NEUR*3100 Molecular Biology of Neurodevelopmental and Degenerative Disease

Fall 2018
Section(s): C01

Department of Molecular and Cellular Biology
Credit Weight: 0.50
Version 1.00 - August 24, 2018

---

1 Course Details

1.1 Calendar Description

This course will follow the life of nervous system cells from birth, through their functional life, and ending in ageing and degenerative disease. Focus will be on the molecular and cellular events that govern these processes and the diseases and pathologies, such as ParkinsonGÇÖs and AlzheimerGÇÖs, that arise as a consequence of their dysfunction. Finally, students will be introduced to the new and rapidly advancing field of adult neural stem cells and the promises and potential problems of their use in treating many of the diseases that will have been discussed throughout.

Pre-Requisite(s): MCB*2050, (NEUR*2000 or PSYC*2410)
Restriction(s): This is a Priority Access Course. Enrolment may be restricted to particular programs (BSCH.NEUR, NEUR minor) or semester levels during certain periods.

1.2 Course Description

This course will build upon the knowledge gained in NEUR*2000 and will examine the neurobiological mechanisms of central nervous system diseases. In the first half of the course, students will learn about molecular events and cellular pathways that are important for proper neuronal and brain systems function. The second half of the course will expand upon these concepts by discussing their dysregulation in various neurodevelopmental, neuropsychiatric and neurodegenerative disease pathologies using recent literature from preclinical and clinical studies. Diseases that will be discussed include, but are not limited to, depression, schizophrenia, addiction, Alzheimer’s disease and Parkinson’s disease. Current therapies and their limitations will also be addressed.

1.3 Timetable

Lectures are Tuesdays and Thursdays at 10:00 am – 11:20 am in CRSC 117

1.4 Final Exam

The final exam will be on December 4th, 2018. The exact time and location will be provided by the registars office later in the semester. Details will be provided well in advance.

---

2 Instructional Support

2.1 Instructor(s)

Dr. Jasmin Lalonde
Email: jlalon07@uoguelph.ca
Telephone: +1-519-824-4120 x54706
Office: SSC 3460
Office Hours: By Appointment
Lectures 1 through 11

Dr. Melissa Perreault
Email: perreaum@uoguelph.ca
Telephone: +1-519-824-4120 x52013
Office: SSC 3446
Office Hours: By Appointment
Lectures 13 through 24

2.2 Instructional Support Team

Course Co-ordinator: Dr. John Vessey
Email: jvessey@uoguelph.ca
Telephone: +1-519-824-4120 x56997
Office: SC1 3455
Office Hours: By Appointment

2.3 Teaching Assistant(s)

Teaching Assistant: Abdalla Albeely
Email: amoham10@uoguelph.ca

---

3 Learning Resources

3.1 Required Resource(s)

Courselink (Website)
https://courselink.uoguelph.ca
Course material, news, announcements, and grades will be regularly posted to the NEUR*3100 Courselink site. You are responsible for checking the site regularly.

The online forums are meant for discussions concerning course material only. Non-course related postings are not permitted. We always appreciate comments regarding the class; however, suggestions or complaints about the course should be brought up to the instructors directly and not posted on the forum. All postings deemed inappropriate will be removed.

Basic Neurochemistry: Principles of Molecular, Cellular, and Medical Neurobiology, 8th Addition (Textbook)
A copy of the text is available on reserve in the Library. Contact the course coordinator with any questions or issues accessing material from the libary.

Journal Articles (Article)

A mixture of comprehensive review articles and primary research papers from various peer-reviewed journals will be used throughout the course. These articles will be accessible and suitable for the knowledge level of the students. All material will be posted well in advance on CourseLink.

---

4 Learning Outcomes

4.1 Course Learning Outcomes

By the end of this course, you should be able to:

1. Understand the functional importance of select molecular events and cell signaling pathways on neuron function.
2. Be familiar with the mechanisms underlying neuronal communication.
3. Understand how the dysregulation of specific molecular and cellular processes contribute to CNS diseases.
4. Understand the relationship between cell signaling, system function and behaviour in CNS disease.
5. Have an appreciation for the current available therapies and their limitations.
6. Have an appreciation for techniques utilized in the study of cellular and molecular neuroscience.

---

5 Teaching and Learning Activities

5.1 Lecture

Neurobiology Basics

Topic(s): **Lecture 1 (September 6) and Lecture 2 (September 11)**

1. Cell biology of the nervous system
2. Electrical excitability and ion channels
3. Cell adhesion molecules, myelin, cytoskeleton

Intercellular Signaling I

Topic(s): **Lecture 3 (September 13) and Lecture 4 (September 18)**

1. Acetylcholine
2. Catecholamines: Dopamine, norepinephrine, epinephrine
3. Serotonin

Intercellular Signalling II

Topic(s): **Lecture 5 (September 20) and Lecture 6 (September 25)**

1. Glutamate and glutamate receptors
2. GABA and GABA receptors

Intracellular Signalling I

Topic(s): **Lecture 7 (September 27) and Lecture 8 (October 2)**

1. G Proteins
2. Phosphoinositides
3. Calcium Signaling

Intracellular Signalling II

Topic(s): **Lecture 9 (Ocotber 4) and Lecture 10 (October 11)**

1. Posttranslational modifications
2. Epigenetics and transcription factors

Growth, Development, and Differentiation

Topic(s): **Lecture 11 (October 16)**

1. Growth factors, receptor tyrosine kinases, and brain development

Zika Virus and the Developing Cerebral Cortex (And Other Interesting Oddities)

Topic(s): **Lecture 12 (October 18)**

Presented by Dr. John Vessey

Neural oscillations in brain function

Topic(s): **Lecture 13 (October 23) and Lecture 14 (October 25)**

1. intro, communication, networks

2. analysis
3. relevance to neuropsychiatric and neurodegenerative disease

Mechanisms in schizophrenia

Topic(s): **Lecture 15 (October 30) and Lecture 16 (November 1)**

1. intro, subtypes, symptoms, etiology

2. neuropathology, structural and neurochemical deficits, 2-hit hypothesis

3. immune hypothesis, glutamate hypothesis, dopamine hypothesis

4. epigenetic mechanisms

5. circuit dysfunction

6. treatments

Mechanisms in depression and anxiety

Topic(s): **Lecture 17 (November 6) and Lecture 18 (November 8)**

1. intro, symptoms, etiology

2. circuit dysfunction

3. neuropathology, neurotransmitters

4. sex differences and the role of estrogen

5. treatments and limitations

Opioids, cocaine and amphetamines, phencyclidine, marijuana

Topic(s): **Lecture 19 (November 13) and Lecture 20 (November 15)**

1. intro

2. receptor targets and cell signaling mechanisms

3. treatments and limitations

Parkinson's and Alzheimer's disease

Topic(s): **Lecture 21 (November 20) and Lecture 22 (November 22)**

1. intro, symptoms, etiology

2. neuropathology, structural and neurochemical deficits

3. treatments and limitations

Obsessive-Compulsive Disorder, Tourette's Syndrome, Autism Spectrum Disorders

Topic(s): **Lecture 23 (November 27) and Lecture 24 (November 29)**

1. intro, symptoms, etiology

2. structural and neurochemical deficits

3. treatments and limitations

4. Exam Review

---

6 Assessments

6.1 Marking Schemes & Distributions

Name	Scheme A (%)
Quiz #1	5
Quiz #2	5
Midterm Examination	40
Quiz #3	5
Quiz #4	5
Final Examination	40
Total	100

6.2 Assessment Details

Quiz #1 (5%)

Date: Week 2
Dr. Lalonde

Quiz #2 (5%)
Date: Week 4
Dr. Lalonde

Midterm Examination (40%)
Date: Sat, Oct 20, 12:30 PM - 2:30 PM, THRN 1307
Please note that the 20th of October is a Saturday. The midterm will cover material presented in the first half of the class.

Quiz #3 (5%)
Date: Week 7
Dr. Perreault

Quiz #4 (5%)
Date: Week 9
Dr. Perreault

Final Examination (40%)
Date: Tue, Dec 4, TBD
The final exam will cover material presented in the second half of the class.

The exact time and location will be provided by the registars office later in the semester. Details will be provided to the class well in advance.

---

7 University Statements

7.1 Email Communication

As per university regulations, all students are required to check their e-mail account regularly: e-mail is the official route of communication between the University and its students.

7.2 When You Cannot Meet a Course Requirement

When you find yourself unable to meet an in-course requirement because of illness or compassionate reasons please advise the course instructor (or designated person, such as a teaching assistant) in writing, with your name, id#, and e-mail contact. The regulations and procedures for Academic Consideration are detailed in the Undergraduate Calendar.

7.3 Drop Date

Courses that are one semester long must be dropped by the end of the fortieth class day; two-semester courses must be dropped by the last day of the add period in the second semester. The regulations and procedures for Dropping Courses are available in the Undergraduate Calendar.

7.4 Copies of Out-of-class Assignments

Keep paper and/or other reliable back-up copies of all out-of-class assignments: you may be asked to resubmit work at any time.

7.5 Accessibility

The University promotes the full participation of students who experience disabilities in their academic programs. To that end, the provision of academic accommodation is a shared responsibility between the University and the student.

When accommodations are needed, the student is required to first register with Student Accessibility Services (SAS). Documentation to substantiate the existence of a disability is required, however, interim accommodations may be possible while that process is underway.

Accommodations are available for both permanent and temporary disabilities. It should be noted that common illnesses such as a cold or the flu do not constitute a disability.

Use of the SAS Exam Centre requires students to book their exams at least 7 days in advance, and not later than the 40th Class Day.

More information: www.uoguelph.ca/sas

7.6 Academic Misconduct

The University of Guelph is committed to upholding the highest standards of academic integrity and it is the responsibility of all members of the University community – faculty, staff, and students – to be aware of what constitutes academic misconduct and to do as much as possible to prevent academic offences from occurring. University of Guelph students have the responsibility of abiding by the University's policy on academic misconduct regardless of their location of study; faculty, staff and students have the responsibility of supporting an environment that discourages misconduct. Students need to remain aware that instructors have access to and the right to use electronic and other means of detection.

Please note: Whether or not a student intended to commit academic misconduct is not relevant for a finding of guilt. Hurried or careless submission of assignments does not excuse students from responsibility for verifying the academic integrity of their work before submitting it. Students who are in any doubt as to whether an action on their part could be construed as an academic offence should consult with a faculty member or faculty advisor.

The Academic Misconduct Policy is detailed in the Undergraduate Calendar.

7.7 Recording of Materials

Presentations which are made in relation to course work—including lectures—cannot be recorded or copied without the permission of the presenter, whether the instructor, a classmate or guest lecturer. Material recorded with permission is restricted to use for that course unless further permission is granted.

7.8 Resources

The Academic Calendars are the source of information about the University of Guelph's procedures, policies and regulations which apply to undergraduate, graduate and diploma programs.
