# *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.

## 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 Requirements

| Code | Title | Hours |
| --- | --- | --- |
| **Computer Science Overview** | | |
| CS 1200 | First Year Seminar | 1 |
| or BNSC 1000 | Behavioral Neuroscience at Northeastern | |
| or INSC 1000 | Science 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 |
| **Statistics Foundation** | | |
| Complete one of the following: | | 4-5 |

| | | |
|---|---|---|
| ENVR 2500<br>and ENVR 2501 | Biostatistics<br>and Lab for ENVR 2500 | |
| PSYC 2320 | Statistics in Psychological Research | |

## Writing Requirements

| Code | Title | Hours |
|---|---|---|
| **College Writing** | | |
| ENGW 1111 | First-Year Writing | 4 |
| or ENGW 1102 | First-Year Writing for Multilingual Writers | |
| **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** | | |
| BIOL 1107<br>and BIOL 1108 | Foundations of Biology<br>and Lab for BIOL 1107 | 5 |
| BIOL 2299 | Inquiries in Biological Sciences | 4 |
| BIOL 2301<br>and BIOL 2302 | Genetics and Molecular Biology<br>and Lab for BIOL 2301 | 5 |
| CHEM 1161<br>and CHEM 1162<br>and CHEM 1163 | General Chemistry for Science Majors<br>and Lab for CHEM 1161<br>and Recitation for CHEM 1161 | 5 |
| CHEM 2311<br>and CHEM 2312 | Organic Chemistry 1<br>and Lab for CHEM 2311 | 5 |
| PSYC 1101 | Foundations of Psychology | 4 |
| **Mathematics Foundation** | | |
| MATH 1341 | Calculus 1 for Science and Engineering | 4 |
| or MATH 1251 | Calculus and Differential Equations for Biology 1 | |
| **Behavioral Neuroscience Foundations** | | |
| BIOL 3405 | Neurobiology | 4 |
| or BIOL 5587 | Comparative Neurobiology | |
| PT 5410<br>and PT 5411 | Functional Human Neuroanatomy<br>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 | 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 | |
| **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** | | |
| CS 4100 | Artificial Intelligence | 4 |
| PSYC 4540 | Quantitative Topics in Psychology and Behavioral Neuroscience | 4 |
| or BINF 6308 | Bioinformatics Computational Methods 1 | |
| **Upper-Division Elective** | | |
| Complete four credits from the following list, not taken to fulfill previous requirements: | | 4 |
| BIOL 3400 or higher | | |
| BINF 6309 | Bioinformatics Computational Methods 2 | |
| BNSC 4970 or higher | | |
| 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 | | |
| 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

## 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
- 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

130 total semester hours required

## Plan of Study
## Sample Plan of Study:
## 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 | |
| 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 | |
| BIOL 3405 or 5587 | 4 | CS 1210 | 1 | General elective | 4 | | |
| CS 3200 | 4 | DS 4200 | 4 | | | | |
| DS 3000 | 4 | PSYC 2320 | 4 | | | | |
| | | BNS foundation | 4 | | | | |
| | 17 | | 18 | | 8 | | 0 |

**Year 3**

| Fall | Hours | Spring | Hours | Summer 1 | Hours | Summer 2 | Hours |
|---|---|---|---|---|---|---|---|
| Co-op | | DS 4300 | 4 | Integrative advanced elective | 4 | Co-op | |
| | | PSYC 3200 | 4 | General elective | 4 | ENGW 3315 (online) | 4 |
| | | BNS foundation | 4 | | | | |
| | | General elective | 4 | | | | |
| | 0 | | 16 | | 8 | | 4 |

**Year 4**

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

Total Hours: 134