

# NEUROSCIENCE (NSC)

The following courses are offered by the Faculty of Medicine.

## **NSC 5102 Cellular and Molecular Neuroscience (3 units)**

The molecular and cellular properties of neurons. Emphasis to be placed on the molecular basis of electrical activity of neurons and chemical synaptic transmission.

**Course Component:** Lecture

## **NSC 5104 Systems Neuroscience (3 units)**

Structure and function of representative components of the nervous system to be presented in an integrated and comprehensive manner, emphasizing a reductionist approach to the study of neural networks and their behavioural output.

**Course Component:** Lecture

## **NSC 5106 Molecular Psychiatry (3 units)**

Study of genetic and neurochemical bases of mental illnesses using transgenic and gene knockout mouse models, animal behavioural paradigms, in vivo imaging. Gene therapy approaches in psychiatry; influence of environmental stressors.

**Course Component:** Lecture

## **NSC 6101 Consciousness: An Interdisciplinary Perspective from Neuroscience, Philosophy and Psychology (3 units)**

This interdisciplinary course addresses two fundamental questions in the study of the mind: 1) what is consciousness? 2) Can we explain the emergence and operation of this central feature of human life by analyzing the brain?

**Course Component:** Lecture

## **NSC 6300 Seminars**

**Course Component:** Lecture

## **NSC 7100 Neurotransmission and Neuromodulation (3 units)**

Molecular and cell biology of neurotransmission including the identity, actions and mechanisms of neurotransmitters and neuromodulators. Use of computer simulations to explore the complex interactions between synaptic input and the electrical architecture of neurons.

**Course Component:** Seminar

Permission of the Department is required.

## **NSC 8101 Advanced Topics in Neuropathology (3 units)**

General histopathological responses of central and peripheral nervous tissue to pathological stimuli including hypoxic-ischemic, traumatic, inflammatory/infectious, demyelinating and toxic. Emerging topics in neurology and neuropathology including the following: the pathology and pathogenesis of protein-based neurodegenerative disorders, the emerging family of RNA-mediated neurological disorders, mendelian and non-mendelian genetic diseases of the nervous system (including the role of microRNA in neurological disease), advances in diseases of skeletal muscle, advances in the molecular pathogenesis of Central Nervous System tumours, and advances in metabolic/mitochondrial/storage diseases.

**Course Component:** Lecture

## **NSC 8103 Developmental Neuroscience (3 units)**

Fundamental concepts of development of the nervous system with an emphasis on those aspects unique to this tissue type. Topics to include control of proliferation and differentiation, axonal outgrowth and pathfinding, synaptogenesis and formation of neuronal maps, neuronal plasticity, growth factor action and neural regeneration.

**Course Component:** Lecture

## **NSC 8104 Computational Neuroscience (3 units)**

Basic concepts of sensory-motor processing from the cellular level of excitable membranes and synaptic signalling mechanisms to the emergent properties of complex neural networks.

**Course Component:** Lecture

## **NSC 8105 Molecular Biology of the Neuron (3 units)**

Emphasis on how signal transduction regulates neuronal function. Topics to include the role of the cytoskeleton in neuronal function, membrane sorting in exocytosis and endocytic pathways, metabotropic and ionotropic receptor signaling, signaling by the GTP-binding proteins, plasma membrane and vesicular transporters, role of protein-protein interactions in the regulation of neuronal signaling, and genomic and proteomic approaches to study neuronal signaling.

**Course Component:** Lecture

## **NSC 8106 Mechanisms of Neurological Disease (3 units)**

Current knowledge of select neuropathologies with emphasis on the underlying genetics and biochemistry of these conditions. Examination of some fundamental cellular processes important for understanding neurological diseases.

**Course Component:** Lecture

## **NSC 8107 NEURAL CONTROL OF METABOLISM (3 units)**

Examination of how the brain controls metabolism and how metabolic disorders affect brain function. Topics include the brain's control of food intake, glucose homeostasis and energy expenditure. Examination of the effects of mental states on metabolic homeostasis, the relationship between neurogenesis and metabolism, neurovascular coupling in brain metabolism, and genetic risk in metabolic syndromes.

**Course Component:** Lecture

Prerequisite: NSC 5102 or NSC 5104

## **NSC 8324S Seminar for MSc Students (3 crédits / 3 units)**

All graduate students enrolled in the MSc program or who have been admitted to a PhD program without an MSc must participate in these seminars for one year. Two seminars must be presented by each student during the year.

**Volet / Course Component:** Séminaire / Seminar

## **NSC 8325S Seminar for PhD Students (3 crédits / 3 units)**

All graduate students enrolled in the PhD program must participate in these seminars for one year during their doctoral or post MSc training. Two seminars must be presented by each student during the year: one on an assigned subject, the other on his or her research project.

**Volet / Course Component:** Séminaire / Seminar

## **NSC 8340 Neuromuscular Function and Dysfunction (3 units)**

Topics to be covered include factors controlling muscle- and synapse-specific gene expression, regulation of myogenesis and muscle cell growth, formation of the neuromuscular junction, motor neuron-muscle interactions, the role of the cytoskeleton in the organization of post-synaptic domains, functional role of ion channels in muscle, molecular genetics of neuromuscular disease.

**Course Component:** Lecture

Prerequisite: CMM 5340 or equivalent.

## **NSC 9998 Examen de synthèse (doctorat) / Comprehensive Examination (Ph.D.)**

**Volet / Course Component:** Recherche / Research