Neuroscience (NEU)

Courses

NEU 24 Freshman Seminar 1 Unit

Terms offered: Fall 2025, Spring 2025, Fall 2024

The Freshman Seminar Program has been designed to provide new students with the opportunity to explore an intellectual topic with a faculty member in a small seminar setting. Freshman seminars are offered in all campus departments. Topics vary from department to department and semester to semester. Final assessment to be decided by the instructor when the class is offered.

Rules & Requirements

Prerequisites: Open to freshmen only

Repeat rules: Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 1 hour of seminar per week

Additional Details

Subject/Course Level: Neuroscience/Undergraduate

Grading/Final exam status: The grading option will be decided by the instructor when the class is offered. Final Exam To be decided by the instructor when the class is offered.

NEU 61 Brain, Mind, and Behavior 3 Units

Terms offered: Summer 2025 First 6 Week Session

The human brain is the most complex structure in the known universe. The study of its structure and function and how it figures into our actions and mental experience is among the most exciting projects of modern science. This class begins with molecules and cells, builds up to brains and nervous systems, encompasses neural signaling, sensory perception, memory, language, and emotion, and culminates with the great mystery of how brain processes relate to consciousness and mental experience — that is, how the mind is related to the brain. This is a comprehensive introduction to the exciting subject of contemporary neuroscience, open to all interested students. This course runs in Session A.

Rules & Requirements

Credit Restrictions: Students will receive no credit for NEU 61 after completing NEU C61, MCELLBI 104, CHEM C130, MCELLBI 110, MCELLBI C130, MCELLBI 136, MCELLBI 160, PSYCH 110, or NEU 100A. A deficient grade in NEU 61 may be removed by taking NEU C61.

Hours & Format

Summer: 6 weeks - 7 hours of lecture and 2.5 hours of discussion per week

Online: This is an online course.

Additional Details

Subject/Course Level: Neuroscience/Undergraduate

Grading/Final exam status: Letter grade. Alternative to final exam.

Instructor: Presti

Formerly known as: Molecular and Cell Biology W61

NEU C61 Brain, Mind, and Behavior 3 Units

Terms offered: Spring 2025, Spring 2024, Spring 2023

The human brain is the most complex structure in the known universe. The study of its structure and function and how it figures into our actions and mental experience is among the most exciting projects of modern science. This class begins with molecules and cells, builds up to brains and nervous systems, encompasses neural signaling, sensory perception, memory, language, and emotion, and culminates with the great mystery of how brain processes relate to consciousness and mental experience — that is, how mind may be related to brain. This is a comprehensive introduction to the exciting subject of contemporary neuroscience, open to all interested students.

Rules & Requirements

Credit Restrictions: Students will receive no credit for NEU C61 after completing CHEM C130, NEU 61, MCELLBI 104, MCELLBI 110, MCELLBI C130, MCELLBI 136, MCELLBI 160, NEU 100A, PSYCH 110, or PSYCH N110.

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture and 1 hour of discussion per week

Additional Details

Subject/Course Level: Neuroscience/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

Instructor: Presti

Formerly known as: Molecular and Cell Biology C61/Psychology C61

Also listed as: PSYCH C61

NEU 62 Drugs and the Brain 3 Units

Terms offered: Not yet offered

Psychoactive drugs — stimulants, sedatives, psychedelics, analgesics, antidepressant and antipsychotic pharmaceuticals, and others — powerfully impact the human mind and brain. Understanding these substances and their effects is a truly transdisciplinary endeavor: anthropology, botany, cell biology, chemistry, clinical medicine, physiology, psychology, public policy, sociology, governmental law, and more. This class explores that territory, emphasizing the complex nature of drugs as both medicines and poisons, and emanating from plants and fungi having deep historical relationships with humankind.

Rules & Requirements

Credit Restrictions: Students will receive no credit for NEU C62 after completing MCELLBI 136, MCELLBI 160, INTEGBI 132, MCELLBI 104, MCELLBI 62, CHEM C130, PSYCH 119, or NEU 62. A deficient grade in NEU C62 may be removed by taking NEU 62.

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture and 1 hour of discussion per week

Summer: 8 weeks - 4.5 hours of lecture and 2 hours of discussion per week

Additional Details

Subject/Course Level: Neuroscience/Undergraduate

Grading/Final exam status: Letter grade. Final exam not required.

Instructor: Presti

Formerly known as: Neuroscience C62/Letters and Science C30T

NEU 63 Introduction to Functional Neuroanatomy 3 Units

Terms offered: Summer 2025 Second 6 Week Session
This course aims to introduce students to concepts that are central to the field of Neuroanatomy. The main emphasis of the course will be on the human central nervous system, which includes the brain and spinal cord. Importantly, anatomy will be discussed in relation to the functions of the nervous system. Students will learn topics such as Cell Biology and Physiology, Neurodevelopment, sensory-motor systems, autonomic divisions, and the anatomy responsible for generating some of our higher cognitive functions. There are no prerequisites for this course, but a basic understanding of high school chemistry and biology is recommended.

Rules & Requirements

Credit Restrictions: Students will receive no credit for NEU 63 after completing MCELLBI 104, CHEM C130, MCELLBI 110, MCELLBI C130, MCELLBI 136, MCELLBI 160, NEU 100B, or INTEGBI 132.

Hours & Format

Summer:
4 weeks - 12 hours of lecture per week
6 weeks - 7.5 hours of lecture per week
8 weeks - 6 hours of lecture per week

Additional Details

Subject/Course Level: Neuroscience/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

Formerly known as: Molecular and Cell Biology 63

NEU C64 Exploring the Brain: Introduction to Neuroscience 3 Units

Terms offered: Summer 2025 8 Week Session, Summer 2024 8 Week Session, Summer 2023 8 Week Session
This course will introduce lower division undergraduates to the fundamentals of neuroscience. The first part of the course covers basic membrane properties, synapses, action potentials, chemical and electrical synaptic interactions, receptor potentials, and receptor proteins. The second part of the course covers networks in invertebrates, memory and learning behavior, modulation, vertebrate brain and spinal cord, retina, visual cortex architecture, hierarchy, development, and higher cortical centers.

Rules & Requirements

Prerequisites: High school chemistry or Chemistry 1A; high school biology or Biology 1A. Biology 1AL is not required

Credit Restrictions: Students will receive no credit for NEU C64 after completing NEU C61, MCELLBI 104, CHEM C130, MCELLBI 110, MCELLBI C130, MCELLBI 136, MCELLBI 160, or INTEGBI 132.

Hours & Format

Fall and/or spring: 15 weeks - 2 hours of lecture and 1 hour of discussion per week

Summer: 8 weeks - 4 hours of lecture and 2 hours of discussion per week

Additional Details

Subject/Course Level: Neuroscience/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

Formerly known as: Molecular and Cell Biology C64/Psychology C64

Also listed as: PSYCH C64

NEU 65 Neuroscience, Film, and Philosophy 3 Units

Terms offered: Spring 2025
Advances in neuroscience are forcing us to confront anew questions concerning the nature of identity, reality, morality, and free will. Scientists can now implant artificial memories, augment natural brain capabilities, and read out intentions from the brain before they are acted upon. This class intends to shine a light on the brave new world enabled by modern neuroscience through three lenses: science, film, and philosophy. Topics to be covered include: the architecture of the brain, AI & the mind body problem, the neural construction of reality, action and free will, memory, the neural basis of morality, mechanisms for brain wiring, mental illness, and brain machine interfaces.

Hours & Format

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

Additional Details

Subject/Course Level: Neuroscience/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

Instructor: Tsao

Formerly known as: Molecular and Cell Biology 65

NEU 77 Survey of Neuroscience Research 1 Unit

Terms offered: Fall 2025, Spring 2025, Fall 2024
This course provides a survey of neuroscience research areas represented by faculty members in the Department of Neuroscience. Each week a different faculty member will give a one hour lecture on how their research field contributes to our understanding of the brain and behavior. The course will span molecular, cellular, circuits, systems, behavioral, cognitive, and computational neuroscience, to illustrate how different approaches fit into the overall field of neuroscience. Faculty will also inform students about courses that they teach in neuroscience and related areas. This course gives undergraduates an opportunity to learn about the spectrum of research within the field of neuroscience.
Hours & Format

Fall and/or spring: 15 weeks - 1 hour of lecture per week

Additional Details

Subject/Course Level: Neuroscience/Undergraduate

Grading/Final exam status: Offered for pass/not pass grade only. Final exam required.

Instructor: Feller

NEU 98 Directed Group Study 1 - 4 Units

Terms offered: Prior to 2007
Lectures and small group discussions focusing on topics of interest, varying from semester to semester.
Rules & Requirements

Repeat rules: Course may be repeated for credit without restriction. Students may enroll in multiple sections of this course within the same semester.

Hours & Format

Fall and/or spring: 15 weeks - 1-4 hours of directed group study per week

Additional Details

Subject/Course Level: Neuroscience/Undergraduate

Grading/Final exam status: Offered for pass/not pass grade only. Final exam not required.

NEU 99 Supervised Independent Study 1 - 4 Units

Terms offered: Prior to 2007
This course provides credit for independent study by undergraduates working in a lab with a faculty member. The student is responsible for finding an instructor to supervise the work and should meet with that instructor regularly throughout the semester. Faculty members must commit to supervising and evaluating the student's work.
Rules & Requirements

Prerequisites: Consent of instructor

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

Hours & Format

Fall and/or spring: 15 weeks - 1-4 hours of independent study per week

Summer:
6 weeks - 2-10 hours of independent study per week
8 weeks - 2-8 hours of independent study per week

Additional Details

Subject/Course Level: Neuroscience/Undergraduate

Grading/Final exam status: Offered for pass/not pass grade only. Alternative to final exam.

NEU 100A Cellular and Molecular Neurobiology 4 Units

Terms offered: Fall 2025, Fall 2024
This course is a comprehensive introductory survey of cellular and molecular neuroscience, including cellular neurophysiology, membrane biophysics, ion channel function, synaptic transmission and plasticity, sensory transduction, and nervous system development. We will discuss topics at the level of molecules to cells to simple circuits.
Rules & Requirements

Prerequisites: BIOLOGY 1A and BIOLOGY 1AL; PHYSICS 8A and PHYSICS 8B (can be taking concurrently)

Credit Restrictions: Students will receive no credit for NEU 100A after completing MCELLBI 160. A deficient grade in NEU 100A may be removed by taking MCELLBI 160.

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture and 1 hour of discussion per week

Additional Details

Subject/Course Level: Neuroscience/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

Instructors: Feller, Kramer, Isacoff

NEU 100B Circuit, Systems and Behavioral Neuroscience 4 Units

Terms offered: Spring 2025

This course is a comprehensive survey of circuits and systems neuroscience, including how brain function underlies behavior. Students will learn how brain circuits are organized, how the brain processes sensory information, how it plans and executes movement, and how it stores information during learning. We will discuss brain rhythms and sleep, and brain systems for emotion, reward, attention, and other higher functions. The major focus is on the mammalian brain, but we will also discuss principles from other organisms. By the end of the course, students will have a strong understanding of the biological and computational principles for neural circuit function, and the neurobiological basis of behavior.

Rules & Requirements

Prerequisites: NEU 100A (or MCELLBI 160)

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture and 1 hour of discussion per week

Additional Details

Subject/Course Level: Neuroscience/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

Instructors: Tsao, Dan, Feldman

Formerly known as: Molecular and Cell Biology 161

NEU 110 Scientific Logic and Communication 2 Units

Terms offered: Fall 2025, Spring 2025

Students in this course will develop competency in scientific communication, including scientific writing and presentation of data. We will use active learning exercises to teach strategies for organizing and presenting scientific ideas and evidence verbally and in writing. Each semester there will be one broad neuroscience topic (such as color vision or memory) that we will study in three different research areas: cellular, circuits/systems and cognitive neuroscience. Throughout the semester, students will read and discuss research articles, practice interpreting graphs, make presentations, and complete scientific writing assignments such as analyzing a research article.

Rules & Requirements

Prerequisites: BIOLOGY 1A and BIOLOGY 1AL with minimum grades of C- (or equivalent courses)

Hours & Format

Fall and/or spring: 15 weeks - 1 hour of lecture and 1 hour of discussion per week

Additional Details

Subject/Course Level: Neuroscience/Undergraduate

Grading/Final exam status: Letter grade. Alternate method of final assessment during regularly scheduled final exam group (e.g., presentation, final project, etc.).

NEU C121 Human Neuroanatomy 3 Units

Terms offered: Spring 2025

This course covers the anatomical composition of the human brain with particular emphasis on modern understanding regarding the micro- and macroanatomy of the cerebral cortex and the underlying white matter. The course is designed for students who intend to continue their postgraduate education toward a masters, doctorate, or medical degree in a field involving the study of the human brain.

Rules & Requirements

Credit Restrictions: Students will receive no credit for PSYCH 111 after completing PSYCH 111, or PSYCH 111. A deficient grade in PSYCH 111 may be removed by taking PSYCH 111, or PSYCH 111.

Hours & Format

Fall and/or spring: 15 weeks - 2 hours of lecture and 1 hour of discussion per week

Additional Details

Subject/Course Level: Neuroscience/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

Formerly known as: Psychology 111

Also listed as: PSYCH C111

NEU 123 Psychedelics 3 Units

Terms offered: Fall 2025

This course will provide a comprehensive overview of psychedelic drugs. We will examine their pharmacological, biochemical, synaptic, behavioral, and clinical effects, with a focus on the neurobiological framework. Drugs in this category (e.g. ketamine, PCP, LSD, Psilocybin, DMT, Mescaline, MDMA, Ibogaine) will be contrasted with psychoactive drugs that are not psychedelic (e.g. cocaine, fentanyl, marijuana) and compared with non-drug practices with overlapping phenomenological mechanistic or therapeutic effects (breathwork, EMDR, deprivation, meditation). While much of the course will focus on the neurobiology of psychedelics, historical and anthropological uses will be explored where appropriate.

Rules & Requirements

Prerequisites: Basic knowledge from an introductory neuroscience or pharmacology class required. UC Berkeley classes that satisfy this requirement are NEU C61/PSYCH C61, NEU C62/L & S C30T, or PSYCH 110

Hours & Format

Fall and/or spring: 15 weeks - 2 hours of lecture and 1 hour of discussion per week

Additional Details

Subject/Course Level: Neuroscience/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

NEU C124 Interface Between Neuroethology & Neural Engineering 3 Units

Terms offered: Spring 2025

The course will provide students with an overview of the tight interface between neural engineering and neuroethological approaches in the field of neuroscience. This course will also discuss the concepts of causal manipulations, such as the control of brain circuits using optics and genetic engineering. Lastly, students will also inquire and discuss what discoveries have yet to be made and how neuroethological approaches can inform neural engineering designs that will revolutionize the future of neural medicine.

Objectives & Outcomes

Course Objectives: Understand the close interface between studies of the nervous system and technology

Student Learning Outcomes: The course will review the utilization, development and implementation of a wide diversity of neural engineering technologies to the study of the brain. Students will discuss the bidirectional road between the two approaches.
The overreaching goal of this course is to expose student interested in neural engineering to the remarkable history of neuroethological approaches that have been a foundation of discoveries in the field.

Rules & Requirements

Prerequisites: BIO ENG 105; and BIO ENG 101 or EECS 16A and EECS 16B; or consent of instructor

Hours & Format

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

Additional Details

Subject/Course Level: Neuroscience/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

Instructor: Yartsev

Formerly known as: Bioengineering 171

Also listed as: BIO ENG C171

NEU C125 Neuroethology: Complex Animal Behaviors and Brains 4 Units

Terms offered: Spring 2024, Spring 2023, Spring 2022

Neuroethologists study neural systems by combining behavior and neuroscience to understand the neural mechanism that have evolved in various animals to solve particular problems encountered in their environmental niches. This comparative approach that emphasizes how information is processed and transformed by the brain is particularly powerful for understanding neural systems. In this course, you will learn important concepts in ethology, sensory systems, motor systems and neural plasticity and development by studying the behavior and brains of animals such as crickets, lobsters, barn-owls, honey-bees, echolocating bats, electric fishes and songbirds.

Rules & Requirements

Prerequisites: One foundational lower division level in general Biology, Animal Behavior or Neurosciences; UC Berkeley classes that satisfy this requirement are Bio 1A, Bio1B, IB 31, Psych C61/MCB C61, or Psych 110

Credit Restrictions: Students will receive no credit for INTEGBI C147 after completing INTEGBI 147. A deficient grade in INTEGBI C147 may be removed by taking INTEGBI 147.

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture and 1 hour of discussion per week

Additional Details

Subject/Course Level: Neuroscience/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

Instructor: Theunissen

Formerly known as: Integrative Biology C147/Psychology C115C

Also listed as: PSYCH C115C

NEU C126 Hormones and Behavior 3 Units

Terms offered: Spring 2025, Spring 2022, Spring 2021
This course provides a comprehensive overview of behavioral endocrinology beginning with hormone production and actions on target tissues/circuits and continuing with an exploration of a variety of behaviors and their regulation/consequences. The course also examines the reciprocal interactions between the neuroendocrine system and behavior, considering the impact of hormones on development and adult behavior, and how behavior regulates physiology. Although non-human vertebrate species will be the primary focus, the relevance of these topics to humans will also be explored. Topics include sexual differentiation and sex differences in behavior, reproductive, parental, and aggressive behavior, biological rhythms, and homeostatic regulation.
Rules & Requirements

Prerequisites: Completion of biological prerequisites for the major and consent of instructor; a course in mammalian physiology recommended

Hours & Format

Fall and/or spring: 15 weeks - 2 hours of lecture and 1 hour of discussion per week

Additional Details

Subject/Course Level: Neuroscience/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

Instructor: Kriegsfeld

Also listed as: PSYCH C116

NEU 128 Cognitive Neuroscience 3 Units

Terms offered: Fall 2025
This course provides an overview of cognitive neuroscience. Cognitive neuroscience is a broad field of study that aims to create quantitative computational models that explain how behavior and cognition are subserved by brain anatomy and function. The field combines philosophy, insights and methods from several other fields: neurology, cellular neuroscience, systems neuroscience, computational neuroscience, statistics, and machine learning.
Rules & Requirements

Prerequisites: NEU 100A

Hours & Format

Fall and/or spring: 15 weeks - 2 hours of lecture and 1 hour of discussion per week

Additional Details

Subject/Course Level: Neuroscience/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

NEU 151 Introduction to Computational Neuroscience 3 Units

Terms offered: Fall 2025
This course is an introduction to the theories and application of computational methods to neuroscience. Students will learn how computational methods are applied to cellular processes, sensory coding, learning and memory, and cognitive processes. The major focus is on the mammalian brain, but we will also discuss principles from other organisms. By the end of the course, students will have a strong understanding of the computational principles for neural circuit function, and the neurobiological basis of behavior.
Rules & Requirements

Prerequisites: NEU 100A and NEU 100B

Hours & Format

Fall and/or spring: 15 weeks - 2 hours of lecture and 1 hour of discussion per week

Additional Details

Subject/Course Level: Neuroscience/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

NEU 152 Neurotechnology 3 Units

Terms offered: Spring 2025
This course covers topics in emerging neurotechnology including a primer on the basic rates and biophysical timescales of cellular processes, electrophysiological recordings, electrical stimulation of nervous tissue and discussions on how technologies can be built to understand and control the nervous system. We will describe technologies prolifically used to learn about the brain, focusing on electron and fluorescence microscopy. In the second part, we will focus on technologies to monitor and manipulate the nervous system that have been leveraged for use in implantable medical devices and brain-machine interface applications, including high-density extracellular electrophysiology and invasive and non-invasive neurostimulation techniques.
Rules & Requirements

Prerequisites: It is expected that students have the knowledge and background equivalent of junior- or senior-level neuroscience or BioE students + an introductory biology course. Prerequisites include BIOLOGY 1A, or BIO ENG 11 and PHYSICS 7A

Hours & Format

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

Additional Details

Subject/Course Level: Neuroscience/Undergraduate

Grading/Final exam status: Letter grade. Alternative to final exam.

NEU 162 Learning and Memory 3 Units

Terms offered: Spring 2025

The biology of learning and memory is critical to our understanding of development, culture, behavioral change, the uniqueness of individuals, and limits to an organism's potential. We will study experimental investigations of learning and memory at the cellular, circuit, and population level. We will discuss these topics in the context of normal development and disease. Students will become familiar with thinking about the brain at the level of circuits, cells, synapses, and proteins.

Rules & Requirements

Prerequisites: NEU 100A and NEU 100B

Hours & Format

Fall and/or spring: 15 weeks - 2 hours of lecture and 1 hour of discussion per week

Additional Details

Subject/Course Level: Neuroscience/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

NEU 163 Brain, Behavior, and Environment 4 Units

Terms offered: Fall 2025

How do experiences and exposures get "under the skin" to impact human development? This course takes a research approach to understanding how the environment can shape adult behavior. We begin a review of foundations in endocrinology, neurobiology, reproduction, and development. This sets the stage for studying the developmental impacts of exposures and experiences including nutrition, stress, immune challenges, endocrine disruption, and more. Weekly sections will be used to discuss papers, conduct investigations, analyze data, and provide peer feedback.

Rules & Requirements

Prerequisites: BIOLOGY 1A and at least one of: NEU 100A, NEU 100B, PSYCH 110, or INTEGBI 132

Credit Restrictions: Students will receive no credit for NEU 163 after completing INTEGBI 142L, or NEU 163C.

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture and 1 hour of discussion per week

Additional Details

Subject/Course Level: Neuroscience/Undergraduate

Grading/Final exam status: Letter grade. Alternative to final exam.

Instructor: Beery

NEU 163C Brain, Behavior, and Environment Capstone Course 4 Units

Terms offered: Fall 2025

How do experiences and exposures get "under the skin" to impact human development? This course takes a research approach to understanding how the environment can shape adult behavior. We begin a review of foundations in endocrinology, neurobiology, reproduction, and development. This sets the stage for studying the developmental impacts of exposures and experiences including nutrition, stress, immune challenges, endocrine disruption, and more. Capstone courses involve reading, writing and discussion related to research and research design. Capstones also culminate in a substantial research paper on a topic related to the course subject matter and areas of student interest.

Rules & Requirements

Prerequisites: BIOLOGY 1A and at least one of: NEU 100A, NEU 100B, PSYCH 110, or INTEGBI 132

Credit Restrictions: Students will receive no credit for NEU 163C after completing INTEGBI 142L, or NEU 163.

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture and 1 hour of discussion per week

Additional Details

Subject/Course Level: Neuroscience/Undergraduate

Grading/Final exam status: Letter grade. Alternative to final exam.

Instructor: Beery

NEU 164 Neurodevelopment 3 Units

Terms offered: Fall 2025, Fall 2024

This course will provide students with insights into the cellular mechanisms underlying development of the nervous system. We will discuss the importance of these mechanisms by highlighting cases where alterations in these processes lead to neurodevelopmental disorders. We will review what is currently known about these topics and the areas of active research. In the lecture, we will refer to figures from research literature, and you will be reading and discussing articles in the discussion section. Reading articles critically is an important skill for all biologists and a great way to learn how research is conducted. By the end of the course, you will have a good background in neural development and the latest methods used to study it.

Rules & Requirements

Prerequisites: NEU 100A with minimum grade of C-

Hours & Format

Fall and/or spring: 15 weeks - 2 hours of lecture and 1 hour of discussion per week

Additional Details

Subject/Course Level: Neuroscience/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

Instructors: Feller, Bateup

NEU 165 Neurobiology of Disease 3 Units

Terms offered: Spring 2025

The course will give insights into the cellular mechanisms underlying neurological diseases. The course is divided into three main sections: neurodevelopmental disorders, psychiatric disorders, and neurodegeneration. We will explore each of these topics at the molecular and cellular levels, reviewing what is currently known and the areas of active research. In lecture we will refer to figures from the research literature, and you will be reading and discussing articles in the discussion section. Reading articles critically is an important skill for all biologists and a great way to learn how research is conducted. By the end, you will have a good background in neurological diseases and a better ability to understand primary literature.

Rules & Requirements

Prerequisites: NEU 100A or equivalent

Hours & Format

Fall and/or spring: 15 weeks - 2 hours of lecture and 1 hour of discussion per week

Additional Details

Subject/Course Level: Neuroscience/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

Formerly known as: Molecular and Cell Biology 165

NEU C166 The Neurobiology of Stress and Resilience 4 Units

Terms offered: Fall 2025, Fall 2011, Fall 2010

Exposure to stress is an inevitable part of life and the body's response to stress can shape mental and physiological health. The study of stress is an interdisciplinary endeavor, and in this class, we will examine basic, translational, and clinical aspects of the stress response. We adopt a broad-based approach to explore the concepts of stress, health, and disease, and connect them to underlying neural mechanisms. Exposure to stress can be motivating and enhance performance of some but induce anxiety and impede performance in others. In this class we will discuss and discover the mechanisms underlying trajectories towards both resilience and vulnerability.

Rules & Requirements

Prerequisites: BIOLOGY 1A

Credit Restrictions: Students will receive no credit for INTEGBI C139 after completing INTEGBI 139, or INTEGBI C139. A deficient grade in INTEGBI C139 may be removed by taking INTEGBI C139.

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture and 1 hour of discussion per week

Additional Details

Subject/Course Level: Neuroscience/Undergraduate

Grading/Final exam status: Letter grade. Alternative to final exam.

Instructor: Kaufer

Also listed as: INTEGBI C139

NEU 171L Neurobiology Laboratory 4 Units

Terms offered: Fall 2025, Fall 2024

In this course you will be introduced to a variety of techniques that are commonly used to study the nervous system including electrophysiology, optogenetics, cell biology, imaging, genetics, and anatomy. Experiments will be done on cells and invertebrates, and will cover molecular channel properties, neuronal cell physiology, development, and behavior. We hope that by analyzing the data from these experiments you will gain a better understanding of key principles in neuroscience. In addition, you will learn how to design experiments, troubleshoot experiments, analyze your data, and present your findings in written reports.

Rules & Requirements

Prerequisites: BIOLOGY 1A, BIOLOGY 1AL; PHYSICS 8A, PHYSICS 8B; NEU 100A or equivalent (may be taken concurrently)

Credit Restrictions: Students will receive no credit for NEU 171L after completing MCELLBI 160L.

Hours & Format

Fall and/or spring: 15 weeks - 1 hour of lecture and 8 hours of laboratory per week

Additional Details

Subject/Course Level: Neuroscience/Undergraduate

Grading/Final exam status: Letter grade. Final exam not required.

NEU 172L Cognitive and Computational Lab 4 Units

Terms offered: Fall 2025

In this laboratory course, students will be taught the experimental and analytical techniques used by cognitive and computational neuroscientists. Students will learn how to assess humans' performance in visual and auditory tasks, how to design experiments for testing theories of motor control, and how cognitive processes such as memory and decision-making affect perceptual and motor behavior. Students will also be introduced to computational methods used to analyze the large behavioral and neural data sets that are acquired in systems and cognitive neuroscience. Finally, students will be introduced to the tools of theoretical neuroscience for generating mathematical descriptions of the computations performed by a thinking brain.

Rules & Requirements

Prerequisites: NEU 100A and NEU 100B. Basic Concepts in Programming and Data Analysis: DATA C8 or equivalent

Hours & Format

Fall and/or spring: 15 weeks - 1 hour of lecture and 2 hours of laboratory per week

Additional Details

Subject/Course Level: Neuroscience/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

NEU 173L Neuroanatomy Laboratory 4 Units

Terms offered: Spring 2025
This course provides you with a basic understanding of the principles of brain structures and function. Our emphasis is more integrative and broadly-based than in most neuroanatomy courses. In addition to the fundamental structural biology of the central and autonomic nervous systems, we will introduce a variety of techniques that are commonly used to study the nervous system including immunohistochemistry, MRI, and fluorescence imaging. We will address topics in developmental neurobiology, the sensory, motor, and limbic systems, as well as aspects of neurochemistry and neuropathology. You will also learn how to design experiments, troubleshoot experiments, analyze your data, and present your findings in written reports.
Rules & Requirements

Prerequisites: BIOLOGY 1A and BIOLOGY 1AL; PHYSICS 8A and PHYSICS 8B; NEU 100A, NEU 100B, or equivalent (can be taken concurrently)

Hours & Format

Fall and/or spring: 15 weeks - 1 hour of lecture and 6 hours of laboratory per week

Additional Details

Subject/Course Level: Neuroscience/Undergraduate

Grading/Final exam status: Letter grade. Final exam not required.

Instructors: Lammel, Jagust, Feinberg

Formerly known as: Molecular and Cell Biology 163L

NEU 191 Senior Research Thesis 4 Units

Terms offered: Prior to 2007
This course is intended for advanced undergraduates wishing to pursue independent research projects under the mentorship of a Neuroscience faculty member. To apply for NEU 191, the research project must be rigorous and provide significant training in biology.
Rules & Requirements

Prerequisites: Consent of instructor and departmental adviser

Credit Restrictions: Students will receive no credit for NEU 191 after completing NEU H196A, or NEU H196B.

Hours & Format

Fall and/or spring: 15 weeks - 12 hours of independent study per week

Summer:
6 weeks - 30 hours of independent study per week
8 weeks - 22.5 hours of independent study per week
10 weeks - 18 hours of independent study per week

Additional Details

Subject/Course Level: Neuroscience/Undergraduate

Grading/Final exam status: Letter grade. Alternative to final exam.

NEU H196A Honors Research Thesis 1 - 4 Units

Terms offered: Prior to 2007
This course is intended for advanced undergraduates wishing to pursue independent research projects under the mentorship of a Neuroscience faculty member. To apply for NEU H196A, the research project must be rigorous and provide significant training in biology, have a major GPA of 3.5 or higher, and a cumulative UC Berkeley GPA of 3.3.
Rules & Requirements

Prerequisites: Senior honors status and consent of instructor

Hours & Format

Fall and/or spring: 15 weeks - 1-4 hours of independent study per week

Summer: 8 weeks - 1.5-7.5 hours of independent study per week

Additional Details

Subject/Course Level: Neuroscience/Undergraduate

Grading/Final exam status: Offered for pass/not pass grade only. Alternative to final exam.

NEU H196B Honors Research Thesis 4 Units

Terms offered: Prior to 2007
This course is intended for advanced undergraduates wishing to pursue independent research projects under the mentorship of a Neuroscience faculty member. To apply for NEU H196B, the research project must be rigorous and provide significant training in biology, have a major GPA of 3.5 or higher, and have a cumulative UC Berkeley GPA of 3.3.
Rules & Requirements

Prerequisites: Senior honors status and consent of instructor

Hours & Format

Fall and/or spring: 15 weeks - 12 hours of independent study per week

Summer: 8 weeks - 22.5 hours of independent study per week

Additional Details

Subject/Course Level: Neuroscience/Undergraduate

Grading/Final exam status: Letter grade. Alternative to final exam.

NEU 197 Supervised Internship 1 Unit

Terms offered: Summer 2025 Second 6 Week Session
This course is intended for students who are engaged in a major-related internship program that requires the student to earn academic credit. The mentorship of a Neuroscience faculty member is required. It is the student's responsibility to find a faculty member to sponsor this course (Instructor of Record).
Rules & Requirements

Prerequisites: Students must be declared in Neuroscience, have completed at least 60 semester units of undergraduate study and a major GPA of 2.0 or better

Repeat rules: Course may be repeated for credit with instructor consent.

Hours & Format

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

Summer: 6 weeks - 7.5 hours of internship per week

Additional Details

Subject/Course Level: Neuroscience/Undergraduate

Grading/Final exam status: Offered for pass/not pass grade only. Alternative to final exam.

NEU 198 Directed Group Study 1 - 4 Units

Terms offered: Spring 2025
Lectures and small group discussions focusing on topics of interest, varying from semester to semester.
Rules & Requirements

Repeat rules: Course may be repeated for credit without restriction. Students may enroll in multiple sections of this course within the same semester.

Hours & Format

Fall and/or spring: 15 weeks - 1-4 hours of directed group study per week

Additional Details

Subject/Course Level: Neuroscience/Undergraduate

Grading/Final exam status: Offered for pass/not pass grade only. Final exam not required.

NEU 199 Supervised Independent Study 1 - 4 Units

Terms offered: Prior to 2007
This course provides credit for independent study by undergraduates working in a lab with a faculty member. The student is responsible for finding an instructor to supervise the work and should meet with that instructor regularly throughout the semester. Faculty members must commit to supervising and evaluating the student's work.
Rules & Requirements

Prerequisites: Consent of instructor

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

Hours & Format

Fall and/or spring: 15 weeks - 1-4 hours of independent study per week

Summer:
6 weeks - 2-10 hours of independent study per week
8 weeks - 2-8 hours of independent study per week
10 weeks - 1.5-6 hours of independent study per week
12 weeks - 1-5 hours of independent study per week

Additional Details

Subject/Course Level: Neuroscience/Undergraduate

Grading/Final exam status: Offered for pass/not pass grade only. Alternative to final exam.

NEU 210A Neuroscience Research Design and Analysis 1 Unit

Terms offered: Fall 2025, Fall 2024
Professional core competency training for graduate students involved in neuroscience research at Berkeley. Includes survey of modern research methods, and professional skills including principles of experimental design and data reproducibility.
Rules & Requirements

Prerequisites: Graduate standing in the Neuroscience PhD program or consent of instructor

Hours & Format

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

Additional Details

Subject/Course Level: Neuroscience/Graduate

Grading: Offered for satisfactory/unsatisfactory grade only.

Instructors: Feldman, Neuroscience Graduate Advisors, Guest faculty speakers

Formerly known as: Neuroscience 290A

NEU 210B Neuroscience Career Skills 1 Unit

Terms offered: Spring 2025
Professional core competency training for graduate students involved in neuroscience research at Berkeley. Includes training in giving scientific presentations, scientific writing, and project management.
Rules & Requirements

Prerequisites: Graduate standing in the Neuroscience PhD program or consent of instructor

Hours & Format

Fall and/or spring: 15 weeks - 1.5 hours of seminar per week

Additional Details

Subject/Course Level: Neuroscience/Graduate

Grading: Offered for satisfactory/unsatisfactory grade only.

Instructors: Feldman, Neuroscience Graduate Advisors, Guest faculty speakers

Formerly known as: Neuroscience 290B

NEU C231 Neural Computation 3 Units

Terms offered: Not yet offered
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.
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

NEU C241 Proseminar: Cognition, Brain, and Behavior 3 Units

Terms offered: Prior to 2007
A survey of the field of biological psychology. Areas covered are (a) cognitive neuroscience; (b) biological bases of behavior; (c) sensation and perception (d) learning and memory, (e) thought and language.
Rules & Requirements

Prerequisites: Consent of instructor

Hours & Format

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

Additional Details

Subject/Course Level: Neuroscience/Graduate

Grading: Letter grade.

Formerly known as: Psychology 210A

Also listed as: PSYCH C210A

NEU 242 Reinforcement Learning and Decision-making 3 Units

Terms offered: Spring 2025
The focus of the course is on weekly readings of recent papers in Reinforcement Learning and Decision-Making. The instructors have created a topical list of recent papers published in leading journals. We selected the papers because they sounded important and/or interesting. We have not necessarily read them. This should help you to not only learn about the field, but also learn to spot and critique a bad paper. Typical topics that are covered include: dopamine and temporal difference learning, model-based learning, cognitive maps in the hippocampus and beyond, economic choice, and the role of replay.
Rules & Requirements

Prerequisites: NEU 100B or equivalent undergraduate-level systems and cognitive neuroscience courses

Hours & Format

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

Additional Details

Subject/Course Level: Neuroscience/Graduate

Grading: Letter grade.

NEU 250 Circuit and Systems Neuroscience 3 Units

Terms offered: Spring 2025
This is a graduate-level course on current topics in circuit and systems neuroscience. Topics include sensory coding, neural circuit computations, plasticity and learning, hippocampal function, motor control, and circuits for innate behaviors.
Hours & Format

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

Additional Details

Subject/Course Level: Neuroscience/Graduate

Grading: Letter grade.

Formerly known as: Molecular and Cell Biology C262/Neuroscience C262

NEU C260 Molecular and Cellular Neurobiology 3 Units

Terms offered: Fall 2025, Fall 2024, Fall 2015
This course covers molecular and cellular aspects of cellular excitability (including membrane potential, action potential generation, spike propagation, and ion channel structure and function), synaptic transmission and plasticity, and sensory systems. Primary reading material will be research papers. We will provide references to textbook chapters for background and review. This will be an interactive course in which you will be expected to be an active participant.
Rules & Requirements

Prerequisites: NEU 100A or equivalent undergraduate-level molecular and cellular neuroscience course

Credit Restrictions: Students will receive no credit for NEU C260 after completing MCELLBI 260, or MCELLBI C261.

Hours & Format

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

Additional Details

Subject/Course Level: Neuroscience/Graduate

Grading: Letter grade.

Formerly known as: Molecular and Cell Biology C260/Neuroscience C260

Also listed as: MCELLBI C260

NEU 271 Functional MRI Methods 2 Units

Terms offered: Fall 2025
This graduate course will provide a complete introduction to the theoretical and practical skills needed to conduct human functional MRI experiments. Topics to be covered include: MRI physics, BOLD signals and functional imaging, data preprocessing, data analysis and interpretation. The course will consist of lectures, practical lab sessions, and group work. Some sessions will take place in the Henry J. Wheeler Brain Imaging Center, where students will learn how to conduct their own MRI experiments.
Rules & Requirements

Prerequisites: The course is open to all graduate students who are potential or current users of fMRI, and to others working in fMRI labs (upon permission of the instructor)

Hours & Format

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

Additional Details

Subject/Course Level: Neuroscience/Graduate

Grading: Letter grade.

NEU C272 Modern Optical Microscopy for the Modern Biologist 3 Units

Terms offered: Fall 2025, Spring 2025, Fall 2024, Fall 2023
This course is intended for graduate students in the early stages of their thesis research who are contemplating using modern microscopy tools as part of their work. It endeavors to cut through the confusion of the wide array of new imaging methods, with a practical description of the pros and cons of each. In addition to providing an intuitive physical understanding how these microscopes work, the course will offer hands on experience with cutting-edge microscopes where students will be able to see firsthand how different imaging modalities perform on their own samples, and where they will be able to access computational tools for the visualization and analysis of their data.
Rules & Requirements

Credit Restrictions: Students will receive no credit for MCELLBI 205 after completing MCELLBI 205, or MCELLBI 205. A deficient grade in MCELLBI 205 may be removed by taking MCELLBI 205, or MCELLBI 205.

Hours & Format

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

Additional Details

Subject/Course Level: Neuroscience/Graduate

Grading: Letter grade.

Instructors: Betzig, Ji

Formerly known as: Molecular and Cell Biology 205

Also listed as: MCELLBI C205/PHYSICS C218

NEU 273 Applied Statistics for Neuroscience 2 Units

Terms offered: Not yet offered
This intermediate-level statistics class is tailored for PhD students in neuroscience and related fields, emphasizing a collaborative learning approach. Led by a GSI with faculty oversight, students actively engage in discussions, presentations, and exercises. The course focuses on understanding statistical methods' applications, assumptions, and limitations in neuroscience research, as well as their implementation in Python. Covering traditional statistics and data modeling, students learn to analyze data and design experiments effectively. It's a dynamic format that requires students' active participation and commitment to reading and practical exercises.
Rules & Requirements

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

Hours & Format

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

Additional Details

Subject/Course Level: Neuroscience/Graduate

Grading: Offered for satisfactory/unsatisfactory grade only.

NEU 290 Seminars 1 Unit

Terms offered: Fall 2025, Spring 2025, Fall 2024
Course that focuses on topical subjects in specific fields of neuroscience.
Rules & Requirements

Repeat rules: Course may be repeated for credit without restriction. Students may enroll in multiple sections of this course within the same semester.

Hours & Format

Fall and/or spring: 15 weeks - 1 hour of seminar per week

Additional Details

Subject/Course Level: Neuroscience/Graduate

Grading: Letter grade.

Formerly known as: Neuroscience 299

NEU 291A Neuroscience Introduction to Research 4 - 12 Units

Terms offered: Fall 2025, Fall 2024
Closely supervised, intensive laboratory experimental research under the direction of an individual faculty member. For first-year neuroscience graduate students, this course will provide an introduction to experimental methods and research approaches in the different areas of neuroscience. Course sequence includes 3 ten-week laboratory rotations spread out over the fall and spring semesters. Credit and grade to be awarded upon completion of the full sequence.
Rules & Requirements

Prerequisites: Graduate standing in the Neuroscience PhD program or consent of instructor

Hours & Format

Fall and/or spring: 15 weeks - 12-36 hours of laboratory per week

Additional Details

Subject/Course Level: Neuroscience/Graduate

Grading: Letter grade. This is part one of a year long series course. A provisional grade of IP (in progress) will be applied and later replaced with the final grade after completing part two of the series.

Formerly known as: Neuroscience 291A

NEU 291B Neuroscience Introduction to Research 4 - 12 Units

Terms offered: Spring 2025
Closely supervised, intensive laboratory experimental research under the direction of an individual faculty member. For first-year neuroscience graduate students, this course will provide an introduction to experimental methods and research approaches in the different areas of neuroscience. Course sequence includes 3 ten-week laboratory rotations spread out over the fall and spring semesters. Credit and grade to be awarded upon completion of the full sequence.
Rules & Requirements

Prerequisites: Graduate standing in the Neuroscience PhD program or consent of instructor

Hours & Format

Fall and/or spring: 15 weeks - 12-36 hours of laboratory per week

Additional Details

Subject/Course Level: Neuroscience/Graduate

Grading: Letter grade. This is part two of a year long series course. Upon completion, the final grade will be applied to both parts of the series.

Formerly known as: Neuroscience 291B

NEU 292 Neuroscience Graduate Research 3 - 12 Units

Terms offered: Fall 2025, Spring 2025, Fall 2024
For graduate students in neuroscience in their second or later years. 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.
Rules & Requirements

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

Repeat rules: Course may be repeated for credit without restriction. Students may enroll in multiple sections of this course within the same semester.

Hours & Format

Fall and/or spring: 15 weeks - 9-36 hours of laboratory per week

Summer: 10 weeks - 13.5-54 hours of laboratory per week

Additional Details

Subject/Course Level: Neuroscience/Graduate

Grading: Letter grade.

Formerly known as: Neuroscience 292

NEU 294 Neuroscience Graduate Student Presentation Seminar 1 Unit

Terms offered: Spring 2025, Fall 2024
This course provides a holistic approach to graduate neuroscience education, with a focus on three key areas: 1) Improving research presentation skills: Fourth and fifth-year students present seminars on their dissertation research, emphasizing conceptual organization, data presentation, and summarization. 2) Exploring current neuroscience topics: Faculty speakers discuss advanced technical methods, analytical techniques, and preparing grant applications. 3) Seminar readiness: Students engage with seminar speakers during class sessions, reviewing articles authored by upcoming speakers and related publications.
Rules & Requirements

Prerequisites: Graduate standing in the Neuroscience PhD program or consent of instructor

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

Hours & Format

Fall and/or spring: 15 weeks - 1 hour of seminar per week

Additional Details

Subject/Course Level: Neuroscience/Graduate

Grading: Letter grade.

Formerly known as: Neuroscience 294

NEU 295 Neuroscience Research Review 2 Units

Terms offered: Fall 2025, Spring 2025, Fall 2024
For graduate students in neuroscience in their second or later years. Two hours of seminar per week which complements the individual laboratory work under faculty supervision. Seminar will review current scientific literature and discuss original research performed by faculty, postdoctoral fellows, scientists, and graduate students in individual faculty laboratories.
Rules & Requirements

Prerequisites: Graduate standing in the Neuroscience PhD program or consent of instructor

Repeat rules: Course may be repeated for credit without restriction. Students may enroll in multiple sections of this course within the same semester.

Hours & Format

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

Summer:
6 weeks - 5 hours of seminar per week
8 weeks - 3.5 hours of seminar per week
10 weeks - 3 hours of seminar per week

Additional Details

Subject/Course Level: Neuroscience/Graduate

Grading: Offered for satisfactory/unsatisfactory grade only.

Formerly known as: Neuroscience 293

NEU 296 Neuroscience Colloquium 0.0 Units

Terms offered: Prior to 2007
Meetings for the presentation of original work by faculty, visiting lecturers, postdoctoral fellows, and graduate students.
Hours & Format

Fall and/or spring: 15 weeks - 1.5 hours of colloquium per week

Additional Details

Subject/Course Level: Neuroscience/Graduate

Grading: Offered for satisfactory/unsatisfactory grade only.

NEU 375 Pedagogy for NEU Graduate Student Instructors 2 Units

Terms offered: Not yet offered

This course will introduce you to effective teaching methods that you can use in the courses you will be teaching this year. Through readings, discussions and demonstrations, you will learn how to engage and motivate students, facilitate active participation, plan a class period, and write exam or practice problems. Emphasis will be placed on science education literature and proven practical techniques. We will also provide support and solutions for dealing with difficult situations that may come up during your first semester of teaching.

Rules & Requirements

Prerequisites: Appointment as Graduate Student Instructor or consent of instructor

Hours & Format

Fall and/or spring: 10 weeks - 1 hour of seminar per week

Additional Details

Subject/Course Level: Neuroscience/Professional course for teachers or prospective teachers

Grading: Offered for satisfactory/unsatisfactory grade only.