NEUROSCIENCE MAJOR, B.S.

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Neuroscience embodies the liberal arts experience as it draws on techniques and findings from several academic disciplines including biology, chemistry, computer science, mathematics, physics, and psychology. This program provides students with the fundamental knowledge and exposure needed to pursue careers and post-graduate studies in fields related to psychology, human development and aging, health and disease, rehabilitation, biomedical research, human-machine interactions, and other emerging disciplines.

The neuroscience major is open to all undergraduate students.

Department Programs

Majors
- Neuroscience Major, B.S. (p. 1)
- Psychology Major, B.A. (http://catalog.unc.edu/undergraduate/programs-study/psychology-major-ba)
- Psychology Major, B.S. (http://catalog.unc.edu/undergraduate/programs-study/psychology-major-bs)

Minors
- Neuroscience Minor (http://catalog.unc.edu/undergraduate/programs-study/neuroscience-minor)

Graduate Programs
- M.A. in Psychology (http://catalog.unc.edu/graduate/schools-departments/psychology-neuroscience)
- Ph.D. in Psychology (http://catalog.unc.edu/graduate/schools-departments/psychology-neuroscience)

Student Learning Outcomes

Upon completion of the neuroscience program, students should be able to:
- Knowledge Base: Demonstrate familiarity with the major concepts, theoretical perspectives, empirical findings, and trends in neuroscience including its links to other science disciplines
- Research Methods: Apply basic research methods in psychology, including research design, data analysis, and interpretation
- Critical Thinking Skills: Demonstrate critical and creative thinking, skeptical inquiry, and when possible, the scientific approach to solve problems related to behavior and mental processes
- Application: Apply psychological principles to personal, social, and organizational issues
- Values: Demonstrate use of empirical evidence, tolerate ambiguity, act ethically, and reflect other values that are the underpinning of neuroscience as a science

Requirements

In addition to the program requirements, students must
- attain a final cumulative GPA of at least 2.0
- complete a minimum of 45 academic credit hours earned from UNC–Chapel Hill courses
- take at least half of their major course requirements (courses and credit hours) at UNC–Chapel Hill
- earn a minimum of 18 hours of C or better in the major core requirements (some majors require 21 hours).

For more information, please consult the degree requirements section of the catalog (http://catalog.unc.edu/undergraduate/general-education-curriculum-degree-requirements/#degreerequirementstext).

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<thead>
<tr>
<th>Code</th>
<th>Title</th>
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<tr>
<td>NSCI 175</td>
<td>Introduction to Neuroscience (with a grade of C or better)</td>
<td>3</td>
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<tr>
<td>PSYC 210</td>
<td>Statistical Principles of Psychological Research ^H</td>
<td>3-4</td>
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<tr>
<td>or STOR 155</td>
<td>Introduction to Data Models and Inference</td>
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<td>PSYC 270</td>
<td>Laboratory Research in Psychology</td>
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<tr>
<td>NSCI 222</td>
<td>Learning ^H</td>
<td>3</td>
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<tr>
<td>NSCI 225</td>
<td>Sensation and Perception ^H</td>
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<td>Knowledge Electives (select at least six credit hours from list below)</td>
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<tr>
<td>Mathematics, Methods, Statistics Electives (select at least six credit hours from list below)</td>
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<td>BIOL 101 &amp; 101L</td>
<td>Principles of Biology and Introductory Biology Laboratory ^H</td>
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<td>Molecular Biology and Genetics ^H</td>
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<td>CHEM 102 &amp; 102L</td>
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<td>CHEM 241</td>
<td>Modern Analytical Methods for Separation and Characterization ^H</td>
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<td>Introduction to Organic Chemistry I H</td>
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<td>CHEM 262</td>
<td>Introduction to Organic Chemistry II H</td>
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<td>CHEM 262L</td>
<td>Laboratory in Organic Chemistry</td>
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<td>COMP 116</td>
<td>Introduction to Scientific Programming</td>
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<tr>
<td>MATH 231</td>
<td>Calculus of Functions of One Variable I H</td>
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<td>MATH 232</td>
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Select one course: 4

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<td>General Physics I</td>
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<td>PHYS 114</td>
<td>General Physics I: For Students of the Life Sciences</td>
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<td>PHYS 116</td>
<td>Mechanics H</td>
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<td>PHYS 118</td>
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Select one course: 4

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<td>General Physics II</td>
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<td>PHYS 115</td>
<td>General Physics II: For Students of the Life Sciences</td>
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<td>PHYS 117</td>
<td>Electromagnetism and Optics H</td>
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<td>Introductory Calculus-based Electromagnetism and Quanta</td>
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Total Hours: 76-77

H Honors version available. An honors course fulfills the same requirements as the nonhonors version of that course. Enrollment and GPA restrictions may apply.

1 Previously offered as PSYC 315 and PSYC 175.

### Knowledge Electives (6 Credit Hours)

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<td>BIOL 425</td>
<td>Human Genetics</td>
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<td>BIOL 450</td>
<td>Neurobiology 1</td>
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<td>BIOL 455</td>
<td>Behavioral Neuroscience 1</td>
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<tr>
<td>BIOL 458</td>
<td>Sensory Neurobiology and Behavior 1</td>
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<td>BIOL 542</td>
<td>Light Microscopy for the Biological Sciences 1</td>
<td>3</td>
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<td>BIOL 552</td>
<td>Behavioral Endocrinology 1</td>
<td>3</td>
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<td>BIOL 553</td>
<td>Mathematical and Computational Models in Biology 1</td>
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<tr>
<td>CHEM 430</td>
<td>Introduction to Biological Chemistry H</td>
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<td>COMP 401</td>
<td>Foundation of Programming H</td>
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<td>COMP 410</td>
<td>Data Structures</td>
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<td>COMP 411</td>
<td>Computer Organization</td>
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<td>COMP 555</td>
<td>Bioalgorithms 1</td>
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<td>COMP 560</td>
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<tr>
<td>COMP 562</td>
<td>Introduction to Machine Learning 1</td>
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<tr>
<td>COMP 576</td>
<td>Mathematics for Image Computing 1</td>
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<td>COMP 581</td>
<td>Introduction to Robotics 1, H</td>
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<td>COMP 631</td>
<td>Computer Networks 1</td>
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<td>COMP 633</td>
<td>Parallel and Distributed Computing 1</td>
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<td>COMP 651</td>
<td>Computational Geometry 1</td>
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<td>COMP 665</td>
<td>Images, Graphics, and Vision 1</td>
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<tr>
<td>EXSS 175</td>
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<td>EXSS 276</td>
<td>Human Physiology</td>
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<td>NSCI 320</td>
<td>Neuropsychopharmacology</td>
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<td>NSCI 325</td>
<td>Neuroscience of Psychiatric Disorders</td>
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<td>NSCI 401</td>
<td>Animal Behavior</td>
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<td>NSCI 405</td>
<td>Advanced Molecular Neuropharmacology</td>
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<td>NSCI 415</td>
<td>History of Neuroscience</td>
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<td>NSCI 420</td>
<td>Functional Neuroanatomy</td>
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<td>NSCI 421</td>
<td>Principles of Brain Circuits</td>
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<td>NSCI 422</td>
<td>Genetics of Brain Diseases</td>
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<td>NSCI 423</td>
<td>Neurotechnology in Modern Neuroscience Research</td>
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<td>NSCI 424</td>
<td>Neural Connections: Hands on Neuroscience</td>
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<td>NSCI 427</td>
<td>Neurobiology of Aging</td>
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<tr>
<td>NSCI 428</td>
<td>Neuroscience, Society, and the Media</td>
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<td>NSCI 433</td>
<td>Cognitive Neuroscience</td>
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<tr>
<td>NSCI 437</td>
<td>Neurobiology of Learning and Memory</td>
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<tr>
<td>NSCI 507</td>
<td>Autism</td>
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<tr>
<td>NSCI 568</td>
<td>Emotion</td>
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<td>NSCI 571</td>
<td>Social Neuroscience</td>
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<tr>
<td>NSCI 573</td>
<td>Neuropsychobiology of Stress</td>
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<tr>
<td>PHYS 133</td>
<td>How Bio Works</td>
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<tr>
<td>PHYS 405</td>
<td>Biological Physics</td>
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<tr>
<td>PSYC 245</td>
<td>Psychopathology H</td>
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<td>PSYC 404</td>
<td>Clinical Psychopharmacology</td>
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<tr>
<td>PSYC 469</td>
<td>Evolution and Development of Biobehavioral Systems</td>
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<td>PSYC 559</td>
<td>Applied Machine Learning in Psychology</td>
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<td>PSYC 602</td>
<td>Evolutionary Psychology</td>
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1 Course requires a prerequisite(s) not otherwise counting in the major. Please review prerequisite information carefully when planning your course selection.

2 Students may take one of COMP 283, MATH 381, or STOR 215.

### Mathematics, Methods, and Statistics Electives (6 Credit Hours)

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<tr>
<td>BIOL 226</td>
<td>Mathematical Methods for Quantitative Biology</td>
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<td>BIOL 226L</td>
<td>Mathematical Methods for Quantitative Biology Laboratory</td>
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<tr>
<td>BIOS 500H</td>
<td>Introduction to Biostatistics 1</td>
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<td>BMME 350</td>
<td>Electronics for Biomedical Engineers 1</td>
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<tr>
<td>BMME 351</td>
<td>Human Physiology and Biological Measurements for Engineers 1</td>
<td>4</td>
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<tr>
<td>BMME 445</td>
<td>Systems Neuroscience 1</td>
<td>3</td>
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</table>
BMME 550  Medical Imaging I: Ultrasonic, Optical, and Magnetic Resonance Systems 1  3
COMP 283  Discrete Structures 2  3
MATH 233  Calculus of Functions of Several Variables H  4
MATH 381  Discrete Mathematics 2, H  3
MATH 383  First Course in Differential Equations 1, H  3
MATH 383L  First Course in Differential Equations Laboratory 1  1
MATH 523  Functions of a Complex Variable with Applications 1  3
MATH 528  Mathematical Methods for the Physical Sciences I  3
MATH 528L  Laboratory for Mathematical Methods for the Physical Sciences I  1
MATH 529  Mathematical Methods for the Physical Sciences II  3
MATH 529L  Laboratory for Mathematical Methods for the Physical Sciences II  1
MATH 535  Introduction to Probability  3
MATH 547  Linear Algebra for Applications 1  3
MATH 555  Introduction to Dynamics 3  3
MATH 564  Mathematical Modeling in the Life Sciences 1  3
MATH 566  Introduction to Numerical Analysis 1  3
MATH 577  Linear Algebra 1  3
MATH 661  Scientific Computation I  3
MATH 662  Scientific Computation II  3
MATH 668  Methods of Applied Mathematics I  3
MATH 669  Methods of Applied Mathematics II  3
NSCI 275  Neuroscience Research Methods  4
NSCI 403  Advanced Biopsychology Laboratory H  3
PSYC 533  The General Linear Model in Psychology H  3
STOR 215  Foundations of Decision Sciences 2  3
STOR 415  Introduction to Optimization 1  3
STOR 435  Introduction to Probability 1  3
STOR 445  Stochastic Modeling 1  3
STOR 455  Methods of Data Analysis 1  3
STOR 555  Mathematical Statistics 1  3
STOR 556  Advanced Methods of Data Analysis 1  3
STOR 565  Machine Learning 1  3

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1 Course requires a prerequisite(s) not otherwise counting in the major. Please review prerequisite information carefully when planning your course selection.
2 Students may take one of COMP 283, MATH 381, or STOR 215.

Sample Plan of Study
Sample plans can be used as a guide to identify the courses required to complete the major and other requirements needed for degree completion within the expected eight semesters. The actual degree plan may differ depending on the course of study selected (second major, minor, etc.). Students should meet with their academic advisor to create a degree plan that is specific and unique to their interests. The sample plans represented in this catalog are intended for first-year students entering UNC–Chapel Hill in the fall term. Some courses may not be offered every term.

Sample I

<table>
<thead>
<tr>
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<td>First Year</td>
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<td>Fall Semester</td>
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<td>MATH 231</td>
<td>Calculus of Functions of One Variable I</td>
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<td>ENGL 105</td>
<td>English Composition and Rhetoric</td>
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<td>Foreign language level 2</td>
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<td>Lifetime Fitness</td>
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<td>Spring Semester</td>
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<td>CHEM 102 &amp; 102L</td>
<td>General Descriptive Chemistry II and Quantitative Chemistry Laboratory II</td>
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<td>MATH 232</td>
<td>Calculus of Functions of One Variable II</td>
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<td>Hours</td>
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<td>Principles of Biology and Introductory Biology Laboratory</td>
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<td>PSYC 101</td>
<td>General Psychology</td>
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<td>CHEM 241 &amp; 241L</td>
<td>Modern Analytical Methods for Separation and Characterization and Laboratory in Separations and Analytical Characterization of Organic and Biological Compounds</td>
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<td>COMP 116</td>
<td>Introduction to Scientific Programming</td>
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<td>Hours</td>
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<td>BIOL 202</td>
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<td>CHEM 262 &amp; 262L</td>
<td>Introduction to Organic Chemistry II and Laboratory in Organic Chemistry</td>
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<td>General Physics I: For Students of the Life Sciences</td>
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<td>PSYC 210</td>
<td>Statistical Principles of Psychological Research</td>
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### Spring Semester

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<td>General Physics II: For Students of the Life Sciences</td>
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<td>PSYC 270</td>
<td>Laboratory Research in Psychology</td>
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**Hours**

14

### Senior Year

**Fall Semester**

| Knowledge elective #2 | 3 |
| MMS elective #1       | 3 |
| NSCI 225              | 3 |
| Approaches (http://catalog.unc.edu/undergraduate/general-education-curriculum-degree-requirements) (e.g., HS) | 3 |
| Elective 2            | 3 |

**Hours**

15

### Spring Semester

| MMS elective #2       | 3 |
| Approaches (http://catalog.unc.edu/undergraduate/general-education-curriculum-degree-requirements) (e.g., SS) | 3 |
| Electives 2           | 9 |

**Hours**

16

### Junior Year

**Fall Semester**

| CHEM 261 Introduction to Organic Chemistry I H | 3 |
| NSCI 222 Learning H                           | 3 |
| PHYS 114 General Physics II: For Students of the Life Sciences | 4 |
| Approaches (http://catalog.unc.edu/undergraduate/general-education-curriculum-degree-requirements) (e.g., SS/HS) | 3 |
| Elective                                      | 2 |

**Hours**

16

### Sample II (for students with MATH 231 and CHEM 101/L credit)

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>First Year</td>
<td></td>
<td></td>
</tr>
<tr>
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<td>Principles of Biology and Introductory Biology Laboratory H</td>
<td>4</td>
</tr>
<tr>
<td>NSCI 175</td>
<td>Introduction to Neuroscience</td>
<td>3</td>
</tr>
<tr>
<td>ENGL 105</td>
<td>English Composition and Rhetoric</td>
<td>3</td>
</tr>
<tr>
<td>Foreign language level 2</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Lifetime fitness</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>

**Hours**

14

### Spring Semester

| CHEM 102 General Descriptive Chemistry II and Quantitative Chemistry Laboratory II H | 4     |
| MATH 232 Calculus of Functions of One Variable II H                              | 4     |
| PSYC 101 General Psychology                                                      | 3     |

**Hours**

15

### Sophomore Year

**Fall Semester**

| CHEM 241 Modern Analytical Methods for Separation and Characterization and Laboratory in Separations and Analytical Characterization of Organic and Biological Compounds H | 3     |
| PSYC 210 Statistical Principles of Psychological Research H                      | 4     |
| COMP 116 Introduction to Scientific Programming                                  | 3     |
| Approaches (http://catalog.unc.edu/undergraduate/general-education-curriculum-degree-requirements) (e.g., VP) | 3     |
| Elective 2                                                                        | 3     |

**Hours**

16

**Spring Semester**

| CHEM 261 Introduction to Organic Chemistry II H | 3     |
| NSCI 222 Learning H                           | 3     |
| PHYS 114 General Physics II: For Students of the Life Sciences | 4     |
| Approaches (http://catalog.unc.edu/undergraduate/general-education-curriculum-degree-requirements) (e.g., SS/HS) | 3     |
| Elective                                      | 2     |

**Hours**

16

### Junior Year

**Fall Semester**

| CHEM 262 Introduction to Organic Chemistry II and Laboratory in Organic Chemistry H | 4     |
| NSCI 222 Learning H                           | 3     |
| PHYS 114 General Physics II: For Students of the Life Sciences | 4     |
| Approaches (http://catalog.unc.edu/undergraduate/general-education-curriculum-degree-requirements) (e.g., SS/HS) | 3     |
| Elective                                      | 2     |

**Hours**

16

### Sample II (for students with MATH 231 and CHEM 101/L credit)

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**Hours**

14

### Spring Semester

| CHEM 102 General Descriptive Chemistry II and Quantitative Chemistry Laboratory II H | 4     |
| MATH 232 Calculus of Functions of One Variable II H                              | 4     |
| PSYC 101 General Psychology                                                      | 3     |

**Hours**

15

### Senior Year

**Fall Semester**

| Knowledge elective #2 | 3 |
| MMS elective #1       | 3 |
| Approaches (http://catalog.unc.edu/undergraduate/general-education-curriculum-degree-requirements) (e.g., HS) | 3 |
| Electives 2           | 6 |

**Hours**

16
Approaches (http://catalog.unc.edu/undergraduate/general-education-curriculum-degree-requirements) (e.g., SS) 1

Electives 2

<table>
<thead>
<tr>
<th>Hours</th>
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<td>15</td>
<td>120</td>
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H Honors version available. An honors course fulfills the same requirements as the nonhonors version of that course. Enrollment and GPA restrictions may apply.

1 The remaining Connections requirements (NA, BN, US, GL, WB, CI) should overlap with Approaches courses.

2 Students planning to apply to medical schools are advised to include BIOL 252 and BIOL 252L as a general elective in their course plan.

3 Students planning to apply to medical schools are advised to include CHEM 430 as a knowledge elective in their course plan.

**Special Opportunities in Psychology and Neuroscience**

**Honors in Psychology and Neuroscience**

Any major in the program with an overall grade point average of 3.3 or higher, a major (psychology or neuroscience) grade point average of at least 3.5, and prior research experience in a faculty lab (e.g., PSYC 395 or NSCI 395) is eligible for enrollment in the departmental senior honors program. Each candidate for honors participates in a two-semester course sequence (PSYC 693H and PSYC 694H or NSCI 693H and NSCI 694H) and carries out independent research in an area of the student’s choice under the guidance of a psychology faculty member. Please see the department Web site for the application form (http://psychology.unc.edu/undergraduate-studies/honors-program) and additional information.

**Departmental Involvement**

Membership in the Psychology Club (https://heelfive.unc.edu/organization/psychology-club) is open to any interested psychology major. There is no minimum grade point average requirement. The club meets frequently to discuss psychology-related topics and learn about careers in psychology.

The Carolina Neuroscience Club (http://carolinaneuroscience.web.unc.edu) brings together students who have an interest in the brain and nervous system. Club members meet regularly to discuss courses, research articles, and post-college neuroscience opportunities. Membership is open to anyone interested in neuroscience.

The Undergraduate Minority Psychology Student Association (https://uncstudentorgs.collegiatelink.net/organization/minoritypsych) provides a supportive and educational environment where minority psychology students can gain the tools necessary to advance competitively in the field of psychology. Club members use mentoring, informational sessions, networking, and advocacy to create an environment in which minority students can succeed at UNC–Chapel Hill and beyond.

**Experiential Education**

Several opportunities for experiential education are available. The Karen M. Gil Internship Program (http://psychology.unc.edu/undergraduate-studies/gil-internship) offers both course credit and a monthly stipend to selected psychology majors who are placed in approved internship sites in the community. Interns are selected through a competitive process (minimum grade point average is 3.4). Other experiential education opportunities include PSYC 395; NSCI 395; PSYC 294; NSCI 294; NSCI 424; APPLES, performed either through the APPLES program or in conjunction with a specific psychology class; and other classes for which service learning is a central focus. See course listings for details.

**Undergraduate Awards**

The David Bray Peele Award, the Lindquist Undergraduate Research Award, the J. Steven Reznick Diversity and Psychological Research Grant (all of which are administered in the Department of Psychology and Neuroscience), and several fellowships and grants administered through the UNC Office for Undergraduate Research or the UNC Honors Carolina Office are available to students who conduct research in psychology. Each year, the Dashiell-Thurstone Prize is awarded for the best undergraduate research project. An additional honor is election to Psi Chi, the national honor society for psychology undergraduates. Psychology majors who have completed at least three courses in psychology and who have an overall grade point average of at least 3.2 at UNC–Chapel Hill will be invited to join Psi Chi. In the spring of each year, one graduating senior who has conducted excellent research that contributes to psychological knowledge about diversity will be chosen to receive the J. Steven Reznick Award for Outstanding Research That Enhances Diversity. In addition, a second student will receive the Susan M. McHale Award for Outstanding Research by a Student Who Enhances Diversity. For each of these awards, diversity is broadly defined, including but not limited to diversity based on race, ethnicity, sexual orientation, gender, disability, religious affiliation, and socioeconomic status. Finally, each year, a graduating senior is awarded the Donald T. Lysle Service Award which recognizes a psychology or neuroscience major who has made exemplary service contributions. This award is presented at the Chancellor’s Award Ceremony, the only campus-wide recognition at Carolina.

**Undergraduate Research**

Qualified students interested in doing independent research under the direction of a faculty member may enroll for independent research credit (PSYC 395 or NSCI 395). Students interested in this option should speak directly with psychology faculty members regarding opportunities in their laboratories. Additional information is available on the department’s Web site (http://psychology.unc.edu/undergraduate-studies/undergraduate-research). Many other psychology courses also include heavy research components. See the research methods, research intensive, and research exposure courses at the Office for Undergraduate Research (https://our.unc.edu/find-research-courses).