

# NEUROSCIENCE - MD (NEURO)

## NEURO 501: Neuroscience Seminar

2 Credits/Maximum of 8

This is a weekly seminar involving discussion of research approaches and methodologies used by guest speakers for the neuroscience seminar series. NEURO 501 Neuroscience Seminar (2 per semester/ maximum of 8) This course examines issues related to the research presented by invited speakers in the Neuroscience Seminar series. This is a required course for first and second-year graduate students in the Neuroscience program. The intent is to generate discussion that aids in the understanding of the general research questions, techniques and conclusions reflected in the work of the various speakers. Speakers will address topics ranging from the molecular to human behavior. The Neuroscience Seminar course has two components: (1) the students present on the background research (approaches, methods, and concepts) related to the invited speaker's work. The students will read 2-3 papers from a list of the speaker's publications prior to the seminar. The host of the invited speaker (and sometimes the speaker himself or herself, depending on availability) will join the students in the discussion. Each time there will be one student who leads the discussion. Students will participate in discussions with the invited speaker, the instructor, and with other students who may have different research experiences and backgrounds. (2) the students will attend the seminar delivered by the invited speaker and participate in the discussion and question and answer periods.

## NEURO 511: Neurobiology II

3 Credits

Structure and physiology of central and peripheral nervous system, including specific sense organs.

**Prerequisite:** graduate student status

## NEURO 512: Comparative Neuroanatomy

4 Credits

This course elucidates the structural organization of the nervous system and describes the evolutionary principles that guide brain development. NEURO 512 Comparative Neuroanatomy (4) This course provides instruction on the functional and structural organization of the vertebrate central nervous system. In addition to lectures, students attend laboratory sessions devoted to human brain dissections, histologic sections of various vertebrate brains, and non-invasive magnetic resonance images. Following instruction on the structural and physiological properties of neurons, students learn how structural and neurochemical variations endow neurons with specific computational properties so that connections between different neuronal subtypes enable local circuits to extract information and create specific input-output transformations that define the functional character of each neural system. The structural organization of the brain is then described both grossly and at the level of functional circuits. Material at the gross level describes the 3-D spatial relationships among the nuclei and fiber tracts within each subdivision of the central nervous system so that students can describe the internal organization of the forebrain, midbrain, hindbrain, and spinal cord. As part of this, students learn to recognize specific structures in different planes of sections along the major axes of the brain. Material at the functional level describes the sensory, motor, and

limbic systems according to their circuit connections. Emphasis is placed on the specific connections that enable circuits to transform specific types of information. Students are expected to describe the successive series of nuclei and interconnected pathways that comprise each major neural system. Students are also taught to view neuroanatomy as a scientific field of inquiry. Landmark discoveries and the methods by which prominent neuroanatomists made those discoveries provide a context for describing brain organization. Breakthrough scientific experiments are discussed to illustrate how the structural-functional relationships of the brain have been elucidated. Attention is also devoted to instructing students in modern experimental methods that are used to determine how brain circuits are altered by experimental manipulations. While the course emphasizes the mammalian nervous system, many aspects of brain organization in non-mammalian vertebrates are presented. In the last third of the course, students read a monograph focused on the principles that guided vertebrate brain evolution across different phylogenetic lineages. A series of lectures are devoted to neurocladistics and the evidence that has prompted competing theories of brain evolution so that students can critically evaluate differences in brain organization across different groups of vertebrates.

## NEURO 515: Developmental Neurobiology

2 Credits

Development of the nervous system in all its aspects.

Cross-listed with: ANAT 515

## NEURO 520: Cellular and Molecular Neuroscience

3 Credits

This course covers the biology and function of neurons at the cellular level. It provides a broad exploration of how neurons communicate with each other chemically and electrically. In particular, it investigates how the electrical properties of cells and their ion channels are used to generate action potentials and electrical signals, how neurons communicate with each other chemically, and how these chemical signals are transduced. Students will gain awareness of modern methods to visualize, identify, record from, and manipulate the activity of neurons. Building on these insights, students will use this knowledge to analyze and critique the current neuroscience literature and apply this knowledge to the design of experiments in the context of neuroscience research.

Cross-listed with: ESC 526

## NEURO 521: Systems Neuroscience

3 Credits

An introduction to the major neural systems and their integrative functions.

## NEURO 522: Seminars in Neuroscience I

2 Credits

Study at the cellular, molecular, and metabolic level of selected subjects in neuroscience.

NEURO 523: Seminars in Neuroscience II

2 Credits

Study at the cellular, molecular, and metabolic level of selected subjects in neuroscience.

NEURO 524: Neuroscience Bootcamp

2 Credits

This is a laboratory course that meets twice weekly. The goal of this course is to engage incoming graduate students in the Neuroscience Program to a didactic/hands-on methods-based primer and overview of modern neuroscience laboratory methodology. After successful completion of this course, students will be able to: - Demonstrate an understanding of basic laboratory safety and standard laboratory practices. - Demonstrate an understanding of how to keep data and records in a proper laboratory notebook. - Demonstrate an understanding of basic laboratory approaches used in a modern neuroscience research lab to address questions in neuroscience. - Demonstrate an understanding of how to perform and interpret laboratory experiments and analyze data acquired from those experiments.

NEURO 530: Professional Development and Responsible Conduct in Science

1 Credits

An introduction to the professional skills necessary for careers in biomedical sciences.

NEURO 580: Translational Medicine in Substance Use Disorder

3 Credits

This course provides students with insight into the dynamic and ongoing relationship between laboratory research and clinical practice as it relates to substance use disorder. Students will shadow a clinician in order to observe the current clinical treatment strategies for substance use disorder as well as learn about how this chronic disease affects the afflicted patients. In parallel, weekly lectures and classroom discussions will provide students with the most up-to-date understanding of the physiological mechanisms mediating substance use disorder based on preclinical and clinical data. To provide students with a government and health insurance perspective on substance use disorder, this course will discuss policies put in place to control illicit drug use as well as discuss the approach insurance companies take when covering patients getting treatment. The goal of this course is to provide students with a comprehensive understanding of drug addiction at the clinical, preclinical, and government levels with the purpose of training students to observe clinical needs and address them through experimental design.

**COREQUISITES:** BMS 571 **RECOMMENDED PREPERATION:** The student must: (a) be at least a 2nd year graduate student (b) select a thesis relevant clinical rotation and (c) have been approved by the course director

NEURO 590: Colloquium

1-3 Credits/Maximum of 3

Continuing seminars which consist of a series of individual lectures by faculty, students or outside speakers.

NEURO 596: Individual Studies

1-9 Credits/Maximum of 9

Creative projects, including nonthesis research, which are supervised on an individual basis and which fall outside the scope of formal courses.

NEURO 597: Special Topics

1-9 Credits/Maximum of 9

Formal courses given on a topical or special interest subject which may be offered infrequently; several different topics may be taught in one year or semester.

NEURO 600: Thesis Research

1-15 Credits/Maximum of 999

Thesis Research

NEURO 601: Ph.D. Dissertation Full-Time

0 Credits/Maximum of 999

No description.

NEURO 602: Supervised Experience in College Teaching

1 Credits/Maximum of 2

Supervised experience in teaching and orientation to other selected aspects of the profession at The Pennsylvania State University

**Prerequisite:** NEURO 511, NEURO 520, NEURO 521

NEURO 610: Thesis Research Off Campus

1-15 Credits/Maximum of 999

No Description.