



# **NEUR\*6000 Principles of Neuroscience**

Winter 2019

Section(s): C01

Department of Biomedical Sciences

Credit Weight: 0.50

Version 1.00 - January 07, 2019

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## **1 Course Details**

### **1.1 Calendar Description**

This course is designed to ensure that graduate students with diverse neuroscience backgrounds registered in the collaborative specialization in Neuroscience are exposed to the fundamentals in all areas of neuroscience.

### **1.2 Course Description**

#### **Rationale:**

Our understanding of the nervous system has increased dramatically in recent years. It is now possible to describe in detail the complex events that underlie communication within and between neurons. However, even with these advances, we are only at the beginning of being able to understand how the coordinated activity within millions of nerve cells ultimately results in the behaviours we exhibit. The purpose of this course is to introduce Graduates Students in the Neuroscience Program to the fundamentals of neuroscience, including the molecular biology of neurons, neurotransmission and receptors, neurodevelopment and basic neuroanatomy, motor and sensory control, learning and memory and neuronal damage and degeneration.

#### **Format and Procedures:**

This course consists of a variety of lectures, student presentations and writing assignments. Students are expected to attend all classes and to participate in discussions.

### **1.3 Timetable**

Timetable is subject to change. Please see WebAdvisor for the latest information.

### **1.4 Final Exam**

The final exam in this course is a take-home exam. Details will be provided on CourseLink.

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## 2 Instructional Support

### 2.1 Instructional Support Team

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## 3 Learning Resources

### 3.1 Recommended Resource(s)

**Principles of Neural Science 5th Edition, Eric R. Kandel, James H. Schwartz, Thomas M. Jessel, Editors. (Textbook)**

A copy of this textbook can be found at MacLaughlin Library.

### 3.2 Additional Resource(s)

**Other resources (Other)**

TBA – see also additional reading materials in the CourseLink site.

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## 4 Learning Outcomes

The overall aim of this course is to provide students with a fundamental understanding of the structure and function of the nervous system through a broad range of topics ranging from molecular and cellular biology to behaviour.

### 4.1 Course Learning Outcomes

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

1. Provide an overview of the molecular biology and signalling mechanisms involved in neurotransmission (knowledge).
  2. Understand the study of neural development and the mechanisms through which neurons are appropriately connected in the brain (knowledge).
  3. Understand how neurons and neuronal pathways are assembled and how this integration is thought to control processes, such as movement, learning and memory formation and behaviour (knowledge).
  4. Better communicate research findings (skills).
  5. Gain knowledge of the important characteristics of a good neuroscience research (or -be able to locate and critically appraise the methodological quality of neuroscience research) (skills).
  6. Formulate a searchable research question (skills).
  7. Develop informed opinions about ethical issues related to neuroscience research (skills).
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## 5 Teaching and Learning Activities

### Class location and meeting times:

Thursday 2:30 to 5:20 in OVC 1642 (unless otherwise indicated)

**3 hours of contact time per week (*times may change to accommodate guest lecturers*)**

### 5.1 Lecture

**Thu, Jan 10**

**Topic(s):** Introduction/Neuron structure/protein trafficking

Week 1

**Details/background reading:** Chapters 4 & 5, Principles of Neural Science text book

**Instructor:** B. Kalisch

**Thu, Jan 17**

**Topic(s):** Synaptic transmission

Week 2

**Details/background reading:** Chapters 10, 13 & 14, Principles of Neural Science text book

**Instructor:** B. Kalisch

**Thu, Jan 24**

**Topic(s):** Membranes/ion channels/receptors

Week 3

**Details/background reading:** Articles and homework assignment posted on CourseLink

**Instructor:** B. Hanna

**Thu, Jan 31**

**Topic(s):** No class this week - two classes during the last week

of March - Thursday March 28 and Friday March 29.

**Thu, Feb 7**

**Topic(s):** Neuroanatomy

Week 5

**Details/background reading:**

Neuroanatomy

Human anatomy laboratories (meet in OVC1642 first)

**Instructor:** Human anatomy laboratories

**Thu, Feb 14**

**Topic(s):** Homeostasis

Week 6

**Details/background reading:** TBA

**Instructor:** B. Kalisch

**Mon, Feb 18 - Fri, Feb 22**

**Topic(s):** WINTER BREAK

**Thu, Feb 28**

**Topic(s):** Neurodevelopment

Week 7

**Details/background reading:** TBA

**Instructor:** N. MacLusky

**Thu, Mar 7**

**Topic(s):** Perception/senses

Week 8

**Details/background reading:** TBA

**Instructor:** C. Fiacconi

**Thu, Mar 14**

**Topic(s):** Voluntary Movement

Week 9

**Details/background reading:** Chapter 38 Principles of Neural Science text book

**Instructor:** J. Srbely

**Thu, Mar 21**

**Topic(s):** Reflex Pathways

Week 10

**Details/background reading:** Chapters 36, & 37 (pages 744 to 749) Principles of Neural Science text book

**Instructor:** L. Bent

**Thu, Mar 28**

**Topic(s):** Brain and Behaviour

Week 11

**Details/background reading:** TBA

**Instructor:** J. Khokhar

**Fri, Mar 29**

**Topic(s):** Learning and Memory

Week 11

**(note the date change – FRIDAY)**

**Details/background reading:** Chapters 62 & 63 Principles of Neural Science text book

**Instructor:** B. Winters

**Thu, Apr 4**

**Topic(s):** Disorders and diseases of the nervous system

Week 12

**Details/background reading:** TBA

Stroke

**Instructor:** T. Saleh

Developmental Neurotoxicology

**Instructor:** C. Bailey

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## 6 Assessments

### Confidentiality

Research proposals should be reviewed with due respect for authors' confidentiality. In submitting their proposals for review, authors entrust granting agencies and reviewers with the ideas and results of their scientific work and creative effort, on which their reputation and career may depend. Authors' rights may be violated by disclosure of the confidential details of the review of their proposal. Reviewers also have rights to confidentiality, which must be respected by the editor. Confidentiality may have to be breached if dishonesty or fraud is alleged but otherwise must be honored.

### 6.1 Assessment Details

#### Research Proposal (35%)

**Due:** Mon, Mar 18

Students will write a research proposal (NSERC style- but can be health-related) based on their own neuroscience research project or neuroscience topic of their choice.

This assignment incorporates several objectives. First, it will allow you to spend time critically appraising the literature in your research area. Secondly, you will gain experience summarizing information and developing hypotheses based on the primary literature and previous findings from your laboratory. Third, it will give you experience in the preparation of a proposal with a defined format and deadline.

Format of the proposal:

The proposal (maximum 10 pages) can have a health focus and should be a multi-year proposal (three to five years). It should be written in 12 point font (or 10 cpi), double-spaced, with 1" (2.5 cm) page margins on all sides and the pages of the proposal should be numbered.

Title page: Proposal title, your name and student number, key words and a brief lay summary of the proposal (not part of the 10 page limit)

Proposal: 10 double-spaced pages (figures and tables can be on additional pages) including (estimated lengths provided):

- a brief review of the literature on your topic (1 to 2 pages)
- the hypothesis you are testing
- specific goals or objectives (1 paragraph - expanding on the hypothesis to state the research plan that you will use to test the hypothesis)
- the proposed experiments (5 to 7 pages) that describe the approach for each objective or goal outlined to test your hypothesis including:
  - a. The specific experiments that you are proposing including what model system(s) you will use and why
  - b. The specific methods and protocols that you will use to conduct the experiments
  - c. Data analysis
  - d. Pitfalls and alternative methods
- significance of the proposed experiments (1 to 2 pages) including:
  - a. The anticipated outcome/ information gained from these experiments
  - b. How the information will advance knowledge in this area
  - c. Relevance

References: Can be any format (not part of the 10 page limit)

Budget: Maximum one-page (not part of the 10 page limit) estimated cost of the resources you will need for the experiments (eg. equipment, reagents, animals, user fees, manpower)

The majority of the marks for this assignment will be based on your ability to integrate information from the literature into a testable hypothesis and design experiments to test your hypothesis. A marking rubric will be posted on CourseLink.

### **Peer Review (10%)**

**Due:** Wed, Apr 3



Students will anonymously review one NSERC proposal and provide a two-page report of their assessment.

Students will provide constructive critical reviews of their peers' research proposal using a standard rubric. Each review should consist of an honest assessment of the quality of the report, including an explicit statement of its major strengths and weaknesses. This review will be due 2 weeks after the proposal is given to the student for review. As is the case with the actual scientific peer-review process the identity of the reviewer will be known only by the instructor.

### **Journal Club Presentation (15%)**

**Due:** By topic, throughout the semester

Students will work in pairs to prepare an oral presentation based on a recent research article related to the lecture topic of that week. Some faculty assign papers, others provide guidance for students to select their own paper

Students will prepare a presentation (not less than 20 minutes and not more than 30 minutes) based on a primary research article on a topic chosen at the beginning of the semester. The paper will be made available to the class one week before the presentation. The presentation should be a concise and logical overview and critical appraisal of the study, including sufficient background information leading into the objectives and rationale of the paper, the methods used (including data analysis and statistics), the results and conclusions of the paper and a critique of the paper (strengths and weaknesses). The presentation will be followed by 5 to 10 minutes of questions on the study. Both students will receive the same mark based on a standard rubric (posted on CourseLink) that will include an assessment of presentation style, knowledge of the topic, summary of the research presented and critique of the study.

### **Critical Appraisal Paper (20%)**

**Due:** By topic, throughout the semester

Students will critically assess an assigned paper, discussing the highlights and flaws. Students will also be required to provide alternate experiments or future experiments that address the research question. A marking rubric will be provided on CourseLink.

The written report should be no less than 1000 words and include:

- A brief background on the research topic synthesized from course content and the current literature.
- A concise, lucid summary of the research presented in the article, including the methods used, the data generated and the conclusions of the article.
- A thorough critical analysis of the paper, discussing the highlights and flaws.
- A searchable scientific question (including proposed experiments), related to the article, that the student wanted answered but which was not answered in

the article or alternative experiments that would better address the question being answered in the article.

### **Final exam (20%)**

**Due:** Mon, Apr 8, 12:00 AM - Mon, Apr 15

Based on in class material. The take-home exam will be available on-line from Monday April 8 to Monday April 15, 2019. Answers are to be submitted via the CourseLink Drop Box.

## **7 Course Statements**

### **7.1 Course Evaluation**

Students will be asked to complete a questionnaire on the instructors' teaching abilities. This information is required by the university to evaluate faculty performance for purposes of Tenure, Promotion and Selective Increases. Administered by a third party rather than the instructions, these evaluations will be delivered to the instructors only after the final grades have been submitted to the Registrar's Office. The numerical ratings from the form will be made available to the Chair for administrative purposes. If a student wishes the Chair to see his/her written comments in addition to the scores, he/she must include with those comments his/her name (legibly printed) and signature.

## **8 University Statements**

### **8.1 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.

### **8.2 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 grounds for Academic Consideration are detailed in the Undergraduate and Graduate Calendars.

Undergraduate Calendar - Academic Consideration and Appeals

<https://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-ac.shtml>

Graduate Calendar - Grounds for Academic Consideration

<https://www.uoguelph.ca/registrar/calendars/graduate/current/genreg/index.shtml>

### **8.3 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 course registration are available in the Undergraduate and Graduate Calendars.

Undergraduate Calendar - Dropping Courses

<https://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-drop.shtml>

Graduate Calendar - Registration Changes

<https://www.uoguelph.ca/registrar/calendars/graduate/current/genreg/genreg-reg-regchg.shtml>

## 8.4 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.

## 8.5 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 can be found on the SAS website

<https://www.uoguelph.ca/sas>

## 8.6 Academic Integrity

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 encourages academic integrity. 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.

Undergraduate Calendar - Academic Misconduct

<https://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-amisconduct.shtml>

Graduate Calendar - Academic Misconduct

<https://www.uoguelph.ca/registrar/calendars/graduate/current/genreg/index.shtml>

## **8.7 Recording of Materials**

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

## **8.8 Resources**

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

Academic Calendars

<https://www.uoguelph.ca/academics/calendars>

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