Neuroscience

Neuroscience is the study of the biological mechanisms that underlie behavior and cognition. In this major, students learn how the brain works at the molecular, biochemical, and cellular levels; how it processes information; and how it generates sensation, action, emotion, and high-level cognition. Students learn about the nature of neural computation in the brain, the causes of neurological and neuropsychiatric disease, and how emerging neurotechnologies are uniting brain science and engineering.

The major combines biology, psychology, behavior, and computation, providing a broad education that spans the interdisciplinary field of neuroscience. An optional capstone experience allows seniors to apply their knowledge to an in-depth research question. Neuroscience students who elect to participate in independent research may choose from sponsoring research laboratories within the department, or in laboratories outside the department (e.g., at Berkeley, LBNL, CHORI, UCSF).

The neuroscience major prepares students for many careers and post-baccalaureate training programs, including health-related professional programs (e.g., medicine, dentistry, optometry, pharmacy), PhD training programs, biotechnology and pharma industries, teaching, science communication, data science, and scientific research.

Declaring the Major

Students may declare the Neuroscience major when they have fulfilled the following requirements:

- Completed CHEM 1A/CHEM 1AL
- Completed BIOLOGY 1A/BIOLOGY 1AL
- Completed MATH 1A/MATH 1B or MATH 10A/MATH 10B
- Enrolled in or completed PHYSICS 8A
- Have a GPA of 2.0 or higher in lower division major requirements, upper division major requirements, and UC Berkeley cumulative GPA

Lower Division

CHEM 1A & 1AL	General Chemistry and General Chemistry Laboratory	5
BIOLOGY 1A & 1AL	General Biology Lecture and General Biology Laboratory	5
MATH 1A & MATH 1B	Calculus and Calculus	8
OR		
MATH 10A & MATH 10B	Methods of Mathematics: Calculus, Statistics, and Combinatorics and Methods of Mathematics: Calculus, Statistics, and Combinatorics	8
PHYSICS 8A & PHYSICS 8B	Introductory Physics and Introductory Physics	8
Total Units		**34**

Upper Division

NEU 100A	Cellular and Molecular Neurobiology	4
NEU 100B	Circuit, Systems and Behavioral Neuroscience	4
NEU 110	Scientific Logic and Communication	2
Neuroscience Lab (1 course):		
NEU 171L	Neurobiology Laboratory	4
NEU 172	Course Not Available	
NEU 173L	Neuroanatomy Laboratory	4
Three Neuroscience Electives: **New courses will be added soon!**		
NEU C121	Course Not Available	
NEU C124	Course Not Available	
NEU C125	Neuroethology: Complex Animal Behaviors and Brains	4
NEU C126	Hormones and Behavior	3
NEU 128	Course Not Available	
NEU 151	Course Not Available	
NEU 152	Course Not Available	
NEU 162	Course Not Available	
NEU 163	Course Not Available	
NEU 164	Neurodevelopment	3
NEU 165	Neurobiology of Disease	3
COG SCI C127	Cognitive Neuroscience	3
PSYCH C127	Cognitive Neuroscience	3
One Outside Perspectives:		

Please see our website for outside perspectives options

Neuroscience course plans can be found on this page **(**https://docs.google.com/document/d/1BGxJowpLvhynv4AEH_G484VlGZrE4qQ3lJ7KA8-x04E/edit/**).**

Undergraduate students must fulfill the following requirements in addition to those required by their major program.

For a detailed lists of L&S requirements, please see Overview tab to the right in this guide or visit the L&S Degree Requirements (https://lsadvising.berkeley.edu/degree-requirements/) webpage. For College advising appointments, please visit the L&S Advising (https://lsadvising.berkeley.edu/home/) Pages.

University of California Requirements

Entry Level Writing **(**https://guide.berkeley.edu/undergraduate/colleges-schools/letters-science/entry-level-writing-requirement/**)**

All students who will enter the University of California as freshmen must demonstrate their command of the English language by fulfilling the Entry Level Writing requirement. Fulfillment of this requirement is also a prerequisite to enrollment in all reading and composition courses at UC Berkeley and must be taken for a letter grade.

American History and American Institutions **(**http://guide.berkeley.edu/undergraduate/colleges-schools/letters-science/american-history-institutions-requirement/**)**

The American History and American Institutions requirements are based on the principle that all U.S. residents who have graduated from an American university should have an understanding of the history and governmental institutions of the United States.

Berkeley Campus Requirement

American Cultures **(**http://americancultures.berkeley.edu/students/courses/**)**

All undergraduate students at Cal need to take and pass this campus requirement course in order to graduate. The requirement offers an exciting intellectual environment centered on the study of race, ethnicity and culture of the United States. AC courses are plentiful and offer

students opportunities to be part of research-led, highly accomplished teaching environments, grappling with the complexity of American Culture.

College of Letters & Science Essential Skills Requirements

Quantitative Reasoning (http://guide.berkeley.edu/undergraduate/colleges-schools/letters-science/quantitative-reasoning-requirement/)

The Quantitative Reasoning requirement is designed to ensure that students graduate with basic understanding and competency in math, statistics, or computer/data science. The requirement may be satisfied by exam or by taking an approved course taken for a letter grade.

Foreign Language (http://guide.berkeley.edu/undergraduate/colleges-schools/letters-science/foreign-language-requirement/)

The Foreign Language requirement may be satisfied by demonstrating proficiency in reading comprehension, writing, and conversation in a foreign language equivalent to the second semester college level, either by passing an exam or by completing approved course work taken for a letter grade.

Reading and Composition (http://guide.berkeley.edu/undergraduate/colleges-schools/letters-science/reading-composition-requirement/)

In order to provide a solid foundation in reading, writing, and critical thinking the College of Letters and Science requires two semesters of lower division work in composition in sequence. Students must complete parts A & B reading and composition courses in sequential order by the end of their fourth semester for a letter grade.

College of Letters & Science 7 Course Breadth Requirements

Breadth Requirements (http://guide.berkeley.edu/undergraduate/colleges-schools/letters-science/#breadthrequirementstext)

The undergraduate breadth requirements provide Berkeley students with a rich and varied educational experience outside of their major program. As the foundation of a liberal arts education, breadth courses give students a view into the intellectual life of the University while introducing them to a multitude of perspectives and approaches to research and scholarship. Engaging students in new disciplines and with peers from other majors, the breadth experience strengthens interdisciplinary connections and context that prepares Berkeley graduates to understand and solve the complex issues of their day.

Unit Requirements

- 120 total units
- Of the 120 units, 36 must be upper division units
- Of the 36 upper division units, 6 must be taken in courses offered outside your major department

Residence Requirements

For units to be considered in "residence," you must be registered in courses on the Berkeley campus as a student in the College of Letters & Science. Most students automatically fulfill the residence requirement by attending classes at Cal for four years, or two years for transfer students. In general, there is no need to be concerned about this requirement, unless you graduate early, go abroad for a semester or year, or want to take courses at another institution or through UC Extension during your senior year. In these cases, you should make an appointment to meet an L&S College adviser to determine how you can meet the Senior Residence Requirement.

Note: Courses taken through UC Extension do not count toward residence.

Senior Residence Requirement

After you become a senior (with 90 semester units earned toward your B.A. degree), you must complete at least 24 of the remaining 30 units in residence in at least two semesters. To count as residence, a semester must consist of at least 6 passed units. Intercampus Visitor, EAP, and UC Berkeley-Washington Program (UCDC) units are excluded.

You may use a Berkeley Summer Session to satisfy one semester of the Senior Residence requirement, provided that you successfully complete 6 units of course work in the Summer Session and that you have been enrolled previously in the college.

Modified Senior Residence Requirement

Participants in the UC Education Abroad Program (EAP), Berkeley Summer Abroad, or the UC Berkeley Washington Program (UCDC) may meet a Modified Senior Residence requirement by completing 24 (excluding EAP) of their final 60 semester units in residence. At least 12 of these 24 units must be completed after you have completed 90 units.

Upper Division Residence Requirement

You must complete in residence a minimum of 18 units of upper division courses (excluding UCEAP units), 12 of which must satisfy the requirements for your major.

University of California Requirements

Entry Level Writing (https://guide.berkeley.edu/undergraduate/education/#earningyourdegreetext)

All students who will enter the University of California as freshmen must demonstrate their command of the English language by satisfying the Entry Level Writing Requirement (ELWR). The UC Entry Level Writing Requirement website (https://admission.universityofcalifornia.edu/elwr/) provides information on how to satisfy the requirement.

American History and American Institutions (https://guide.berkeley.edu/undergraduate/education/#earningyourdegreetext)

The American History and Institutions (AH&I) requirements are based on the principle that a US resident graduated from an American university should have an understanding of the history and governmental institutions of the United States.

Campus Requirement

American Cultures (https://guide.berkeley.edu/undergraduate/education/#earningyourdegreetext)

The American Cultures requirement is a Berkeley campus requirement, one that all undergraduate students at Berkeley need to pass in order to graduate. You satisfy the requirement by passing, with a grade not lower than C- or P, an American Cultures course. You may take an American Cultures course any time during your undergraduate career at Berkeley. The requirement was instituted in 1991 to introduce students to the diverse cultures of the United States through a comparative framework.

Courses are offered in more than fifty departments in many different disciplines at both the lower and upper division level.

1. Understand brain function at the cellular, molecular, and circuit levels, and how these mediate behavior: Gain a comprehensive understanding of the anatomy and physiology of the brain, and how this contributes to cognition and behavior. Understand the molecular and cellular mechanisms that underlie brain development.
2. Understand the nature of neural computation: Understand the computational principles of brain function, including computational neuroscience approaches to studying brain and behavior, and computational tools for analyzing and interpreting complex data sets.
3. Disease mechanisms and pathways: Gain in-depth knowledge of the molecular and cellular mechanisms underlying neurological diseases, including neurodegenerative, neuropsychiatric, and neurodevelopmental disorders.
4. Scientific research skills: Develop proficiency in research methods, including experimental design, data collection, and data analysis. Acquire hands-on experience with techniques such as neuroimaging, electrophysiology, molecular methods, and behavioral analysis.
5. Integration of multidisciplinary knowledge: Understand the interdisciplinary nature of neuroscience by integrating knowledge from biology, psychology, chemistry, physics, and other fields.
6. Critical thinking and problem-solving: Cultivate critical thinking skills to analyze complex scientific concepts and research findings. Develop the ability to identify and solve scientific problems related to neuroscience.
7. Scientific communication: Learn to effectively communicate complex scientific concepts and findings, in writing and verbally. Read primary scientific literature and present scientific results.

All students interested in the Neuroscience major should come in for major advising as soon as possible starting their first semester on campus for individualized assistance. Staff advisors can assist with a wide range of matters including academic course planning, research, career, and graduate school goals.

Undergraduate Advising: neuro-uao@berkeley.edu

Advising Appointments: neuroscience.berkeley.edu/academics/undergraduate/advising (https://neuroscience.berkeley.edu/academics/undergraduate/advising/)