

# NEUROSCIENCE PROGRAM (NEU)

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## **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. All incoming freshman neuroscience majors are required to take this course.

**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. 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. To learn more about the procedure for enrolling in NEU 280—either for credit or as a volunteer—see the PSY departmental website, which contains the forms you will need: <https://www.psy.miami.edu/undergraduate/undergraduate-research-opportunities/index.html>. Note: Although research credit does not count toward the neuroscience major, NEU 280, NEU 380, and NEU 480 can count toward general electives. This course is only for neuroscience majors.

Students must complete the following form to register: [https://umiami.qualtrics.com/jfe/form/SV\\_bdWUmMs30jWZXZs](https://umiami.qualtrics.com/jfe/form/SV_bdWUmMs30jWZXZs). Only neuroscience majors can register for NEU 280.

**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. 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. To learn more about the procedure for enrolling in NEU 380—either for credit or as a volunteer—see the PSY departmental website, which contains the forms you will need: <https://www.psy.miami.edu/undergraduate/undergraduate-research-opportunities/index.html>. Note: Although research credit does not count toward the neuroscience major, NEU 280, NEU 380, and NEU 480 can count toward general electives. This course is only for neuroscience majors.

Prerequisite: PSY 291 or PSY 292 Placement: Students must complete the following form to register: [https://umiami.qualtrics.com/jfe/form/SV\\_bdWUmMs30jWZXZs](https://umiami.qualtrics.com/jfe/form/SV_bdWUmMs30jWZXZs). Only neuroscience majors can register for NEU 380.

**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.

Prerequisite: BIL 150, BIL 104 Or BIL 112.

**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 & Spring.

**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.

CRS: BIL 255; BIL 268 or PSY 220, and CHM 222.

**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.

CRS: BIL 255; BIL 268 or PSY 220, and CHM 222.

**Components:** LEC.

**Grading:** GRD.

**Typically Offered:** Spring.

**NEU 480. Research Projects III. 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. To learn more about the procedure for enrolling in NEU 480—either for credit or as a volunteer—see the PSY departmental website, which contains the forms you will need: <https://www.psy.miami.edu/undergraduate/undergraduate-research-opportunities/index.html>. Note: Although research credit does not count toward the neuroscience major, NEU 280, NEU 380, and NEU 480 can count toward general electives. This course is only for neuroscience majors.

Prerequisite: PSY 291 or PSY 292 Placement: Students must complete the following form to register: [https://umiami.qualtrics.com/jfe/form/SV\\_bdWUmMs30jWZXZs](https://umiami.qualtrics.com/jfe/form/SV_bdWUmMs30jWZXZs). Only neuroscience majors can register for NEU 480.

**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.

**NEU 700. Seminars in Neuroscience. 1 Credit Hour.**

Required each Fall and Spring for all NEU students, emphasizes student research presentations (30 min each for 2nd year students; 60 min each for student 3rd year on). Attendance at neuroscience related seminars is also required.

Requisite: Neuroscience.

**Components:** LEC.

**Grading:** GRD.

**Typically Offered:** Fall & Spring.

**NEU 721. Principles of Membrane Physiology and Biophysics I. 3 Credit Hours.**

Course discusses chemical and physical structure of membranes, model systems, permeability and transport, membrane potential, ionic channels, excitability in nerve and muscle, ionophores, active transport, and membrane receptors. Identical with MCP 641.

**Components:** LEC.

**Grading:** GRD.

**Typically Offered:** Spring.

**NEU 722. Principles of Membrane Physiology and Biophysics II. 3 Credit Hours.**

Course topics include osmosis and cell volume, tracer analysis of permeability and compartmentation, theory of channels and carriers, cable properties, Hodgkin-Huxley formalism, Na, K, and Ca ion channels, regulation of cellular Na, Ca activities, single-channel analysis, chemical synapses, membrane receptors, cell junctions, excitation and E-C coupling in muscle. Identical with MCP 642.

Prerequisite: NEU 721.

**Components:** LEC.

**Grading:** GRD.

**Typically Offered:** Spring.

**NEU 731. Advanced Topics in Neuroscience. 1 Credit Hour.**

Special work, lecture, laboratory, reading, seminar, or a combination of these as determined by advisor in accordance with student's interest.

Requisite: Neuroscience.

**Components:** LEC.

**Grading:** GRD.

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

**NEU 760. Neuroscience 1A (Molecular and Cellular Neuroscience). 2 Credit Hours.**

An advanced introduction to modern neurobiology, focusing on the cellular and molecular biology of neurons, glia, synapses, and neurotransmitters.

**Components:** LEC.

**Grading:** GRD.

**Typically Offered:** Spring.

**NEU 761. Neuroscience 1B (Developmental Neuroscience). 2 Credit Hours.**

This course will explore nervous system development from early neural induction and neurogenesis to the construction of neural circuits. Basic mechanisms of neurulation and CNS patterning, neural progenitor migration, neural crest and ectodermal placodes, programmed cell death, construction of neural circuits, axon guidance, synaptogenesis and several emerging techniques in neurobiology will be covered.

Requisite: Neuroscience.

**Components:** LEC.

**Grading:** GRD.

**Typically Offered:** Spring.

**NEU 762. NEU II - Systems Neuroscience. 4 Credit Hours.**

The course aims to provide a general, but intensive, background to the neurosciences beyond Cellular Neuroscience (NEU 661) and Developmental Neuroscience (NEU 663) and to prepare students for more specialized neuroscience courses, for lab rotations, and for subsequent dissertation work. NEU 662 will present sensory, motor and integrative neuroscience at the level of functional systems, but will do so in the context of cellular and molecular neuroscience. The course concentrates on the experimental basis for our understanding of nervous system function and uses both didactic lectures and student discussions of current research literature. The course expects that students have a working knowledge of synaptic transmission, excitable cell membranes, and ion channels from previous coursework in PHS 641/2 and NEU 661, as well as a general knowledge of biochemistry and molecular biology from their PIBS course. It will also be useful to have taken NEU 663. [Pre-requisites: PHS641/2 and NEU661, or in exceptional cases, permission of instructors].

Requisite: Neuroscience.

**Components:** LEC.

**Grading:** GRD.

**Typically Offered:** Fall.

**NEU 763. Developmental Neuroscience. 2 Credit Hours.**

This course will explore nervous system development from early neural induction and neurogenesis to the construction of neural circuits. Cellular and molecular mechanisms of neurulation and CNS patterning, neural progenitor migration, neural crest and ectodermal placodes, programmed cell death, construction of neural circuits and axon guidance, and synaptogenesis will be covered

Requisite: Neuroscience.

**Components:** LEC.

**Grading:** GRD.

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

**NEU 797. Neuroanatomy. 3 Credit Hours.**

This course is designed to teach functional neuroanatomy to individuals engaged in basic neuroscience research. Therefore, most of the emphasis will be placed upon gross anatomy, identification of pathways and circuits, and a description of the physiological functions of neuroanatomical systems.

To the extent that it may help to explain functional aspects of the nervous system, each lecture will contain some clinical examples and/or case histories. An important feature of each class period will be a laboratory segment in which the student will study human and sheep brains, examine models of the brain, and use internet neuroanatomy websites containing pictures, text, clinical examples, and 3-dimensional rotations of the nervous system

Requisite: Neuroscience.

**Components:** LEC.

**Grading:** GRD.

**Typically Offered:** Fall.

**NEU 830. Doctoral Dissertation. 1-12 Credit Hours.**

Required for all PhD students before passing the Qualifying Examination. The student will enroll for credits as determined by the Program Office, but no more than a total of 6 credits.

**Components:** THI.

**Grading:** SUS.

**Typically Offered:** Offered by Announcement Only.

**NEU 840. Doctoral Dissertation- Post Candidacy. 1-12 Credit Hours.**

Required for all PhD students before passing the Qualifying Examination. The student will enroll for credits as determined by the Program Office, but no more than a total of 6 credits.

**Components:** THI.

**Grading:** SUS.

**Typically Offered:** Fall.

**NEU 850. Research in Residence. 1-14 Credit Hours.**

Students register in the semester they plan to submit their dissertation to the Graduate School.

**Components:** THI.

**Grading:** SUS.

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