



NEUR*3500 Techniques in Neuroscience

Winter 2023

Section(s): C01

Department of Molecular and Cellular Biology

Credit Weight: 1.00

Version 1.00 - January 10, 2023

1 Course Details

1.1 Calendar Description

This course provides an introduction to selected techniques used in Neuroscience. Students will investigate and learn key methods in neurophysiology and biomechanics, neuroanatomy, cognitive neuroscience, and molecular and cellular neurobiology, used to address contemporary problems in this multidisciplinary field. These techniques will be introduced through literature review, hands-on laboratory exercises and demonstrations. A diversity of vertebrate and invertebrate model organisms will be considered as well as the ethical considerations that accompany the use of animals or human subjects in research.

Pre-Requisites: MCB*2050, PSYC*3270, (NEUR*2000 or PSYC*2410), (1 of BIOM*3200, HK*2810, ZOO*3600)

Restrictions: This is a Priority Access Course. Enrolment may be restricted to particular programs (BSCH.NEUR) or semester levels during certain periods.

1.2 Course Description

This course will provide an introduction to selected techniques used in Neuroscience. Students will learn about a diversity of methods employed in preclinical and clinical research such as the measurement of gene and protein expression, brain circuit tracing, viral-mediated gene transfer, physiology techniques, and behavioural characterization to address contemporary problems in this multidisciplinary field. A diversity of vertebrate and invertebrate model organisms will be considered as well the ethical considerations that accompany the use of animals or human subjects in research.

This is a draft course outline and is subject to change up to the first day of classes, in keeping with the policy described in the University of Guelph Academic Calendar.

1.3 Timetable

Lectures are **Mondays 12:30PM-2:20PM**

Labs are **Mondays and Tuesdays 2:30PM-5:20PM**

1.4 Final Exam

There is no final exam for this course.

2 Instructional Support

2.1 Instructional Support Team

Instructor: Jenna Penney, Neuroscience
Email: penneyj@uoguelph.ca
Office: SSC 3516
Office Hours: Office hours by appointment

Instructor: Mazyar Fallah, Human Health and Nutrition
Email: mfallah@uoguelph.ca
Telephone: 518-824-4120 ex 52593
Office: SSC1320
Office Hours: Office hours by appointment.

Instructor: Jennifer Murray, Psychology
Email: jmurr@uoguelph.ca
Telephone: +1-519-824-4120 x56330
Office: MCKN 4001

Lab Co-ordinator: Jenna Penney, Neuroscience
Email: penneyj@uoguelph.ca
Office: SSC 3516
Office Hours: Office hours by appointment.

2.2 Teaching Assistants

Your teaching assistants (TAs) will be responsible for helping in lab sessions and marking all assignments. Please contact your TA should you have any questions.

2.3 Etiquette

When communicating with anyone in the course, including other students, TAs, coordinators

or instructors, it is expected that you address the other person with respect. Any communication that is deemed to be disrespectful or intimidating will be taken seriously and addressed accordingly.

3 Learning Resources

3.1 Required Resources

Courselink (Website)

<https://courselink.uoguelph.ca>

Course material, news, announcements, and grades will be regularly posted to the NEUR*3500 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. While we appreciate feedback regarding the course, 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.

SPSS (Software)

<https://guelph.onthehub.com/WebStore/Welcome.aspx>

It is mandatory to download the statistics program, SPSS, which you can get free from the University website.

Lab Chart Reader (Software)

<https://www.adinstruments.com/support/downloads/windows/labchart-reader>

You will require this free software in order to complete analysis for your second lab report. Note: LabChart Reader is used for data analysis but not acquisition. To collect data, students must use laptops provided in the lab session. Data can then be analyzed with LabChart Reader in lab or at a later time.

Neuromantic (Software)

Neuromatic is a free software used to trace neurons for analysis, you can find it on Courselink under Content > Laboratory Content > Lab 3: Neuron Tracing > Neuromantic_7_5. Please download **before** your neuron tracing lab.

3.2 Recommended Resources

Neuroscience (6th Edition, 2018) (Textbook)

Neuroscience (6th Edition, 2018). Edited by Dale Purves, George J. Augustine, David Fitzpatrick, William C. Hall, Anthony-Samuel LaMantia, Richard D. Mooney, Michael L. Platt, and Leonard E. White. Published by Sinauer Associates, Oxford University Press.

Discovering Statistics using IBM SPSS Statistics (5th Edition, 2017). Andy Field. Sage Publications. This book will provide background information *to support success* in your weekly lab session.

*NOTE there is no required textbook for this course. You will be provided with all necessary resources but these textbooks may compliment course material.

4 Learning Outcomes

4.1 Course Learning Outcomes

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

1. Describe the various subdisciplines within neuroscience, their primary research goals and established methods.
2. Describe the underlying basis and application of a variety of techniques in neuroscience.
3. Identify and justify a plan for using multiple techniques to address a problem in neuroscience.
4. Contrast the strengths and challenges involved in using a variety of model organisms for particular problems in neuroscience.
5. Understand statistical analyses for neuroscience research.
6. Demonstrate proficiency in the use of molecular and cellular biology, physiology, and behaviour data within the context of neurosciences.

5 Teaching and Learning Activities

This course will consist of both lectures and labs. The lecture material will give you the background information required to succeed in the weekly lab sessions. Attendance is mandatory to both lectures and lab sessions.

5.1 Lecture

Topics: Lab and Lecture Topics

Week	Date	Lecture Topic	Lab Topic
1	Jan. 9	<i>Scientific grant writing and animal ethics</i>	<i>Introduction to neurophysiology, neuroanatomy, and microscopy</i>

2	Jan. 16	<i>Multidisciplinary approaches and model systems in neuroscience</i>	<i>Experimental design and data analysis</i>
3	Jan. 23	Molecular/Cellular Neuroanatomy <i>Circuitry and tracing techniques</i> <i>Techniques for identification of neuronal activity</i>	<i>Neuron tracing and sholl analysis</i>
4	Jan. 30	Molecular/Cellular Neuroanatomy <i>Techniques to detect mRNA expression, protein expression</i> <i>Viral-mediated gene transfer</i>	<i>Immunohistochemistry on rodent brain sections</i>
5	Feb. 6	Molecular/Cellular Neuroanatomy <i>Research questions and experimental design</i> <i>Understanding a research paper</i>	<i>Data Analysis and assistance with Lab Report 1</i>
6	Feb. 13	Neurophysiology <i>Introduction to Neurophysiology</i> <i>Techniques used to understand reflexes and voluntary movement: microneurography, TMS, EMG</i> <i>Benefits and drawbacks of research in animals vs. humans</i>	<i>Earthworm Action Potential Lab</i>

Winter Break	Feb. 20	NO LECTURES	NO LAB
7	Feb. 27	<p>Neurophysiology</p> <p><i>The human spinal cord and circuitry</i></p> <p><i>Spinal reflex techniques to measure motor neuron excitability</i></p>	<i>Hoffman's Reflex Lab</i>
8	Mar. 6	<p>Neurophysiology</p> <p><i>Experimental Design & Data Analysis</i></p>	<i>Data Analysis and assistance with Lab Report 2</i>
9	Mar. 13	Human Cognitive Neuroscience	<i>Human electro-encephalogram</i>
10	Mar. 20	<p>Animal Behavioural Neuroscience</p> <p><i>Humans vs models</i></p> <p><i>Control procedures</i></p>	<i>Cognitive tasks in rodent model: video analysis</i>
11	Mar. 27	<i>Drop in help session for Grant Proposals</i>	<i>Data Analysis and assistance with Lab Report 3</i>
12	Apr. 3	<i>No Lectures</i>	<i>No Lab</i>

5.2 Lab

Topics:

Labs are Mondays and Tuesdays at 2:30-5:30pm in SSC 2313. You must attend your scheduled session.

6 Assessments

Assignment	Due Date	Grade
Stats assignment	Sunday, Jan 22 rd @ 11:59pm	5%
IHC lab report	Friday, Feb 10 th @ 11:59pm	20%
H-Reflex Lab Report	Friday, March 10 th @ 11:59pm	20%
Grant Proposal Outline	Sunday, March 13 th @ 11:59pm	5%
Behavioural Lab Report	Friday, March 31 st @ 11:59pm	20%
Grant Proposal	Monday April 24 th @ 11:59pm	30%
TOTAL		100%

** For flexibility we will automatically transfer 5% from your lowest graded lab report to your highest (ie. your highest report will be worth 25% and your lowest will be worth 15% when your final grade is calculated)

6.1 Missing Laboratory Sessions

Attendance to both Lab and Lectures is **mandatory** in this course. If you are unable to attend a lab, documentation will not be required as per COVID-related University statements, however, you are still responsible for any lab report associated with the missed session.

Missing more than one lab session may result in an incomplete being given for the course.

Please contact the Lab Coordinator with any questions.

6.2 Submitting Assignments

You will have 3 marked lab reports this semester, each worth 20% of your final grade. You will also prepare and submit a grant proposal outline and a statistics assignment each worth 5% of your grade, followed by your final grant proposal worth 30% of your final grade. ALL of these assignments are to be submitted electronically by the due date given. Based on the time-stamp of submission, each 24-hr delay will result in 20% automatic deduction in the assignment grade. An assignment submitted 4 days and 1 minute past the due date **will not be graded**.

For flexibility, we are implementing an assignment 'Hall Pass'. Each student will be allowed to use this Hall Pass to grant themselves a 48-hr extension on **one** assignment, with no justification required. To use the Hall Pass, students must email the Lab Coordinator

(penneyj@uoguelph.ca) prior to the assignment deadline to inform they will be using the Hall Pass for a specific assignment. **You may only use the Hall Pass once throughout the semester.**

Any student that wishes to have an assignment regraded must contact the lab coordinator **within 1 week** of the mark being posted on Courselink.

Turnitin® may be used for some or all student papers in this course, as the case may be, at the instructor's discretion.

*Note: by registering for this course you are agreeing to the deadlines and grading scheme set out in the course outline

6.3 Bonus

Optional activity sheets associated with your Earthworm Lab and your MUSE lab will be available to you. Completion and submission of these activity sheets will replace up to **1% of the overall course grade each (total 2% bonus)**. The quality of the submission will be assessed and the extra credit will be distributed at our discretion.

7 Department of Molecular and Cellular Biology Statements

7.1 Academic Advisors

If you are concerned about any aspect of your academic program:

- Make an appointment with a program counsellor in your degree program. [B.Sc. Academic Advising](#) or [Program Counsellors](#)

7.2 Academic Support

If you are struggling to succeed academically:

- Learning Commons: There are numerous academic resources offered by the Learning Commons including, Supported Learning Groups for a variety of courses, workshops related to time management, taking multiple choice exams, and general study skills. You can also set up individualized appointments with a learning specialist.
<http://www.learningcommons.uoguelph.ca/>
- Science Commons: Located in the library, the Science Commons provides support for physics, mathematic/statistics, and chemistry. Details on their hours of operations can be found at: <http://www.lib.uoguelph.ca/get-assistance/studying/chemistry-physics-help> and <http://www.lib.uoguelph.ca/get-assistance/studying/math-stats-help>

7.3 Wellness

If you are struggling with personal or health issues:

- Counselling services offers individualized appointments to help students work through personal struggles that may be impacting their academic performance.
<https://www.uoguelph.ca/counselling/>
- Student Health Services is located on campus and is available to provide medical attention. <https://www.uoguelph.ca/studenthealthservices/clinic>
- For support related to stress and anxiety, besides Health Services and Counselling Services, Kathy Somers runs training workshops and one-on-one sessions related to stress management and high performance situations.
<http://www.selfregulationskills.ca/>

7.4 Personal information

Personal information is collected under the authority of the University of Guelph Act (1964), and in accordance with Ontario's Freedom of Information and Protection of Privacy Act (FIPPA) <http://www.e-laws.gov.on.ca/index.html>. This information is used by University officials in order to carry out their authorized academic and administrative responsibilities and also to establish a relationship for alumni and development purposes.

For more information regarding the Collection, Use and Disclosure of Personal Information policies please see the Undergraduate Calendar.
(<https://www.uoguelph.ca/registrar/calendars/undergraduate/current/intro/index.shtml>)

7.5 Course Offering Information Disclaimer

Please note that course delivery format (face-to-face vs online) is subject to change up to the first-class day depending on requirements placed on the University and its employees by public health bodies, and local, provincial and federal governments. Any changes to course format prior to the first class will be posted on WebAdvisor/Student Planning as they become available.

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.
