

# Computer Science and Behavioral Neuroscience, BS

The Bachelor of Science in Computer Science and Behavioral Neuroscience underscores how research in neuroscience has become a computational field of study. The combined major is designed for students who are interested in applying mathematical and computational methodologies toward understanding human behavior, artificial intelligence, and the human-machine interface. Courses across multiple science disciplines—including biology, chemistry, and computer science—lay a strong foundation necessary to explore brain mechanisms and how they give rise to behavioral functions and pathological states using computational approaches. Students will have an opportunity to develop skills in software development as they apply algorithms and data structures to brain research and neurotechnology.

## 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/>).

## Computer Science Requirements

Code	Title	Hours
<b>Overview</b>		
CS 1200	First Year Seminar <sup>1</sup>	1
CS 1210	Professional Development for Khoury Co-op <sup>2</sup>	1
<b>Computer Science Foundations</b>		
CS 1800 and CS 1802	Discrete Structures and Seminar for CS 1800	5
CS 2500 and CS 2501	Fundamentals of Computer Science 1 and Lab for CS 2500	5
CS 2510 and CS 2511	Fundamentals of Computer Science 2 and Lab for CS 2510	5
<b>Computer Science Required Courses</b>		
CS 3000	Algorithms and Data	4
CS 3200	Database Design	4
CS 3500 and CS 3501	Object-Oriented Design and Lab for CS 3500	5
CS 4100	Artificial Intelligence	4
CS 4500 or CS 4530	Software Development Fundamentals of Software Engineering	4
<b>Statistics Foundation</b>		
Complete one of the following. Students who receive transfer credit for the Advanced Placement Statistics exam may complete the 1 SH PSYC 2315 course (requires department permission).		4-5
ENVR 2500 and ENVR 2501	Biostatistics and Lab for ENVR 2500	
PSYC 2320	Statistics in Psychological Research	

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

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

## 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**

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
<b>COS Foundations</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
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
PSYC 1101	Foundations of Psychology	4
<b>Mathematics Foundation</b>		
MATH 1341 or MATH 1251	Calculus 1 for Science and Engineering Calculus and Differential Equations for Biology 1	4
<b>Behavioral Neuroscience Foundations</b>		
BIOL 3405 or BIOL 5587	Neurobiology Comparative Neurobiology	4
PT 5410 and PT 5411 or PSYC 3200	Functional Human Neuroanatomy and Lab for PT 5410 Clinical Neuroanatomy	4-5
<b>Psychology Elective</b>		
Complete one of the following:		4
PSYC 3404	Developmental Psychology	
PSYC 3406	Clinical Psychology and Mental Health	
PSYC 3450	Learning and Motivation	
PSYC 3451	Learning Principles and Behavior Analysis	
PSYC 3452	Sensation and Perception	
PSYC 3464	Psychology of Language	
PSYC 3466	Cognition	
PSYC 4524	Cognitive Development	
<b>Behavioral Neuroscience Core Courses</b>		
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
<b>Integrative Courses</b>		
IS 4300 or CS 4120 or CS 4180	Human Computer Interaction Natural Language Processing Reinforcement Learning	4
PSYC 4540 or BINF 6308	Quantitative Topics in Psychology and Behavioral Neuroscience Bioinformatics Computational Methods 1	4
<b>Upper-Division Elective</b>		
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		

## Supporting Courses

Code	Title	Hours
<b>Computing and Social Issues</b>		
Complete one of the following:		4
AFAM 2600	Issues in Race, Science, and Technology	
CY 4170	The Law, Ethics, and Policy of Data and Digital Technologies	
CY 5240	Cyberlaw: Privacy, Ethics, and Digital Rights	
ENGL 2150	Literature and Digital Diversity	
HIST 2220	History of Technology	
INSH 2102	Bostonography: The City through Data, Texts, Maps, and Networks	
PHIL 1145	Technology and Human Values	
SOCL 1280	The Twenty-First-Century Workplace	
SOCL 2485	Environment, Technology, and Society	
SOCL 4528	Computers and Society	

## 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

## Computer Science and Behavioral Neuroscience Major Credit Requirement

102 SH required in the major

## NUpath Requirements Satisfied

- Engaging with the Natural and Designed World
- Conducting Formal and Quantitative Reasoning
- Understanding Societies and Institutions
- Analyzing and Using Data
- Writing in the First Year
- Advanced Writing in the Disciplines

4 Computer Science and Behavioral Neuroscience, BS

- 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**

133 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	Hours
BIOL 1107 and BIOL 1108		5 BIOL 2299		4 Vacation		Vacation		
CS 1200		1 CHEM 1161 and CHEM 1162 and CHEM 1163		5				
CS 1800 and CS 1802		5 CS 2510 and CS 2511		5				
CS 2500 and CS 2501		5 MATH 1341		4				
ENGW 1111		4						
	20		18			0		0
Year 2								
Fall	Hours	Spring	Hours	Summer 1	Hours	Summer 2	Hours	Hours
BIOL 2301 and BIOL 2302		5 CHEM 2311 and CHEM 2312		5 Vacation		Co-op		
BIOL 3405 or 5587		4 CS 1210		1				
CS 3500 and CS 3501		5 CS 3000		4				
PSYC 1101		4 PSYC 3200		4				
		General elective		4				
	18		18			0		0
Year 3								
Fall	Hours	Spring	Hours	Summer 1	Hours	Summer 2	Hours	Hours
Co-op		CS 3200		4 PSYC elective		4 Co-op		
		CS 4500		4 General elective		4		
		BNS core		4				
		Statistics requirement		4				
	0		16			8		0
Year 4								
Fall	Hours	Spring	Hours	Summer 2	Hours	Hours	Hours	Hours
Co-op		CS 4100		4		Co-op		
		BNS core		4		ENGW 3302 (online)		4
		CS integrative course		4				
		General elective		4				
	0		16					4
Year 5								
Fall	Hours	Spring	Hours	Hours	Hours	Hours	Hours	Hours
Co-op		BNS integrative course		4				
		Computing and social issues		4				
		Upper-division 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
BIOL 1107 and BIOL 1108	5	BIOL 2299	4	CS 3500 and CS 3501	5	Vacation	0
CS 1200	1	CHEM 1161 and CHEM 1162 and CHEM 1163	5	PSYC 1101	4		
CS 1800 and CS 1802	5	CS 2510 and CS 2511	5				
CS 2500 and CS 2501	5	MATH 1341	4				
ENGW 1111	4						
	20		18		9		0

**Year 2**

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

**Year 3**

Fall	Hours	Spring	Hours	Summer 1	Hours	Summer 2	Hours
Co-op		CS 4500	4	Upper-division elective	4	Co-op	0
		BNS core	4	General elective	4	ENGW 3302 (online)	4
		BNS core	4				
		CS integrative course	4				
	0		16		8		4

**Year 4**

Fall	Hours	Spring	Hours
Co-op		CS 4100	4
		BNS integrative course	4
		Computing and social issues	4
		General elective	4
	0		16

Total Hours: 134