NEUROBIOLOGY, B.S.

REQUIREMENTS

UNIVERSITY GENERAL EDUCATION REQUIREMENTS

All undergraduate students at the University of Wisconsin–Madison are required to fulfill a minimum set of common university general education requirements to ensure that every graduate acquires the essential core of an undergraduate education. This core establishes a foundation for living a productive life, being a citizen of the world, appreciating aesthetic values, and engaging in lifelong learning in a continually changing world. Various schools and colleges will have requirements in addition to the requirements listed below. Consult your advisor for assistance, as needed. For additional information, see the university Undergraduate General Education Requirements (http://guide.wisc.edu/undergraduate/#requirementsforundergraduates) section of the Guide.

General Education

• Breadth—Humanities/Literature/Arts: 6 credits
• Breadth—Natural Science: 4 to 6 credits, consisting of one 4- or 5-credit course with a laboratory component; or two courses providing a total of 6 credits
• Breadth—Social Studies: 3 credits
• Communication Part A & Part B *
• Ethnic Studies *
• Quantitative Reasoning Part A & Part B *

* The mortarboard symbol appears before the title of any course that fulfills one of the Communication Part A or Part B, Ethnic Studies, or Quantitative Reasoning Part A or Part B requirements.

COLLEGE OF LETTERS & SCIENCE DEGREE REQUIREMENTS: BACHELOR OF SCIENCE (B.S.)

Students pursuing a Bachelor of Science degree in the College of Letters & Science must complete all of the requirements below. The College of Letters & Science allows this major to be paired with either the Bachelor of Arts or the Bachelor of Science degree requirements.

BACHELOR OF SCIENCE DEGREE REQUIREMENTS

Mathematics

Complete two courses of 3+ credits at the Intermediate or Advanced level in MATH, COMP SCI, or STAT subjects. A maximum of one course in each of COMP SCI and STAT subjects counts toward this requirement.

Foreign Language

Complete the third unit of a foreign language.

L&S Breadth

Complete:
• 12 credits of Humanities, which must include at least 6 credits of Literature; and
• 12 credits of Social Science; and
• 12 credits of Natural Science, which must include 6 credits of Biological Science and 6 credits of Physical Science.

Liberal Arts and Science Coursework

Complete at least 108 credits.

Depth of Intermediate/Advanced Coursework

Complete at least 60 credits at the Intermediate or Advanced level.

Major

Declare and complete at least one major.

Total Credits

Complete at least 120 credits.

UW-Madison Experience

Complete both:
• 30 credits in residence, overall, and
• 30 credits in residence after the 86th credit.

Quality of Work

• 2.000 in all coursework at UW–Madison
• 2.000 in Intermediate/Advanced level coursework at UW–Madison

NON–L&S STUDENTS PURSUING AN L&S MAJOR

Non–L&S students who have permission from their school/college to pursue an additional major within L&S only need to fulfill the major requirements. They do not need to complete the L&S Degree Requirements above.

REQUIREMENTS FOR THE MAJOR

MATH, STATISTICS, CHEMISTRY & PHYSICS

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
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<tr>
<td>MATH 211</td>
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<td>MATH 217</td>
<td>Calculus with Algebra and Trigonometry II</td>
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<tr>
<td>MATH 221</td>
<td>Calculus and Analytic Geometry 1</td>
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<tr>
<td>MATH 275</td>
<td>Topics in Calculus I</td>
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<tr>
<td>STAT 371</td>
<td>Introductory Applied Statistics for the Life Sciences</td>
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<tr>
<td>STAT/B M I 541</td>
<td>Introduction to Biostatistics</td>
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<tr>
<td>BOTANY 575</td>
<td>Special Topics (Intro to Modern Statistical Methods for Biologists)</td>
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</tr>
<tr>
<td>CHEM 103</td>
<td>General Chemistry I</td>
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</tr>
<tr>
<td>&amp; CHEM 104</td>
<td>and General Chemistry II</td>
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<td>CHEM 109</td>
<td>Advanced General Chemistry</td>
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<tr>
<td>CHEM 115</td>
<td>Chemical Principles I</td>
<td></td>
</tr>
<tr>
<td>&amp; CHEM 116</td>
<td>and Chemical Principles II</td>
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<tr>
<td>CHEM 341</td>
<td>Elementary Organic Chemistry</td>
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<tr>
<td>CHEM 343</td>
<td>Introductory Organic Chemistry</td>
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<tr>
<td>&amp; CHEM 345</td>
<td>and Intermediate Organic Chemistry</td>
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<td>PHYSICS 207</td>
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24-33

30 CREDITS OF BIOLOGY AND NEUROBIOLOGY

Will be calculated from General Biology, Neurobiology, Lab/Research Experience and Additional Elective (if required) sections.

General Biology

<table>
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<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
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<tr>
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<tr>
<td>ZOOLOGY/ BIOLOGY/ BOTANY 152</td>
<td>Introductory Biology</td>
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<tr>
<td>BIOCORE 381</td>
<td>Evolution, Ecology, and Genetics</td>
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<td>BIOCORE 383</td>
<td>Cellular Biology</td>
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<tr>
<td>BIOCORE 485</td>
<td>Principles of Physiology</td>
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<tr>
<td>BIOCORE 587</td>
<td>Biological Interactions</td>
<td></td>
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<tr>
<td>BIOCORE 384</td>
<td>Evolution, Ecology, and Genetics Laboratory</td>
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<tr>
<td>BIOCORE 486</td>
<td>Principles of Physiology Laboratory</td>
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<tr>
<td>ZOOLOGY/ BIOLOGY 101</td>
<td>Animal Biology</td>
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<td>ZOOLOGY/ BIOLOGY 102</td>
<td>Animal Biology Laboratory</td>
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<tr>
<td>BOTANY/ BIOLOGY 130</td>
<td>General Botany</td>
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Animal Biology

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<td>ZOOLOGY/ BIOLOGY 500</td>
<td>Undergraduate Neurobiology Seminar</td>
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Distributed Neuroscience Coursework—choose three courses

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<td>Physiology</td>
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<td>Fundamentals of Human Physiology</td>
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<td>AN SCI/ DY SCI 373</td>
<td>Animal Physiology</td>
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<td>BIOCHEM 501</td>
<td>Introduction to Biochemistry</td>
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<td>BIOCHEM 508</td>
<td>General Biochemistry II</td>
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<td>BIOCHEM/ PHMCOL-M/ ZOOLOGY 630</td>
<td>Cellular Signal Transduction Mechanisms</td>
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<td>BIOCHEM/ NUTR SCI 645</td>
<td>Molecular Control of Metabolism and Metabolic Disease</td>
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<tr>
<td>B M E/CBE 520</td>
<td>Stem Cell Bioengineering</td>
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<tr>
<td>B M E 601</td>
<td>Special Topics in Biomedical Engineering (Introduction to Neuroengineering)</td>
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<tr>
<td>CS&amp;D 210</td>
<td>Neural Basis of Communication</td>
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<tr>
<td>CS&amp;D 503</td>
<td>Neural Mechanisms of Speech, Hearing and Language</td>
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<tr>
<td>ED PSYCH 326</td>
<td>Mind, Brain and Education</td>
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<td>GENETICS 520</td>
<td>Neurogenetics</td>
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<td>KINES 531</td>
<td>Neural Control of Movement</td>
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<tr>
<td>NTP/ NEURODPT 610</td>
<td>Cellular and Molecular Neuroscience</td>
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<tr>
<td>NTP/ NEURODPT/ PSYCH 611</td>
<td>Systems Neuroscience</td>
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<tr>
<td>NTP/ZOOLOGY 616</td>
<td>Lab Course in Neurobiology and Behavior</td>
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<tr>
<td>NTP/ NEURODPT 629</td>
<td>Molecular and Cellular Mechanisms of Memory</td>
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<td>NTP/ NEURODPT 630</td>
<td>Neuronal Mechanisms for Sensation and Memory in Cerebral Cortex</td>
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<tr>
<td>NTP/ MED PHYS 651</td>
<td>Methods for Neuroimaging Research</td>
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<td>NTP 670</td>
<td>Stem Cells and the Central Nervous System</td>
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<td>NTP 675</td>
<td>Special Topics (Functional Brain Imaging of Cognitive Disorders)</td>
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<td>NTP 675</td>
<td>Special Topics (Molecular Mechanisms of Brain Damage)</td>
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<td>NTP 675</td>
<td>Special Topics (Neuroendocrinology)</td>
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<td>NTP 675</td>
<td>Special Topics (Reproductive Neuroendocrinology)</td>
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<tr>
<td>NTP 675</td>
<td>Special Topics (Brain Mapping in Health and Disease: Applications)</td>
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<td>NTP 677</td>
<td>Basic Sleep Mechanisms and Sleep Disorders: from Neurobiology to Sleep Medicine</td>
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<tr>
<td>PHM SCI 310</td>
<td>Drugs and Their Actions</td>
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<td>PHM SCI/ PHMCOL-M 521</td>
<td>Pharmacology I</td>
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<tr>
<td>PSYCH 406</td>
<td>Psychology of Perception</td>
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<tr>
<td>PSYCH 414</td>
<td>Cognitive Psychology</td>
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<tr>
<td>PSYCH 505</td>
<td>Depth Topic in Biological Science (Cognitive Neuroscience: Bridging Mind and Brain)</td>
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<tr>
<td>PSYCH 513</td>
<td>Hormones, Brain, and Behavior</td>
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<tr>
<td>PSYCH 601</td>
<td>Current Topics in Psychology (Neural Basis of Cognitive Control)</td>
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<tr>
<td>PSYCH 601</td>
<td>Current Topics in Psychology (Neuroeconomics)</td>
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</table>
PSYCH 603  Epigenetics and the Brain
PSYCH 606  Hormones and Behavior
PSYCH 612  Neuropharmacology
ZOOLOGY 400  Topics in Biology (Neurogenetics of Sleep)
ZOOLOGY 400  Topics in Biology (Music and the Brain)
ZOOLOGY 470  Introduction to Animal Development
ZOOLOGY 555  Laboratory in Developmental Biology
ZOOLOGY 603  Endocrinology
ZOOLOGY 604  Computer-based Gene and Disease/Disorder Research Lab
ZOOLOGY 611  Comparative and Evolutionary Physiology
ZOOLOGY/ANTHRO/NTP/PSYCH 619  Biology of Mind
ZOOLOGY/NTP 620  Neuroethology Seminar
ZOOLOGY 625  Development of the Nervous System
ZOOLOGY 655  Modeling Neurodevelopmental Disease
ZOOLOGY/NEURODPT/PSYCH 674  Behavioral Neuroendocrinology Seminar

**Lab/Research Experience**

Choose one option from the 3 listed: Neuroscience Laboratory Course OR Directed Study OR Honors/Senior Thesis.

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>1. Neuroscience Laboratory Course—one course:²</td>
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<tr>
<td>BIOCORE 486</td>
<td>Principles of Physiology Laboratory</td>
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<td>ANAT&amp;PHY 435</td>
<td>Fundamentals of Human Physiology</td>
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<tr>
<td>ZOOLOGY 555</td>
<td>Laboratory in Developmental Biology</td>
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<tr>
<td>ZOOLOGY 604</td>
<td>Computer-based Gene and Disease/Disorder Research Lab</td>
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<tr>
<td>ZOOLOGY 612</td>
<td>Comparative Physiology Laboratory</td>
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<tr>
<td>ZOOLOGY/NEURODPT/NTP 616</td>
<td>Lab Course in Neurobiology and Behavior</td>
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<tr>
<td>2. Directed Study—3 credits from:³</td>
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<tr>
<td>ANATOMY 699</td>
<td>Independent Study</td>
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<td>ANESTHES 699</td>
<td>Independent Study</td>
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<tr>
<td>BIOCHEM 699</td>
<td>Special Problems</td>
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<tr>
<td>BIOLOGY 699</td>
<td>Directed Studies</td>
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<tr>
<td>B M E 399</td>
<td>Independent Study</td>
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<tr>
<td>BMOLCHEM 699</td>
<td>Special Research Problems</td>
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<td>CBE 699</td>
<td>Advanced Independent Studies</td>
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<tr>
<td>CHEM 699</td>
<td>Directed Study</td>
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<td>COMP BIO 699</td>
<td>Directed Study</td>
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<tr>
<td>CRB 699</td>
<td>Independent Study</td>
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<tr>
<td>CS&amp;D 699</td>
<td>Directed Study</td>
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<td>ED PSYCH 699</td>
<td>Independent Reading Undergrad</td>
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<td>FAM MED 699</td>
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<tr>
<td>GENETICS 699</td>
<td>Special Problems</td>
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<tr>
<td>H ONCOL 699</td>
<td>Independent Study in Human Cancer Biology</td>
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<td>KINES 699</td>
<td>Independent Study</td>
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<tr>
<td>MED PHYS 699</td>
<td>Independent Reading or Research</td>
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<td>MEDICINE 699</td>
<td>Independent Study</td>
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<td>MED SC-V 669</td>
<td>Small Animal Cardiology Rotation</td>
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<td>M M &amp; I 699</td>
<td>Directed Study</td>
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<tr>
<td>MOL BIOL 699</td>
<td>Directed Studies in Molecular Biology</td>
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<tr>
<td>NEURSURG 699</td>
<td>Neurosurgery: Directed in Study in Research</td>
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<td>NEUROL 699</td>
<td>Directed Research in Neurology</td>
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<tr>
<td>NEURODPT 699</td>
<td>Directed Study</td>
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<tr>
<td>NUTR SCI 699</td>
<td>Special Problems</td>
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<td>OBS&amp;GYN 699</td>
<td>Directed Study</td>
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<td>ONCOLOGY 699</td>
<td>Special Research Problems</td>
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<td>OPHTHALM 699</td>
<td>Directed Study</td>
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<td>PATH 699</td>
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<td>PATH-BIO 699</td>
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<td>PEDIAT 699</td>
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<td>PHM SCI 699</td>
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<td>PHYSIOL 699</td>
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<td>POP HLTH 699</td>
<td>Independent Reading</td>
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<td>PSYCH 621</td>
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<td>PSYCH 699</td>
<td>Directed Study</td>
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<td>PSYCHIAT 699</td>
<td>Independent Study</td>
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<td>SURGERY 699</td>
<td>Independent Study</td>
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<td>SURG SCI 699</td>
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<td>ZOOLOGY 699</td>
<td>Directed Studies in Zoology</td>
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<td>3. Honors/Senior Thesis (two semesters):</td>
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<td>Senior Honors Thesis</td>
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<td>ZOOLOGY 691</td>
<td>Senior Thesis</td>
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<tr>
<td>&amp; ZOOLOGY 692</td>
<td>and Senior Thesis</td>
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<td>B M E 389</td>
<td>Honors in Research</td>
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<tr>
<td>&amp; B M E 489</td>
<td>and Honors in Research</td>
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**Additional Electives (if needed)**

Students may take additional credits from the list of Distributed Neuroscience Coursework, Independent/Directed study, or the following list, to attain 30 credits in the major:

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<th>Title</th>
<th>Credits</th>
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<td>ANAT&amp;PHY 337</td>
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<td>Human Anatomy Laboratory</td>
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<td>AN SCI/DY SCI 362</td>
<td>Veterinary Genetics</td>
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<tr>
<td>AN SCI/DY SCI 434</td>
<td>Reproductive Physiology</td>
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### RESIDENCE AND QUALITY OF WORK

- 2.00 GPA in all major courses
- 2.00 GPA on 15 upper-level major credits, taken in residence
- 15 credits in in the major, taken on the UW–Madison campus

### HONORS IN THE MAJOR

Students may declare Honors in the Neurobiology Major in consultation with the Neurobiology undergraduate advisor(s).

### HONORS IN THE MAJOR REQUIREMENTS

To earn Honors in the Major in Neurobiology, students must satisfy both the requirements for the major (above) and the following additional requirements:

<table>
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<th>Course Code</th>
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<tbody>
<tr>
<td>AN SCI 610</td>
<td>Quantitative Genetics</td>
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<tr>
<td>BIOCHEM 507</td>
<td>General Biochemistry I</td>
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<tr>
<td>BIOCHEM 510</td>
<td>Nutritional Biochemistry and Metabolism</td>
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<tr>
<td>BIOCHEM 601</td>
<td>Protein and Enzyme Structure and Function</td>
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<td>BIOCHEM 625</td>
<td>Mechanisms of Action of Vitamins and Minerals</td>
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<td>BMOLCHEM 314</td>
<td>Introduction to Human Biochemistry</td>
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<td>BMOLCHEM 503</td>
<td>Human Biochemistry</td>
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<td>BMOLCHEM 504</td>
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<td>F&amp;W ECOL 401</td>
<td>Physiological Animal Ecology</td>
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<td>GENETICS 466</td>
<td>Principles of Genetics</td>
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<td>GENETICS 545</td>
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<td>GENETICS 562</td>
<td>Human Cytogenetics</td>
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<td>GENETICS 565</td>
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<td>GENETICS 592</td>
<td>Eukaryotic Molecular Biology</td>
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<td>GENETICS 620</td>
<td>Physiology of Exercise</td>
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<td>M &amp; I 301</td>
<td>Medical Microbiology Laboratory</td>
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<td>M &amp; I 342</td>
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<td>M &amp; I 411</td>
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<td>MICROBIO 303</td>
<td>Biology of Microorganisms</td>
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<td>PSYCH 505</td>
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<td>Cell Biology</td>
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• Earn a 3.300 University GPA
• Earn a 3.300 GPA for all major courses
• Complete 14 credits, taken for Honors, with individual grades of B or better, while in residence, to include:
  • Two courses from PSYCH 454, ZOOLOGY/PSYCH 523, and ZOOLOGY 500
  • One course from the Required Neuroscience or Distributed Neuroscience course lists (above), taken for honors credit
  • A two-semester Senior Honors Thesis\(^5\), for a total of 6 credits, from:

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**UNIVERSITY DEGREE REQUIREMENTS**

**Total Degree**

To receive a bachelor’s degree from UW–Madison, students must earn a minimum of 120 degree credits. The requirements for some programs may exceed 120 degree credits. Students should consult with their college or department advisor for information on specific credit requirements.

**Residency**

Degree candidates are required to earn a minimum of 30 credits in residence at UW–Madison. "In residence" means on the UW–Madison campus with an undergraduate degree classification. "In residence" credit also includes UW–Madison courses offered in distance or online formats and credits earned in UW–Madison Study Abroad/Study Away programs.

**Quality of Work**

Undergraduate students must maintain the minimum grade point average specified by the school, college, or academic program to remain in good academic standing. Students whose academic performance drops below these minimum thresholds will be placed on academic probation.

**FOOTNOTES**

1. Students may apply only one DNS course toward the elective requirement.
2. Lab courses may also count in the Distributed Neuroscience Coursework above.
3. Only Directed Study courses taken after—and not concurrent with—the completion of an Introductory Biology sequence are accepted in the major.
4. Major courses numbered 300–699 are considered upper-level.
5. The Senior Honors Thesis project must be approved by the Neurobiology Major Program Committee at least one month before beginning the first course (681). The project must focus on its relevance to a neuroscience-related topic. Please see the Neurobiology major website (https://neuromajor.wisc.edu/) for more information.