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

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/).

Data Science Courses

Code	Title	Hours
Computer Science Overview		
CS 1200	First Year Seminar	1
or INSC 1000	Science at Northeastern	
or PHYS 1000	Physics at Northeastern	
CS 1210	Professional Development for Khoury Co-op	1
or EESC 2000	Professional Development for Co-op	
Programming Sequence Pathways		
Choose one of the two options		12
Computer Science Option		
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	
Data Science Option		
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	Database Design	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	Quantum Mechanics	4
or PHYS 5116	Network Science 1	
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	Advanced Writing in the Technical Professions	4
or ENGW 3307	Advanced Writing in the Sciences	
or ENGW 3315	Interdisciplinary Advanced Writing in the Disciplines	

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 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
CS 1200	1	CS 2510 and CS 2511	5	MATH 2321	4	MATH 2341	4
CS 1800 and CS 1802	5	ENGW 1111	4	General elective	4	General elective	4
CS 2500 and CS 2501	5	MATH 1342	4				
MATH 1341	4	PHYS 1165 and PHYS 1166 and PHYS 1167	5				
PHYS 1161 and PHYS 1162 and PHYS 1163	5						
	20		18		8		8

Year 2

Fall	Hours	Spring	Hours	Summer 1	Hours	Summer 2	Hours
CS 3500 and CS 3501	5	CS 1210	1	CS 3200	4	Co-op	0
DS 3000	4	DS 4200	4	MATH 3081	4		
PHYS 2303	4	ENGW 3307	4				
General elective	4	PHYS 3601	4				
		General elective	4				
	17		17		8		0

Year 3

Fall	Hours	Spring	Hours	Summer 1	Hours	Summer 2	Hours
Co-op		DS 4300	4	PHYS 3600	4	Co-op	
		PHYS 3602	4	PHYS 3603	4		
		PHYS 4305	4				

		Khoury elective	4		
	0		16	8	0

Year 4

Fall	Hours	Spring	Hours
Co-op		DS 4400	4
		PHYS 5318	4
		PHYS 4115 or 5116	4
		PHYS advanced physics elective	4
	0		16

Total Hours: 136

- Modern Physics (PHYS 2303) offered every fall, spring, and summer 2
- Electronics (PHYS 2371)/Lab for PHYS 2371 (PHYS 2372) offered every fall
- Advanced Physics Laboratory (PHYS 3600) offered every summer 1 and summer 2
- 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 1 (odd years)
- Quantum Mechanics (PHYS 4115) offered every fall and spring
- Thermodynamics and Statistical Mechanics (PHYS 4305) offered every spring and summer 2 (even years)
- Biological Physics 1 (PHYS 4621) offered spring (odd years) and fall (even years)
- Medical Physics (PHYS 4623) offered summer 1 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