NU CORE COURSES**  
Complete 16 semester hours in NU Core course work as indicated below.  

**Writing**  
Complete the following two courses with a grade of C or higher in each course:  
**ENGL 1111**  College Writing  4 SH  
**ENGL 3302**  Advanced Writing in the Technical Professions  4 SH  

**Arts/Humanities Level 1**  
Complete 4 semester hours from the NU Core arts/humanities level 1 domain, as described on page 26.  

**Social Science Level 1**  
Complete 4 semester hours from the NU Core social science level 1 domain, as described on page 26.  

**GENERAL ELECTIVES**  
Complete four 4-SH-equivalent academic, nonremedial, nonrepetitive courses.  

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

**MAJOR GPA REQUIREMENT**  
2.000 minimum GPA required in IE, ME, and MEIE courses  

**NU CORE REQUIREMENTS**  
See page 26 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:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>SH</th>
</tr>
</thead>
<tbody>
<tr>
<td>IE 2310</td>
<td>Introduction to Industrial Engineering</td>
<td>4</td>
</tr>
<tr>
<td>IE 3412</td>
<td>Engineering Probability and Statistics</td>
<td>4</td>
</tr>
<tr>
<td>or equivalent</td>
<td></td>
<td></td>
</tr>
<tr>
<td>IE 4515</td>
<td>Operations Research</td>
<td>4</td>
</tr>
</tbody>
</table>

TECHNICAL ELECTIVE
Complete one course from the following list (see mechanical and industrial engineering academic advisor for additional electives):

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>SH</th>
</tr>
</thead>
<tbody>
<tr>
<td>IE 3420</td>
<td>Computers and Information Systems</td>
<td>4</td>
</tr>
<tr>
<td>IE 3425</td>
<td>Engineering Database Systems</td>
<td>4</td>
</tr>
<tr>
<td>IE 4510</td>
<td>Digital Simulation Techniques</td>
<td>4</td>
</tr>
<tr>
<td>IE 4512</td>
<td>Engineering Economy</td>
<td>4</td>
</tr>
<tr>
<td>IE 4516</td>
<td>Quality Assurance</td>
<td>4</td>
</tr>
<tr>
<td>IE 4520</td>
<td>Stochastic Modeling</td>
<td>4</td>
</tr>
<tr>
<td>IE 4522</td>
<td>Human Machine Systems</td>
<td>4</td>
</tr>
<tr>
<td>IE 4525</td>
<td>Logistics and Supply Chain Management</td>
<td>4</td>
</tr>
<tr>
<td>IE 4530</td>
<td>Manufacturing Systems and Techniques</td>
<td>4</td>
</tr>
</tbody>
</table>

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:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>SH</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL 1111</td>
<td>General Biology 1</td>
<td>4</td>
</tr>
<tr>
<td>with BIOL 1112</td>
<td>Lab for BIOL 1111</td>
<td>1</td>
</tr>
<tr>
<td>CHEM 1151</td>
<td>General Chemistry for Engineers</td>
<td>4</td>
</tr>
<tr>
<td>MATH 1341</td>
<td>Calculus 1 for Science and Engineering</td>
<td>4</td>
</tr>
<tr>
<td>MATH 1342</td>
<td>Calculus 2 for Science and Engineering</td>
<td>4</td>
</tr>
<tr>
<td>MATH 2321</td>
<td>Calculus 3 for Science and Engineering</td>
<td>4</td>
</tr>
<tr>
<td>MATH 2341</td>
<td>Differential Equations and Linear Algebra for Engineering</td>
<td>4</td>
</tr>
<tr>
<td>PHYS 1151</td>
<td>Physics for Engineering 1</td>
<td>4</td>
</tr>
<tr>
<td>with PHYS 1152</td>
<td>Lab for PHYS 1151</td>
<td>1</td>
</tr>
<tr>
<td>PHYS 1155</td>
<td>Physics for Engineering 2</td>
<td>4</td>
</tr>
<tr>
<td>with PHYS 1156</td>
<td>Lab for PHYS 1155</td>
<td>1</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>SH</th>
</tr>
</thead>
<tbody>
<tr>
<td>GE 1111</td>
<td>Engineering Problem Solving and Computation</td>
<td>4</td>
</tr>
</tbody>
</table>

ENGINEERING REQUIREMENT
Complete 68 semester hours in engineering as indicated below.

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

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>SH</th>
</tr>
</thead>
<tbody>
<tr>
<td>EECE 2210</td>
<td>Electrical Engineering</td>
<td>4</td>
</tr>
<tr>
<td>with EECE 2211</td>
<td>Lab for EECE 2210</td>
<td>1</td>
</tr>
</tbody>
</table>
ME 2340 Introduction to Material Science 4 SH
with ME 2341 Lab for ME 2340 1 SH
ME 2350 Engineering Mechanics and Design 4 SH
ME 2355 Mechanics of Materials 4 SH
with ME 2356 Lab for ME 2355 1 SH
ME 2380 Thermodynamics 4 SH
ME 3455 Dynamics and Vibrations 4 SH
with ME 3456 Lab for ME 3455 1 SH
ME 3475 Fluid Mechanics 4 SH
or ME 3480 International Applications of Fluid Mechanics 4 SH
ME 4505 Measurement and Analysis with Thermal Science Application 4 SH
with ME 4506 Lab for ME 4505 1 SH
ME 4508 Mechanical Engineering Computation and Design 4 SH
ME 4550 Mechanical Engineering Design 4 SH
ME 4555 System Analysis and Control 4 SH
ME 4570 Thermal Systems Analysis and Design 4 SH
MEIE 4701 Capstone Design 1 1 SH
MEIE 4702 Capstone Design 2 5 SH

MECHANICAL AND INDUSTRIAL ENGINEERING TECHNICAL ELECTIVE
Complete one technical elective in one of the following subjects:
IE, ME, or MEIE.

Further Credit
3 semester hours from the following course count toward the engineering requirement:
GE 1110 Engineering Design 4 SH
2 semester hours from the following course count toward the engineering requirement:
GE 1111 Engineering Problem Solving and Computation 4 SH

PROFESSIONAL DEVELOPMENT REQUIREMENT
Complete 5 semester hours in professional development as indicated below.

Professional Development
Complete the following three courses:
GE 1000 Introduction to the Study of Engineering 1 SH
MEIE 2000 Introduction to Engineering Co-op Education 1 SH
MEIE 3000 Professional Issues in Engineering 1 SH

Further Credit
1 semester hour from each of the following courses counts toward the professional development requirement:
GE 1110 Engineering Design 4 SH
GE 1111 Engineering Problem Solving and Computation 4 SH

ADDITIONAL NU CORE COURSES
Complete 16 semester hours in NU Core course work as indicated below.

Writing
Complete the following two courses with a grade of C or higher in each course:
ENGL 1111 College Writing 4 SH
ENGL 3302 Advanced Writing in the Technical Professions 4 SH

Arts/Humanities Level 1
Complete 4 semester hours from the NU Core arts/humanities level 1 domain, as described on page 26.

Social Science Level 1
Complete 4 semester hours from the NU Core social science level 1 domain, as described on page 26.

GENERAL ELECTIVES
Complete four 4-SH-equivalent academic, nonremedial, nonrepetitive courses.

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

MAJOR GPA REQUIREMENT
2.000 minimum GPA required in IE, ME, and MEIE courses

NU CORE REQUIREMENTS
See page 26 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:
ME 2350 Engineering Mechanics and Design 4 SH
ME 2380 Thermodynamics 4 SH

MECHANICAL ENGINEERING TECHNICAL ELECTIVES
Complete two courses from the following list:
ME 2340 Introduction to Material Science 4 SH
ME 2355 Mechanics of Materials 4 SH
ME 3455 Dynamics and Vibrations 4 SH
ME 3475 Fluid Mechanics 4 SH
or ME 3480 International Applications of Fluid Mechanics 4 SH
ME 4508 Mechanical Engineering Computation and Design 4 SH
ME 4550  Mechanical Engineering Design  4 SH  
ME 4555  System Analysis and Control  4 SH  
ME 4570  Thermal Systems Analysis and Design  4 SH  

**GPA REQUIREMENT**  
2.000 GPA required in the minor

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### Minor in Biomechanical Engineering

**REQUIRED BIOLOGY**  
Complete the following two courses with corresponding labs:  
BIOL 1111  General Biology 1  4 SH  
with BIOL 1112  Lab for BIOL 1111  1 SH  
BIOL 1117  Integrated Anatomy and Physiology 1  4 SH  
with BIOL 1118  Lab for BIOL 1117  1 SH  

**REQUIRED MECHANICAL ENGINEERING**  
Complete the following three courses with a biomedical engineering component:  
ME 5665  Musculoskeletal Biomechanics  4 SH  
MEIE 4701  Capstone Design 1  1 SH  
MEIE 4702  Capstone Design 2  5 SH  

**TECHNICAL ELECTIVE**  
Complete one technical elective from the following list (additional electives may be approved by your academic advisor):  
IE 4520  Stochastic Modeling  4 SH  
IE 4522  Human Machine Systems  4 SH  
ME 4640  Mechanical Behavior and Processing of Materials  4 SH  
ME 5650  Advanced Mechanics of Materials  4 SH  
ME 5655  Dynamics and Mechanical Vibration  4 SH  
PHYS 4621  Biological Physics 1  4 SH  

**GPA REQUIREMENT**  
2.000 GPA required in the minor