

# Computer Engineering and Computer Science, BSCmpE

This intercollege dual major serves students who are interested in both computer hardware and software, combining an accredited Bachelor of Science degree in engineering with the added benefits of depth in software principles found in a Bachelor of Science degree in computer science. This program provides a well-rounded computing education that includes engineering design principles, computational thinking, proper program design, and a solid background in mathematics and science. The degree is fully accredited as a Bachelor of Science in Computer Engineering and adds the computer science depth.

Because of the large body of shared knowledge between computer engineering and computer science, an integrated dual 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 a solid foundation in both computer hardware and software principles, and should be prepared for a wide range of career paths in the computing field or any related field that relies on the application of engineering or computing principles.

Students interested in this program should contact the Department of Electrical and Computer Engineering or the Department of Computer and Information Science as early as possible, preferably prior to registering for first-year courses.

## 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 (<http://catalog.northeastern.edu/undergraduate/university-academics/university-wide-requirements/>).

## NUpath Requirements

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

NUpath requirements Interpreting Culture (IC), Societies and Institutions (SI), and Differences and Diversity (DD) are not explicitly satisfied by required engineering courses. Students are responsible for satisfying these requirements with general electives.

## 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>Computer Engineering Fundamentals</b>		
CS 3000	Algorithms and Data	4
EECE 2322 and EECE 2323	Fundamentals of Digital Design and Computer Organization and Lab for EECE 2322	5
EECE 2540	Fundamentals of Networks	4
<b>Electrical Engineering Fundamentals</b>		
Complete one of the following:		4
EECE 2412 and EECE 2413	Fundamentals of Electronics and Lab for EECE 2412	
EECE 2520	Fundamentals of Linear Systems	
EECE 2530 and EECE 2531	Fundamentals of Electromagnetics and Lab for EECE 2530	
<b>Computer Engineering Capstone Courses</b>		
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 / EECE 4993 more than once. For these courses combined, a maximum of 8SH will be allowed to satisfy the requirement of technical electives. An additional 4SH will be allowed as a general elective. At most one of these courses (4SH) can be taken in a semester.

## 2 Computer Engineering and Computer Science, BSCmpE

Though students may register for EECE 2750 more than once, only 4SH will be allowed to satisfy the requirements of technical electives. An additional 4SH will be allowed as a general elective.

Complete two of the following:	8
EECE 2412 to EECE 2530	
EECE 2750	Enabling Engineering
EECE 3324 to EECE 4698	
EECE 4991	Research
EECE 4992	Directed Study
EECE 4993	Independent Study
EECE 5115 to EECE 5698	
ENGR 5670	Sustainable Energy: Materials, Conversion, Storage, and Usage

### **Khoury Elective Courses** 8

With advisor approval, directed study, research, project study, and appropriate graduate-level courses may also be taken as upper-division electives.

Complete 8 credits of CS, CY, DS, or IS classes that are not already required. Choose courses within the following ranges:	8
CS 2500 or higher, except CS 5010	
CY 2000 or higher, except CY 4930	
DS 2500 or higher, except DS 4900	
IS 2000 or higher, except IS 4900	

### **Supplemental Credit**

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>

## **Computer Science Requirements**

Code	Title	Hours
<b>Computer Science Introductory Courses</b>		
CS 2500 and CS 2501	Fundamentals of Computer Science 1 and Lab for CS 2500	5
CS 2510 and CS 2511	Fundamentals of Computer Science 2 and Lab for CS 2510	5
CS 2800	Logic and Computation	4
<b>Computer Science Upper-Level Courses</b>		
CS 3500 and CS 3501	Object-Oriented Design and Lab for CS 3500	5
CS 3650	Computer Systems	4
CS 4500 or CS 4530	Software Development Fundamentals of Software Engineering	4

## **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
CS 1800 and CS 1802	Discrete Structures and Seminar for CS 1800	5
MATH 1341	Calculus 1 for Science and Engineering	4
MATH 1342	Calculus 2 for Science and Engineering	4
MATH 2341	Differential Equations and Linear Algebra for Engineering	4
MATH 3081	Probability and Statistics	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
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**Supplemental Credit**

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

GE 1501	Cornerstone of Engineering 1 <sup>1</sup>	
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**Professional Development**

Code	Title	Hours
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**Required Professional Development**

GE 1000	First-Year Seminar	1
ENCP 2000	Introduction to Engineering Co-op Education	1
ENCP 3000	Professional Issues in Engineering	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>	
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1 semester hour from the following course counts toward the professional development requirement: 1

GE 1502	Cornerstone of Engineering 2 <sup>1</sup>	
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**Writing Requirements**

Code	Title	Hours
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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
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Complete 8 SH of academic, nonremedial, nonrepetitive courses. 8

**Integrative Courses**

Code	Title	Hours
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The following courses are already required above and also fulfill the integrative requirement.

CS 1800	Discrete Structures	
EECE 4791	Electrical and Computer Engineering Capstone 1	
EECE 4792	Electrical and Computer Engineering Capstone 2	
MATH 1341	Calculus 1 for Science and Engineering	
MATH 1342	Calculus 2 for Science and Engineering	
MATH 3081	Probability and Statistics	
PHYS 1151 and PHYS 1152	Physics for Engineering 1 and Lab for PHYS 1151	

**Major GPA Requirement**

2.000 minimum GPA in EECE courses

2.000 minimum GPA required in all CS, CY, DS, and IS courses

**Program Requirement**

140 total semester hours required

<sup>1</sup> Students can substitute GE 1110 and GE 1111 for GE 1501 and 1502 in approved situations.

**Plan of Study****Four Years, Two Co-ops in Summer 2/Fall**

Year 1							
Fall	Hours	Spring	Hours	Summer 1	Hours	Summer 2	Hours
CHEM 1151 (ND)		4 CS 2500 (ND, FQ)		4 MATH 2341		4 General Elective	4
CHEM 1153	0	CS 2501		1 PHYS 1155 (ND)		3 General Elective	4
ENGW 1111 (WF)	4	GE 1502 (ER)		4 PHYS 1156 (AD)		1	
GE 1000	1	MATH 1342 (FQ)		4 PHYS 1157		1	
GE 1501	4	PHYS 1151 (ND)		3			
MATH 1341 (FQ)	4	PHYS 1152 (AD)		1			
		PHYS 1153		1			
	17		18		9		8
Year 2							
Fall	Hours	Spring	Hours	Summer 1	Hours	Summer 2	Hours
CS 1800 (FQ)		4 CS 2800		4 CS 3000		4 Co-op	0
CS 1802	1	EECE 2160		4 Khoury Elective		4	
CS 2510 (ND, AD)	4	EECE 2540		4			
CS 2511	1	ENCP 2000		1			
EECE 2140	4	MATH 3081 (AD)		4			
EECE 2150 (AD)	5						
	19		17		8		0
Year 3							
Fall	Hours	Spring	Hours	Summer 1	Hours	Summer 2	Hours
Co-op	0	CS 3650		4 CS 3500 and CS 3501 (ND, AD)		5 Co-op	0
		ENCP 3000		1 EECE 4791 (EI, WI, CE)		1	
		EECE 2322		4 EECE Technical Elective		4	
		EECE 2323		1			
		ENGW 3302 or 3315 (WD)		4			
		EE Fundamentals		4			
	0		18		10		0
Year 4							
Fall	Hours	Spring	Hours	Summer 1	Hours	Summer 2	Hours
Co-op	0	CS 4500 or 4530 (WI)		4			
		EECE 4792 (EI, WI, CE)		4			
		EECE Technical Elective		4			
		Khoury Elective		4			
	0		16				

Total Hours: 140

**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 CS 2500 (ND, FQ)		4 MATH 2341		4 General Elective	4
CHEM 1153	0	CS 2501		1 PHYS 1155 (ND)		3 General Elective	4
ENGW 1111 (WF)	4	GE 1502 (ER)		4 PHYS 1156 (AD)		1	
GE 1000	1	MATH 1342 (FQ)		4 PHYS 1157		1	
GE 1501	4	PHYS 1151 (ND)		3			
MATH 1341 (FQ)	4	PHYS 1152 (AD)		1			
		PHYS 1153		1			
	17		18		9		8

<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>
CS 1800 (FQ)		4 Co-op		0 Co-op		0 CS 3000	4
CS 1802		1				Khoury Elective	4
CS 2510 (ND, AD)		4					
CS 2511		1					
EECE 2140		4					
EECE 2150 (AD)		5					
ENCP 2000		1					
		20		0		0	8
<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>
CS 2800		4 Co-op		0 Co-op		0 EECE 4791 (EI, WI, CE)	1
EECE 2160		4				Khoury Elective	4
ENCP 3000		1				EECE Technical Elective	4
MATH 3081 (AD)		4					
EECE 2540		4					
		17		0		0	9
<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>
EECE 2322		4 CS 4500 or 4530 (WI)		4			
EECE 2323		1 ENGW 3302 or 3315 (WD)		4			
EECE 4792 (EI, WI, CE)		4 EECE Technical Elective		4			
CS 3500 and CS 3501		5 CS 3650		4			
EE Fundamentals		4					
		18		16			

Total Hours: 140

**Five Years, Three Co-ops in Summer 2/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>
CHEM 1151 (ND)		4 GE 1502 (ER)		4 Vacation		0 Vacation	0
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
<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>
CS 1800 (FQ)		4 CS 2510 (ND, AD)		4 Vacation		0 Co-op	0
CS 1802		1 CS 2511		1			
CS 2500 (ND, FQ)		4 CS 2800		4			
CS 2501		1 EECE 2160		4			
EECE 2140		4 ENCP 2000		1			
MATH 2341		4 PHYS 1155 (ND)		3			
		PHYS 1156 (AD)		1			
		PHYS 1157		1			
		18		19		0	0

Year 3							
Fall	Hours	Spring	Hours	Summer 1	Hours	Summer 2	Hours
Co-op	0	CS 3650		4 CS 3500 and CS 3501 (ND, AD)		5 Co-op	0
		EECE 2150 (AD)		5 ENGW 3302 or 3315 (WD)		4	
		EECE 2323		1			
		EECE 2322		4			
		EECE 2540		4			
	0			18		9	0
Year 4							
Fall	Hours	Spring	Hours	Summer 1	Hours	Summer 2	Hours
Co-op	0	ENCP 3000		1 CS 3000		4 Co-op	0
		MATH 3081 (AD)		4 EECE 4791 (EI, WI, CE)		1	
		EE Fundamentals		4 General Elective		4	
		Khoury Elective		4			
		Khoury Elective		4			
	0			17		9	0
Year 5							
Fall	Hours	Spring	Hours	Summer 1	Hours	Summer 2	Hours
Co-op	0	CS 4500 or 4530 (WI)		4			
		EECE 4792 (EI, WI, CE)		4			
		EECE Technical Elective		4			
		EECE Technical Elective		4			
	0			16			

Total Hours: 140

### Five Years, Three 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 Vacation		0 Vacation	0
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
CS 1800 (FQ)	4	Co-op		0 Co-op		0 Vacation	0
CS 1802	1						
CS 2500 (ND, FQ)	4						
CS 2501	1						
EECE 2140	4						
ENCP 2000	1						
MATH 2341	4						
	19			0		0	0
Year 3							
Fall	Hours	Spring	Hours	Summer 1	Hours	Summer 2	Hours
CS 2510 (ND, AD)	4	Co-op		0 Co-op		0 ENGW 3302 or 3315 (WD)	4
CS 2511	1					MATH 3081 (AD)	4
CS 2800	4						
EECE 2160	4						

PHYS 1155 (ND)	3						
PHYS 1156 (AD)	1						
PHYS 1157	1						
	18			0		0	8

**Year 4**

Fall	Hours	Spring	Hours	Summer 1	Hours	Summer 2	Hours
CS 3500 and CS 3501 (ND, AD)	5	Co-op		0	Co-op	0	CS 3000
CS 3650	4					EECE 4791 (EI, WI, CE)	1
EECE 2150 (AD)	5					EECE Technical Elective	4
EECE 2540	4						
ENCP 3000	1						
	19			0		0	9

**Year 5**

Fall	Hours	Spring	Hours
EECE 2322	4	CS 4500 or 4530 (WI)	4
EECE 2323	1	EE Fundamentals	4
EECE 4792 (EI, WI, CE)	4	EECE Technical Elective	4
Khoury Elective	4	General Elective	4
Khoury Elective	4		
	17		16

Total Hours: 140

**Notes:**

The capstone design courses are taken as follows:

- Electrical and Computer Engineering Capstone 1 (EECE 4791) in Summer 1 and Electrical and Computer Engineering Capstone 2 (EECE 4792) in Spring, or...
- ... Electrical and Computer Engineering Capstone 1 (EECE 4791) in Summer 2 and Electrical and Computer Engineering Capstone 2 (EECE 4792) in Fall.