

# Industrial Engineering, BSIE

Industrial engineering involves the design and analysis of systems that include people, equipment, and materials and their interactions and performance in the workplace. An 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 simulation modeling, engineering 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 supply chain or 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 healthcare operations to enhance patient safety; and improve efficiency, productivity, and development of computer systems for information control.

More than 90% 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/data analyst evaluating the performance of a manufacturing system and progress to designing manufacturing engineering workstations by the senior year.

Visit the department website (<https://mie.northeastern.edu/academics/undergraduate-studies/mie-accreditation/>) for program educational objectives.

## Program Requirements

Complete all courses listed below unless otherwise indicated. Also complete any corequisite labs, recitations, clinicals, or tools courses where specified and complete any additional courses needed beyond specific college and major requirements to satisfy graduation credit requirements.

## Universitywide Requirements

All undergraduate students are required to complete the Universitywide Requirements (<https://catalog.northeastern.edu/undergraduate/university-academics/university-wide-requirements/>).

## NUpath Requirements

All undergraduate students are required to complete the NUpath Requirements (<https://catalog.northeastern.edu/undergraduate/university-academics/nupath/>).

NUpath requirements Interpreting Culture (IC), Understanding Societies and Institutions (SI), Engaging Differences and Diversity (DD), and Integrating Knowledge and Skills Through Experience (EX) are not explicitly satisfied by required engineering coursework. Successful completion of a cooperative education experience fulfills the EX requirement. Students are responsible for satisfying unfulfilled NUpath requirements with general elective coursework.

## Engineering Requirements

Code	Title	Hours
<b>Required Engineering</b>		
IE 2310 and IE 2311	Introduction to Industrial Engineering and Recitation for IE 2310	4
IE 3425 and IE 3426	Engineering Database Systems and Recitation for IE 3425	4
IE 4510	Simulation Modeling and Analysis	4
IE 4516	Quality Assurance	4
IE 4522 and IE 4523	Human-Machine Systems and Lab for IE 4522	5
IE 4525	Logistics and Supply Chain Management	4
IE 4530 and IE 4531	Manufacturing Systems and Techniques and Lab for IE 4530	5
<b>Industrial Engineering Capstone</b>		
MEIE 4701	Capstone Design 1	1
MEIE 4702	Capstone Design 2	5
<b>Engineering Electives</b>		

Complete 8 semester hours of technical electives in the following subject areas: 8

BIOE, CHME, CIVE, EECE, EMGT, ENSY, IE, ME, and MEIE

### Supplemental Credit

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

IE 3412 Engineering Probability and Statistics  
or MATH 3081 Probability and Statistics

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

IE 4512 Engineering Economy

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

IE 4515 Operations Research

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

IE 4520 Stochastic Modeling

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

GE 1501 Cornerstone of Engineering 1 <sup>1</sup>

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

GE 1502 Cornerstone of Engineering 2 <sup>1</sup>

### Supporting Courses: Mathematics/Science

Complete all mathematics/science courses with a minimum of 30 semester hours.

Code	Title	Hours
<b>Required Mathematics/Science</b>		
CHEM 1151 and CHEM 1153	General Chemistry for Engineers and Recitation for CHEM 1151	4
MATH 1341	Calculus 1 for Science and Engineering	4
MATH 1342	Calculus 2 for Science and Engineering	4
MATH 2321	Calculus 3 for Science and Engineering	4
MATH 2341	Differential Equations and Linear Algebra for Engineering	4
PHYS 1151 and PHYS 1152 and PHYS 1153	Physics for Engineering 1 and Lab for PHYS 1151 and Interactive Learning Seminar for PHYS 1151	5
<b>Science Elective</b>		
Complete one of the following:		5
BIOL 1111 and BIOL 1112	General Biology 1 and Lab for BIOL 1111	
BIOL 2217 and BIOL 2218	Integrated Anatomy and Physiology 1 and Lab for BIOL 2217	
CHEM 2311 and CHEM 2312 and CHEM 2319	Organic Chemistry 1 and Lab for CHEM 2311 and Recitation for CHEM 2311	
PHYS 1155 and PHYS 1156 and PHYS 1157	Physics for Engineering 2 and Lab for PHYS 1155 and Interactive Learning Seminar for PHYS 1155	
<b>Supplemental Credit</b>		
3 semester hours from the following course count toward the mathematics/science requirement:		3
IE 3412 or MATH 3081	Engineering Probability and Statistics Probability and Statistics	
1 semester hour from the following course counts toward the mathematics/science requirement:		1
IE 4512	Engineering Economy	
2 semester hours from the following course count toward the mathematics/science requirement:		2
IE 4515	Operations Research	
2 semester hours from the following course count toward the mathematics/science requirement:		2
IE 4520	Stochastic Modeling	
1 semester hour from the following course counts toward the mathematics/science requirement:		1
GE 1501	Cornerstone of Engineering 1 <sup>1</sup>	

## Professional Development

Code	Title	Hours
<b>Required Professional Development</b>		
GE 1000	First-Year Seminar	1
ENCP 2000	Introduction to Engineering Co-op Education	1
ENCP 3000	Professional Issues in Engineering	1
<b>Additional Required Courses</b>		
1 semester hour from the following course counts toward the professional development requirement:		1
GE 1501	Cornerstone of Engineering 1 <sup>1</sup>	
1 semester hour from the following course counts toward the professional development requirement:		1
GE 1502	Cornerstone of Engineering 2 <sup>1</sup>	

## Writing Requirements

Code	Title	Hours
<b>Writing</b>		
A grade of C or higher is required:		
ENGW 1111	First-Year Writing	4
ENGW 3302 or ENGW 3315	Advanced Writing in the Technical Professions Interdisciplinary Advanced Writing in the Disciplines	4

## Required General Electives

Code	Title	Hours
Complete 28 semester hours of academic, nonremedial, nonrepetitive courses.		28

## Program Requirement

137 total semester hours required

## Major GPA Requirement

A 2.000 minimum GPA is required in ME/MEIE/EECE/ENCP coursework.

<sup>1</sup> Students can substitute Engineering Design (GE 1110) and Engineering Problem Solving and Computation (GE 1111) for Cornerstone of Engineering 1 (GE 1501) and Cornerstone of Engineering 2 (GE 1502) in approved situations.

## Plan of Study

### Sample Plans of Study

#### FOUR YEARS, TWO CO-OPS IN SUMMER 2/FALL

<b>Year 1</b>							
Fall	Hours	Spring	Hours	Summer 1	Hours	Summer 2	Hours
CHEM 1151 (ND)		4 GE 1502 (ER)		4 MATH 2321 (FQ)		4 General elective	4
CHEM 1153	0	MATH 1342 (FQ)	4	General elective	4	General elective	4
ENGW 1111 (WF)	4	PHYS 1151 (ND)	3				
GE 1000	1	PHYS 1152 (AD)	1				
GE 1501	4	PHYS 1153	1				
MATH 1341 (FQ)	4	General elective	4				
	17		17		8		8
<b>Year 2</b>							
Fall	Hours	Spring	Hours	Summer 1	Hours	Summer 2	Hours
IE 2310 (WI)		4 ENCP 2000		1 General elective		4 Co-op	0
IE 2311	0	ENGW 3302 or 3315 (WD)	4	General elective	4		
IE 3425	4	IE 3412 or MATH 3081 (AD)	4				
IE 3426	0	IE 4512	4				
MATH 2341	4	Technical elective	4				
Science elective	5						
	17		17		8		0

Year 3							
Fall	Hours	Spring	Hours	Summer 1	Hours	Summer 2	Hours
Co-op		0 IE 4510		4 MEIE 4701 (EI, WI, CE)		1 Co-op	0
		IE 4515		4 General elective		4	
		IE 4516		4 Technical elective		4	
		IE 4530		4			
		IE 4531		1			
		0		17		9	0
Year 4							
Fall	Hours	Spring	Hours				
Co-op		0 ENCP 3000		1			
		IE 4520		4			
		IE 4522		4			
		IE 4523		1			
		IE 4525		4			
		MEIE 4702 (EI, WI, CE)		5			
		0		19			

Total Hours: 137

**FOUR YEARS, TWO CO-OPS IN SPRING/SUMMER 1**

Year 1							
Fall	Hours	Spring	Hours	Summer 1	Hours	Summer 2	Hours
CHEM 1151 (ND)		4 GE 1502 (ER)		4 MATH 2321 (FQ)		4 General elective	4
CHEM 1153		0 MATH 1342 (FQ)		4 General elective		4 General elective	4
ENGW 1111 (WF)		4 PHYS 1151 (ND)		3			
GE 1000		1 PHYS 1152 (AD)		1			
GE 1501		4 PHYS 1153		1			
MATH 1341 (FQ)		4 General elective		4			
		17		17		8	8
Year 2							
Fall	Hours	Spring	Hours	Summer 1	Hours	Summer 2	Hours
ENCP 2000		1 Co-op		0 Co-op		0 MATH 3081 (AD)	4
IE 2310 (WI)		4				General elective	4
IE 2311		0					
IE 3425		4					
IE 3426		0					
MATH 2341		4					
Science elective		5					
		18		0		0	8
Year 3							
Fall	Hours	Spring	Hours	Summer 1	Hours	Summer 2	Hours
ENGW 3302 or 3315 (WD)		4 Co-op		0 Co-op		0 General elective	4
IE 4510		4				General elective	4
IE 4515		4					
IE 4530		4					
IE 4531		1					
		17		0		0	8
Year 4							
Fall	Hours	Spring	Hours				
ENCP 3000		1 IE 4520		4			
IE 4512		4 IE 4522		4			
IE 4516		4 IE 4523		1			

IE 4525	4	MEIE 4702 (EI, WI, CE)	5
MEIE 4701 (EI, WI, CE)	1	Technical elective	4
Technical elective	4		
	<b>18</b>		<b>18</b>

**Total Hours: 137**

### **FIVE YEARS, THREE CO-OPS IN SUMMER 2/FALL**

#### **Year 1**

<b>Fall</b>	<b>Hours</b>	<b>Spring</b>	<b>Hours</b>	<b>Summer 1</b>	<b>Hours</b>	<b>Summer 2</b>	<b>Hours</b>
CHEM 1151 (ND)		4 GE 1502 (ER)		4 Vacation		Vacation	
CHEM 1153	0	MATH 1342 (FQ)		4			
ENGW 1111 (WF)	4	PHYS 1151 (ND)		3			
GE 1000	1	PHYS 1152 (AD)		1			
GE 1501	4	PHYS 1153		1			
MATH 1341 (FQ)	4	General elective		4			
	<b>17</b>		<b>17</b>		<b>0</b>		<b>0</b>

#### **Year 2**

<b>Fall</b>	<b>Hours</b>	<b>Spring</b>	<b>Hours</b>	<b>Summer 1</b>	<b>Hours</b>	<b>Summer 2</b>	<b>Hours</b>
IE 2310 (WI)		4 ENCP 2000		1 Vacation		Co-op	0
IE 2311	0	IE 3412 or MATH 3081 (AD)		4			
IE 3425	4	IE 4512		4			
IE 3426	0	MATH 2341		4			
MATH 2321 (FQ)	4	General elective		4			
Science elective	5						
	<b>17</b>		<b>17</b>		<b>0</b>		<b>0</b>

#### **Year 3**

<b>Fall</b>	<b>Hours</b>	<b>Spring</b>	<b>Hours</b>	<b>Summer 1</b>	<b>Hours</b>	<b>Summer 2</b>	<b>Hours</b>
Co-op	0	ENGW 3302 or 3315 (WD)		4 General elective		4 Co-op	0
		IE 4510		4 General elective		4	
		IE 4515		4			
		IE 4516		4			
	<b>0</b>		<b>16</b>		<b>8</b>		<b>0</b>

#### **Year 4**

<b>Fall</b>	<b>Hours</b>	<b>Spring</b>	<b>Hours</b>	<b>Summer 1</b>	<b>Hours</b>	<b>Summer 2</b>	<b>Hours</b>
Co-op	0	ENCP 3000		1 MEIE 4701 (EI, CE, WI)		1 Co-op	0
		IE 4520		4 General elective		4	
		IE 4525		4 General elective		4	
		IE 4530		4			
		IE 4531		1			
		Technical elective		4			
	<b>0</b>		<b>18</b>		<b>9</b>		<b>0</b>

#### **Year 5**

<b>Fall</b>	<b>Hours</b>	<b>Spring</b>	<b>Hours</b>
Co-op	0	IE 4522	4
		IE 4523	1
		MEIE 4702 (EI, WI, CE)	5
		General elective	4
		Technical elective	4
	<b>0</b>		<b>18</b>

**Total Hours: 137**

**FIVE YEARS, THREE CO-OPS IN SPRING/SUMMER 1****Year 1**

<b>Fall</b>	<b>Hours</b>	<b>Spring</b>	<b>Hours</b>	<b>Summer 1</b>	<b>Hours</b>	<b>Summer 2</b>	<b>Hours</b>
CHEM 1151 (ND)		4 GE 1502 (ER)		4 Vacation		Vacation	
CHEM 1153		0 MATH 1342 (FQ)		4			
ENGW 1111 (WF)		4 PHYS 1151 (ND)		3			
GE 1000		1 PHYS 1152 (AD)		1			
GE 1501		4 PHYS 1153		1			
MATH 1341 (FQ)		4 General elective		4			
	<b>17</b>		<b>17</b>		<b>0</b>		<b>0</b>

**Year 2**

<b>Fall</b>	<b>Hours</b>	<b>Spring</b>	<b>Hours</b>	<b>Summer 1</b>	<b>Hours</b>	<b>Summer 2</b>	<b>Hours</b>
ENCP 2000		1 Co-op		0 Co-op		0 Vacation	
IE 2310 (WI)		4					
IE 2311		0					
IE 3425		4					
IE 3426		0					
MATH 2321 (FQ)		4					
Science elective		5					
	<b>18</b>		<b>0</b>		<b>0</b>		<b>0</b>

**Year 3**

<b>Fall</b>	<b>Hours</b>	<b>Spring</b>	<b>Hours</b>	<b>Summer 1</b>	<b>Hours</b>	<b>Summer 2</b>	<b>Hours</b>
ENGW 3302 or 3315 (WD)		4 Co-op		0 Co-op		0 General elective	4
IE 3412 or MATH 3081 (AD)		4				General elective	4
IE 4512		4					
MATH 2341		4					
	<b>16</b>		<b>0</b>		<b>0</b>		<b>8</b>

**Year 4**

<b>Fall</b>	<b>Hours</b>	<b>Spring</b>	<b>Hours</b>	<b>Summer 1</b>	<b>Hours</b>	<b>Summer 2</b>	<b>Hours</b>
ENCP 3000		1 Co-op		0 Co-op		0 General elective	4
IE 4510		4				General elective	4
IE 4515		4					
IE 4516		4					
IE 4530		4					
IE 4531		1					
	<b>18</b>		<b>0</b>		<b>0</b>		<b>8</b>

**Year 5**

<b>Fall</b>	<b>Hours</b>	<b>Spring</b>	<b>Hours</b>
IE 4520		4 IE 4522	4
IE 4525		4 IE 4523	1
MEIE 4701 (EI, WI, CE)		1 MEIE 4702 (EI, WI, CE)	5
General elective		4 General elective	4
Technical elective		4 Technical elective	4
	<b>17</b>		<b>18</b>

**Total Hours: 137**