Neuroscience Course Descriptions

**NS 201A: Basic Concepts in Cellular and Molecular Neuroscience.**
An interdisciplinary introduction to fundamental aspects of nervous system function. The course emphasizes the ionic and molecular basis of excitability, synaptic transmission and signal transduction.
Offered every Fall.

**NS 201B: Basic Concepts in Systems Neuroscience.**
Introduction to fundamental aspects of nervous system development, including neural determination, axon guidance, and neuron-target interactions, and overview of basics of integrative neural function, including sensory, motor and limbic systems, and computational neuroscience.
Offered every Winter.

**NS 214: Ethics and the Responsible Conduct of Research.**
This course will cover topics related to the responsible conduct of research such as conflicts of interest, responsible authorship, policies regarding the use of human and animal subjects, handling misconduct, proper data management, research funding rules and procedures. Students will review and present case studies for class discussion.

**NS 215: Laboratory Rotation.**
A laboratory rotation course to familiarize new departmental graduate students with various approaches to neurobiological research.
Offered every Fall, Winter and Spring.

**NS 219: Special Topics in Basic and Translational Neuroscience**
Reading and discussion of literature of current important areas of neuroscience research. Separate course offerings will focus on specific topics in molecular, cellular, developmental, systems, and computational neuroscience, and in neurological and behavioral disorders.

**NS 220: Neuroscience Journal Club.**
Pertinent papers from the recent neuroscience literature are read and discussed. Each student must participate regularly. Each third and fourth year student must present once during the academic year.
Offered every Fall, Winter and Spring.

**NS 221: Current Topics in Neuroscience.**
Students will read and discuss papers related to the current week's formal Neuroscience Seminar series, attend the seminar, and meet with the speaker.
Offered every Fall. A year-long course.

**NS 222: Signaling in Neurobiology.**
This course will discuss receptor-mediated signal transduction and its regulation at the cellular level. The first part of the course will be largely didactic, reviewing basic principles of information theory and molecular pharmacology that are relevant to all signaling systems. The second part of the course will focus on selected receptors and regulatory mechanisms that function in neurons. Faculty experts in each area will present a lecture and assign relevant research paper(s) for student discussion. Topics include G protein-coupled receptors and regulation, regulation of ion channel signaling, receptor tyrosine kinases, Wnt signaling, TGF-beta signaling, polarity and chemotaxis.

**NS 223: Developmental Neurobiology.**
This course will cover important areas of vertebrate and invertebrate nervous system development. It will integrate findings from anatomical, cellular, molecular and genetic approaches. Topics may include: neural induction, regionalization of the neural plate and neural tube, cell-type specification, proliferation, apoptosis, morphogenesis, neurogenesis, gliogenesis, migration, differentiation, axon pathfinding, dendritogenesis, synaptogenesis.

**NS 225: Neurobiology of Disease.**
Lectures and student-led discussions on physiological and molecular bases of diseases such as Alzheimer's, Parkinson's, multiple sclerosis, epilepsy, autism, addiction, triple repeat and prion diseases.

**NS 230: Topics in Membrane Biophysics and Synaptic Physiology.**
Topics addressed in this course will include ligand- and voltage-sensitive calcium permeation, ion transport, exocytosis/endocytosis, calcium domains and buffering in the nerve terminal, transmitter release statistics, neuromodulation of ion channels, co-transmission, short-term and long-term synaptic plasticity, dendritic backpropagation, lateral inhibition, and integration.

**NS 240: Neurobiology of Vision.**
Visual information processing by the retina and central nervous system. Molecular, electrophysiological, pharmacological, anatomical,
and psychophysical approaches will be discussed. Topics may include synaptic interactions, diseases specific to the visual system, color vision, form perception, motion detection, and visual development.

**NS 243: Cognitive Neuroscience.**
This course will cover research investigating the neural basis of cognition, primarily focusing on neurophysiological studies in humans using fMRI, PET, MEG, EEG, and TMS. Topics to be covered include visual perception, attention, memory, sensory and motor control and language.

**NS 245: Behavioral Neuroscience.**
Lectures and discussion of primary research concerning the neural basis of behavior. Topics will include basic concepts of learning and neuroethology with examples from vertebrate and invertebrate systems. A comparative approach will be taken to understanding psychological constructs such as drive, motivation and emotion. Emphasis will be placed on neural circuit analysis of behaviors such as sound localization, drug self-administration, and fear conditioning.

**NS 248: Analysis of Neural and Behavioral Data.**
Lectures, critical discussions, and problem solving using Matlab. Topics will include: probability, descriptive statistics, binomial and poisson processes, analysis of spike trains, and analysis of dynamic neural and behavioral data. Previous Matlab experience strongly suggested.

**NS 250: Dissertation Research.**
Offered every Fall, Winter and Spring.