DOCTORATE IN PHILOSOPHY NEUROSCIENCE

Summary
- Degree offered: Doctorate in Philosophy (PhD)
- Registration status option: Full-time
- Language of instruction:
  - French
  - English

Note: Most of the courses in this program are offered in English.

- Program option (expected duration of the program):
  - with thesis (16 full-time terms; 64 consecutive months)
- Academic units: Faculty of Medicine (http://med.uottawa.ca/en/), Department of Cellular and Molecular Medicine (http://med.uottawa.ca/cellular-molecular/).

Program Description
The Department of Cellular and Molecular Medicine is located in the Faculty of Medicine and offers graduate programs leading to the degrees of Master of Science (MSc) and Doctor of Philosophy (PhD) in Neuroscience.

The programs help students develop their theoretical knowledge as well as their capacity for critical analysis. This is achieved through reading and critiquing the scientific literature, conducting experiments in the laboratory, analyzing the data and results generated, and presenting their results in the form of research seminars or posters. The programs prepare candidates for a variety of careers in teaching and research both within and outside of academia.

Graduates of the program will acquire autonomy in conducting research and in preparing scholarly publications and grant applications. A comprehensive set of courses, state-of-the-art research facilities and outstanding research opportunities ensure a career in neuroscience.

The Department is a participating unit in the collaborative program in Human and Molecular Genetics and in Pathology and Experimental Medicine at the master’s and doctoral levels.

The doctoral program participates in the Combined MD / PhD Program, which allows students to graduate with both a PhD in Neuroscience and an MD. For more information please see the website of the Faculty of Medicine (http://www.med.uottawa.ca/md-phd/eng/).

Main Areas of Research
The Department of Cellular and Molecular Medicine is located at the Health Sciences Center of the University of Ottawa. Through its cross-appointed and adjunct members, the Department has research affiliations with the following institutes: the Ottawa Hospital Research Institute (OHRI), the University of Ottawa Heart Institutes at the Ottawa Hospital (Civic Campus), the Institute of Mental Health Research (IMHR) at the Royal Ottawa Hospital, the Children’s Hospital of Eastern Ontario (CHEO) Research Institute, Elizabeth Bruyere Hospital, and the National Research Council.

Other Programs Offered Within the Same Discipline or in a Related Area
- Master of Science Neuroscience (MSc)
- Master of Science Neuroscience Specialization in Human and Molecular Genetics (MSc)
- Master of Science Neuroscience Specialization in Pathology and Experimental Medicine (MSc)
- Master of Science Cellular and Molecular Medicine (MSc)
- Master of Science Cellular and Molecular Medicine Specialization in Bioinformatics (MSc)
- Master of Science Cellular and Molecular Medicine Specialization in Human and Molecular Genetics (MSc)
- Master of Science Cellular and Molecular Medicine Specialization in Pathology and Experimental Medicine (MSc)
- Doctorate in Philosophy Neuroscience Specialization in Human and Molecular Genetics (PhD)
- Doctorate in Philosophy Neuroscience Specialization in Pathology and Experimental Medicine (PhD)
- Doctorate in Philosophy Cellular and Molecular Medicine (PhD)
- Doctorate in Philosophy Cellular and Molecular Medicine Specialization in Human and Molecular Genetics (PhD)
- Doctorate in Philosophy Cellular and Molecular Medicine Specialization in Pathology and Experimental Medicine (PhD)

Fees and Funding
- Program fees:

  The estimated amount for university fees (https://www.uottawa.ca/university-fees/) associated with this program are available under the section Finance your studies (http://www.uottawa.ca/graduate-studies/programs-admission/finance-studies/).

  International students enrolled in a French-language program of study may be eligible for a differential tuition fee exemption (https://www.uottawa.ca/university-fees/differential-tuition-fee-exemption/).

  To learn about possibilities for financing your graduate studies, consult the Awards and financial support (https://www.uottawa.ca/graduate-studies/students/awards/) section.

Notes
- Programs are governed by the general regulations (http://www.uottawa.ca/graduate-studies/students/general-regulations/) in effect for graduate studies.
- In accordance with the University of Ottawa regulation, students have the right to complete their assignments, examinations, research papers, and theses in French or in English. Research activities can be conducted either in English, French or both, depending on the language used by the professor and the members of his or her research group.

Program Contact Information
Graduate Studies Office, Faculty of Medicine (https://med.uottawa.ca/graduate-postdoctoral/)
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Ottawa, Ontario, Canada
K1N 6N5

Tel.: 613-562-5215
Email: grad.med@uottawa.ca

Twitter | Faculty of Medicine (https://twitter.com/uOttawaMed/)
Youtube | Faculty of Medicine (https://www.youtube.com/channel/UCP2nDlrjFEfEtyfMi0mLe2hA/)
Flickr | Faculty of Medicine (https://www.flickr.com/photos/uottawamed/)
Dr. Bernard Jasmin, Vice-Dean, Research at the Faculty of Medicine

Educators strongly influence national and international priorities. With cutting-edge research, our graduate students, researchers and scientists. Our research activity also attracts significant investment, care. In the process they educate the next generation of Canadian biomedical discoveries that have a significant impact on health. These partnerships lead to biomedical discoveries that have a significant impact on health care. In the process they educate the next generation of Canadian scientists. Our research activity also attracts significant investment, which stimulates the Ottawa economy.”  

- Dr. Bernard Jasmin, Vice-Dean, Research

### Facilities, Research Centres and Institutes at the Faculty of Medicine

- Centre for Neural Dynamics (http://www.neurodynamic.uottawa.ca/)
- University of Ottawa Centre for Neuromuscular Disease (http://med.uottawa.ca/neuromuscular/)
- Centre for Research in Biopharmaceuticals and Biotechnology (http://www.med.uottawa.ca/crbb/eng/)
- Canadian Partnership for Stroke Recovery (http://www.canadianstroke.ca/en/)
- Kidney Research Centre (http://www.ohri.ca/centres/KRC/default.asp)
- University of Ottawa Skills and Simulation Centre (http://uosssc.ca/)
- Medical Devices Innovation Institute
- Ottawa Institute of Systems Biology (http://med.uottawa.ca/oisb/)
- University of Ottawa Centre for Neuromuscular Disease (http://med.uottawa.ca/neuromuscular/)
- University of Ottawa Centre for Neuromuscular Disease (http://med.uottawa.ca/neuromuscular/)

For more information, refer to the list of faculty members and their research fields on Uniweb.

**IMPORTANT:** Candidates and students looking for professors to supervise their thesis or research project can also consult the website of the faculty or department ([https://www.uottawa.ca/graduate-studies/students/academics-unit-contact-information/) of their program of choice. Uniweb does not list all professors authorized to supervise research projects at the University of Ottawa.

### Courses

**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