NEUROBIOLOGY

neurobiology.northwestern.edu

The Department of Neurobiology offers a major in neuroscience, the study of the nervous system from the level of individual genes and proteins that control neural activity through mechanisms that govern complex human behavior and cognition. Although traditionally associated with biology and psychology, modern neuroscience is highly interdisciplinary and integrates approaches and ideas from many other areas, including chemistry, physics, mathematics, linguistics, communication sciences, computer science, and engineering. The interdisciplinary nature of neuroscience is reflected in the neuroscience curriculum, which provides

• A deep understanding of the structure and function of nervous systems and the mechanisms by which the brain generates behavior, as well as of the history, major ideas, and research approaches used in neuroscience
• Knowledge and experience in an allied field to develop interdisciplinary skills for diverse careers
• A strong foundation in principles of chemistry, mathematics, physics, and physiology, as well as practical knowledge in computer programming and statistics
• Laboratory coursework or independent laboratory research

Interested students typically complete the chemistry and math courses listed under related courses in their first year. Sophomores should take BIOL_SCI 217-0 Physiology in the fall, followed by the core courses NEUROSCI 202-0 Cellular and Molecular Neuroscience and NEUROSCI 206-0 Systems and Behavioral Neuroscience before taking 300-level NEUROSCI courses. Neuroscience electives and allied field courses should be chosen with a faculty adviser.

Students are strongly encouraged to meet with the director of undergraduate studies to develop a course plan that provides exceptional preparation for graduate study in neuroscience or a related field; for medical school; and for careers in science journalism, patent law, and the pharmaceutical, biotech, and other industries.

Practical research experience is highly encouraged. See the department website for many for-credit research opportunities with affiliated world-class faculty.

Neurobiology faculty members also contribute to the major in biological sciences (https://catalogs.northwestern.edu/undergraduate/arts-sciences/biological-sciences).

Programs of Study

• Neuroscience Major (https://catalogs.northwestern.edu/undergraduate/arts-sciences/neurobiology/neuroscience-major)
• Neuroscience Second Major for ISP Students (https://catalogs.northwestern.edu/undergraduate/arts-sciences/neurobiology/neuroscience-second-major-isp-students)

NEUROSCI 202-0 Cellular and Molecular Neuroscience (1 Unit)
Introduction to principles governing nervous system function at the cellular and molecular level. May not receive credit for both NEUROSCI 202-0 and BIOL_SCI 302-0. Prerequisite: BIOL_SCI 217-0. Natural Sciences Distro Area

NEUROSCI 206-0 Systems and Behavioral Neuroscience (1 Unit)
Introduction to the organization and function of brain systems and their role in generating behavior. May not receive credit for both this course and the former NEUROSCI 306-0/BIOL_SCI 306-0. Prerequisite: NEUROSCI 202-0 or NEUROSCI 311-0 or BIOL_SCI 302-0. Natural Sciences Distro Area

NEUROSCI 303-0 Molecular Mechanisms of Neuropsychopharmacology (1 Unit) Advanced seminar focusing on molecular mechanisms and aberrations of synaptic signal transduction and drugs that target them. Prerequisite: NEUROSCI 202-0 or NEUROSCI 311-0 or BIOL_SCI 302-0.

NEUROSCI 304-0 Developmental Neurobiology (1 Unit) Embryology and cellular/molecular mechanisms of nervous system development. Topics include patterning of the early nervous system, neurogenesis, neuronal differentiation, wiring of neural circuits, activity and experience-dependent development and sex differences in early and late development. May not receive credit for both this course and the former BIOL_SCI 304-0. Prerequisites: BIOL_SCI 215-0; and NEUROSCI 202-0 or NEUROSCI 311-0 or BIOL_SCI 302-0.

NEUROSCI 311-0 Biophysical Analysis of Neurons for ISP (1 Unit) Emphasis on quantitative, electrophysiological studies of the nervous system at the level of single neurons. The course examines in detail the mechanisms that permit nerve cells to generate and propagate electrical signals and to communicate these signals chemically to other cells. Prerequisites: Any biology class; and ISP major or Neuroscience major may request permission.

NEUROSCI 320-0 Animal Behavior (1 Unit) Animal behavior from the neuroscience perspective. Neurobiological bases of foraging, communication, migration, predator-prey interactions, mating, and parental care. Prerequisites: NEUROSCI 202-0 and NEUROSCI 206-0; or NEUROSCI 311-0 and NEUROSCI 206-0; or BIOL_SCI 302-0. Natural Sciences Distro Area

NEUROSCI 324-0 Neurobiology of Biological Clocks and Sleep (1 Unit) General properties of sleep and circadian rhythms; how sleep and the circadian clock regulate a number of diverse activities at the cell, organ, and organism levels. May not receive credit for both this course and the former BIOL_SCI 324-0. Prerequisite: NEUROSCI 202-0 or NEUROSCI 311-0.

NEUROSCI 326-0 Neurobiology of Learning and Memory (1 Unit) Molecular and neural bases of memory. Taught with BIOL_SCI 326-0; may not receive credit for both courses. Prerequisites: NEUROSCI 202-0 and NEUROSCI 206-0; or NEUROSCI 311-0 and NEUROSCI 206-0; or BIOL_SCI 302-0.

NEUROSCI 350-0 Advanced Neurophysiology Laboratory (1 Unit) Learn to record electrophysiological signals (action potentials and post synaptic potentials) from living neural systems using amplifiers and recording equipment commonly found in research labs around the world. Prerequisites: NEUROSCI 202-0 and NEUROSCI 206-0; or NEUROSCI 311-0 and NEUROSCI 206-0; or BIOL_SCI 302-0; and consent of instructor.

NEUROSCI 355-0 Neurogenetics of Behavior Laboratory (1 Unit) Project-based laboratory investigating the genetic basis of behavior in a simple model system; molecular genetic techniques used in neurobiology. Prerequisites: NEUROSCI 202-0 and NEUROSCI 206-0; or NEUROSCI 311-0 and NEUROSCI 206-0; or BIOL_SCI 302-0.
NEUROSCI 360-0  Neuroscience of Brain Disorders (1 Unit)  Survey of brain disorders such as neurodegenerative diseases, developmental disorders, narcolepsy, and migraine. Trace progress from the laboratory to the clinic, evaluate the state of knowledge and understand future directions. Strongly recommend review of basic genetics and molecular biology. Prerequisites: NEUROSCI 202-0 and NEUROSCI 206-0; or NEUROSCI 311-0 and NEUROSCI 206-0; or BIOL_SCI 302-0. Natural Sciences Distro Area

NEUROSCI 377-0  Neurobiology of Sensation and Perception (1 Unit)  Analysis of the key concepts underlying the neurobiological mechanisms of vision, hearing, taste, smell, touch, and pain. Neural pathways leading to perception and processing of stimuli will also be discussed. Prerequisite: NEUROSCI 202-0 or NEUROSCI 311-0 or BIOL_SCI 302-0. Natural Sciences Distro Area

NEUROSCI 390-0  Topics in Neuroscience (1 Unit)  Special Topics in Neuroscience. Topics to be announced. Prerequisites vary. May be repeated for credit with different topic. With approval of the director of undergraduate studies, may be used to fulfill a Neuroscience elective or serve as an Allied Field course. Prerequisites: NEUROSCI 202-0 and other specific prerequisites as set by instructors.

NEUROSCI 398-0  Senior Thesis Seminar (1 Unit)  Instruction in writing a scientific thesis, discussion of student projects, instructor and peer feedback on thesis drafts, and continued independent research. Open to seniors pursuing departmental honors. With the approval of the director of undergraduate studies.

NEUROSCI 399-0  Independent Study in Neuroscience (1 Unit)  Supervised laboratory or methods research with a faculty member. With approval of the director of undergraduate studies.