

NEUROSCIENCE

NSC 130/ PSY 130 Clinical Neuroscience (4 Credits)

Offered as NSC 130 and PSY 130. Introduction to brain-behavior relations in humans and other species. An overview of anatomical, neural, hormonal and neurochemical bases of behavior in both normal and clinical cases. Discussions include the biological basis of sexual behavior, sleep, emotions, depression, schizophrenia, autism, ADHD and neurological disorders. The course focuses on clinical cases in human neuroscience. Open to entering students. Enrollment limited to 60. {N}{S}
Fall, Spring

NSC 210 Fundamentals of Neuroscience (4 Credits)

The course provides an introduction to the organization and function of the mammalian nervous system along with an exploration of the brain using multiple levels of analysis ranging from molecular to cognitive and behavioral approaches. The course develops an appreciation of how brain cells interact to orchestrate responses and experiences. Emphasis is placed on the cellular and molecular physiology of the nervous system with a focus on retinal phototransduction and mechanisms governing memory. The material is presented at a level accessible for life science majors. Prerequisites: BIO 132 (may be concurrent) or AP BIO. Enrollment limited to 30. {N}

Fall, Spring, Variable

NSC 230 Experimental Methods in Neuroscience (4 Credits)

A laboratory course exploring anatomical research methods, neurochemical techniques, behavioral testing, design of experiments and data analysis. Prerequisites: CHM 111 or CHM 118; and NSC 130/ PSY 130 or NSC 210 (may be concurrent), or equivalent. Restrictions: Not open to seniors. Enrollment limited to 16. {N}

Fall, Spring

NSC 308/ BIO 308 Cellular and Molecular Neuroscience (4 Credits)

Offered as BIO 308 and NSC 308. Formerly BIO 310. Molecular level structure-function relationships in the nervous system. Topics include development of neurons and glia, neuron-specific gene expression, molecular biology of neurological disorders and the mechanisms of nervous system plasticity and repair. Prerequisites: BIO 200 and NSC 210 or equivalent. Enrollment limited to 20. {N}

Fall, Spring, Variable

NSC 310 Human Neuroscience (4 Credits)

This course covers contemporary methods and questions in human neuroscience across the lifespan. This course deeply examines several areas of human neuroscience rather than a broad overview of the field. Students focus on the following domains of study: memory, neural plasticity, decision-making and social cognition. The course examines human neuroscience methods and research to understand domain in 1) healthy young adults 2) across development and 3) in aging, disease and brain damage. The course is designed around class discussion and critical analysis of research findings. Prerequisite: NSC 210 and one statistics course from any department. Enrollment limited to 20. {N}

Fall, Spring, Annually

NSC 312ad Seminar: Topics in Neuroscience- Adversity (4 Credits)

This course covers the current understanding of the impact of early life adversity on the brain and how this can lead to differences in cognitive and mental health outcomes. The course deeply examines different dimensions of early life adversity. Students focus mainly on studies in humans, but look to the animal literature for grounding in mechanisms. Students examine current theoretical models of how adversity impacts the brain, the latest literature testing these models, how these differences in brain development may impact children in the long term and factors that may provide resilience for those experiencing adversity. Prerequisite: NSC 210. Restrictions: Juniors and seniors only; NSC 312 may be repeated once with a different topic. Enrollment limited to 12. Instructor permission required. {N}

Fall, Spring, Variable

NSC 312al Seminar: Topics in Neuroscience-Alzheimer's Disease (4 Credits)

This seminar focuses on Alzheimer's Disease research from multiple vantages. The course begins with the human experience, how this neurodegenerative disease impacts individuals, their families and society. Then the class studies clinical symptoms and neuropathology. Students select topics within cellular and molecular topics for their final research paper. Prerequisites: NSC 210 and a 200-level Biology course. Restrictions: Juniors and seniors only; NSC 312 may be repeated once with a different topic. Enrollment limited to 12. Instructor permission required. {N}

Fall, Spring, Variable

NSC 312cb Seminar: Topics in Neuroscience-Communication and the Brain (4 Credits)

Communication is an indispensable feature of everyday lives. To communicate, the brain must generate, receive, and interpret signals like speech and facial expressions. This seminar examines how this occurs, with a focus on visual and auditory mediums. Students examine early and current scientific literature to understand the neural mechanisms of communication from a variety of angles, from gene expression and cellular physiology to brain regions and brain-wide activity. Additionally, students examine what is currently known about the neural mechanisms behind communication disorders in humans. The course also examines animal systems that have developed methods of communication very different from humans. Prerequisite: NSC 210. Restrictions: Juniors and seniors only; NSC 312 may be repeated once with a different topic. Enrollment limited to 12. Instructor permission required. {N}

Fall, Spring, Variable

NSC 312nd Seminar: Topics in Neuroscience-Cellular and Molecular Mechanisms of Neurodegenerative Diseases (4 Credits)

The course examines the cellular and molecular mechanisms behind neurodegenerative diseases and describes the basic anatomy and physiology of the brain and nerves. Students dive into the roles that cell quality control plays in neuronal health by exploring the function of the proteasome, lysosome and autophagy in neurodegeneration. Additionally, the course looks at how inflammation can perpetuate and maintain the chronic state seen in neurodegeneration by examining the roles that microglia and astrocytes play in brain health. Students gain experience in the areas of literature search, scientific format and preparation of an oral presentation. Prerequisite: NSC 210. Restrictions: Juniors and seniors only; NSC 312 may be repeated once with a different topic. Enrollment limited to 12. Instructor permission required. {N}

Fall, Spring, Variable

NSC 312oe Seminar: Topics in Neuroscience-Brains Beyond the Classroom-Neuroscience Outreach and Engagement (4 Credits)

This course trains students to design and deliver neuroscience outreach activities for public audiences, with a focus on youth engagement. Students gain foundational neuroscience knowledge and apply it through the creation of interactive, age-appropriate workshops. Emphasis is placed on science communication, inclusive educational design, and ethical public engagement. Through team-based projects, guest speakers, and mentorship, students develop leadership, collaboration, and communication skills. The course culminates in a community outreach event, where students present their activities to middle school participants, serving as STEM role models and ambassadors. Prerequisite: NSC 210. Restrictions: Juniors and seniors only; NSC 312 may be repeated once with a different topic. Enrollment limited to 12. Instructor permission required. {N}

Fall, Spring, Variable

NSC 314 Neuroendocrinology (4 Credits)

This course investigates how the brain regulates the production and release of hormones, as well as how hormones act on the brain to affect behaviors such as aggression, affiliation, parenting, sexual behavior, feeding and learning. Prerequisites: NSC 210 and one of BIO 200, BIO 202 or BIO 230, or equivalent. Enrollment limited to 20. {N}

Fall, Spring, Variable

NSC 318 Systems Neurobiology (4 Credits)

Systems neurobiology is the study of how networks of neurons function and how these networks mediate sensation, movement and higher-order functions such as language. The development of new technologies to image the brain, measure and manipulate neural activity, and understand whole-brain patterns of gene expression means our knowledge of systems neurobiology is growing rapidly. Thus, the major goal of this class is to teach what types of questions to ask and what approaches to use to find their answers. Course material focuses primarily on the neuroanatomy, functional organization and evolution of the vertebrate brain. Students demonstrate their mastery of course material through group work, discussions of the primary literature and short writing projects. Prerequisites: NSC 210 and BIO 200 or BIO 202 or equivalent. Enrollment limited to 20. {N}

Spring, Alternate Years

NSC 320 Sex and the Brain (4 Credits)

In this course students journey into how sex (and where relevant, gender) can and should be considered as a variable in biomedical research, with a focus on brain function and health. The course covers how and why the sex of research subjects has historically been overlooked and how males have been considered the "default" model systems for whole species and beyond. The class discusses the dimensionality of sex as a variable, learning about sex-related factors (such as chromosomes and hormones) that impact humans dynamically. The class explores research demonstrating within-sex variability, cross-sex similarities and sex-related differences in brain structure, function and health in various species, while critically evaluating this work through the lenses of rigor, ethics and equity. Prerequisite: NSC 210. Enrollment limited to 25. (E) {N}

Fall, Spring, Annually

NSC 324 Research in Behavioral Neuroscience (3 Credits)

This course consists of laboratory investigations of neuroscience research questions linking brain and behavior. Each semester, students may take on different questions in behavioral neuroscience. Students spend the first portion of the semester learning techniques, discussing relevant articles and developing research proposals. This lays the foundation for open-ended research in the second part of the semester. Prerequisites: NSC 230 or PSY 202. Enrollment limited to 12. Instructor permission required. {N}

Fall, Spring, Alternate Years

NSC 325 Research Methods in Cellular Signaling (3 Credits)

This is an interactive lab class giving students hands-on experience working with techniques used in the study of cellular neuroscience. Techniques include: sterile cell culture, transfection (overexpression and siRNA), immunocytochemistry, cellular signaling assays and a variety of cellular functional assays. Major physiological mechanisms that underlie cellular signaling mechanisms are explored through the discussion of recent scientific literature with an emphasis on innovative techniques and strategies which allow researchers to test hypotheses and advance new concepts. Cannot be taken S/U. Prerequisite: NSC 230. Restrictions: Juniors and seniors only. Enrollment limited to 6. Instructor permission required. {N}

Fall, Spring, Alternate Years

NSC 334sb Topics: Research in Computational Neuroscience-Spiking and Behavior Analysis (3 Credits)

Animals perform a wide variety of behaviors, which are supported by patterns of neuronal firing, or spiking. This computational lab explores some of these behaviors and how neuronal firing supports this behavior at the individual and population level using available datasets. Students dive deep into primary literature to understand the theoretical basis for behavior, learn to measure some aspects of behavior, and gain experience in using specialized programming to apply to video and spiking data sets. The semester culminates with individual research projects utilizing publicly available data to apply the readings and experience from the lab to topics of student interest. Prerequisite: SDS 201 or SDS 220, and one neuroscience course. Enrollment limited to 12. (E) {N}

Fall, Variable

NSC 335 Research in Human Neuroscience (3 Credits)

In this class students learn two approaches for conducting neuroscience experiments in human subjects. Students first learn about ethical considerations for working in human subjects. Students then learn to collect and analyze neural data from human subjects performing behavioral tasks using functional near-infrared spectroscopy. In the second portion of the class students learn tools for processing and analyzing publicly available fMRI data. This class provides two opportunities to complete projects utilizing the tools learned to answer questions of student interest. Prerequisites: NSC 230 and (SDS 201 or SDS 220). Enrollment limited to 12. {N}

Fall, Spring, Variable

NSC 400 Special Studies (1-4 Credits)

A scholarly project completed under the supervision of any member of the program. S/U only. Instructor permission required.

Fall, Spring

NSC 430 Honors Project (4 Credits)

One semester honors thesis completion. This normally follows a prior semester special studies in NSC or a related discipline. Department permission required.

Fall, Spring

NSC 430D Honors Project (4 Credits)

This is a full-year course. Department permission required.

Fall, Spring