

Computer Engineering and Physics, BSCmpE (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 Computer Engineering degree. The combined major integrates study within the College of Engineering's Department of Electrical and Computer Engineering with study within the College of Science's Department of Physics.

Because of the large body of shared knowledge between computer engineering and physics, an integrated combined major between these two disciplines is a logical course of study and can be accomplished within either a four-year plan of study or a five-year plan of study (including three co-op placements in the latter), without requiring course overloads in any semester. A student graduating from this program will have studied both physics fundamentals and computer systems.

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 first-year courses.

Visit the department website (<https://ece.northeastern.edu/academics/undergraduate-studies/ece-accreditation/>) for 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 |
| Computer Engineering Fundamentals | | |
| EECE 2322 and EECE 2323 | Fundamentals of Digital Design and Computer Organization and Lab for EECE 2322 | 5 |
| EECE 2540 | Fundamentals of Networks | 4 |
| EECE 2560 | Fundamentals of Engineering Algorithms | 4 |
| Electrical Engineering Fundamentals | | |
| If more than one electrical engineering fundamentals course is taken, it can count as a technical elective. | | |
| 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 | |
| Computer 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 |
| 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.

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 5115 to EECE 5699 | |

One CS/CY/IS course from the following approved list may be taken toward the EECE technical elective requirement:

| | |
|--------------------|--|
| CS 3100 | Program Design and Implementation 2 |
| CS 3200 | Introduction to Databases |
| CS 3540 to CS 3800 | |
| CS 4100 to CS 4770 | |
| CS 4850 | Building Game Engines |
| CS 5100 | Foundations of Artificial Intelligence |
| CS 5200 | Database Management Systems |
| CS 5310 | Computer Graphics |
| CS 5400 | Principles of Programming Language |
| CS 5500 | Foundations of Software Engineering |
| CS 5520 | Mobile Application Development |
| CS 5600 | Computer Systems |
| CS 5610 | Web Development |
| CS 5700 | Fundamentals of Computer Networking |
| CY 2550 | Foundations of Cybersecurity |

Supplemental Credit

2 semester hours from the following course count 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 |
|---------|---|

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

2

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

Mathematics/Science

| Code | Title | Hours |
|---|--|-------|
| Required Mathematics/Science | | |
| 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 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 |

Advanced Physics Elective

Complete one of the following: 4

| | | |
|------------------------|--|--|
| MATH 4606 | Mathematical and Computational Methods for Physics | |
| PHYS 3600 to PHYS 5999 | | |

Supplemental Credit

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

| | | |
|---------|---|--|
| GE 1501 | Cornerstone of Engineering 1 ¹ | |
|---------|---|--|

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 | |
|-----------|---|--|

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 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 or ENGW 1102 | First-Year Writing First-Year Writing for Multilingual Writers | 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 8 semester hours of academic, nonremedial, nonrepetitive courses. | | 8 |

Integrative Requirement

| Code | Title | Hours |
|--|--|-------|
| This course is already required above and also fulfills the integrative requirement: | | |
| EECE 4791 | Electrical and Computer Engineering Capstone 1 | 1 |

Major GPA Requirement

A 2.000 minimum GPA is required in EECE courses.

Program Requirement

133 total semester hours required

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).

Plan of Study

Sample Plans of Study

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 | |
| CHEM 1151 | | 4 PHYS 1165 | | 4 | | | |
| CHEM 1153 | | 0 PHYS 1166 | | 1 | | | |
| PHYS 1161 | | 4 PHYS 1167 | | 0 | | | |
| PHYS 1162 | | 1 GE 1502 | | 4 | | | |
| PHYS 1163 | | 0 ENGW 1111 | | 4 | | | |
| GE 1501 | | 4 | | | | | |
| GE 1000 | | 1 | | | | | |
| | 18 | | 17 | | 4 | | 0 |
| Year 2 | | | | | | | |
| Fall | Hours | Spring | Hours | Summer 1 | Hours | Summer 2 | Hours |
| EECE 2140 | | 4 PHYS 4305 | | 4 Vacation | | Co-op | 0 |
| EECE 2160 | | 4 EECE 2150 | | 5 | | | |
| MATH 2321 | | 4 CS 1800 | | 4 | | | |
| PHYS 2303 | | 4 CS 1802 | | 1 | | | |
| | | CE Fundamental | | 5 | | | |
| | | ENCP 2000 | | 1 | | | |
| | 16 | | 20 | | 0 | | 0 |
| Year 3 | | | | | | | |
| Fall | Hours | Spring | Hours | Summer 1 | Hours | Summer 2 | Hours |
| Co-op | | 0 PHYS 3602 | | 4 Vacation | | PHYS 3600 | 4 |
| | | CE Fundamental | | 4 | | EECE 4791 | 1 |
| | | CE Fundamental | | 4 | | ENGW 3302 or 3315 | 4 |
| | | General Elective | | 4 | | | |
| | 0 | | 16 | | 0 | | 9 |
| Year 4 | | | | | | | |
| Fall | Hours | Spring | Hours | | | | |
| PHYS 4115 | | 4 Technical Elective | | 4 | | | |
| ENCP 3000 | | 1 Advanced Physics Elective | | 4 | | | |
| EECE 3468 | | 4 EE Fundamental | | 4 | | | |
| EECE 4792 | | 4 General Elective | | 4 | | | |
| Technical Elective | | 4 | | | | | |
| | 17 | | 16 | | | | |

Total Hours: 133

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 |
| Year 2 | | | | | | | | |
| Fall | Hours | Spring | Hours | Summer 1 | Hours | Summer 2 | Hours | |
| EECE 2140 | 4 | CS 1800 (FQ) | 4 | Vacation | | Vacation | | |
| EECE 2160 | 4 | CS 1802 | 1 | | | | | |
| ENCP 2000 | 1 | EECE 2150 (AD) | 5 | | | | | |
| MATH 2321 (FQ) | 4 | PHYS 4305 (ND) | 4 | | | | | |
| PHYS 2303 (ND) | 4 | CE Fundamentals | 4 | | | | | |
| | 17 | | 18 | | 0 | | | 0 |
| Year 3 | | | | | | | | |
| Fall | Hours | Spring | Hours | Summer 1 | Hours | Summer 2 | Hours | |
| PHYS 3602 (ND) | 4 | Co-op | 0 | Co-op | 0 | EECE 4791 (EI, WI, CE) ¹ | 1 | |
| CE Fundamentals | 5 | | | | | ENGW 3302 or 3315 (WD) | 4 | |
| CE Fundamentals | 4 | | | | | PHYS 3600 (ND, AD, WI) | 4 | |
| General Elective | 4 | | | | | | | |
| | 17 | | 0 | | 0 | | | 9 |
| Year 4 | | | | | | | | |
| Fall | Hours | Spring | Hours | | | | | |
| EECE 4792 (EI, WI, CE) ¹ | 4 | EE Fundamentals | 4 | | | | | |
| ENCP 3000 | 1 | Technical Elective | 4 | | | | | |
| EECE 3468 | 4 | General Elective | 4 | | | | | |
| PHYS 4115 (ND, FQ) | 4 | PHYS Advanced Elective | 4 | | | | | |
| Technical Elective | 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 | Vacation | | Vacation | | |
| CHEM 1151 | 4 | PHYS 1165 | 4 | | | | | |
| CHEM 1153 | 0 | PHYS 1166 | 1 | | | | | |
| PHYS 1161 | 4 | PHYS 1167 | 0 | | | | | |
| PHYS 1162 | 1 | GE 1502 | 4 | | | | | |
| PHYS 1163 | 0 | ENGW 1111 | 4 | | | | | |
| GE 1501 | 4 | | | | | | | |
| GE 1000 | 1 | | | | | | | |
| | 18 | | 17 | | 0 | | | 0 |
| Year 2 | | | | | | | | |
| Fall | Hours | Spring | Hours | Summer 1 | Hours | Summer 2 | Hours | |
| EECE 2140 | 4 | Co-op | 0 | Co-op | 0 | Vacation | | |
| MATH 2321 | 4 | | | | | | | |
| MATH 2341 | 4 | | | | | | | |
| PHYS 2303 | 4 | | | | | | | |
| ENCP 2000 | 1 | | | | | | | |
| | 17 | | 0 | | 0 | | | 0 |
| Year 3 | | | | | | | | |
| Fall | Hours | Spring | Hours | Summer 1 | Hours | Summer 2 | Hours | |
| CS 1800 | 4 | Co-op | 0 | Co-op | 0 | PHYS 3600 | 4 | |
| CS 1802 | 1 | | | | | | | |

6 Computer Engineering and Physics, BSCmpE (Boston)

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|------------------|--------------|---------------------------|--------------|-----------------|--------------|-----------------|------------------------|---|
| EECE 2150 | 5 | | | | | | | |
| EECE 2160 | 4 | | | | | | | |
| PHYS 3602 | 4 | | | | | | | |
| | 18 | | | 0 | | 0 | | 4 |
| Year 4 | | | | | | | | |
| Fall | Hours | Spring | Hours | Summer 1 | Hours | Summer 2 | Hours | |
| PHYS 4115 | 4 | Co-op | | 0 | Co-op | 0 | EECE 4791 | 1 |
| CE Fundamental | 4 | | | | | | ENGW 3302 or 3315 (WD) | 4 |
| CE Fundamental | 4 | | | | | | Technical Elective | 4 |
| CE Fundamental | 5 | | | | | | | |
| | 17 | | | 0 | | 0 | | 9 |
| Year 5 | | | | | | | | |
| Fall | Hours | Spring | Hours | | | | | |
| ENCP 3000 | 1 | Technical Elective | 4 | | | | | |
| EECE 3468 | 4 | Advanced Physics Elective | 4 | | | | | |
| PHYS 4305 | 4 | General Elective | 4 | | | | | |
| EECE 4792 | 4 | EE Fundamental | 4 | | | | | |
| General 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 | ENGW 1111 (WF) | 4 | Vacation | | 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 | | | 0 | | 0 |
| Year 2 | | | | | | | | |
| Fall | Hours | Spring | Hours | Summer 1 | Hours | Summer 2 | Hours | |
| EECE 2140 | 4 | CS 1800 (FQ) | 4 | Vacation | | Co-op | | 0 |
| MATH 2321 (FQ) | 4 | CS 1802 | 1 | | | | | |
| MATH 2341 | 4 | EECE 2150 (AD) | 5 | | | | | |
| PHYS 2303 (ND) | 4 | EECE 2160 | 4 | | | | | |
| | | ENCP 2000 | 1 | | | | | |
| | | PHYS 3602 (ND) | 4 | | | | | |
| | 16 | | 19 | | | 0 | | 0 |
| Year 3 | | | | | | | | |
| Fall | Hours | Spring | Hours | Summer 1 | Hours | Summer 2 | Hours | |
| Co-op | 0 | PHYS 4115 (ND, FQ) | 4 | PHYS 3600 (ND, AD, WI) | 4 | Co-op | | 0 |
| | | CE Fundamentals | 5 | | | | | |
| | | CE Fundamentals | 4 | | | | | |
| | | CE Fundamentals | 4 | | | | | |
| | 0 | | 17 | | | 4 | | 0 |
| Year 4 | | | | | | | | |
| Fall | Hours | Spring | Hours | Summer 1 | Hours | Summer 2 | Hours | |
| Co-op | 0 | ENCP 3000 | 1 | EECE 4791 (EI, WI, CE) ¹ | 1 | Co-op | | 0 |

| | | | | |
|---------------|------------------|-------------------------------------|------------------------|----------|
| | EECE 3468 | 4 | ENGW 3302 or 3315 (WD) | 4 |
| | PHYS 4305 (ND) | 4 | Technical Elective | 4 |
| | EE Fundamentals | 4 | | |
| | General Elective | 4 | | |
| | 0 | 17 | 9 | 0 |
| Year 5 | | | | |
| Fall | Hours | Spring | Hours | |
| Co-op | 0 | EECE 4792 (EI, WI, CE) ¹ | 4 | |
| | | Technical Elective | 4 | |
| | | General Elective | 4 | |
| | | PHYS Advanced Elective | 4 | |
| | 0 | 16 | | |

Total Hours: 133

¹ 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 courses are offered on the following schedule:

- Modern Physics (PHYS 2303) offered every fall, spring, and summer second half
- Electronics (PHYS 2371)/Lab for PHYS 2371 (PHYS 2372) offered every fall
- Advanced Physics Laboratory (PHYS 3600) offered every summer first half and summer second half
- Classical Dynamics (PHYS 3601) offered spring and fall (even years)
- Electricity and Magnetism 1 (PHYS 3602) offered every fall and spring
- Electricity and Magnetism 2 (PHYS 3603) offered fall (even years) and summer first half (odd years)
- Quantum Mechanics (PHYS 4115) offered every fall and spring
- Thermodynamics and Statistical Mechanics (PHYS 4305) offered spring and summer second half (even years)
- Biological Physics 1 (PHYS 4621) offered spring (odd years) and fall (even years)
- Medical Physics (PHYS 4623) offered summer first half and fall (even years)
- Medical Physics Seminar 1 (PHYS 4651) offered spring and fall (odd years)
- Medical Physics Seminar 2 (PHYS 4652) offered every spring
- Principles of Experimental Physics (PHYS 5318) offered every spring