



NEUR*6000 Principles of Neuroscience

Winter 2023

Section(s): 01

Department of Biomedical Sciences

Credit Weight: 0.50

Version 1.00 - January 08, 2023

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

Thursday 2:30 to 5:20 PM, unless otherwise indicated.

1.4 Final Exam

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

2 Instructional Support

2.1 Instructional Support Team

Course Co-ordinator:	Dr. Bettina Kalisch
Email:	bkalisch@uoguelph.ca
Telephone:	+1-519-824-4120 x54939
Office:	OVC 1646F

2.2 Teaching Assistants

Teaching Assistant (GTA):	Andrila Collins
Email:	andrila@uoguelph.ca

3 Learning Resources

3.1 Recommended Resources

Principles of Neural Science Eric R. Kandel et al (Textbook)

A copy of the sixth edition textbook can be signed out from the course coordinator.

A copy of the fifth edition textbook can be found at MacLaughlin Library.

3.2 Additional Resources

Other resources (Other)

Additional reading materials will be posted on the CourseLink site.

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 high quality 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

Three hours of contact time per week

Class schedule:

In-person: Thursday 2:30 PM to 5:20 PM; ECLA 3708 Note: in-person lectures will not be recorded.

5.1 Lecture

Thu, Jan 12

Topics: Course Introduction/Neuron Structure & Protein Trafficking

Dr. Bettina Kalisch

Thu, Jan 19

Topics: Synaptic Transmission

Dr. Bettina Kalisch

Thu, Jan 26

Topics: Membranes/Ion Channels/Receptors

Dr. Brad Hanna

Thu, Feb 2

Topics: Neuroanatomy

Student Presentations

NOTE: Students will also have the opportunity to visit the human anatomy laboratory to see their brain and spinal cord specimens. This session take place outside of class time; details will be provided once the session has been scheduled.

Thu, Feb 9

Topics: Homeostasis

Dr. Bettina Kalisch

Thu, Feb 16

Topics: Neurodevelopment

Dr. Neil MacLusky

Mon, Feb 20 - Fri, Feb 24

Topics: Winter Break - No Lecture

Thu, Mar 2

Topics: Voluntary Movement

Dr. John Srbely

Thu, Mar 9

Topics: Reflex Pathways

Mr. Tushar Sharma (PhD candidate in Dr. Leah Bent's laboratory)

Thu, Mar 16, 1:00 PM

Topics: Sensation & Perception

Dr. Naseem Al-Aidroos

Thu, Mar 23

Topics: Brain & Behaviour

Dr. Giannina Descalzi

Thu, Mar 30

Topics: Learning & Memory

Dr. Boyer Winters

Thu, Apr 6

Topics: Neurodegenerative Diseases & Disorders

Dr. Tarek Saleh

6 Assessments

6.1 Assessment Details

Collaborative Research Proposal (25%)

Due: Mon, Mar 27

Students will work in groups of three to develop a research proposal. Each student in the group must be from a different academic department and the proposal can focus on any neuroscience topic the group chooses.

This assignment incorporates several objectives. First, it will allow you to spend time critically appraising the literature in your chosen research area. Secondly, you will gain experience summarizing information and developing hypotheses based on the primary literature and previous research findings. Third, it will give you experience in the preparation of a proposal with a defined format and deadline. Finally, it will give you the opportunity to collaborate with and learn from researchers who work in a field different from your own.

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 names, department affiliations and student numbers, 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: Mon, Apr 10

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

Students will provide constructive critical reviews of their peers' research proposal based on specific criteria that will be provided on CourseLink. 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 course coordinator and teaching assistant.

Neuroanatomy (10%)

Date: Thu, Feb 2

Students will work in groups of three to prepare a brief oral presentation and written

summary that will be posted on CourseLink. The presentation should be no more than 10 minutes long and the written summary, one page maximum. Both should include a description of the structure and function of the anatomical area. All students will receive the same mark based on a standard rubric (posted on CourseLink) that will include an assessment of the content, presentation style and quality of the writing.

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 a primary research paper, discussing the highlights and flaws. Students will also be required to provide alternate experiments or future experiments that address the research question. Some faculty assign papers, others provide guidance for students to select their own paper. 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%)

Date: Thu, Apr 20, 11:59 PM

Based on in class material. The take-home exam will be available on-line on Thursday April 13, 2023. Answers are to be submitted on or before Thursday April 20, 2023 via the CourseLink Drop Box.

7 Course Statements

7.1 Group Work

Students will work in groups for the research proposal, journal club and anatomy assignments. Each group member must evenly contribute to the presentation and proposal preparation, as well as the 'in-class' presentation of the material. Please let the course coordinator know well before your presentation date if there are any issues in the degree of effort being made by a presenting group member.

7.2 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. Confidentiality may have to be breached if dishonesty or fraud is alleged but otherwise must be honored.

7.3 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 instructors, 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.

7.4 Netiquette

Online Behaviour

Inappropriate online behaviour will not be tolerated. Examples of inappropriate online behaviour include:

- Posting inflammatory messages about your instructor or fellow students
- Using obscene or offensive language online
- Copying or presenting someone else's work as your own

- Adapting information from the Internet without using proper citations or references
- Buying or selling term papers or assignments
- Posting or selling course materials to course notes websites
- Having someone else complete your quiz or completing a quiz for/with another student
- Stating false claims about lost quiz answers or other assignment submissions
- Threatening or harassing a student or instructor online
- Discriminating against fellow students, instructors and/or TAs
- Using the course website to promote profit-driven products or services
- Attempting to compromise the security or functionality of the learning management system
- Sharing your user name and password
- Recording lectures without the permission of the instructor

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>

Associate Diploma Calendar - Academic Consideration, Appeals and Petitions

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

8.3 Drop Date

Students will have until the last day of classes to drop courses without academic penalty. The deadline to drop two-semester courses will be the last day of classes in the second semester. This applies to all students (undergraduate, graduate and diploma) except for Doctor of Veterinary Medicine and Associate Diploma in Veterinary Technology (conventional and alternative delivery) students. The regulations and procedures for course registration are available in their respective Academic 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>

Associate Diploma Calendar - Dropping Courses

<https://www.uoguelph.ca/registrar/calendars/diploma/current/c08/c08-drop.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 make a booking at least 14 days in advance, and no later than November 1 (fall), March 1 (winter) or July 1 (summer). Similarly, new or changed accommodations for online quizzes, tests and exams must be approved at least a week ahead of time.

For Guelph students, information can be found on the SAS website

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

For Ridgetown students, information can be found on the Ridgetown SAS website

<https://www.ridgetownc.com/services/accessibilityservices.cfm>

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>

8.9 Disclaimer

Please note that the ongoing COVID-19 pandemic may necessitate a revision of the format of course offerings, changes in classroom protocols, and academic schedules. Any such changes will be announced via CourseLink and/or class email.

This includes on-campus scheduling during the semester, mid-terms and final examination schedules. All University-wide decisions will be posted on the COVID-19 website

(<https://news.uoguelph.ca/2019-novel-coronavirus-information/>) and circulated by email.

8.10 Illness

Medical notes will not normally be required for singular instances of academic consideration, although students may be required to provide supporting documentation for multiple missed assessments or when involving a large part of a course (e.g.. final exam or major assignment).

8.11 Covid-19 Safety Protocols

For information on current safety protocols, follow these links:

- <https://news.uoguelph.ca/return-to-campusess/how-u-of-g-is-preparing-for-your-safe-return/>
- <https://news.uoguelph.ca/return-to-campusess/spaces/#ClassroomSpaces>

Please note, these guidelines may be updated as required in response to evolving University, Public Health or government directives.
