Neuroscience

The Neuroscience Graduate Program at UC Berkeley is a unique, diverse PhD training program that offers intensive, integrated training in multiple areas of neuroscience research.

The program includes approximately 65 training faculty from different campus departments, with expertise ranging from molecular and cellular neuroscience to systems and computational neuroscience to human cognitive neuroscience.

We provide a highly interdisciplinary, intellectually dynamic training environment of coursework, research training, professional development, and mentoring, within a strong research program that produces fundamental advances in knowledge and novel techniques.

Admission to the University

Applying for Graduate Admission

Thank you for considering UC Berkeley for graduate study! UC Berkeley offers more than 120 graduate programs representing the breadth and depth of interdisciplinary scholarship. A complete list of graduate academic departments, degrees offered, and application deadlines can be found on the Graduate Division website (http://grad.berkeley.edu/programs/list/).

Prospective students must submit an online application to be considered for admission, in addition to any supplemental materials specific to the program for which they are applying. The online application can be found on the Graduate Division website (http://grad.berkeley.edu/admissions/).

Admission Requirements

The minimum graduate admission requirements are:

1. A bachelor’s degree or recognized equivalent from an accredited institution;
2. A satisfactory scholastic average, usually a minimum grade-point average (GPA) of 3.0 (B) on a 4.0 scale; and
3. Enough undergraduate training to do graduate work in your chosen field.

For a list of requirements to complete your graduate application, please see the Graduate Division’s Admissions Requirements page (https://grad.berkeley.edu/admissions/steps-to-apply/requirements/). It is also important to check with the program or department of interest, as they may have additional requirements specific to their program of study and degree. Department contact information can be found here (http://guide.berkeley.edu/archive/2023-24/graduate/degree-programs/).

Where to apply?

Visit the Berkeley Graduate Division application page (http://grad.berkeley.edu/admissions/apply/).

Admission to the Program

Applicants to the program should have a bachelor's degree from a four-year college and at least one year of laboratory experience. The Graduate Record Examination (GRE) General Test is optional.

For more information on our program requirements go to: https://neuroscience.berkeley.edu/phd-applications/.

Normative Time Requirements

Normative Time to Advancement

Normative time to advancement is 2 years.

Step I: Lab Rotations and Presentations, First Year Classes

During the first year of graduate study, each neuroscience graduate student spends three 10-week periods performing research projects in different faculty laboratories. The goal is to expose students to different techniques and approaches in neuroscience and to provide training in experimental design, critical analysis of data, and presentation of research findings. Rotations also allow students to identify the laboratory in which their thesis research will be performed. Rotation research is graded and receives academic credit. This is accomplished by enrolling in NEUROSC 291A/B, a year-long course, during the rotation year. Also during the first-year students take NEUROSC 290A/B Methods & Career Skills Classes which introduce a broad range of modern neuroscience research methods in didactic lectures and provide advising in initial career skills. NEUROSC 290A (Fall) includes a survey of cutting-edge research methods, advising on how to choose a thesis mentor, training in scientific rigor and reproducibility, and an introduction to the use and misuse of statistics in neuroscience research. NEUROSC 290B (Spring) includes in-depth training on how to give a top-notch scientific talk, advising on how to write effective research papers, and on scientific project management. Finally, student also enroll in MCELLBI 293C during the spring of their first year to ensure that research trainees receive ample training in Responsible Conduct in Research, and to gain an understanding of federal, state, and UC Berkeley policies and resources available to further support their research endeavors.

Step II: Qualifying Exam

Students complete an oral qualifying exam during the spring semester of Year 2. The examination has three parts: Thesis Proposal, Related Research Areas, and Foundational Questions in Neuroscience. The thesis proposal is in the form of a written, NIH-style grant proposal, which is turned in to the committee, and then defended orally. Related Research Areas are identified cooperatively by the student and his/her committee prior to the exam, and are chosen to be complementary to the main thesis research subject. These areas are examined orally. The Foundational Questions in Neuroscience are designed to test broad knowledge in Neuroscience. These are a published list of questions, the same for all students, that are available upon entry to the program. These questions are designed to test basic common knowledge of neuroscience facts and principles, and a subset of them are examined orally during the qualifying exam. During the exam, students must demonstrate the ability to recognize fundamentally important research problems, propose relevant experimental approaches, and display comprehensive knowledge of appropriate disciplinary areas and related subjects. Students must pass the qualifying examination before advancing to doctoral candidacy.

Normative Time in Candidacy

Normative time in candidacy is 3-4 years.

Step III: Dissertation

Students undertake research for the PhD dissertation under a four-person committee in charge of their research and dissertation. Students do original research using a wide variety of cutting-edge neuroscience methods. During this time, students must meet at least annual with their thesis committee to discuss dissertation progress, review experimental results, set goals, and ensure students are adhering to appropriate timelines to completion. The students then write a dissertation based on the results of their research.

STEP IV: Dissertation Presentation/Formal Exit Seminar

There is no formal defense of the completed dissertation. However, Neuroscience students are required to publicly present a thesis seminar about their dissertation research in their final year. On completion of the research and approval of the dissertation by the committee, the students are awarded the doctorate.

Total Normative Time

Total normative time is 5-6 years.

Curriculum

Pedagogy, Rotations, Ethics, & Seminar Courses

Student must take all of the following courses. Pedagogy, Rotations, and Ethics courses are taken in year 1. Brain Lunch Seminar is taken in Years 1, 2, and 4.

Pedagogy courses		
NEUROSC 290A	Course Not Available	1
NEUROSC 290B	Course Not Available	1
Rotations		
NEUROSC 291A	Course Not Available	4-12
NEUROSC 291B	Course Not Available	4-12
Ethics in Research		
MCELLBI 293C	Responsible Conduct in Research	1
Brain Lunch Seminar		
NEUROSC 294	Course Not Available (Brain Lunch)	1
All students are required to enroll in the Brain Lunch seminar for 1 semester in each of Years 1 and 2, and again in Year 4 (see "Presentations" under "Required Professional Development" below)		

One Graduate Course in Each of the Following Three Foundational Areas

Students can either take one graduate-level course from each category, or three graduate level courses from two areas, plus a selected advanced undergraduate course from a third area. They are taken in years 1–2. Courses offered will vary depending on the semester. The courses below are samples of courses that fulfill the area requirements.

1. Cellular, Molecular and Developmental Neuroscience

Choose one:		
MCELLBI 160	Cellular and Molecular Neurobiology	4
MCELLBI 166	Biophysical Neurobiology	3
MCELLBI 230	Advanced Cell and Developmental Biology	4
MCELLBI 231	Advanced Developmental and Stem Cell Biology	4
MCELLBI 240	Advanced Genetic Analysis	4
NEUROSC/ MCELLBI C261	Cellular and Developmental Neurobiology	3

2. Systems and Computational Neuroscience

Choose one:		
INTEGBI 139	The Neurobiology of Stress	4
MCELLBI 236	Advanced Mammalian Physiology	5
NEUROSC/ MCELLBI C262	Course Not Available	3
PSYCH 210B	Proseminar: Cognition, Brain, and Behavior	3
VIS SCI 260C	Introduction to Visual Neuroscience	3
VIS SCI 265	Neural Computation	3

3. Cognition, Brain and Behavior

Choose one:		
PSYCH 117	Human Neuropsychology	3
PSYCH C127	Cognitive Neuroscience	3
PSYCH 210A	Course Not Available	3
PSYCH 240A	Proseminar: Biological, Cognitive, and Language Development	3
PB HLTH C217D	Biological and Public Health Aspects of Alzheimer's Disease	3
PB HLTH 290	Health Issues Seminars (Neuroepidemiology)	1-4
VIS SCI 262	Visual Cognitive Neuroscience	3

One course on statistical analysis or quantitative methods

Students must complete a 1-semester course in Applied Statistics in Neuroscience, or an equivalent approved course in statistics or quantitative analysis methods. This can be completed at any time prior to the semester of graduation. Students with prior appropriate coursework or whose thesis research uses substantial quantitative methods can use that prior experience to fulfill this requirement, subject to approval by the Head Graduate Adviser.

NEUROSC 299	Course Not Available (Applied Statistics for Neuroscience)	1-3

One Graduate Elective Course

Students must take one additional elective course. This can be either a graduate-level seminar or graduate-level lecture course, and can be 1 unit or more. This is typically taken in years three-four. You may also select a foundation course as an elective. Consult your thesis adviser and thesis committee to select the most appropriate course for you.

Neuro-Related Courses		
EL ENG 290A	Advanced Topics in Electrical Engineering: Advanced Topics in Computer-Aided Design	1-3
EL ENG 290B	Advanced Topics in Electrical Engineering: Advanced Topics in Solid State Devices	1-3
EL ENG 290C	Advanced Topics in Electrical Engineering: Advanced Topics in Circuit Design	1-3
EL ENG 290D	Advanced Topics in Electrical Engineering: Advanced Topics in Semiconductor Technology	1-3
EL ENG 290F	Advanced Topics in Electrical Engineering: Advanced Topics in Photonics	1-3
EL ENG 290N	Advanced Topics in Electrical Engineering: Advanced Topics in System Theory	1-3
EL ENG 290O	Advanced Topics in Electrical Engineering: Advanced Topics in Control	1-3
EL ENG 290P	Advanced Topics in Electrical Engineering: Advanced Topics in Bioelectronics	1-3
EL ENG 290Q	Advanced Topics in Electrical Engineering: Advanced Topics in Communication Networks	1-3

EL ENG 290S	Advanced Topics in Electrical Engineering: Advanced Topics in Communications and Information Theory	1-3
EL ENG 290T	Advanced Topics in Electrical Engineering: Advanced Topics in Signal Processing	1-3
EL ENG 290Y	Advanced Topics in Electrical Engineering: Organic Materials in Electronics	3
LINGUIS 290A	Topics in Linguistic Theory: Syntax	3
LINGUIS 290B	Topics in Linguistic Theory: Semantics	3
LINGUIS 290D	Topics in Linguistic Theory: Pragmatics	3
LINGUIS 290E	Topics in Linguistic Theory: Phonology	3
LINGUIS 290F	Topics in Linguistic Theory: Diachronic Linguistics	3
LINGUIS 290H	Topics in Linguistic Theory: Linguistic Reconstruction	3
LINGUIS 290L	Additional Seminar on Special Topics to Be Announced	3
LINGUIS 290M	Topics in Linguistic Theory: Psycholinguistics	3
MCELLBI 290	Graduate Seminar	1
PSYCH 290B	Seminars: Biological	2
PSYCH 290E	Seminars: Perception	2
PSYCH 290H	Seminars: Developmental	2
PSYCH 290I	Seminars: Personality	2
PSYCH 290J	Seminars: Social	2
PSYCH 290K	Seminars: Clinical	2
PSYCH 290Q	Seminars: Cognition	2
PSYCH 290Z	Seminars	1-3
VIS SCI 298	Group Studies, Seminars, or Group Research	1-6
Neuroscience		
NEUROSC 299	Course Not Available	1-3
Psychology		
PSYCH 102	Methods for Research in Psychological Sciences	3
PSYCH 111	Human Neuroanatomy	3
PSYCH 115	Introduction to Brain Imaging Analysis Methods	3
PSYCH 125	The Developing Brain	3
PSYCH 205	Data Analysis	3
PSYCH 208	Methods in Computational Modeling for Cognitive Science	3
Statistics		
STAT 150	Stochastic Processes	3
STAT 151A	Linear Modelling: Theory and Applications	4
STAT 153	Introduction to Time Series	4
STAT 158	Experimental Design	4
STAT C241A	Statistical Learning Theory	3
STAT C241B	Advanced Topics in Learning and Decision Making	3
STAT 248	Analysis of Time Series	4
Mathematics		
MATH 118	Fourier Analysis, Wavelets, and Signal Processing	4
Computer Science and Programming		
COMPSCI C280	Computer Vision	3
Electrical Engineering		
EL ENG 120	Signals and Systems	4
EL ENG 123	Digital Signal Processing	4
EL ENG 126	Probability and Random Processes	4
EL ENG 221A	Linear System Theory	4
EL ENG 226A	Random Processes in Systems	4
EL ENG C227C	Convex Optimization and Approximation	3
EL ENG 229A	Information Theory and Coding	3
Bioengineering		
BIO ENG 231	Introduction to Computational Molecular and Cellular Biology	4
BIO ENG C265/ EL ENG C225E	Principles of Magnetic Resonance Imaging	4
Vision Science		
VIS SCI 260A	Optical and Neural Limits to Vision	3
VIS SCI 260D	Seeing in Time, Space and Color	3
Public Health		
PB HLTH 245	Introduction to Multivariate Statistics	4

Required Professional Development Presentations

During their fourth year of study, students are required to make a presentation on the progress of their thesis work while enrolling in NEUROSC 294 (Neuroscience Graduate Student Presentation Seminar, also known as "Brain Lunch"), a journal club, for a letter grade.

Teaching

Neuroscience students are required to serve as graduate student instructors (GSIs) for two semesters. Whenever possible, GSI assignments are determined with an eye toward student research interests. Teaching occurs during fall semester of the second year and spring semester of the third. Teaching affords students supervised experience in a variety of educational situations, including labs, discussion sections, and demonstrations. GSIs also participate in record-keeping, grading, advising, and student consultations.

GSIs are evaluated by both supervising faculty and the students they teach. These evaluations become a permanent part of the student file. Deserving GSIs are nominated for the Outstanding Graduate Student Instructor Award.

Neuroscience

Expand all course descriptions [+]Collapse all course descriptions [-]

NEUROSC C217D Biological and Public Health Aspects of Alzheimer's Disease 3 Units

Terms offered: Spring 2017, Spring 2015, Spring 2014, Spring 2013
This course will survey the field of Alzheimer's disease (AD) from a biological and public health perspective by reading original research papers in the fields of medicine, neuroscience, and epidemiology. The course will begin with a historical survey of the concept of AD, followed by a description of clinical and neuropathological features. Subsequent classes will cover the genetics and molecular biology of the disease, as well as biomarkers, epidemiology, risk factors, treatment, development of new diagnostic approaches, and ethical issues. The course will also serve as a model for the analysis of complex diseases with multiple genetic and environmental causes, and late onset neurodegenerative diseases. The course will also serve as a model for the analysis of complex diseases with multiple genetic and environmental causes and late-onset neurodegenerative disease.
Biological and Public Health Aspects of Alzheimer's Disease: Read More [+]
Rules & Requirements

Prerequisites: Graduate standing or consent of instructor

Hours & Format

Fall and/or spring: 15 weeks - 2 hours of seminar per week

Additional Details

Subject/Course Level: Neuroscience/Graduate

Grading: Letter grade.

Instructor: Jagust

Also listed as: PB HLTH C217D

Biological and Public Health Aspects of Alzheimer's Disease: Read Less [-]

NEUROSC C261 Cellular and Developmental Neurobiology 3 Units

Terms offered: Fall 2023, Fall 2022, Fall 2021
This course covers the molecular/cellular basis of neuron excitability (membrane potentials, action potential generation and propagation, ion channels), synaptic transmission and plasticity, sensory receptor function, and developmental neurobiology.
Cellular and Developmental Neurobiology: Read More [+]
Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture per week

Additional Details

Subject/Course Level: Neuroscience/Graduate

Grading: Letter grade.

Also listed as: MCELLBI C261

Cellular and Developmental Neurobiology: Read Less [-]

NEUROSC C265 Neural Computation 3 Units

Terms offered: Prior to 2007
This course provides an introduction to the theory of neural computation. The goal is to familiarize students with the major theoretical frameworks and models used in neuroscience and psychology, and to provide hands-on experience in using these models. Topics include neural network models, supervised and unsupervised learning rules, associative memory models, probabilistic/graphical models, and models of neural coding in the brain.
Neural Computation: Read More [+]
Rules & Requirements

Prerequisites: Calculus, differential equations, basic probability and statistics, linear algebra, and familiarity with high level programming languages such as Matlab

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture per week

Additional Details

Subject/Course Level: Neuroscience/Graduate

Grading: Letter grade.

Instructor: Olshausen

Also listed as: VIS SCI C265

Neural Computation: Read Less [-]

NEUROSC 290 Neuroscience First Year Research 2 Units

Terms offered: Spring 2017, Spring 2016, Spring 2015
Seminar on the presentation and evaluation of research results for first-year neuroscience graduate students. During the first weeks, faculty present their research (FERPS); later, students present individual research results and evaluate their own and each other's work. Course enrollment limited to 15.
Neuroscience First Year Research: Read More [+]
Rules & Requirements

Prerequisites: Graduate standing in Neuroscience Graduate Group; concurrent enrollment in 291A-291B

Hours & Format

Fall and/or spring: 15 weeks - 2 hours of seminar per week

Additional Details

Subject/Course Level: Neuroscience/Graduate

Grading: Letter grade.

Instructor: Ngai

Neuroscience First Year Research: Read Less [-]

NEUROSC 292 Neuroscience Graduate Research 3 - 12 Units

Terms offered: Spring 2024, Fall 2023, Summer 2023 10 Week Session
For graduate students in neuroscience in their second or later years. During the summer, the course will count for 3-6 units. Individual research under faculty supervision. In this course each graduate student conducts basic thesis and dissertation research after successful completion of the first-year laboratory rotation, Neuroscience 291A-291B. Laboratory work provides the basis for students' thesis research, preparation for the preliminary examination, and continued progress toward completion of Ph.D. dissertation.
Neuroscience Graduate Research: Read More [+]
Rules & Requirements

Prerequisites: Graduate standing in the Neuroscience Graduate Group; advanced approval from instructor

Repeat rules: Course may be repeated for credit without restriction.

Hours & Format

Fall and/or spring: 15 weeks - 10-40 hours of laboratory per week

Summer: 10 weeks - 15-60 hours of laboratory per week

Additional Details

Subject/Course Level: Neuroscience/Graduate

Grading: Letter grade.

Neuroscience Graduate Research: Read Less [-]