

# Electrical Engineering and Physics, BSEE (Boston)

This intercollege combined major serves students who would like to explore their interest in physics while earning the benefit of an accredited Bachelor of Science in Electrical Engineering degree. The major combines a major in physics from the Department of Physics in the College of Science with the Bachelor of Science in Electrical Engineering degree from the Department of Electrical and Computer Engineering.

Because of the large body of shared knowledge between electrical engineering and physics, a combined major between these two disciplines is a logical course of study and can be accomplished within a student's usual five-year program (including three co-op placements) without requiring course overloading in any semester. A student graduating from this program will have studied both the physical fundamentals and the applications of electronic devices and systems. The program is a particularly appropriate course of study for students who wish to pursue a career in solid-state devices, microelectromechanical systems, or nanotechnology.

Students interested in this program should contact the Department of Electrical and Computer Engineering or the Department of Physics as early as possible, preferably prior to registering for freshman courses.

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
<b>Required Courses</b>		
EECE 2140	Computing Fundamentals for Engineers	4
EECE 2150	Circuits and Signals: Biomedical Applications	5
EECE 2160	Embedded Design: Enabling Robotics	4
<b>Electrical Engineering Fundamentals</b>		
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
<b>Computer Engineering Fundamentals</b>		
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	
If taking EECE 4791 in First Half Summer, EECE 4792 must be taken in Spring. If taking EECE 4791 in Summer EECE 4792 must be taken in Fall.		
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

**EECE 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. Only for Khoury students.

Complete two of the following:

8-9

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 course count toward the engineering requirement:

2

EECE 3468	Analysis of Random Phenomena in Electrical and Computer Engineering
-----------	---

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>
---------	---

**Mathematics/Science**

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
Complete one of the following:		5
PHYS 1151 and PHYS 1152 and PHYS 1153	Physics for Engineering 1 and Lab for PHYS 1151 and Interactive Learning Seminar for PHYS 1151	
PHYS 1161 and PHYS 1162 and PHYS 1163	Physics 1 and Lab for PHYS 1161 and Recitation for PHYS 1161	
Complete one of the following:		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	
PHYS 1165 and PHYS 1166 and PHYS 1167	Physics 2 and Lab for PHYS 1165 and Recitation for PHYS 1165	
PHYS 2303	Modern Physics	4
PHYS 3600	Advanced Physics Laboratory	4
PHYS 3602	Electricity and Magnetism 1	4
PHYS 4115	Quantum Mechanics	4
PHYS 4305	Thermodynamics and Statistical Mechanics	4
<b>Advanced Physics Elective</b>		
Complete one of the following:		4
MATH 4606	Mathematical and Computational Methods for Physics	

PHYS 3600 to PHYS 7999

**Supplemental Credit**

2 semester hours from the following course count toward the mathematics/science requirement: 2

EECE 3468 Analysis of Random Phenomena in Electrical and Computer Engineering

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
------	-------	-------

**Required 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 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
------	-------	-------

A grade of C or higher is required:

ENGW 1111 First-Year Writing 4

or ENGW 1102 First-Year Writing for Multilingual Writers

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 12 semester hours of academic, nonremedial, nonrepetitive courses. 12

**Major GPA Requirement**

2.000 minimum GPA required in EECE courses

**Program Requirement**

133 total semester hours required

<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) .

**Plan of Study****Sample Plans of Study****FOUR YEARS, ONE CO-OP IN SPRING/SUMMER FIRST HALF**

Year 1							
Fall	Hours	Spring	Hours	Summer 1	Hours	Summer 2	Hours
CHEM 1151 (ND)		4 ENGW 1111 (WF)		4 MATH 2341		4 Vacation	
CHEM 1153	0	GE 1502 (ER)		4			
GE 1000	1	MATH 1342 (FQ)		4			
GE 1501	4	PHYS 1165 or 1155 (ND)		4			
MATH 1341 (FQ)	4	PHYS 1166 or 1156 (AD)		1			
PHYS 1161 or 1151 (ND)	4	PHYS 1167 or 1157		0			
PHYS 1162 or 1152 (AD)	1						
PHYS 1163 or 1153	0						
18		17		4		0	

#### 4 Electrical Engineering and Physics, BSEE (Boston)

Year 2							
Fall	Hours	Spring	Hours	Summer 1	Hours	Summer 2	Hours
EECE 2140		4 EECE 2160		4 Vacation		Vacation	
EECE 2150 (AD)		5 ENCP 2000		1			
MATH 2321 (FQ)		4 PHYS 4305 (ND)		4			
PHYS 2303 (ND)		4 EE Fundamentals		5			
		EE Fundamentals		5			
	17		19		0		0
Year 3							
Fall	Hours	Spring	Hours	Summer 1	Hours	Summer 2	Hours
EECE 3468		4 Co-op		0 Co-op		0 EECE 4791 (EI, WI, CE) <sup>1</sup>	1
PHYS 3602 (ND)		4				PHYS 3600 (ND, AD, WI)	4
EE Fundamentals		4				General Elective	4
CE Fundamentals		4					
	16		0		0		9
Year 4							
Fall	Hours	Spring	Hours				
ENGW 3302		4 EECE Technical Elective		4			
EECE 4792 (EI, WI, CE) <sup>1</sup>		4 EECE Technical Elective		4			
ENCP 3000		1 General Elective		4			
PHYS 4115 (ND, FQ)		4 PHYS Advanced Elective		4			
General Elective		4					
	17		16				

Total Hours: 133

#### FOUR YEARS, ONE CO-OP IN SUMMER SECOND HALF/FALL

Year 1							
Fall	Hours	Spring	Hours	Summer 1	Hours	Summer 2	Hours
MATH 1341		4 MATH 1342		4 MATH 2341		4 Vacation	
PHYS 1161		4 PHYS 1165		4			
PHYS 1162		1 PHYS 1166		1			
PHYS 1163		0 PHYS 1167		0			
GE 1501		4 GE 1502		4			
GE 1000		1 ENGW 1111		4			
CHEM 1151		4					
CHEM 1153		0					
	18		17		4		0
Year 2							
Fall	Hours	Spring	Hours	Summer 1	Hours	Summer 2	Hours
EECE 2140		4 EECE 2160		4 Vacation		Co-op	0
EECE 2150		5 PHYS 4305		4			
MATH 2321		4 EE Fundamental		4			
PHYS 2303		4 EE Fundamental		5			
		ENCP 2000		1			
	17		18		0		0
Year 3							
Fall	Hours	Spring	Hours	Summer 1	Hours	Summer 2	Hours
Co-op		0 ENGW 3302 or 3315		4 Vacation		EECE 4791	1
		PHYS 3602		4		PHYS 3600	4
		EE Fundamental		5		General Elective	4
		CE Fundamental		4			
	0		17		0		9

**Year 4**

Fall	Hours	Spring	Hours
EECE 3468		4 CE Technical Elective	4
EECE 4792		4 Technical Elective	4
ENCP 3000		1 General Elective	4
PHYS 4115		4 Advanced Physics Elective	4
General Elective 2	4		
	17		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
MATH 1341		4 MATH 1342	4	4 Vacation		Vacation	
ENGW 1111		4 PHYS 1165	4				
PHYS 1161		4 PHYS 1166	1				
PHYS 1162		1 PHYS 1167	0				
PHYS 1163		0 GE 1502	4				
GE 1501		4 CHEM 1151	4				
GE 1000		1 CHEM 1153	0				
	18		17		0		0

**Year 2**

Fall	Hours	Spring	Hours	Summer 1	Hours	Summer 2	Hours
ENCP 2000		1 Co-op	0	0 Co-op		0 Vacation	
MATH 2321	4						
MATH 2341	4						
PHYS 2303	4						
EECE 2140	4						
	17		0		0		0

**Year 3**

Fall	Hours	Spring	Hours	Summer 1	Hours	Summer 2	Hours
PHYS 3602		4 Co-op	0	0 Co-op		0 PHYS 3600	4
EECE 2160	4					General Elective 2	4
General Elective 1	4						
EECE 2150	5						
	17		0		0		8

**Year 4**

Fall	Hours	Spring	Hours	Summer 1	Hours	Summer 2	Hours
EE Fundamental		4 Co-op	0	0 Co-op		0 EECE 4791	1
EE Fundamental	5					Technical Elective 1	4
PHYS 4115	4					General Elective 3	4
ENGW 3302 or 3315	4						
	17		0		0		9

**Year 5**

Fall	Hours	Spring	Hours
EECE 4792		4 Advanced Physics Elective	4
ENCP 3000		1 Technical Elective 2	4
EE Fundamental		5 CE Fundamental	4
EECE 3468	4		

PHYS 4305	4		
	<b>18</b>	<b>12</b>	

**Total Hours: 133****FIVE YEARS, THREE CO-OPS IN SUMMER SECOND HALF/FALL**

<b>Year 1</b>							
<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 1111 (WF)		4 CHEM 1151 (ND)		4 Vacation		Vacation	
GE 1000		1 CHEM 1153		0			
GE 1501		4 GE 1502 (ER)		4			
MATH 1341 (FQ)		4 MATH 1342 (FQ)		4			
PHYS 1161 or 1151 (ND)		4 PHYS 1165 or 1155 (ND)		4			
PHYS 1162 or 1152 (AD)		1 PHYS 1166 or 1156 (AD)		1			
PHYS 1163 or 1153		0 PHYS 1167 or 1157		0			
	<b>18</b>		<b>17</b>		<b>0</b>		<b>0</b>
<b>Year 2</b>							
<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>
EECE 2140		4 EECE 2150 (AD)		5 Vacation		Co-op	0
MATH 2321 (FQ)		4 EECE 2160		4			
MATH 2341		4 ENCP 2000		1			
PHYS 2303 (ND)		4 PHYS 3602 (ND)		4			
		General elective		4			
	<b>16</b>		<b>18</b>		<b>0</b>		<b>0</b>
<b>Year 3</b>							
<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 PHYS 3600 (ND, AD, WI)		4 Co-op	0
		PHYS 4115 (ND, FQ)		4 General elective		4	
		EE fundamentals		4			
		EE fundamentals		5			
	<b>0</b>		<b>17</b>		<b>8</b>		<b>0</b>
<b>Year 4</b>							
<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 EECE 3468		4 EECE 4791 (EI, WI, CE) <sup>1</sup>		1 Co-op	0
		ENCP 3000		1 EECE technical elective		4	
		PHYS 4305 (ND)		4 General elective		4	
		CE fundamentals		4			
		EE fundamentals		5			
	<b>0</b>		<b>18</b>		<b>9</b>		<b>0</b>
<b>Year 5</b>							
<b>Fall</b>	<b>Hours</b>	<b>Spring</b>	<b>Hours</b>				
Co-op		0 EECE 4792 (EI, WI, CE) <sup>1</sup>		4			
		EECE technical elective		4			
		PHYS advanced elective		4			
	<b>0</b>		<b>12</b>				

**Total Hours: 133**<sup>1</sup> Note:

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

**PHYSICS COURSE OFFERING SCHEDULE**

PHYS 2303 offered every fall, spring, and summer second half

PHYS 2371/PHYS 2372 offered every fall

PHYS 3600 offered every summer first half and summer second half

PHYS 3601 offered every fall and spring

PHYS 3602 offered every fall and spring

PHYS 3603 offered fall, spring all years, and summer first half (odd years)

PHYS 4115 offered every fall and spring

PHYS 4305 offered fall, spring all years, and summer second half (even years)

PHYS 4621 offered fall (even years) and spring (odd years)

PHYS 4623 offered fall (even years) and summer first half (even years)

PHYS 4651 offered fall (odd years) and spring (odd years)

PHYS 4652 offered every spring

PHYS 5318 offered every spring