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/](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/](http://catalog.northeastern.edu/undergraduate/university-academics/nupath/)).

**Data Science Requirements**

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<tbody>
<tr>
<td>CS 1200</td>
<td>First Year Seminar</td>
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<td>Professional Development for Khoury Co-op</td>
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**Programming Sequence Pathways**

Choose one of the two options.

**Computer Science Option**

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<tr>
<td>CS 2500</td>
<td>Fundamentals of Computer Science 1</td>
<td></td>
</tr>
<tr>
<td>and CS 2501</td>
<td>and Lab for CS 2500</td>
<td></td>
</tr>
<tr>
<td>CS 2510</td>
<td>Fundamentals of Computer Science 2</td>
<td></td>
</tr>
<tr>
<td>and CS 2511</td>
<td>and Lab for CS 2510</td>
<td></td>
</tr>
<tr>
<td>CS 3500</td>
<td>Object-Oriented Design</td>
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</tr>
<tr>
<td>and CS 3501</td>
<td>and Lab for CS 3500</td>
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**Data Science Option**

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<tr>
<td>DS 2000</td>
<td>Programming with Data</td>
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<tr>
<td>and DS 2001</td>
<td>and Data Science Programming Practicum</td>
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<tr>
<td>DS 2500</td>
<td>Intermediate Programming with Data</td>
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<tr>
<td>and DS 2501</td>
<td>and Lab for DS 2500</td>
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<tr>
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<td>Advanced Programming with Data</td>
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**Computer Science Required Courses**

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<td>Discrete Structures</td>
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<tr>
<td>and CS 1802</td>
<td>and Seminar for CS 1800</td>
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<tr>
<td>CS 3200</td>
<td>Database Design</td>
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**Data Science Foundations**

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<tr>
<td>DS 3000</td>
<td>Foundations of Data Science</td>
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<tr>
<td>DS 4200</td>
<td>Information Presentation and Visualization</td>
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<tr>
<td>DS 4300</td>
<td>Large-Scale Information Storage and Retrieval</td>
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<tr>
<td>DS 4400</td>
<td>Machine Learning and Data Mining 1</td>
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**Statistics Foundation**

Complete one of the following:

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<tr>
<td>ENVR 2500</td>
<td>Biostatistics and Lab for ENVR 2500</td>
<td></td>
</tr>
<tr>
<td>PSYC 2320</td>
<td>Statistics in Psychological Research</td>
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</tbody>
</table>

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**

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<tr>
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<th>Hours</th>
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</thead>
<tbody>
<tr>
<td>ENGW 1111</td>
<td>First-Year Writing</td>
<td>4</td>
</tr>
<tr>
<td>ENGW 1102</td>
<td>First-Year Writing for Multilingual Writers</td>
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**Advanced Writing in the Disciplines**

Complete one of the following:

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<tbody>
<tr>
<td>ENGW 3302</td>
<td>Advanced Writing in the Technical Professions</td>
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<tr>
<td>ENGW 3307</td>
<td>Advanced Writing in the Sciences</td>
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<tr>
<td>ENGW 3315</td>
<td>Interdisciplinary Advanced Writing in the Disciplines</td>
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**Behavioral Neuroscience Requirements**

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<td>PSYC 1101</td>
<td>Foundations of Psychology</td>
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<td>BIOL 1107</td>
<td>Foundations of Biology and Lab for BIOL 1107</td>
<td>5</td>
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<tr>
<td>BIOL 2299</td>
<td>Inquiries in Biological Sciences</td>
<td>4</td>
</tr>
<tr>
<td>BIOL 2301</td>
<td>Genetics and Molecular Biology</td>
<td>5</td>
</tr>
<tr>
<td>and BIOL 2302</td>
<td>and Lab for BIOL 2301</td>
<td></td>
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<tr>
<td>CHEM 1161</td>
<td>General Chemistry for Science Majors and Lab for CHEM 1161</td>
<td>5</td>
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<tr>
<td>and CHEM 1162</td>
<td>and Recitation for CHEM 1161</td>
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<tr>
<td>CHEM 2311</td>
<td>Organic Chemistry 1 and Lab for CHEM 2311</td>
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<tr>
<td>MATH 1341</td>
<td>Calculus 1 for Science and Engineering</td>
<td>4</td>
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<tr>
<td>or MATH 1251</td>
<td>Calculus and Differential Equations for Biology 1</td>
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**Mathematics Foundation**

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<tr>
<td>BIOL 3405</td>
<td>Neurobiology</td>
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<tr>
<td>or BIOL 5587</td>
<td>Comparative Neurobiology</td>
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<tr>
<td>PT 5410</td>
<td>Functional Human Neuroanatomy and Lab for PT 5410</td>
<td>4-5</td>
</tr>
<tr>
<td>Code</td>
<td>Title</td>
<td>Hours</td>
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<tr>
<td>---------</td>
<td>------------------------------------------------</td>
<td>-------</td>
</tr>
<tr>
<td>PSYC 3200</td>
<td>Clinical Neuroanatomy</td>
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<td>PSYC 3404</td>
<td>Developmental Psychology</td>
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<tr>
<td>PSYC 3406</td>
<td>Abnormal Psychology</td>
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<tr>
<td>PSYC 3450</td>
<td>Learning and Motivation</td>
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<tr>
<td>PSYC 3451</td>
<td>Learning Principles and Behavior Analysis</td>
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<tr>
<td>PSYC 3452</td>
<td>Sensation and Perception</td>
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<td>PSYC 3358</td>
<td>Behavior Therapies</td>
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<tr>
<td>PSYC 3464</td>
<td>Psychology of Language</td>
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<tr>
<td>PSYC 3466</td>
<td>Cognition</td>
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<tr>
<td>PSYC 4520</td>
<td>Language and the Brain</td>
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<tr>
<td>PSYC 4524</td>
<td>Cognitive Development</td>
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<td><strong>Behavioral Neuroscience Core Courses</strong></td>
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<tr>
<td>BIOL 3403</td>
<td>Animal Behavior</td>
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<td>BIOL 3415</td>
<td>Current Topics in Behavioral Neuroscience</td>
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<tr>
<td>BIOL 3601</td>
<td>Neural Systems and Behavior</td>
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<tr>
<td>BIOL 3605</td>
<td>Developmental Neurobiology</td>
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<tr>
<td>BIOL 4705</td>
<td>Neurobiology of Cognitive Decline</td>
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<td>BIOL 4709</td>
<td>Neurobiology of Learning and Memory</td>
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<td>BIOL 5595</td>
<td>Cell and Molecular Neuroscience</td>
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<td>BIOL 5601</td>
<td>Multidisciplinary Approaches in Motor Control</td>
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<tr>
<td>PSYC 3506</td>
<td>Neuropsychology of Fear</td>
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<tr>
<td>PSYC 3508</td>
<td>Behavioral Endocrinology</td>
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<tr>
<td>PSYC 3510</td>
<td>Brain, Behavior, and Immunity</td>
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<tr>
<td>PSYC 4510</td>
<td>Psychopharmacology</td>
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<td>PSYC 4512</td>
<td>Neuropsychology</td>
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<td>PSYC 4514</td>
<td>Clinical Neuroscience</td>
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<td>PSYC 4570</td>
<td>Behavioral Genetics</td>
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<table>
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<tr>
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<tbody>
<tr>
<td>PSYC 4540</td>
<td>Quantitative Topics in Psychology and Behavioral Neuroscience</td>
<td>4</td>
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<tr>
<td>or BINF 6308</td>
<td>Bioinformatics Computational Methods 1</td>
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<td>CS 4100</td>
<td>Artificial Intelligence</td>
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**Integrative Requirements**

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<td>PSYC 4540</td>
<td>Artificial Intelligence</td>
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**Upper-Division Elective**

Complete four credits from the following list, not taken to fulfill previous requirements:

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<tbody>
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<tr>
<td>CY 2000 or higher, except CY 4930</td>
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<tr>
<td>DS 2500 or higher, except DS 4900</td>
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<tr>
<td>IS 2000 or higher, except IS 4900</td>
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<tr>
<td>BNSC 4970 or higher</td>
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<tr>
<td>BIOL 3400 or higher</td>
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<tr>
<td>BINF 6309</td>
<td>Bioinformatics Computational Methods 2</td>
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<td>PSYC 3200 or higher</td>
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**Required General Electives**

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<tr>
<td>PSYC 3200 or higher</td>
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<td>16</td>
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**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**

<table>
<thead>
<tr>
<th>Fall</th>
<th>Hours</th>
<th>Spring</th>
<th>Hours</th>
<th>Summer 1</th>
<th>Hours</th>
<th>Summer 2</th>
<th>Hours</th>
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</thead>
<tbody>
<tr>
<td>CS 1200</td>
<td>1</td>
<td>CS 2510 and CS 2511</td>
<td>5</td>
<td>Vacation</td>
<td></td>
<td>Vacation</td>
<td></td>
</tr>
<tr>
<td>CS 1800 and CS 1802</td>
<td>5</td>
<td>BIOL 2299</td>
<td>4</td>
<td></td>
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<td></td>
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<tr>
<td>CS 2500 and CS 2501</td>
<td>5</td>
<td>CHEM 1161 and CHEM 1162 and CHEM 1163</td>
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<td>BIOL 1107 and BIOL 1108</td>
<td>5</td>
<td>MATH 1341</td>
<td>4</td>
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<th>Spring</th>
<th>Hours</th>
<th>Summer 1</th>
<th>Hours</th>
<th>Summer 2</th>
<th>Hours</th>
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<tbody>
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<td>DS 3000</td>
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<td>Vacation</td>
<td>Co-op</td>
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<td>CS 3200</td>
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<td>PSYC 1101</td>
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<td>CHEM 2311 and CHEM 2312</td>
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**Year 2**

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<th>Hours</th>
<th>Summer 2</th>
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<tbody>
<tr>
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<td>Vacation</td>
<td>Co-op</td>
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<td>CHEM 2311 and CHEM 2312</td>
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<td>BIOL 2301 and BIOL 2302</td>
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<td>PSYC 2320</td>
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**Year 3**

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<th>Summer 1</th>
<th>Hours</th>
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<th>Hours</th>
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<tbody>
<tr>
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<td></td>
<td>DS 4200</td>
<td>4</td>
<td>General elective</td>
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<td>Co-op</td>
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<tr>
<td>BNS foundation</td>
<td>4</td>
<td>PSYC elective</td>
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<tr>
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**Year 4**

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<th>Summer 1</th>
<th>Hours</th>
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<th>Hours</th>
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<tr>
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### Year 5

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<th>Hours</th>
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<tr>
<td>Co-op</td>
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<td>CS 4100</td>
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<tr>
<td>General elective</td>
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Total Hours: 134

### Four Years, Two Co-ops

#### Year 1

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<th>Hours</th>
<th>Summer 1</th>
<th>Hours</th>
<th>Summer 2</th>
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<tbody>
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<td>CS 3500 and CS 3501</td>
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<td>Vacation</td>
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<td>CS 1800 and CS 1802</td>
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<td>MATH 1341</td>
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<td>PSYC 1101</td>
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<td>CS 2500 and CS 2501</td>
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<td>BIOL 2299</td>
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</tr>
<tr>
<td>BIOL 1107 and BIOL 1108</td>
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<td>CHEM 1161 and CHEM 1162 and CHEM 1163</td>
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#### Year 2

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#### Year 3

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#### Year 4

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Total Hours: 134