**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/requirementsforundergraduatetestudytext) 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.

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<tr>
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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 I</td>
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<td>MATH 275</td>
<td>Topics in Calculus I</td>
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- **Statistics (complete one):**
  - STAT 371 Introductory Applied Statistics for the Life Sciences
  - STAT/B M I 541 Introduction to Biostatistics

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<tr>
<td>CHEM 103</td>
<td>General Chemistry I</td>
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<tr>
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<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>
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<tr>
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<td>and Chemical Principles II</td>
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<td>Elementary Organic Chemistry</td>
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<td>CHEM 343</td>
<td>Organic Chemistry I</td>
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<tr>
<td>&amp; CHEM 345</td>
<td>and Organic Chemistry II</td>
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- **Organic Chemistry (complete one):**
  - PHYSICS 103 General Physics
  - PHYSICS 104 and General Physics
  - PHYSICS 201 General Physics
  - PHYSICS 202 and General Physics
  - PHYSICS 207 General Physics
  - PHYSICS 208 and General Physics
  - PHYSICS 247 A Modern Introduction to Physics
  - PHYSICS 248 and A Modern Introduction to Physics

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<td>and General Physics</td>
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<td>and General Physics</td>
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<td>A Modern Introduction to Physics</td>
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<td>&amp; PHYSICS 248</td>
<td>and A Modern Introduction to Physics</td>
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# Neurobiology, B.S.

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## Total Credits 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

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<tr>
<td>ZOOLOGY/</td>
<td>Introductory Biology</td>
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<tr>
<td>BIOLOGY/</td>
<td></td>
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<tr>
<td>BOTANY</td>
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#### Biology Core Curriculum 16-18

- BIOCORE 381 Evolution, Ecology, and Genetics 10
- BIOCORE 383 Cellular Biology
- BIOCORE 485 Principles of Physiology
- BIOCORE 587 Biological Interactions

Plus two from:

- BIOCORE 382 Evolution, Ecology, and Genetics Laboratory
- BIOCORE 384 Cellular Biology Laboratory
- BIOCORE 486 Principles of Physiology Laboratory

#### Animal Biology 10

- ZOOLOGY/ BIOLOGY 101 Animal Biology
- ZOOLOGY/ BIOLOGY 102 Animal Biology Laboratory
- BOTANY/ BIOLOGY 130 General Botany

#### Neurobiology

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<tr>
<td>ZOOLOGY</td>
<td>500</td>
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Distributed Neuroscience Coursework—choose three courses 9

- ANAT&PHY 335 Physiology 1
- ANAT&PHY 435 Fundamentals of Human Physiology 1
- AN SCI/ DY SCI 373 Animal Physiology
- BIOCHEM 501 Introduction to Biochemistry 1
- BIOCHEM 508 General Biochemistry II 1
- BIOCHEM/ PHMCOL-M/ ZOOLOGY 630 Cellular Signal Transduction Mechanisms 1

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<td>Molecular Control of Metabolism and Metabolic Disease 1</td>
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<td>B M E 520</td>
<td>Stem Cell Bioengineering</td>
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<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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<td>CS&amp;D 503</td>
<td>Neural Mechanisms of Speech, Hearing and Language</td>
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<td>ED PSYCH</td>
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<td>GENETICS</td>
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<td>KINES 531</td>
<td>Neural Control of Movement</td>
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<td>NTP/NEURODPT/PSYCH 611</td>
<td>Systems Neuroscience</td>
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<td>NTP/NEURODPT/PSYCH 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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<td>NTP 632</td>
<td>Neuroscience of Psychedelics</td>
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<td>NTP 666</td>
<td>Neuroscience of Consciousness and its Disorders</td>
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<td>NTP 670</td>
<td>Stem Cells and the Central Nervous System</td>
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<td>Special Topics (Functional Brain Imaging of Cognitive Disorders)</td>
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<td>Special Topics (Molecular Mechanisms of Brain Damage)</td>
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<td>Special Topics (Trauma and Physiology Therapy)</td>
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<td>Special Topics (Neuroendocrinology)</td>
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<td>Special Topics (Reproductive Neuroendocrinology)</td>
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<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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<td>PHM SCI 310</td>
<td>Drugs and Their Actions</td>
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<td>PHM SCI/</td>
<td>Pharmacology I</td>
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<td>PHMCOL-M</td>
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<td>PSYCH 406</td>
<td>Psychology of Perception</td>
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<td>PSYCH 414</td>
<td>Cognitive Psychology</td>
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<td>PSYCH 505</td>
<td>Depth Topic in Biological Science (Cognitive Neuroscience: Bridging Mind and Brain)</td>
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<td>PSYCH 513</td>
<td>Hormones, Brain, and Behavior</td>
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<td>PSYCH 601</td>
<td>Current Topics in Psychology (Neural Basis of Cognitive Control)</td>
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<td>PSYCH 601</td>
<td>Current Topics in Psychology (Neuroeconomics)</td>
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<td>PSYCH 603</td>
<td>Epigenetics and the Brain</td>
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<tr>
<td>PSYCH 606</td>
<td>Hormones and Behavior</td>
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<tr>
<td>PSYCH 612</td>
<td>Neuropharmacology</td>
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<td>ZOOLOGY 400</td>
<td>Topics in Biology (Neuroeconomics of Sleep)</td>
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<td>ZOOLOGY 400</td>
<td>Topics in Biology (Music and the Brain)</td>
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<tr>
<td>ZOOLOGY 400</td>
<td>Topics in Biology (Cell Biology: Neurons and Neural Circuits)</td>
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<tr>
<td>ZOOLOGY 470</td>
<td>Introduction to Animal Development</td>
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<td>ZOOLOGY 555</td>
<td>Laboratory in Developmental Biology</td>
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<td>ZOOLOGY 603</td>
<td>Endocrinology</td>
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<tr>
<td>ZOOLOGY 604</td>
<td>Computer-based Gene and Disease/ Disorder Research Lab</td>
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<td>ZOOLOGY 611</td>
<td>Comparative and Evolutionary Physiology</td>
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<td>ZOOLOGY/ ANTHRO/ NTP/ PSYCH 619</td>
<td>Biology of Mind</td>
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<td>ZOOLOGY/ NTP 620</td>
<td>Neuroethology Seminar</td>
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<tr>
<td>ZOOLOGY 625</td>
<td>Development of the Nervous System</td>
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<tr>
<td>ZOOLOGY 655</td>
<td>Modeling Neurodevelopmental Disease</td>
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<tr>
<td>ZOOLOGY/ NEURODPT/ PSYCH 674</td>
<td>Behavioral Neuroendocrinology Seminar</td>
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**Lab/Research Experience**

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

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<tr>
<td>1. Neuroscience Laboratory Course—one course:*²</td>
<td>Principles of Physiology Laboratory</td>
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<tr>
<td>BIOCORE 486</td>
<td>Fundamentals of Human Physiology</td>
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<tr>
<td>ANAT&amp;PHY 435</td>
<td>Laboratory in Developmental Biology</td>
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<tr>
<td>ZOOLOGY 555</td>
<td>Computer-based Gene and Disease/ Disorder Research Lab</td>
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<tr>
<td>ZOOLOGY 604</td>
<td>Comparative Physiology Laboratory</td>
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<tr>
<td>ZOOLOGY 612</td>
<td>Lab Course in Neurobiology and Behavior</td>
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<tr>
<td>ZOOLOGY/ NEURODPT/ NTP 616</td>
<td>Directed Studies in Zoology</td>
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2. Directed Study—3 credits from:*³

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<td>ANESTHES 699</td>
<td>Independent Study</td>
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<tr>
<td>BIOLCHEM 699</td>
<td>Special Problems</td>
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<tr>
<td>BIOLOGY 699</td>
<td>Directed Studies</td>
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<td>B M E 399</td>
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3. Honors/Senior Thesis (two semesters):

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<td>ZOOLOGY 691</td>
<td>Senior Thesis</td>
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<td>and Senior Thesis</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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<td>ANAT&amp;PHY 337</td>
<td>Human Anatomy</td>
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<td>ANAT&amp;PHY 338</td>
<td>Human Anatomy Laboratory</td>
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<td>AN SCI/ DY SCI 362</td>
<td>Veterinary Genetics</td>
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<td>AN SCI/ DY SCI 434</td>
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<td>AN SCI/ F&amp;W ECOL/ ZOOLOGY 520</td>
<td>Ornithology</td>
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<td>AN SCI 610</td>
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<td>Human Anatomy-Kinesiology</td>
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<td>General Biochemistry I</td>
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<td>Nutritional Biochemistry and Metabolism</td>
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<td>Protein and Enzyme Structure and Function</td>
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<td>MICROBIO 330</td>
<td>Host-Parasite Interactions</td>
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<td>MICROBIO 450</td>
<td>Diversity, Ecology and Evolution of Microorganisms</td>
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<td>MICROBIO 470</td>
<td>Microbial Genetics &amp; Molecular Machines</td>
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<td>Soil Microbiology and Biochemistry</td>
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<td>MICROBIO 526</td>
<td>Physiology of Microorganisms</td>
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<td>MICROBIO 527</td>
<td>Advanced Laboratory Techniques in Microbiology</td>
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<td>MICROBIO 551</td>
<td>Capstone Research Project in Microbiology</td>
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<td>MICROBIO 607</td>
<td>Advanced Microbial Genetics</td>
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<td>PATH-BIO/ M M &amp; I 528</td>
<td>Immunology</td>
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<td>PL PATH/ ONCOLOGY 640</td>
<td>General Virology-Multiplication of Viruses</td>
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<td>MICROBIO/ BMOLCHEM 668</td>
<td>Microbiology at Atomic Resolution</td>
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<td>Systems Neuroscience</td>
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<td>Neuroscience &amp; Public Policy Seminar</td>
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<td>Nutrition in the Life Span</td>
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<td>Clinical Nutrition I</td>
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<td>Herbs, Homeopathy, and Dietary Supplements</td>
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<td>ONCOLOGY 401</td>
<td>Introduction to Experimental Oncology</td>
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<tr>
<td>ONCOLOGY/ PL PATH 640</td>
<td>General Virology-Multiplication of Viruses</td>
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<td>PHM SCI 558</td>
<td>Laboratory Techniques in Pharmacology and Toxicology</td>
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<td>PSYCH 449</td>
<td>Animal Behavior</td>
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<td>PSYCH 450</td>
<td>Primates and Us: Insights into Human Biology and Behavior</td>
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<td>PSYCH 505</td>
<td>Depth Topic in Biological Science (Comparative Psychology, What Animals Think)</td>
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<tr>
<td>ZOOLOGY/ ANTHRO/ BOTANY 410</td>
<td>Evolutionary Biology</td>
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<td>ZOOLOGY 425</td>
<td>Behavioral Ecology</td>
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<td>ZOOLOGY 430</td>
<td>Comparative Anatomy of Vertebrates</td>
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<tr>
<td>ZOOLOGY 470</td>
<td>Introduction to Animal Development</td>
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<td>ZOOLOGY/ GEOSCI 541</td>
<td>Paleobiology</td>
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<td>ZOOLOGY/ GEOSCI 542</td>
<td>Invertebrate Paleontology</td>
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<td>ZOOLOGY 570</td>
<td>Cell Biology</td>
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</table>

**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 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:

• 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:

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
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<tr>
<td>BIOCHEM 681 &amp; BIOCHEM 682</td>
<td>Senior Honors Thesis</td>
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<tr>
<td>BIOLOGY 681 &amp; BIOLOGY 682</td>
<td>Senior Honors Thesis</td>
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<td>B M E 389 &amp; B M E 489</td>
<td>Honors in Research</td>
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<td>CHEM 681 &amp; CHEM 682</td>
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<td>GENETICS 681 &amp; GENETICS 682</td>
<td>Senior Honors Thesis</td>
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<td>H ONCOL 681 &amp; H ONCOL 682</td>
<td>Senior Honors Thesis in Human Oncology 1 and Senior Honors Thesis in Human Oncology 2</td>
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<td>NUTR SCI 681 &amp; NUTR SCI 682</td>
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<td>ZOOLOGY 681 &amp; ZOOLOGY 682</td>
<td>Senior Honors Thesis</td>
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</table>

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.

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://neuromaj.wisc.edu/) for more information.

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.