

# NEU

## Neuroscience

### NEU 501: Introduction to Neuroscience Research

A series of talks, discussions, and practical exercises to address topics related to research in neurobiology including laboratory etiquette, the laboratory notebook, experimental design and basic experimental techniques used in neuroscience research including electrophysiology, behavioral testing, molecular and cellular techniques, imaging and computational approaches. Prerequisites: Matriculation in MS program or permission of instructor Summer 3 credits, Letter graded (A, A-, B+, etc.)

*3 credits, Letter graded (A, A-, B+, etc.)*

### NEU 502: Reading, Writing, and Speaking Neurobiology

Seminar course for master's students in Neuroscience that will provide the student with practical instruction in analyzing the literature, written and oral presentation skills. Course exercises will focus on the student's thesis research.

*2 credits, Letter graded (A, A-, B+, etc.)*

### NEU 517: Principles of Cell Signaling

Nervous system function is dependant on the ability of signals to flow between and within cells. The basic principles of cellular signaling and maintenance of cellular and organismic homeostasis through intra and intercellular signaling mechanisms will be covered. Emphasis will be placed on relationships between nuclear events and ongoing processes of the cell. The roles of membrane receptors and second-messenger pathways in mediating such diverse events as bacterial chemotaxis, protozoan locomotion, and secretion are discussed. Semesters Offered: Summer

*3 credits, Letter graded (A, A-, B+, etc.)*

### NEU 521: Introduction to Cellular Neuroscience

The course introduces students to basic principles of cellular neuroscience. Topics covered include the ionic basis of resting potentials and electrical excitability, the structure, function and molecular biology of voltage-and ligand-gated ion channels. Semesters Offered: Fall

*2-3 credits, Letter graded (A, A-, B+, etc.)*

### NEU 522: Introduction to Molecular Neuroscience

The course introduces students to basic principles of molecular neuroscience. Topics covered include the signal transduction, regulation of neural gene expression and human neural genetic diseases. Semesters Offered: Fall

*2-3 credits, Letter graded (A, A-, B+, etc.)*

### NEU 531: Sensory and Motor Systems

This course introduces students to current debates on sensory and motor systems. Topics and areas covered include: general principles of sensory and motor coding, sensory systems (somatosensation, audition, vision, taste and olfaction), voluntary control of movement, modulation of movement by cerebellum and basal ganglia.

*2 credits, Letter graded (A, A-, B+, etc.)*

### NEU 532: Neural Plasticity Learning and Memory

This course introduces students to the link between plasticity, learning and memory. Topics covered include: synaptic plasticity, synaptic homeostasis, brain connectivity, neurogenesis, aversive and reward learning, addiction.

*2 credits, Letter graded (A, A-, B+, etc.)*

### NEU 534: Principles of Neurobiology

Neuroscience investigates how the brain functions. This course begins with a review of cellular and molecular mechanisms of brain function, considers brain systems for motor control and sensory processing, and then finishes with a description of the cellular and molecular underpinnings of higher brain functions such as learning, emotion, and cognition. Semester Offered: Summer

*3 credits, Letter graded (A, A-, B+, etc.)*

### NEU 536: Introduction to Computational Neuroscience

This course will introduce students to the fundamental principles and methods underlying computational modeling of neurobiological systems, spanning a range of topics from the biophysics of excitable membranes to models of learning and memory. A major focus of the course will be on the process by which a model of a neurobiological system is developed. Students will be introduced to the mathematical methods required for the modeling of such systems, as well as to tools for numerical and computational simulation. The students will also learn programming skills in the Matlab computing environment and will be required to perform Matlab projects to complement the material learned in the lectures.

*2-3 credits, Letter graded (A, A-, B+, etc.)*

### NEU 537: Neurotransmission and Neuromodulation

Exploration of fundamental concepts of neurotransmission and neuromodulation of synaptic transmission. The subject matter includes an overview of the basic principles of neurotransmission and of the neuromodulatory systems in the brain. The involvement of these systems in behavior and neurological disorders is emphasized. We will discuss how specific neurological disorders can be investigated experimentally and how experimental results can contribute to understanding and treating these disorders.

*3 credits, Letter graded (A, A-, B+, etc.)*

### NEU 547: Introduction to Neural Computation

A broad introduction to neural computation. This course will discuss what counts as computation and in what sense the brain computes, how it computes, and whether those computations look anything like those performed by digital computers. These ideas and concepts will be introduced through examples of computation in the brain, including the neural bases of sensory perception, decision making, learning and memory, and motor control. Students will learn through in-class demonstrations and activities, as well as homework assignments that give students the opportunity to analyze real neural recordings relevant to each of the topic modules. Students taking this class will be expected to have basic working knowledge in undergraduate-level calculus and statistics.

*3 credits, Letter graded (A, A-, B+, etc.)*

### NEU 548: MS Research Practicum in Neuroscience

The student will be introduced to modern neuroscience research techniques through participation in ongoing research in the laboratory of a Program in Neuroscience Faculty member for one semester. Student must obtain permission to register from the sponsoring faculty member. Prerequisite: Matriculation in MS program or permission of instructor Semesters Offered:

*Fall, Spring, Summer, 0-9 credits, S/U grading May be repeated for credit.*

### NEU 549: MS Thesis Research

The student will conduct Neuroscience research in the laboratory of a program in Neuroscience Faculty. Student must obtain permission to register from the sponsoring faculty member. Prerequisite: Matriculation in MS program or permission of instructor.

*0-9 credits, S/U grading May be repeated for credit.*