

# NEUROSCIENCE

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neuroscience.as.miami.edu

Dept. Code (NEUR)

## Introduction

Neuroscience is the study of the nervous system (i.e., the brain, spinal cord, and peripheral nerves), the mechanisms of behavior, and the nature of mind and consciousness. The Neuroscience Program is a rigorous, interdisciplinary program between the Department of Psychology (<http://www.psy.miami.edu/>), the Department of Biology, and the Miller School of Medicine. The neuroscience major provides a broad-based liberal arts background that can be applied to a variety of career fields. It is also excellent preparation for medical school or graduate study in neuroscience, psychology, biology or behavioral medicine.

## Educational Objectives

The neuroscience major seeks to provide students with exposure to and a fundamental understanding of the neural and bio behavioral sciences by delivering an integrative educational experience and promoting interactions among faculty, graduate students, and undergraduate students in basic scientific inquiry, advising, and mentoring.

## Degree Programs

All neuroscience majors are required to pursue a Bachelor of Science (B.S.) degree.

## Departmental Honors

Students can earn Departmental Honors in Neuroscience by demonstrating excellence in their coursework and completing a Senior Honors Thesis in Neuroscience.

1. **Excellence in Coursework** – A minimum 3.3 combined GPA and a minimum 3.5 neuroscience GPA is required.
2. **Senior Honors Thesis in Neuroscience** – This is an independent empirical research project that is completed across two semesters (i.e., NEU 580 and NEU 581) under the supervision of a faculty mentor in the Neuroscience Program. At least one year of prior research experience with the faculty mentor is highly recommended. Written approval from the faculty mentor and the Director of Undergraduate Academic Services in the Department of Psychology is also required.

### NEU 106. Freshman Advising Contact Term (Fact). 1 Credit Hour.

Educates students about the structure and function of a research university, introduces them to the academic rules and regulations of the University of Miami and the Department of Psychology, enables them to think critically about their own graduation plan, and prepares them to enter the professional world.

**Components:** LEC.

**Grading:** GRD.

**Typically Offered:** Fall.

### NEU 110. Introduction to Neuroscience (EXP). 3 Credit Hours.

Students examine the basic aspects of neuroscience research, specifically targeting neurological disorders. Tools and techniques used in the area of neuroscience such as biochemistry, molecular biology, electrophysiology, light and electron microscopy, confocal microscopy, and image analysis will be addressed. Discussions will also include topics in lab diagnostic techniques as well as state of the art instrumentation. This course does not count for the BS in Neuroscience for credit. Restricted to Summer Scholars Program Students only.

Requisite: Summer Scholars/ UM Academy only.

**Components:** LEC.

**Grading:** GRD.

**Typically Offered:** Summer.

### NEU 190. Faculty Overview of Research and Undergraduate Mentoring (FORUM). 1 Credit Hour.

Critical discussion of research reports in neuroscience.

**Components:** LEC.

**Grading:** GRD.

**Typically Offered:** Spring.

**NEU 210. Introduction to Psychiatry (EXP). 3 Credit Hours.**

The course will cover basic aspects of Psychiatry and behavioral sciences. We will emphasize the impact of evidence-based findings on the diagnosis, etiology, management and treatment of all major psychiatric disorders. Concepts such as history of psychiatry, evolution of the psychiatric nomenclature, childhood and adult development, brain circuitry, neurotransmitters, psychotherapies and pharmacological mechanisms of most commonly used medications will be discussed. We will utilize lectures, small group discussions as well as videos and live patient interviews. Students will be able to observe a patient interview by a faculty. This course does not count for the BS in Neuroscience for credit. Restricted to Summer Scholars Program Students only.

Requisite: Summer Scholars/ UM Academy only.

**Components:** LEC.

**Grading:** GRD.

**Typically Offered:** Summer.

**NEU 280. Introduction to Research Projects I. 1-3 Credit Hours.**

Students assist on a research project in neuroscience under supervision of a faculty member. Activities include library research, data collection and management, and attendance at research team meetings.

**Components:** LEC.

**Grading:** GRD.

**Typically Offered:** Fall, Spring, & Summer.

**NEU 342. Neural Mechanisms of Disease. 3 Credit Hours.**

Cellular and molecular mechanisms underlying nervous system dysfunction and mental illness. Biological bases, including clinical and therapeutic aspects, of specific neurological disorders.

Prerequisite: BIL 268 or PSY 220 or PSY 425.

**Components:** LEC.

**Grading:** GRD.

**Typically Offered:** Fall & Spring.

**NEU 380. Introduction to Research Projects II. 1-3 Credit Hours.**

Students assist on a research project in neuroscience under supervision of a faculty member. Activities include library research, data collection and management, and attendance at research team meetings.

Prerequisite: PSY 291 or PSY 292. Requisite: UASP and Faculty Permission, 2.5 NEU GPA.

**Components:** LEC.

**Grading:** GRD.

**Typically Offered:** Fall, Spring, & Summer.

**NEU 403. Neuroscience laboratory. 4 Credit Hours.**

Research methods and laboratory experiments in contemporary neuroscience from individual cells to behavior. Scientific report writing and computer applications in experimental design and analysis.

Prerequisite: PSY 390 And BIL 268 Or PSY 425 And Requisite: Reserved for NEU Majors (NEUR\_BS) and NEU Seniors (>100 Credits).

**Components:** LAB.

**Grading:** GRD.

**Typically Offered:** Fall & Spring.

**NEU 420. Neurogenetics. 3 Credit Hours.**

This course examines the role of genetics/epigenetics in the development of neurological diseases in humans. The availability of the complete human genome sequence and a compendium of genetic variants distributed throughout the human genome in a readily accessible database, together with genetic modification technologies have greatly accelerated the discovery of genes involved in disease. We will discuss how genetic or epigenetic variations can affect the nervous system, leading to a range of genetic disorders. Examples from single-gene recessive defects to complex diseases will be presented. Methods to identify genes involved in disease as well as pathogenesis studies and therapeutic approaches will also be discussed. Lastly, an introduction to the ethical challenges of obtaining and dealing with human genetic information will be presented.

Prerequisites: BIL 255 And BIL 268 or PSY 220 And CHM 222.

**Components:** LEC.

**Grading:** GRD.

**Typically Offered:** Fall & Spring.

**NEU 440. Neural Mechanisms of Psychiatric Disorders. 3 Credit Hours.**

Analysis of different neuropsychiatric disorders including, but not limited to, schizophrenia, depression, post-traumatic stress disorder, drug dependence and abuse, and obsessive-compulsive disorders. Lectures are derived from current research articles looking at in depth mechanisms of these disorders. It is expected that students have a good understanding of neuroscience before registering for this course. This course will include active learning and grades are based upon two projects including writing a script and creating a short video that highlights drugs and other treatments used for these disorders and preparing a poster based upon a published article and presenting it to the class in a poster session format. In addition, there will be two exams designed to test the student's knowledge of the material presented in class and in the readings.

Prerequisite: BIL 268 or PSY 220 or PSY 425.

**Components:** LEC.

**Grading:** GRD.

**Typically Offered:** Fall.

**NEU 465. Cellular and Molecular Neuroscience. 3 Credit Hours.**

Biophysical, biochemical, and structural features of nerve muscle and sensory cells. Basic cellular processes underlying function and development of nervous system.

Prerequisite: BIL 255, BIL 268 or PSY 220, and CHM 202.

**Components:** LEC.

**Grading:** GRD.

**Typically Offered:** Fall & Spring.

**NEU 468. Developmental Neuroscience. 3 Credit Hours.**

Cellular and molecular aspects of nervous system including neuronal differentiation.

Prerequisite: BIL 255, BIL 268 or PSY 220, and CHM 202.

**Components:** LEC.

**Grading:** GRD.

**Typically Offered:** Spring.

**NEU 480. Research with Writing Credit. 1-3 Credit Hours.**

Students assist on a research project in neuroscience under supervision of a faculty member. Activities include library research, data collection and management, and attendance at research team meetings.

**Components:** LEC.

**Grading:** GRD.

**Typically Offered:** Fall, Spring, & Summer.

**NEU 580. Senior Honors in Neuroscience I. 3 Credit Hours.**

Students work closely with a faculty member to design a unique research study and write a scientific paper to report on the results. Limited to undergraduate students only.

**Components:** LEC.

**Grading:** GRD.

**Typically Offered:** Fall, Spring, & Summer.

**NEU 581. Senior Honors in Neuroscience II. 3 Credit Hours.**

Students work closely with a faculty member to design a unique research study and write a scientific paper to report on the results. Limited to undergraduate students only.

**Components:** LEC.

**Grading:** GRD.

**Typically Offered:** Fall, Spring, & Summer.