

Data Science and Physics, BS

The data science and physics combined major brings together computer and data science, physics, and mathematics. The computer science and mathematics requirements serve as a foundation for both data science and physics. From hands-on experience with sophisticated physics instruments, to mathematical theory, to the latest computational innovations, our interdisciplinary approach is designed to prepare students for the myriad challenges in today's rapidly changing world.

Program Requirements

- Concentrations and course offerings may vary by campus and/or by program modality. Please consult with your advisor or admissions coach for the course availability each term at your campus or within your program modality.
- Certain options within the program may be *required* at certain campuses or for certain program modalities. Please consult with your advisor or admissions coach for requirements at your campus or for your program modality.

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/>).

Data Science Courses

| Code | Title | Hours |
|--|---|-------|
| Computer Science Overview | | |
| Must be taken in alignment with your home college: | | |
| CS 1200 or INSC 1000 or PHYS 1000 | First Year Seminar Science at Northeastern Physics at Northeastern | 1 |
| CS 1210 or EESC 2000 | Professional Development for Khoury Co-op Professional Development for Co-op | 1 |
| Programming Sequence Pathways | | |
| Choose one of the two options: | | 12 |
| <i>Computer Science Option</i> | | |
| CS 2500 and CS 2501 | Fundamentals of Computer Science 1 and Lab for CS 2500 | |
| CS 2510 and CS 2511 | Fundamentals of Computer Science 2 and Lab for CS 2510 | |
| CS 3500 and CS 3501 | Object-Oriented Design and Lab for CS 3500 | |
| <i>Data Science Option</i> | | |
| DS 2000 and DS 2001 | Programming with Data and Data Science Programming Practicum | |
| DS 2500 and DS 2501 | Intermediate Programming with Data and Lab for DS 2500 | |
| DS 3500 | Advanced Programming with Data | |
| Computer Science Required Courses | | |
| CS 1800 and CS 1802 | Discrete Structures and Seminar for CS 1800 | 5 |
| CS 3200 | Introduction to Databases | 4 |
| Data Science Foundations | | |

| | | |
|---------|---|---|
| DS 3000 | Foundations of Data Science | 4 |
| DS 4200 | Information Presentation and Visualization | 4 |
| DS 4300 | Large-Scale Information Storage and Retrieval | 4 |
| DS 4400 | Machine Learning and Data Mining 1 | 4 |

Physics Courses

| Code | Title | Hours |
|---|--|-------|
| Required Courses | | |
| PHYS 1161 and PHYS 1162 and PHYS 1163 | Physics 1 and Lab for PHYS 1161 and Recitation for PHYS 1161 | 5 |
| PHYS 1165 and PHYS 1166 and PHYS 1167 | Physics 2 and Lab for PHYS 1165 and Recitation for PHYS 1165 | 5 |
| Intermediate Physics | | |
| PHYS 2303 | Modern Physics | 4 |
| PHYS 3601 | Classical Dynamics | 4 |
| PHYS 3602 | Electricity and Magnetism 1 | 4 |
| PHYS 3603 | Electricity and Magnetism 2 | 4 |
| Advanced Physics | | |
| PHYS 3600 | Advanced Physics Laboratory | 4 |
| PHYS 4115 or PHYS 5116 | Quantum Mechanics Network Science 1 | 4 |
| PHYS 4305 | Thermodynamics and Statistical Mechanics | 4 |

Electives

| Code | Title | Hours |
|---|-------|-------|
| Khoury Elective | | |
| With adviser approval, directed study, research, project study, and appropriate graduate-level courses may also be taken as upper-division electives. | | |
| Complete four semester hours of CS, CY, DS, or IS classes that are not already required. Choose courses within the following ranges: | | 4 |
| 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 | | |
| Physics Elective | | |
| Complete one course not already required in the following range: | | 4 |
| PHYS 3000 to PHYS 5999 | | |

Computer Science Writing Requirement

| Code | Title | Hours |
|--|--|-------|
| College Writing | | |
| ENGW 1111 | First-Year Writing | 4 |
| Advanced Writing in the Disciplines | | |
| ENGW 3302 or ENGW 3307 or ENGW 3315 | Advanced Writing in the Technical Professions Advanced Writing in the Sciences Interdisciplinary Advanced Writing in the Disciplines | 4 |

Supporting Courses

| Code | Title | Hours |
|--|--|-------|
| Calculus | | |
| 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 |
| Additional Mathematics Requirements | | |

| | | |
|-----------|---|---|
| MATH 2341 | Differential Equations and Linear Algebra for Engineering | 4 |
| MATH 3081 | Probability and Statistics | 4 |

Integrative Course and Capstone

| Code | Title | Hours |
|-----------|------------------------------------|-------|
| PHYS 5318 | Principles of Experimental Physics | 4 |

Required General Electives

| Code | Title | Hours |
|------|--|-------|
| | Complete 16 semester hours of general electives. | 16 |

Khoury College GPA Requirement

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

NUpath Requirements Satisfied

- Engaging with the Natural and Designed World
- Conducting Formal and Quantitative Reasoning
- Analyzing and Using Data
- Writing in the First Year
- Advanced Writing in the Disciplines
- Writing-Intensive in the Major
- Demonstrating Thought and Action in a Capstone

Integrating Knowledge and Skills Through Experience is satisfied through co-op.

Program Requirement

132 total semester hours required

Plan of Study

Sample Plan of Study:

Four Years, Two Co-ops in Summer 2/Fall

| Year 1 | | | | | | | | |
|---|-------|---|-------|--------------------|-------|--------------------|-------|----------|
| Fall | Hours | Spring | Hours | Summer 1 | Hours | Summer 2 | Hours | Hours |
| CS 1200 | | 1 DS 2500 and DS 2501 | | 5 MATH 2321 | | 4 MATH 2341 | | 4 |
| CS 1800 and CS 1802 | | 5 ENGW 1111 | | 4 General elective | | 4 General elective | | 4 |
| DS 2000 and DS 2001 | | 4 MATH 1342 | | 4 | | | | |
| MATH 1341 | | 4 PHYS 1165 and PHYS 1166 and PHYS 1167 | | 5 | | | | |
| PHYS 1161 and PHYS 1162 and PHYS 1163 | | 5 | | | | | | |
| | | 19 | | 18 | | 8 | | 8 |
| Year 2 | | | | | | | | |
| Fall | Hours | Spring | Hours | Summer 1 | Hours | Summer 2 | Hours | Hours |
| DS 3000 | | 4 CS 1210 | | 1 MATH 3081 | | 4 Co-op | | 0 |
| PHYS 2303 | | 4 DS 3500 | | 4 PHYS 3600 | | 4 | | |
| PHYS 3602 | | 4 DS 4200 | | 4 | | | | |
| General elective | | 4 PHYS 3601 | | 4 | | | | |
| | | General elective | | 4 | | | | |
| | | 16 | | 17 | | 8 | | 0 |
| Year 3 | | | | | | | | |
| Fall | Hours | Spring | Hours | Summer 1 | Hours | Summer 2 | Hours | Hours |
| Co-op | | DS 4300 | | 4 PHYS 3603 | | 4 Co-op | | |

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|--|--------------------------|-----------|---------------|----------|
| | PHYS 4305 | 4 | PHYS Elective | 4 |
| | CS 3200 | 4 | | |
| | ENGW 3302, 3307, or 3315 | 4 | | |
| | 0 | 16 | 8 | 0 |

Year 4

| Fall | Hours | Spring | Hours |
|-------|----------|-------------------|-------|
| Co-op | | DS 4400 | 4 |
| | | PHYS 5318 | 4 |
| | | PHYS 4115 or 5116 | 4 |
| | | Khoury Elective | 4 |
| | 0 | 16 | |

Total Hours: 134

Four Years, Two Co-ops in Spring/Summer 1

Year 1

| Fall | Hours | Spring | Hours | Summer 1 | Hours | Summer 2 | Hours |
|---|-----------|---|-----------|--------------------|----------|--------------------|----------|
| CS 1200 | | 1 DS 2500 and DS 2501 | | 5 MATH 2321 | | 4 MATH 2341 | 4 |
| CS 1800 and CS 1802 | | 5 ENGW 1111 | | 4 General elective | | 4 General elective | 4 |
| DS 2000 and DS 2001 | | 4 MATH 1342 | | 4 | | | |
| MATH 1341 | | 4 PHYS 1165 and PHYS 1166 and PHYS 1167 | | 5 | | | |
| PHYS 1161 and PHYS 1162 and PHYS 1163 | | 5 | | | | | |
| | 19 | | 18 | | 8 | | 8 |

Year 2

| Fall | Hours | Spring | Hours | Summer 1 | Hours | Summer 2 | Hours |
|-----------|-----------|---------|----------|----------|----------|------------------|----------|
| CS 1210 | | 1 Co-op | | Co-op | | PHYS 3600 | 4 |
| DS 3000 | | 4 | | | | General elective | 4 |
| PHYS 2303 | | 4 | | | | | |
| PHYS 3602 | | 4 | | | | | |
| MATH 3081 | | 4 | | | | | |
| | 17 | | 0 | | 0 | | 8 |

Year 3

| Fall | Hours | Spring | Hours | Summer 1 | Hours | Summer 2 | Hours |
|------------------|-----------|---------|----------|----------|----------|--------------------------|----------|
| DS 3500 | | 4 Co-op | | 0 Co-op | | 0 PHYS 4305 | 4 |
| DS 4200 | | 4 | | | | ENGW 3302, 3307, or 3315 | 4 |
| PHYS 3601 | | 4 | | | | | |
| General Elective | | 4 | | | | | |
| | 16 | | 0 | | 0 | | 8 |

Year 4

| Fall | Hours | Spring | Hours |
|---------------|-----------|---------------------|-------|
| DS 4300 | | 4 DS 4400 | 4 |
| CS 3200 | | 4 PHYS 5318 | 4 |
| PHYS 3603 | | 4 PHYS 4115 or 5116 | 4 |
| PHYS Elective | | 4 Khoury Elective | 4 |
| | 16 | 16 | |

Total Hours: 134

PHYSICS COURSE OFFERING SCHEDULE

PHYS 2303 offered every fall, spring, and summer 2

PHYS 2371/PHYS 2372 offered every fall

PHYS 3600 offered every summer 1 and summer 2

PHYS 3601 offered every fall and spring

PHYS 3602 offered every fall and spring

PHYS 3603 offered fall, spring all years, and summer 1 (odd years)

PHYS 4115 offered every fall and spring

PHYS 4305 offered fall, spring all years, and summer 2 (even years)

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

PHYS 4623 offered fall (even years) and summer 1 (even years)

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

PHYS 4652 offered every spring

PHYS 5318 offered every spring