

# Data Science and Biology, BS

The data science and biology major provides a strong foundation in biology, chemistry, and mathematics, as well as software development and algorithms. Students study the collection, manipulation, storage, retrieval, and computational analysis of data in its various forms, including numeric, textual, image, and video data from small to large volumes. Students also explore the organization and processes of life across broad areas of the field, from molecules and cells through organs and organ systems to populations, ecosystems, and evolution.

## 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 Requirements

Code	Title	Hours
<b>Computer Science Overview</b>		
Must be taken in alignment with your home college:		
CS 1200 or BIOL 1000 or INSC 1000	First Year Seminar Biology at Northeastern Science at Northeastern	1
CS 1210 or EESC 2000	Professional Development for Khoury Co-op Professional Development for Co-op	1
<b>Programming Sequence Pathways</b>		
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	
<b>Computer Science Required Courses</b>		
CS 1800 and CS 1802	Discrete Structures and Seminar for CS 1800	5
CS 3200	Introduction to Databases	4
<b>Data Science Foundations</b>		

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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

### Khoury Elective

With advisor 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

### Statistics Foundations

ENVR 2500 and ENVR 2501	Biostatistics and Lab for ENVR 2500	5
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## Computer Science Writing Requirements

Code	Title	Hours
<b>College Writing</b>		
ENGW 1111 or ENGW 1102	First-Year Writing First-Year Writing for Multilingual Writers	4

### Advanced Writing in the Disciplines

ENGW 3302 or ENGW 3315 or ENGW 3307	Advanced Writing in the Technical Professions Interdisciplinary Advanced Writing in the Disciplines Advanced Writing in the Sciences	4
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## Biology Requirements

Code	Title	Hours
<b>Biology Core Courses</b>		
BIOL 1107 and BIOL 1108	Foundations of Biology and Lab for BIOL 1107	5
BIOL 2299	Inquiries in Biological Sciences	4
BIOL 2301 and BIOL 2302	Genetics and Molecular Biology and Lab for BIOL 2301	5
BIOL 2309	Biology Project Lab	4
BIOL 3611 and BIOL 3612	Biochemistry and Lab for BIOL 3611	5

### Intermediate and Advanced Biology Elective

Complete one of the following:		4
BIOL 2327 to BIOL 3999		
BIOL 4705 to BIOL 5999		
EEMB 2290 to EEMB 5515		
EEMB 5520 to EEMB5534		
EEMB 5548 to EEMB 5569		
Research:		
BIOL 4991	Research	
BIOL 4970	Junior/Senior Honors Project 1	
BIOL 4971	Junior/Senior Honors Project 2	
BIOL 4994	Internship	

### Organismal and Evolutionary Biology Elective

Complete one course and its corresponding lab, if indicated:		4-5
BIOL 2327	Human Parasitology	
BIOL 3401	Comparative Vertebrate Anatomy	
BIOL 3413	Current Topics in Organismal and Population Biology	

EEMB 2302 and EEMB 2303	Ecology and Lab for EEMB 2302	
EEMB 2400	Introduction to Evolution	
EEMB 2700 and EEMB 2701	Marine Biology and Lab for EEMB 2700	
EEMB 3460	Conservation Biology	
EEMB 3466	Disease Ecology	
EEMB 3600	Animal Behavior	

### Supporting Courses for Biology

#### Chemistry

CHEM 1161 and CHEM 1162	General Chemistry for Science Majors and Lab for CHEM 1161	5
CHEM 2311 and CHEM 2312	Organic Chemistry 1 and Lab for CHEM 2311	5
CHEM 2313 and CHEM 2314	Organic Chemistry 2 and Lab for CHEM 2313	5

#### Physics

PHYS 1145 and PHYS 1146 or PHYS 1151 or PHYS 1161	Physics for Life Sciences 1 and Lab for PHYS 1145 (Preferred) Physics for Engineering 1 Physics 1	5
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#### Math

MATH 1341	Calculus 1 for Science and Engineering	4
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### Integrative Requirements

Code	Title	Hours
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#### Integrative Course

Complete one of the following:		4
BINF 6310	Introduction to Computational Methods in Bioinformatics	
BIOL 4707	Cell and Molecular Biology	
BIOL 5581	Biological Imaging	
BIOL 5587	Comparative Neurobiology	
BIOL 5591	Advanced Genomics	

#### Capstone

Choose one:		4
BIOL 4701	Biology Capstone	
BIOL 4900	Biology Research Capstone (concurrent with BIOL 4991 or BIOL 4994, which may be used toward Intermediate/Advanced Biology Electives)	
BIOL 4971	Junior/Senior Honors Project 2	

### Required General Electives

Code	Title	Hours
Complete 20 semester hours of general electives.		20

### 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
- Exploring Creative Expression and Innovation
- Conducting Formal and Quantitative Reasoning
- Analyzing and Using Data
- Writing in the First Year
- Advanced Writing in the Disciplines

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- 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**

138 total semester hours required

**Plan of Study**

**Sample Plan of Study**

**Four Years, Two Co-ops , Summer 2/Fall Co-op**

Year 1							
Fall	Hours	Spring	Hours	Summer 1	Hours	Summer 2	Hours
BIOL 1107 and BIOL 1108		5 BIOL 2299		4 BIOL 2301 and BIOL 2302		5 General Elective	4
CS 1200		1 CHEM 1161 and CHEM 1162 and CHEM 1163		5 General Elective		4 General Elective	4
CS 1800 and CS 1802		5 DS 2500 and DS 2501		5			
DS 2000 and DS 2001		4 MATH 1341		4			
ENGW 1111		4					
		<b>19</b>		<b>18</b>		<b>9</b>	<b>8</b>
Year 2							
Fall	Hours	Spring	Hours	Summer 1	Hours	Summer 2	Hours
BIOL 2309		4 CHEM 2313 and CHEM 2314		5 BIOL 3611 and BIOL 3612		5 Co-op	
CHEM 2311 and CHEM 2312		5 CS 1210		1 General Elective		4	
DS 3000		4 CS 3200		4			
PHYS 1145 and PHYS 1146		5 DS 3500		4			
		DS 4200		4			
		<b>18</b>		<b>18</b>		<b>9</b>	<b>0</b>
Year 3							
Fall	Hours	Spring	Hours	Summer 1	Hours	Summer 2	Hours
Co-op		DS 4300		4 ENGW 3302, 3307, or 3315		4 Co-op	
		DS 4400		4 Khoury Elective		4	
		ENVR 2500 and ENVR 2501		5			
		General Elective		4			
		<b>0</b>		<b>17</b>		<b>8</b>	<b>0</b>
Year 4							
Fall	Hours	Spring	Hours				
Co-op		BIOL 4701	4				
		BIOL Intermediate/ Advanced Science	4				
		Integrative course	4				
		Organismal and Population BIOL Elective	4				
		<b>0</b>	<b>16</b>				

**Total Hours: 140**

**Four Years, Two Co-ops, Spring/Summer 1 Co-op**

<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>	<b>Hours</b>
BIOL 1107 and BIOL 1108		5 BIOL 2299		4 BIOL 2301 and BIOL 2302		5 General Elective		4
CS 1200		1 CHEM 1161 and CHEM 1162 and CHEM 1163		5 General Elective		4 General Elective		4
CS 1800 and CS 1802		5 DS 2500 and DS 2501		5				
DS 2000 and DS 2001		4 MATH 1341		4				
ENGW 1111		4						
		<b>19</b>		<b>18</b>		<b>9</b>		<b>8</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>	<b>Hours</b>
CS 1210		1 Co-op		Co-op		CHEM 2313 and CHEM 2314		5
BIOL 2309		4				General Elective		4
CHEM 2311 and CHEM 2312		5						
DS 3000		4						
PHYS 1145 and PHYS 1146		5						
		<b>19</b>		<b>0</b>		<b>0</b>		<b>9</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>	<b>Hours</b>
CS 3200		4 Co-op		Co-op		ENGW 3302, 3307, or 3315		4
DS 3500		4				General Elective		4
DS 4200		4						
BIOL 3611 and BIOL 3612		5						
		<b>17</b>		<b>0</b>		<b>0</b>		<b>8</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>	<b>Hours</b>
DS 4300		4 BIOL 4701		4				
DS 4400		4 BIOL Intermediate/ Advanced Science		4				
ENVR 2500 and ENVR 2501		5 Integrative course		4				
Khoury Elective		4 Organismal and Population BIOL Elective		4				
		<b>17</b>		<b>16</b>				
<b>Total Hours: 140</b>								