

NEUROSCIENCE (NEU)

NEU 120 | THE BRAIN THROUGH SCIENCE FICTION | 4 quarter hours (Undergraduate)

This is a "Science as a Way of Knowing" (SWK) course that examines applications of neuroscience, the study of the brain and the nervous system, through describing some well-known works of science fiction, from the early 1800s (Frankenstein) to modern times (Inception).

NEU 121 | YOUR CHANGING BRAIN: THE SCIENCE AND APPLICATION OF NEURAL PLASTICITY | 4 quarter hours (Undergraduate)

The human brain is an incredible organ that has the ability to change throughout life and adapt to its environment. In doing so, it allows us as humans to alter our behaviors and thoughts as well as adjust to neurological disease and injury. This course will examine this amazing ability of our nervous system, called neural plasticity. It will examine how cells in the nervous system change in a structural and molecular way, how this results in circuit and functional changes in the anatomy of the brain, and its resulting effect on behavior. We will also examine how the external environment and behaviors can induce neuroplasticity and the history of neuroplasticity research. This will all be done in a way that is accessible to non-science majors and introduces them to science as a way of knowing and learning.

NEU 201 | INTRODUCTION TO NEUROSCIENCE | 4 quarter hours (Undergraduate)

This class will introduce the structure and function of the nervous system as well as approaches to study and model it. Anatomical, cellular, and molecular foundations will be covered and these will be related to behavior and cognition. Computational approaches will also be presented. A historical review will place neuroscience within its contemporary context and current approaches will be presented, discussed, and critiqued. Cannot receive credit for both NEU 201 and PSY 377.

A grade of C- or better in BIO 191 or instructor consent is a prerequisite for this course.

NEU 202 | ADVANCED NEUROSCIENCE FUNDAMENTALS | 4 quarter hours (Undergraduate)

This advanced fundamentals course is designed for students who have a strong foundation in the basic principles of neuroscience and are interested in deepening their understanding of the field. The course will cover advanced topics such as neural development, aging, and diseases of the nervous system, homeostasis, and brain/body connections. Students will engage in literature research, experimental design, and novel analysis of data sets as well as exploration of careers in science.

NEU 201 or PSY 377 with C- or better or permission of the instructor are prerequisites for this class.

NEU 228 | NEUROETHICS | 4 quarter hours (Undergraduate)

This course examines moral standards and issues as these arise in the practice of neuroscience. Advances in this field have developed unprecedented ways of understanding, predicting, and even, influencing and controlling the human mind and, through this, human behavior. Neuroethics considers the ethical dilemmas that emerge in such research and the technologies that it fosters as well as the challenges these advances pose to some of the fundamental underlying concepts of moral theory: human nature, personal identity, and moral responsibility itself. Cross listed as PHL 228.

NEU 256 | INTRODUCTION TO COMPUTATIONAL NEUROSCIENCE | 4 quarter hours (Undergraduate)

Provides an introduction to basic computational methods for understanding what nervous systems do and how they function. The course covers the structure of the brain, from neurons to circuits to regions, and also the computational and theoretical approaches to model the brain. The course will introduce students to the physiology of individual neurons, how they communicate through synapses and firing, and how they work together to create systems that control, learn and memorize. The course will include the application of mathematical and computational models to neural systems.

CSC 241 and NEU 201 (or consent of instructor) are prerequisites for this class.

NEU 280 | RESEARCH METHODS IN NEUROSCIENCE | 4 quarter hours (Undergraduate)

This course is designed to provide students an understanding of how questions are answered in neuroscience by exploring experimental designs used in neuroscience research and individual techniques used by neuroscientists. In addition to reading about these methods, students will have hands on opportunities to conduct some of the methods discussed, as well as conduct a novel research experiment using a Course-based Undergraduate Research Experience (CURE) approach. Students will also learn how to communicate about neuroscience research.

NEU 201 or PSY 377 or BIO 339 or NEU 339 or BIO 340 or instructor consent is a prerequisite for this class.

NEU 310 | SEMINAR IN NEUROPSYCHOPHARMACOLOGY | 4 quarter hours (Undergraduate)

In this discussion-based course we cover how substances from the outside world affect the brain and behavior by reviewing primary research literature. Drugs such as levodopa can be greatly beneficial in the clinic, while other substances like cocaine can lead to addiction and drug abuse. The course will focus on drug action at a molecular and cellular level, as well as drug effects on a behavioral and psychological scale.

NEU 201 or PSY 377 with C- or better or permission of the instructor are prerequisites for this class.

NEU 330 | CELLULAR BASIS OF LEARNING AND MEMORY | 4 quarter hours (Undergraduate)

This course explores the cellular and molecular mechanisms underlying memory formation and storage, with a focus on synaptic plasticity processes such as long-term potentiation (LTP) and long-term depression (LTD). Students will critically analyze recent primary literature to evaluate how changes in synaptic strength contribute to the engram theory of memory. Discussions will also address key controversies in the field, including whether engrams are encoded at the level of neuronal circuits or individual synapses.

NEU 339 | CELLULAR NEUROBIOLOGY | 4 quarter hours (Undergraduate)

This course examines the cellular and molecular mechanisms of neuronal function and the changes that occur in processes such as learning and memory. Emphasis on electrophysiology, synaptic communication, and cellular signaling. Cross-listed as BIO339/439.

BIO 250 (or NEU 201 or PSY 377 or HLTH 301) is a prerequisite for this class.

**NEU 350 | SENSORY NEUROSCIENCE | 4 quarter hours
(Undergraduate)**

This Lecture/lab course explores how the nervous system is involved in the processing of our five senses and our responses to them. The course will explore the gross anatomical organization of the neural pathways involved in sensation and perception as well as how the energy in our environment is detected by the nervous system and turned into neural signals within these sensory pathways. The emphasis is on understanding how individual sensory behaviors are produced by different neural systems and how these individual behaviors integrate into the activities of whole organisms. Cannot receive credit for both NEU 350 and BIO 340.

NEU 201 or PSY 377 or BIO 339 or NEU 339 or instructor consent is a prerequisite for this class. Cannot receive credit for both NEU 350 and BIO 340.

**NEU 351 | NEUROSCIENCE OF MOVEMENT | 4 quarter hours
(Undergraduate)**

This Lecture/lab course explores how the nervous system is involved in the creation of movement. The course will explore the gross anatomical organization of the neural pathways involved in movement, how the different categories and components of movement from reflexes to skilled movements are produced by different neural systems, and how movement is integrated into the activities of whole organisms. Cannot receive credit for both NEU 351 and BIO 340.

NEU 201 or PSY 377 or BIO 339 or NEU 339 or instructor consent is a prerequisite for this class. Cannot receive credit for both NEU 351 and BIO 340.

**NEU 360 | CONVERSATIONS WITH NEUROSCIENTISTS | 4 quarter hours
(Undergraduate)**

Conversations with Neuroscientists is a seminar style course where students have an opportunity to read scientific articles covering a variety of topics in neuroscience and discuss them with the author themselves. The course also examines career trajectories of the Neuroscientists who participate in the class to provide students an understanding of career options in the field.

NEU 201 or PSY 377 or BIO 339 or NEU 339 or BIO 340 or instructor consent AND junior standing are prerequisites for this class.

**NEU 380 | SPECIAL TOPIC IN NEUROSCIENCE | 4 quarter hours
(Undergraduate)**

A lecture and discussion based course focused on a particular topic in neuroscience. Topics may vary depending on the expertise of the instructor.

NEU 201 OR PSY 377 and Junior Standing are prerequisites for this class.

**NEU 390 | NEUROSCIENCE CAPSTONE | 4 quarter hours
(Undergraduate)**

This is a liberal studies course for seniors concluding their neuroscience major. The course will examine one topic in neuroscience from multiple viewpoints in the field of neuroscience as well as relate it to fields outside of science such as history, philosophy, religion, sociology, etc.

NEU 280 (or consent of instructor), Senior standing and major in Neuroscience are prerequisites for this class.

**NEU 397 | RESEARCH EXPERIENCE IN NEUROSCIENCE | 2-4 quarter hours
(Undergraduate)**

In this course, a student works with a faculty mentor on a research project. Under faculty supervision, the student will perform research, analyze data, and review scientific literature while working to answer a scientific question. Writing requirements include a reflection on how the research experience informed their ideas of post-graduate goals as well as a summary write up of results and conclusions. Faculty consent and a research contract is required to register for this course.

**NEU 399 | INDEPENDENT STUDY IN NEUROSCIENCE | 2-4.5 quarter hours
(Undergraduate)**

Experimental and/or library independent study of a topic in neuroscience. Can be repeated if the content of the independent study changes.