

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. {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. {N}

Spring

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 PSY 130 or NSC 125 or NSC 210 (may be concurrent), or equivalent. Not open to seniors. Enrollment limited to 16. {N}

Fall, Spring

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/or 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. Enrollment limited to 12. Juniors and seniors only. 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. Students are limited to a total of two topics of NSC 312. Prerequisite: NSC 210. Enrollment limited to 12. Juniors and seniors only. Instructor permission required. {N}

Fall, Spring, Variable

NSC 312pp Seminar: Topics in Neuroscience-Pleasure and Pain: Pathways to the Brain (4 Credits)

The skin is the largest organ in the body and touch can evoke a wide range of physiological and emotional reactions. Processing of touch information requires circuits of neurons that differ in gene expression patterns, physiological response properties and downstream target areas in the brain. This course explores 1) how various types of skin stimulation activates different sensory circuits, 2) which brain areas process these stimuli and initiate behavioral responses, and 3) behavioral assays to quantify responses to painful and pleasurable stimuli in animal models. Course objectives are met through readings of research articles, in-class presentations, quizzes and an independent literature review. Prerequisite: NSC 210. Enrollment limited to 12. Juniors and seniors only. Instructor permission required. {N}

Fall, Spring, Variable

NSC 312st Seminar: Topics in Neuroscience-Stroke (4 Credits)

This course explores the pathological mechanisms and social determinants of stroke. Prerequisites: NSC 210 and NSC 230. Enrollment limited to 12. Juniors and seniors only. 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. Concurrent enrollment in NSC 324 is recommended when both courses are offered. Prerequisites: NSC 210 and one of BIO 200, 202 or 230, or permission of the instructor. Enrollment limited to 20. {N}

Spring

NSC 316 Seminar: Neuroscience in the Public Eye-The Patient Perspective (4 Credits)

As people privileged to gain a higher education in STEM, we have an important responsibility to help others to understand complex scientific and clinical information. Consider how overwhelming it is to receive a clinical diagnosis. As potential healthcare providers, you will spend the semester diving deep into a clinical neuroscience topic to try to gain an understanding of the complexities for a patient navigating all aspects of this clinical journey. You will prepare an accessible website on your topic that can be used as a resource for patients and their families.

In this interdisciplinary course, material will range from the molecular and cellular neurological origins to discussing pros and cons of various treatment strategies. To further hone your STEM communication skills, you will meet weekly with a mentee in the first-year seminar course to support their learning of these complex neuroscience topics and STEM communication. Enrollment limited to 12. Juniors and seniors only.

Instructor permission required. {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/ PSY 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. In each semester, students may take on different questions in behavioral neuroscience from the effects of endocrine disruptors on behavioral development to the role of oxytocin in social behaviors. 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. Concurrent or prior enrollment in Neuroendocrinology, Systems Neuroscience or Neurobiology of Reproduction is highly recommended. Prerequisites: NSC 230 or PSY 202, and BIO 132 or a biopsychology course. Enrollment limited to 12. {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. Prerequisite: NSC 230. Cannot be taken S/U. Enrollment limited to 6. Juniors and seniors only. Instructor permission required. (E) {N}

Fall, Spring, Alternate Years

NSC 327 Seminar: Race and Gender in Neurological Disorders (4 Credits)

In this seminar, students study major neurological disorders with an eye towards understanding the symptoms, the basic neuropathology, the most common treatments and prognosis. The class also studies how race and ethnicity impact understanding of disease, the practice of medicine and scientific knowledge. The class covers several ways sex and gender can intersect with prevalence, neurobiology and diagnosis and treatment of these disorders. Enrollment limited to 12. Juniors and seniors only. Instructor permission required. {N}

Fall, Spring, Variable

NSC 328 Research in Systems Neurobiology (3 Credits)

Understanding how organisms sense the external world, how they move around in their environment, and why they exhibit complex behaviors requires studying the nervous system function at many levels of biological organization—from genes to whole animals, and everything in between. In this course, you will be engaged in the process of doing real research, including designing experiments, learning lab techniques, collecting and analyzing data, and presenting results in multiple formats. Students will begin the semester reading and discussing relevant literature on a topic of current research and developing skills in experimental design. The second part of the semester will focus on carrying out an open-ended research project. Prerequisites: BIO 132 or equivalent and NSC 230. Enrollment limited to 12. {N}

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. In this computational lab we will explore some of these behaviors, and how neuronal firing supports this behavior at the individual and population level using available datasets. Students will dive deep into primary literature to understand the theoretical basis for behavior, will learn to measure some aspects of behavior, and will gain experience in using specialized programming to apply to video and spiking data sets. The semester will culminate 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 a neuroscience course. (E) {N}

Fall, Spring, 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, Annually

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 will normally follow a prior semester special studies in NSC or a related discipline.

Fall, Spring, Variable

NSC 430D Honors Project (4 Credits)

This is a full-year course.

Fall, Spring

NSC 432D Honors Project (6 Credits)

This is a full-year course.

Fall, Spring