

# NEUROSCIENCE (NS)

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## NS 101 - Neuroscience: Mind and Behavior

Credits: 4

An interdisciplinary examination of the neurobiological bases of behavior and mental processing. Topics include the structure and functioning of the nervous system, brain-behavior relationships, and hormonal and genetic effects on behavior and mental processing. Laboratories develop students' understanding of functional neuroanatomy, neural transmission, and human psychophysiology.

**Note(s):** Fulfills Natural Sciences requirement; fulfills Scientific Inquiry requirement.

## NS 201 - Cellular and Molecular Neuroscience

Credits: 4

An examination of complex cellular and molecular mechanisms underlying all neural processes. Students will learn the fundamentals of neuronal cell and molecular signaling, and apply that knowledge to expand their understanding of higher order processes including plasticity, neuroregeneration, and neural development. In the laboratory students will learn to culture cells, detect cellular proteins through western blotting and immunocytochemistry, and design and implement an independent research plan.

**Prerequisites:** NS 101 and BI 106 or BI 107.

## NS 202 - Neurophysiology

Credits: 4

An intermediate-level examination of the nervous system from a biological perspective. "Neurophysiology" simply means the study of the function of neurons. Lectures will focus on the specialized electrical and chemical signaling that occurs within and between cells in the brain and explore the ways that those signals allow animals to perform behaviors ranging from the most simple (reflexes and rhythmic movements) to the most complex (learning to recognize an environment). Material will span the physics of electricity, genetics, biochemistry, animal and human behavior, and diseases of the nervous system. The lab focuses on neurophysiological approaches to studying the nervous system in invertebrate organisms such as fruit flies and crayfish.

**Prerequisites:** BI 107 and NS 101.

## NS 212 - Topics in Neuroscience

Credits: 3,4

An opportunity to study topics in neuroscience that are not offered on a regular basis. The specific topics will vary each time the course is taught.

**Prerequisites:** NS 101.

**Note(s):** This course may be repeated for credit with focus on a different theme. When this course includes a lab, it will be listed for 4 credits.

## NS 275 - Introduction to Neuroscience Research

Credits: 1

An introductory exploration of conducting research in neuroscience. The purpose of this learning experience is to provide students with an interactive research experience in the laboratory or field, in coordination with a faculty member. Students may be exposed to, and participate in, several aspects of the research process, including planning, designing, and implementing the research, as well as in data analysis and interpretation of the results. This experience will allow students at various stages of their careers to sample research questions/methodologies in particular subdisciplines of neuroscience, and will enhance the student's ability for more independent work.

**Prerequisites:** NS 101 and permission of instructor.

**Note(s):** This course can be repeated for credit up to 5 credits. Must be taken S/U.

## NS 277 - Integrative Seminar in Neuroscience Research

Credits: 1

A study of selected areas of neuroscience research and techniques. Both primary source articles and first-person accounts by faculty in the biology and psychology departments are used to introduce the theoretical and practical aspects of neuroscience research. Emphasis will be placed on understanding the multiple levels (e.g., molecular to behavioral) at which research topics in neuroscience can be addressed and also the ways in which research techniques define the types of questions that can be asked at a given level of analysis.

**Prerequisites:** This course should be taken upon completion of NS 101 and the completion of or current enrollment in at least one other core or elective course from the list of courses in the neuroscience major.

**Note(s):** Must be taken S/U.

## NS 304 - From Molecules to Memory

Credits: 3

An exploration of the current state of knowledge about the neurobiological basis of learning and memory. Through a combination of lectures and discussions of primary literature, students will explore the molecular and cellular basis of learning in invertebrates and vertebrates from a neural perspective.

**Prerequisites:** NS 101 and NS 201 or NS 202 and PS 202 or BI 235.

## NS 305 - Sleep: A Neurobiological Perspective

Credits: 3

An examination of the neurobiology of sleep, an evolutionarily conserved behavioral state in which we spend almost a third of our lives and yet about which we know sparingly little. Specifically, students will study the characteristics of sleep, mechanisms of sleep regulation, disorders that influence sleep, and the many possible functions of sleep. Subject matter will span molecular biology, genetics, animal and human behavior, and medicine.

**Prerequisites:** NS 101 and NS 201 or NS 202 and PS 202 or BI 235.

## NS 312 - Advanced Topics in Neuroscience

Credits: 3,4

A critical examination of fundamental areas of controversy in current theories, research findings, and applications of neuroscience with a psychological focus. Topics might include sensory processing, neurodegeneration, neuropharmacology, brain imaging, and brain plasticity.

**Prerequisites:** NS 101 and PS 202.

## NS 314 - Mapping the Cerebellum: Structure, Connectivity & Bioinformatics

Credits: 3

Advanced study of the cerebellum at the behavioral, cellular, molecular and genetic levels. Students will map the cerebellum through anatomy and histology, investigate cerebellar behavior in humans and mice, analyze the cellular and molecular pathways that underlie cerebellar learning, examine the effects of cerebellar disease and examine the genetic networks of cerebellar neurons via bioinformatics.

**Prerequisites:** NS 201 or BI 247.

**NS 315 - Mechanisms of Alzheimer's Disease**

Credits: 3

In this course, through readings, discussions, and experimental proposal work, we will discuss the past, present and future of Alzheimer's disease (AD) research. Over half of the American population has been touched by AD either through a friend/family member/coworker, or due to having the disease themselves. The prevalence of AD has increased rapidly in all parts of the world, due to increased diagnoses and longer lifespans. The last four decades of cell and molecular research in the AD field have yielded a wealth of information on disease pathology and progression, genetic involvement, environmental contributors, and biochemical changes. However, safe yet potent therapies remain elusive.

**Prerequisites:** NS 201.**NS 316 - Neurobiology of Disease**

Credits: 3

Exploration of multiple brain diseases and common modes of pathogenesis. Classes will include instructor-driven lecture, class discussions and student-led discussion and presentations. Students will help select the diseases and underlying mechanisms studied in the course. Additionally, students will have the opportunity to explore research on a disease of their choice in detail through the eyes of a renowned scientist in the field.

**Prerequisites:** NS 201 or NS 202**NS 371 - Research Experience in Neuroscience**

Credits: 1-3

Directed study providing students with the opportunity for an intensive research experience in a particular laboratory or field setting. The emphasis is on the further development of students' research skills within a particular area of neuroscience inquiry. Each student will work with an individual faculty member on various aspects of the research process, including the design and implementation of a research project, data analyses and interpretation, and scientific writing.

**Prerequisites:** NS 101 and permission of instructor.**Note(s):** May be repeated for credit. Must be taken S/U.**NS 375H - Senior Research Project I**

Credits: 4

The first semester of a yearlong research project or thesis to be followed by NS 376 in the following semester. Students will work with an individual faculty member to develop a major research project, including conceptualization of a topic, review of the scientific literature, learning of any necessary research techniques, execution of any preliminary research, and submission of a research proposal to the faculty supervisor.

**Prerequisites:** Previous research experience (e.g., NS 275, NS 371, PS 275, PS 371, BI 275, BI 371 A-C, summer research, etc.) and permission of instructor.**NS 376 - Senior Research Project II**

Credits: 4

The second semester of a yearlong research project (thesis). The student will work with an individual faculty member to complete a major research project, and be required to submit a final project.

**Prerequisites:** NS 375H.**NS 377 - Senior Coda in Neuroscience**

Credits: 1

Provides students with an opportunity to reflect on their liberal arts education and to prepare them for their future careers. The seminar will meet weekly and will consist of networking with alumni, professional development, post-graduation planning and a reflection of their college experience. The course will also allow neuroscience students to engage with and learn from each other. Must be taken in the senior year.

**Prerequisites:** NS 201 or NS 202.**Note(s):** Fulfills Senior Coda requirement.