Electrical Engineering, BSEE (Boston)

The components of the information age—global communication systems; computers and computer chips and the software that runs them; as well as pacemakers, magnetic resonance imaging, and interplanetary space missions—are possible because of the efforts of electrical engineers. Today, electrical engineers are developing concepts and working to translate these ideas into the next generation of products: from computers and safe, energy-efficient vehicles, to radar that can detect unexploded land mines from the air, to microrobots that diagnose disease from inside the body.

Many electrical engineers work in the traditional areas of communications, computation, and control and components required to realize such systems. They are involved in design and product development, testing and quality control, sales and marketing, and manufacturing. Others use their problem-solving skills in diverse areas such as bioengineering, healthcare, electronic music, meteorology, and experimental psychology. Some graduates draw on their electrical engineering backgrounds to launch successful careers as physicians, financial analysts, attorneys, and entrepreneurs.

The BSEE degree requires a sequence of core courses and advanced study in one or more technical elective areas: electronic circuits and devices; signals and systems; fields, waves, and optics; power engineering; or computer engineering. General electives and electives in the arts and humanities and social sciences are also required.

Visit the department website (https://ece.northeastern.edu/academics/undergraduate-studies/ece-accreditation/) for educational program 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
Required Courses		
EECE 2140	Computing Fundamentals for Engineers	4
EECE 2150	Circuits and Signals: Biomedical Applications	5
EECE 2160	Embedded Design: Enabling Robotics	4
Electrical Engineering Fundamentals		
EECE 2412 and EECE 2413	Fundamentals of Electronics and Lab for EECE 2412	5
EECE 2520	Fundamentals of Linear Systems	4
EECE 2530 and EECE 2531	Fundamentals of Electromagnetics and Lab for EECE 2530	5
Computer Engineering Fundamentals		
If more than one computer engineering fundamentals course is taken, it can count as a technical elective.		
Complete one of the following:		4-5
EECE 2322 and EECE 2323	Fundamentals of Digital Design and Computer Organization and Lab for EECE 2322	
EECE 2540	Fundamentals of Networks	
EECE 2560	Fundamentals of Engineering Algorithms	
Electrical Engineering Capstone Courses		
If taking EECE 4791 in First-Half Summer, EECE 4792 must be taken in Spring. If taking EECE 4791 in Second-Half Summer, EECE 4792 must be taken in Fall.		
EECE 4791	Electrical and Computer Engineering Capstone 1	1

EECE 4792	Electrical and Computer Engineering Capstone 2	4
Electrical Engineering Technical Electives		
Students can register for EECE 4991/EECE 4992 more than once. For these courses combined, a maximum of 8 semester hours will be allowed to satisfy the requirement of technical electives. An additional 4 semester hours will be allowed as a general elective. At most, one of these courses (4 semester hours) can be taken in a semester.		
Though students may register for EECE 2750 more than once, only 4 semester hours will be allowed to satisfy the requirements of technical electives. An additional 4 semester hours will be allowed as a general elective.		
EECE 2310 is not an approved course option for ECE majors to select for a technical elective. It is only for Khoury students.		
Students who choose to complete the optional concentration in semiconductor engineering may fulfill this requirement with concentration coursework.		
Complete four of the following:		16
EECE 2322 and EECE 2323	Fundamentals of Digital Design and Computer Organization and Lab for EECE 2322	
EECE 2540 to EECE 2750		
EECE 3324 to EECE 3410		
EECE 4512 to EECE 4698		
EECE 4991	Research	
EECE 4992	Directed Study	
EECE 5115 to EECE 5699		
EECE 5670	Sustainable Energy: Materials, Conversion, Storage, and Usage	
Supplemental Credit		
2 semester hours from the following counts toward the engineering requirement:		2
EECE 3468	Analysis of Random Phenomena in Electrical and Computer Engineering	
2 semester hours from the following counts toward the engineering requirement:		2
GE 1501	Cornerstone of Engineering 1 [1]	
3 semester hours from the following course count toward the engineering requirement:		3
GE 1502	Cornerstone of Engineering 2 [1]	

Supporting Courses: Mathematics/Science

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

Code	Title	Hours
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
PHYS 1155 and PHYS 1156 and PHYS 1157	Physics for Engineering 2 and Lab for PHYS 1155 and Interactive Learning Seminar for PHYS 1155	5
Supplemental Credit		
2 semester hours from the following counts toward the mathematics/science requirement:		2
EECE 3468	Analysis of Random Phenomena in Electrical and Computer Engineering	
1 semester hour from the following counts toward the mathematics/science requirement:		1
GE 1501	Cornerstone of Engineering 1 [1]	

Professional Development

Code	Title	Hours
Professional Development		
ENCP 2000	Introduction to Engineering Co-op Education	1
ENCP 3000	Professional Issues in Engineering	1
GE 1000	First-Year Seminar	1

Additional Required Courses		
1 semester hour from the following counts toward the professional development requirement:		1
GE 1501	Cornerstone of Engineering 1 [1]	
1 semester hour from the following course counts toward the professional development requirement:		1
GE 1502	Cornerstone of Engineering 2 [1]	

Writing Requirements

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

Required General Electives

Code	Title	Hours
Complete 28 semester hours of academic, nonremedial, nonrepetitive courses. Students who choose to complete the optional concentration in semiconductor engineering may apply concentration coursework to this requirement.		28

[1] 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) .

Optional Concentration

Students may complete an optional concentration. Courses completed in the optional concentration may be applied toward this program's technical elective requirement course ranges or toward this program's general elective requirements. *Students interested in declaring this concentration should discuss course selection with an ECE advisor.*

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Major GPA Requirement

Minimum 2.000 GPA required in EECE courses

Program Requirement

133 total semester hours required

Semiconductor Engineering Concentration

Code	Title	Hours
EECE Core		
Complete four of the following (other courses outside of this list may fulfill this requirement if approved by COE Undergraduate Advising):		16
EECE 3392	Electronic Materials	
EECE 3410	Electronic Design	
EECE 4534	Microprocessor-Based Design	
EECE 4574	Wireless Communication Circuits	
EECE 4604	Integrated Circuit Devices	
EECE 4632	Hardware-Software Codesign for FPGA-Based Systems	
EECE 4646	Optics for Engineers	
EECE 5161	Thin Film Technologies	
EECE 5170	Introduction to Multiferroics Materials and Systems	
EECE 5606	Micro- and Nanofabrication	
EECE 5608	Magnetic Materials for Next-Generation Electronics	
EECE 5647	Nanophotonics	
EECE 5649	Design of Analog Integrated Circuits with Complementary Metal-Oxide-Semiconductor Technology	
EECE 5651	Introduction to Photonic Devices	
EECE 5653	Introduction to Quantum Engineering	

Engineering and Science Breadth		
Complete one of the following:		4
CHME 2310	Transport Processes 1	
CHME 2320	Engineering Thermodynamics	
CHME 3312	Transport Processes 2	
CHME 3322	Chemical Thermodynamics	
CHME 4512	Chemical Engineering Process Control	
CHME 5105	Materials Characterization Techniques	
IE 4530	Manufacturing Systems and Techniques	
IE 5617	Lean Concepts and Applications	
ME 2340	Introduction to Material Science	
ME 5600	Materials Processing and Process Selection	
ME 5620	Fundamentals of Advanced Materials	
PHYS 4305	Thermodynamics and Statistical Mechanics	
PHYS 4623	Medical Physics	
PHYS 5114	Physics and Applications of Quantum Materials	
PHYS 5260	Introduction to Nanoscience and Nanotechnology	
PHYS 5318	Principles of Experimental Physics	
PHYS 5352	Quantum Computation and Information	
Project Management, Product Development, and Entrepreneurship		
Complete one of the following:		4
ENTR 3330	Design Thinking for Startups	
GE 5010	Customer-Driven Technical Innovation for Engineers	
GE 5020	Engineering Product Design Methodology	
GE 5030	Iterative Product Prototyping for Engineers	
GE 5100	Product Development for Engineers	
IE 2310	Introduction to Industrial Engineering	
MISM 2301	Introduction to Information Systems and Digital Technologies	
MISM 2420	Foundations of Business Analysis	
MKTG 4510	New Product Development	
SCHM 2301	Supply Chain and Operations Management	
SCHM 3301	Global Supply Chain Strategy	

Plan of Study

Sample Plans of Study

FOUR YEARS, TWO CO-OPS IN SUMMER SECOND HALF/FALL

Year 1

Fall	Hours	Spring	Hours	Summer 1	Hours	Summer 2	Hours
CHEM 1151 (ND)	4	GE 1502 (ER)	4	General Elective	4	General Elective	4
CHEM 1153	0	MATH 1342 (FQ)	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**		**4**

Year 2

Fall	Hours	Spring	Hours	Summer 1	Hours	Summer 2	Hours
EECE 2140[1]	4	EECE 2160	4	General Elective	4	Co-op	0
EECE 2150 (AD)	5	ENCP 2000	1	General Elective	4		
MATH 2341	4	MATH 2321 (FQ)	4				
PHYS 1155 (ND)	3	EE Fundamentals	5				
PHYS 1156 (AD)	1	EE Fundamentals	4				

PHYS 1157	1						
	18		**18**		**8**		**0**

Year 3

Fall	Hours	Spring	Hours	Summer 1	Hours	Summer 2	Hours
Co-op	0	EECE 3468	4	EECE 4791 (EI, CE, WI)[2]	1	Co-op	0
		ENCP 3000	1	ENGW 3302 or 3315 (WD)	4		
		CE Fundamentals	4	Technical Elective	4		
		EE Fundamentals	5				
		Technical Elective	4				
	0		**18**		**9**		**0**

Year 4

Fall	Hours	Spring	Hours
Co-op	0	EECE 4792 (EI, CE, WI)[2]	4
		Technical Elective	4
		Technical Elective	4
		General Elective	4
	0		**16**

Total Hours: 133

FOUR YEARS, TWO CO-OPS IN SPRING/SUMMER FIRST HALF

Year 1

Fall	Hours	Spring	Hours	Summer 1	Hours	Summer 2	Hours
CHEM 1151 (ND)	4	GE 1502 (ER)	4	General Elective	4	General Elective	4
CHEM 1153	0	MATH 1342 (FQ)	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**		**4**

Year 2

Fall	Hours	Spring	Hours	Summer 1	Hours	Summer 2	Hours
EECE 2140[1]	4	Co-op	0	Co-op	0	General Elective	4
EECE 2150 (AD)	5					General Elective	4
ENCP 2000	1						
MATH 2341	4						
PHYS 1155 (ND)	3						
PHYS 1156 (AD)	1						
PHYS 1157	1						
	19		**0**		**0**		**8**

Year 3

Fall	Hours	Spring	Hours	Summer 1	Hours	Summer 2	Hours
EECE 2160	4	Co-op	0	Co-op	0	EECE 4791 (EI, CE, WI)[2]	1
ENCP 3000	1					ENGW 3302 or 3315 (WD)	4
MATH 2321 (FQ)	4					Technical Elective	4
EE Fundamentals	4						
EE Fundamentals	5						
	18		**0**		**0**		**9**

Year 4

Fall	Hours	Spring	Hours
EECE 3468	4	Technical Elective	4
CE Fundamentals	4	Technical Elective	4
EE Fundamentals	5	General Elective	4

EECE 4792[2]	4	Technical Elective	4
	17		**16**

Total Hours: 133

FIVE YEARS, THREE CO-OPS IN SUMMER SECOND HALF/FALL

Year 1

Fall	Hours	Spring	Hours	Summer 1	Hours	Summer 2	Hours
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				
	17		**17**		**0**		**0**

Year 2

Fall	Hours	Spring	Hours	Summer 1	Hours	Summer 2	Hours
EECE 2140[1]	4	EECE 2160	4	Vacation		Co-op	0
EECE 2150 (AD)	5	ENCP 2000	1				
MATH 2341	4	MATH 2321 (FQ)	4				
PHYS 1155 (ND)	3	EE Fundamentals	4				
PHYS 1156 (AD)	1	General Elective	4				
PHYS 1157	1						
	18		**17**		**0**		**0**

Year 3

Fall	Hours	Spring	Hours	Summer 1	Hours	Summer 2	Hours
Co-op	0	CE Fundamentals	4	ENGW 3302 or 3315 (WD)	4	Co-op	0
		EE Fundamentals	5	General Elective	4		
		EE Fundamentals	5				
		General Elective	4				
	0		**18**		**8**		**0**

Year 4

Fall	Hours	Spring	Hours	Summer 1	Hours	Summer 2	Hours
Co-op	0	EECE 3468	4	EECE 4791 (EI, WI, CE)[2]	1	Co-op	0
		ENCP 3000	1	Technical Elective	4		
		Technical Elective	4				
		General Elective	4				
		General Elective	4				
	0		**17**		**5**		**0**

Year 5

Fall	Hours	Spring	Hours
Co-op	0	EECE 4792 (EI, WI, CE)[2]	4
		Technical Elective	4
		Technical Elective	4
		General Elective	4
	0		**16**

Total Hours: 133

FIVE YEARS, THREE CO-OPS IN SPRING/SUMMER FIRST HALF

Year 1

Fall	Hours	Spring	Hours	Summer 1	Hours	Summer 2	Hours
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				
	17		**17**		**0**		**0**

Year 2

Fall	Hours	Spring	Hours	Summer 1	Hours	Summer 2	Hours
EECE 2140[1]	4	Co-op	0	Co-op	0	Vacation	0
EECE 2150 (AD)	5						
ENCP 2000	1						
MATH 2341	4						
PHYS 1155 (ND)	3						
PHYS 1156 (AD)	1						
PHYS 1157	1						
	19		**0**		**0**		**0**

Year 3

Fall	Hours	Spring	Hours	Summer 1	Hours	Summer 2	Hours
EECE 2160	4	Co-op	0	Co-op	0	ENGW 3302 or 3315 (WD)	4
MATH 2321 (FQ)	4					General Elective	4
EE Fundamentals	4						
General Elective	4						
	16		**0**		**0**		**8**

Year 4

Fall	Hours	Spring	Hours	Summer 1	Hours	Summer 2	Hours
ENCP 3000	1	Co-op	0	Co-op	0	EECE 4791 (EI, WI, CE)[2]	1
CE Fundamentals	4					Technical Elective	4
EE Fundamentals	5						
EE Fundamentals	5						
General Elective	4						
	19		**0**		**0**		**5**

Year 5

Fall	Hours	Spring	Hours
EECE 3468	4	Technical Elective	4
EECE 4792 (EI, WI, CE)[2]	4	Technical Elective	4
Technical Elective	4	General Elective	4
General Elective	4	General Elective	4
	16		**16**

Total Hours: 133

1 Computing Fundamentals for Engineers (EECE 2140) can be taken in year 1 spring instead of a general elective by students who are interested in the course in preparation for co-ops involving programming and computing hardware.

2 The capstone design courses are taken as follows:

- Electrical and Computer Engineering Capstone 1 (EECE 4791) in summer first half and Electrical and Computer Engineering Capstone 2 (EECE 4792) in spring OR
- Electrical and Computer Engineering Capstone 1 (EECE 4791) in summer second half and Electrical and Computer Engineering Capstone 2 (EECE 4792) in fall

3 The following sections of this course are approved to count toward the ECE core requirement of the semiconductor concentration:

- Magnetic Materials and Devices for Microwave Engineering
- Introduction to Quantum Engineering
- Biomedical Microsystems