

Data Science and Behavioral Neuroscience, BS

The data science and behavioral neuroscience major combines the disciplines of biology, psychology, computer science, and data science into an integrated curriculum. The human brain is a complex information processing system requiring scientists to analyze, integrate, and share large data sets garnered from multiple techniques that image and record the activity of the brain at work. Students investigate the anatomy and physiology of neural circuits that underlie brain mechanisms and pathological states that give rise to behavioral functions. Students have an opportunity to develop skills in large-scale data manipulation and storage, machine learning, data mining, and information visualization necessary to execute big brain-mapping initiatives including human neuroconnectivity maps.

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.

University-Wide Requirements

All undergraduate students are required to complete the University-Wide 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 Requirements

Code	Title	Hours
Computer Science Overview		
CS 1200	First Year Seminar ¹	1
CS 1210	Professional Development for Khoury Co-op ²	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	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

Statistics Foundation

Complete one of the following:		4-5
ENVR 2500 and ENVR 2501	Biostatistics and Lab for ENVR 2500	
PSYC 2320	Statistics in Psychological Research	

¹ Students entering through the behavioral neuroscience program may take Behavioral Neuroscience at Northeastern (BNSC 1000).

² Students entering through the behavioral neuroscience program may take Professional Development for Co-op (EESC 2000).

Writing Requirements

Code	Title	Hours
College Writing		
ENGW 1111 or ENGW 1102	First-Year Writing or First-Year Writing for Multilingual Writers	4
Advanced Writing in the Disciplines		
Complete one of the following:		4
ENGW 3302	Advanced Writing in the Technical Professions	
ENGW 3307	Advanced Writing in the Sciences	
ENGW 3315	Interdisciplinary Advanced Writing in the Disciplines	

Behavioral Neuroscience Requirements

Code	Title	Hours
COS Foundations		
PSYC 1101	Foundations of Psychology	4
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
CHEM 1161 and CHEM 1162 and CHEM 1163	General Chemistry for Science Majors and Lab for CHEM 1161 and Recitation for CHEM 1161	5
CHEM 2311 and CHEM 2312	Organic Chemistry 1 and Lab for CHEM 2311	5
Mathematics Foundation		
MATH 1341 or MATH 1251	Calculus 1 for Science and Engineering or Calculus and Differential Equations for Biology 1	4
Behavioral Neuroscience Foundations		
BIOL 3405 or BIOL 5587	Neurobiology or Comparative Neurobiology	4
PT 5410 and PT 5411	Functional Human Neuroanatomy and Lab for PT 5410	4-5

or PSYC 3200	Clinical Neuroanatomy	
Psychology Elective		
Complete one of the following:		4
PSYC 3404	Developmental Psychology	
PSYC 3406	Abnormal Psychology	
PSYC 3450	Learning and Motivation	
PSYC 3451	Learning Principles and Behavior Analysis	
PSYC 3452	Sensation and Perception	
PSYC 3358	Behavior Therapies	
PSYC 3464	Psychology of Language	
PSYC 3466	Cognition	
PSYC 4520	Language and the Brain	
PSYC 4524	Cognitive Development	

Behavioral Neuroscience Core Courses		
Complete two of the following:		8
BIOL 3403	Animal Behavior	
BIOL 3415	Current Topics in Behavioral Neuroscience	
BIOL 3601	Neural Systems and Behavior	
BIOL 3605	Developmental Neurobiology	
BIOL 4705	Neurobiology of Cognitive Decline	
BIOL 4709	Neurobiology of Learning and Memory	
BIOL 5595	Cell and Molecular Neuroscience	
BIOL 5601	Multidisciplinary Approaches in Motor Control	
PSYC 3506	Neuropsychology of Fear	
PSYC 3508	Behavioral Endocrinology	
PSYC 3510	Brain, Behavior, and Immunity	
PSYC 4510	Psychopharmacology	
PSYC 4512	Neuropsychology	
PSYC 4514	Clinical Neuroscience	
PSYC 4570	Behavioral Genetics	

Integrative Requirements

Code	Title	Hours
Integrative Courses		
PSYC 4540	Quantitative Topics in Psychology and Behavioral Neuroscience	4
or BINF 6308	Bioinformatics Computational Methods 1	
CS 4100	Artificial Intelligence	4
Upper-Division Elective		
Complete four credits from the following list, not taken to fulfill previous requirements:		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		
BNSC 4970 or higher		
BIOL 3400 or higher		
BINF 6309	Bioinformatics Computational Methods 2	
PSYC 3200 or higher		

Required General Electives

Code	Title	Hours
Complete 16 credits of general electives.		16

Khoury College GPA Requirement

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

Program Requirement

130 total semester hours required

Plan of Study

Sample Patterns:

Five Years, Three Co-ops

Year 1							
Fall	Hours	Spring	Hours	Summer 1	Hours	Summer 2	Hours
CS 1200	1	CS 2510 and CS 2511	5	Vacation	0	Vacation	0
CS 1800 and CS 1802	5	BIOL 2299	4				
CS 2500 and CS 2501	5	CHEM 1161 and CHEM 1162 and CHEM 1163	5				
BIOL 1107 and BIOL 1108	5	MATH 1341	4				
ENGW 1111	4						
		20		18		0	
Year 2							
Fall	Hours	Spring	Hours	Summer 1	Hours	Summer 2	Hours
CS 3500 and CS 3501	5	DS 3000	4	Vacation	0	Co-op	0
BIOL 3405 or 5587	4	CS 3200	4				
PSYC 1101	4	CHEM 2311 and CHEM 2312	5				
BIOL 2301 and BIOL 2302	5	CS 1210	1				
		PSYC 2320		4			
		18		18		0	
Year 3							
Fall	Hours	Spring	Hours	Summer 1	Hours	Summer 2	Hours
Co-op		DS 4200	4	General elective	4	Co-op	4
		BNS foundation		4 PSYC elective		4	
		General elective		4			
		PSYC 3200		4			
		0		16		8	
Year 4							
Fall	Hours	Spring	Hours	Summer 1	Hours	Summer 2	Hours
Co-op		DS 4300	4	Vacation	0	Co-op	0

BNS integrative course	4	ENGW 3315 (online)	4
BNS foundation	4		
General elective	4		
0	16	0	4

Year 5

Fall	Hours Spring	Hours
Co-op	DS 4400	4
	CS 4100	4
	Integrative advanced elective	4
	General elective	4
0	16	

Total Hours: 134

Four Years, Two Co-ops

Year 1

Fall	Hours Spring	Hours Summer 1	Hours Summer 2	Hours
CS 1200	1 CS 2510 and CS 2511	5 CS 3500 and CS 3501	5 Vacation	
CS 1800 and CS 1802	5 MATH 1341	4 PSYC 1101	4	
CS 2500 and CS 2501	5 BIOL 2299	4		
BIOL 1107 and BIOL 1108	5 CHEM 1161 and CHEM 1162 and CHEM 1163	5		
ENGW 1111	4			
20	18	9	0	

Year 2

Fall	Hours Spring	Hours Summer 1	Hours Summer 2	Hours
CS 3200	4 CS 1210	1 PSYC elective	4 Co-op	
DS 3000	4 DS 4200	4 General elective	4	
BIOL 3405 or 5587	4 CHEM 2311 and CHEM 2312	5		
BIOL 2301 and BIOL 2302	5 BNS foundation	4		
	PSYC 2320	4		
17	18	8	0	

Year 3

Fall	Hours Spring	Hours Summer 1	Hours Summer 2	Hours
Co-op	DS 4300	4 General elective	4 Co-op	
	BNS foundation	4 Integrative advanced elective	4 ENGW 3315 (online)	4
	PSYC 3200	4		

General elective	4		
0	16	8	4

Year 4

Fall	Hours Spring	Hours
Co-op	DS 4400	4
	CS 4100	4
	BNS integrative course	4
	General elective	4
0	16	

Total Hours: 134