UNIVERSITY OF TORONTO SCARBOROUGH

NROC69 – Synaptic Organization & Physiology of the Brain

Wednesday 7:00pm-9:00pm IN-PERSON
MW170

Course Delivery

- **In-person**

Contact Information

Prof. Junior Steininger
junior.steininger@utoronto.ca

Office hours:
By appointment

Teaching Assistants:
Jeff Kates - jeffrey.kates@mail.utoronto.ca
Kylie Lau - kylie.lau@mail.utoronto.ca

Course Description

Synaptic organization is the study of principles underlying the organization of synapses and neurons into circuits that mediate the functional operations of different brain regions. It is a multidisciplinary and multi-level subject that integrates experimental findings from a vast number of disciplines including molecular neurobiology, neuroanatomy, neurochemistry, neurophysiology, neuropharmacology, and behavioural neuroscience. We start with a focus on the property of the synapse as a basic unit of neural circuit organization, moving up to the property of whole neurons and multi-neuronal local circuits characteristic of a given brain region, then explore the interactions between various circuits forming a neural system, right up to system-system interactions that occur in a normal and abnormal brain. We will also explore some exciting new developments in the field such as the use of receptor knockouts in rodents to establish causal functions of specific receptors, optogenetic techniques in the investigation of neural circuitries in brain function, and the approach of looking at network oscillations in the brain as underlying certain functions.

Prerequisites: BIOB10H3 and NROB60H3 and NROB61H3 and [(PSYB01H3) or (PSYB04H3) or PSYB70H3] and [PSYB07H3 or STAB22H3] and [PSYB55H3 or (PSYB65H3)]
If you have questions about missing prerequisites, the waiting list or other enrollment issues, please contact the Academic Counsellor for further information.

Reading Material

You are responsible for reading all lecture notes and any assigned readings. Assigned readings will be posted on Quercus, along with lecture material. Recommended (optional) textbooks for supplemental reading: 1. Purves et al. (2018). Neuroscience (6th ed.). Cary, NC: Oxford University Press. *The 5th edition of this textbook is acceptable as an alternative -or2. Martin et al. From Neuron to Brain (6th ed.). New York, NY: Oxford University Press. *The 5th edition of this textbook is acceptable as an alternative A print copy of these textbooks have been placed in the Library's Course Reserves.

Learning Outcomes

By the end of this course, a successful learner will be able to:

1. Understand the core principles of how the brain is organized at the systems, circuit, and synaptic level to achieve complex information processing
2. Describe how electrical signals are generated, and transmitted throughout the brain
3. Connect how the underlying synaptic organization in a particular brain area is related to its function
4. Explain how & why different methodologies are used in contemporary cellular neuroscience.
5. Develop and implement effective strategies for understanding, critically evaluating, and summarizing primary scientific literature in the field of cellular neuroscience.
6. Develop and implement effective strategies for written work, including how to appropriately paraphrase and reference primary literature.
7. Engage in self-assessment and reflection on their learning process and performance in the course.

Course Evaluation

Midterm	Oct 19 120 minutes	30%	Critical Analysis of Article	Oct 26	15%
Article 1 Discussion post	Sept 23	2.5%	Article 2 Discussion post	Nov 11	2.5%
Final exam TBA	TBA 150 minutes	35%	Final Essay	Nov 25	15%

Reading/Writing Assessments

Learning how to consume and critically analyze primary literature is an absolutely essential skill in the field of neuroscience. These assignments will help you further develop your analytical and scientific writing skills, and receive feedback on areas that may require improvement, prior to your term tests and final exam.

Group Article Discussion (2 x 2.5%; combined total 5% of final grade):
To provide additional opportunities for you to engage with the assigned articles and connect with your peers, you will be assigned on Quercus to collaborate on assigned article readings. Credit can be earned by asking original questions, contributing to an answer, or by posting any other interesting notes relevant to the article. These exercises will be graded on a 4-category scale that assesses a reasonable degree of effort and thoughtfulness: Insufficient (0%), Needs Major Improvement (70%), Needs Minor Improvement (80%), Meets Expectations (100%).

Critical Analysis of Assigned Article (15% of final grade):
You will be assigned to read an empirical article and prepare a written summary and critique. The article will be assigned at the end of week 5 and due by Friday, October 26. This assignment will help you further develop analytical and scientific writing skills before for the final exam and give you the opportunity to receive feedback on areas that require improvement. Detailed assignment guidelines will be posted on Quercus.

Final Essay (15% of final grade):
Essay prompts covering different topics presented in lectures will be given to you no later than two weeks in advance and the paper will be due by Friday, November 25th. You will pick only one prompt to write an essay on, including an introduction, main body of arguments, and a conclusion. A guideline for essay writing will be posted on Quercus.

Normally, students will be required to submit their course essays to the University's plagiarism detection tool for a review of textual similarity and detection of possible plagiarism. In doing so, students will allow their essays to be included as source documents in the tool's reference database, where they will be used solely for the purpose of detecting plagiarism. The terms that apply to the University's use of this tool are described on the Centre for Teaching Support & Innovation web site (https://uoft.me/pdt-faq)

You may opt out of using Turnitin.com to submit your course work, in which case alternative arrangements can be made to support your written work (e.g. providing research notes, etc.). If you intend to opt out of Turnitin.com, please **inform your Instructor by Friday, July 18** so alternate arrangements can be made.

Examinations

Exams will include both multiple-choice (MC) questions and short-answer (SA) questions. MC questions may come in various formats, including (but not limited to) questions with diagrams and "all of the above" or "none of the above" options. Questions will be drawn from lecture and assigned articles. SA questions will often require several sentences to address the question complexity and may also require the creation or analysis of a visual (e.g., diagram), or for you to solve a mathematical equation. The points assigned will be weighted based on the relative importance, as opposed to how many things you need to say (i.e., we will not employ a system of three points requiring three "things" to say).

Success on the exams will require you to develop a clear understanding of both the lecture content and assigned readings. Rote memorization of lectures and readings will not guarantee you a high mark; rather, I expect you to not only learn key concepts, but also to explain why each is relevant and to demonstrate how you can apply your knowledge in new and creative ways. The Midterm will be in class on week 6. The final will be scheduled by the registrar.

Midterm Exam (30%):
The midterm exam will occur on October 19. It is expected that the midterm will include lecture content covered in weeks 1-5, as well as any assigned readings.

Final Exam (35%):
The final exam will be scheduled by the Registrar to take place during the exam period, and is expected to include lecture content covered in weeks 7-12, as well as any assigned readings. The final exam will have you critically analyze an empirical article that will be assigned to you two weeks prior to the final exam date.

Course Webpage

The website associated with this course is accessible via http://q.utoronto.ca
Note: You don't need to create a new login for Canvas; it already knows who you are. You just need your UTORid and password. This is the same login that gets you onto the wireless network with your laptop, and the same one that you use to check your email. If you're confused about your UTORid or don't remember your password, go to: https://www.utorid.utoronto.ca/

IMPORTANT COURSE POLICIES **PLEASE READ**

Email

The main source of communication in the course will be email. Due to incompatibility issues with the Blackboard portal and some email servers (e.g. hotmail, etc.) you must send all email from your utoronto.ca account. Please include the course number (NROC69) in the subject line in all your emails about the course.

Disability-Related Accommodations

Students with diverse learning styles and needs are welcome in this course. In particular, if you have a disability/health consideration that may require accommodations, please feel free to approach me and/or the AccessAbility Services Office (http://www.utsc.utoronto.ca/ability/) as soon as possible.

AccessAbility Services staff (located in Rm AA142, Arts and Administration Building) are available by appointment to assess specific needs, provide referrals and arrange appropriate accommodations. Please contact 416-287-7560 (tel/TTY) or email ability.utsc@utoronto.ca for more information.
The sooner you let us know your needs the quicker we can assist you in achieving your learning goals in this course.

University's Plagiarism Detection Tool

Normally, students will be required to submit their course essays to the University's plagiarism detection tool for a review of textual similarity and detection of possible plagiarism. In doing so, students will allow their essays to be included as source documents in the tool's reference database, where they will be used solely for the purpose of detecting plagiarism. The terms that apply to the University's use of this tool are described on the Centre for Teaching Support & Innovation website (https://uoft.me/pdt-faq).

Department of Psychology Missed Term Work Policy

For missed term work (assignments and term tests) due to illness, emergency, or other mitigating circumstances, please follow the procedures outlined below.

Note:

- The following reasons are not considered sufficient for missed term work: travel for leisure, weddings, personal commitments, work commitments, human error.
- Missed *Final* Exams are handled by the Registrar's Office and should be declared on eService.
- Instructors cannot accept term work any later than five business days after the last day of class**.** Beyond this date, accommodations are only possible via the Registrar's Office petition process.

The email address to submit missed term work accommodation requests in **<NROC69>** is:
<junior.steininger@utoronto.ca>

ILLNESS OR EMERGENCY accommodations:

For missed work due to ILLNESS OR EMERGENCY, complete the following process:

1. Complete the Request for Missed Term Work Accommodations Form.
2. Declare your absence on ACORN (Profile & Settings > Absence Declaration)
3. Email **both** of the following items to the course email **WITHIN 2 BUSINESS DAYS** of the missed work:
   - the Request for Missed Term Work Accommodations Form
     AND
   - a screenshot of your Self-Declared Absence on ACORN

Note:

- *If you are unable to submit your request within 2 business days, you must still email your instructor within the 2 business day window to explain the nature of the delay. Exceptions to the 2 business day deadline will only be made under exceptional circumstances.*
- *If your absence is declared on ACORN, we do not require any additional supporting documentation (e.g. medical notes) to support your missed term work accommodation request.*

ACADEMIC CONFLICT accommodations:

For missed term work due to an ACADEMIC CONFLICT (e.g. two midterms at the same time):

1. Complete the Request for Missed Term Work Accommodations Form.
2. Take screenshots of your course Quercus pages that demonstrate the conflict.

3. Email the form and screenshots to the course email **at least two weeks (10 business days) before the date of the activity,** or as soon as possible if it was not possible to identify the conflict earlier. Requests sent after the activity deadline may not be accommodated.

Note:

- *Multiple assignments due on the same day are not considered conflicts. Students are expected to manage their time effectively to meet assignment deadlines.*
- *Back-to-back tests/quizzes are not considered conflicts. Only overlapping activities are conflicts.*
- *Students are responsible for keeping their course timetables conflict-free. Students who register in two courses with overlapping lecture/tutorial/lab schedules will not be accommodated.*

RELIGIOUS CONFLICT accommodations:

For missed term work due to a RELIGIOUS CONFLICT:

1. Complete the Request for Missed Term Work Accommodations Form.
2. Email the form to the course **email at least two weeks (10 business days) before the date of the activity**, or as soon as possible if it was not possible to identify the conflict earlier. Requests sent after the activity deadline may not be accommodated.

ACCESSABILITY SERVICES accommodations:

For missed ***TERM TESTS*** due to ACCESSABILITY REASONS:

- **Contact your AccessAbility consultant** and have them email the course email detailing accommodations required.

For missed ***ASSIGNMENTS*** due to ACCESSABILITY REASONS:

- If your desired accommodation is **within the scope** of your Accommodation Letter (e.g. your letter includes "extensions of up to 7 days" and you need 3 days):
    1. Complete the Request for Missed Term Work Accommodations Form.
    2. Email the form ***AND*** your **Accommodation Letter** to the course email specifying how many days extension you are requesting.
- If your desired accommodation is **outside the scope** of your Accommodation Letter (e.g. your letter includes "extensions of up to 7 days" but you need more time than that):
    1. **Contact your AccessAbility consultant** and have them email the course email detailing the accommodations required.

Accommodation Procedure:

After submitting your documentation, you will receive a response from your instructor or TA. This form does not guarantee that you will be accommodated. The course instructor reserves the right to decide what accommodations (if any) will be made. Failure to adhere to any aspect of this policy may result in a denial of your request. **You are responsible for checking your official U of T email and Quercus course announcements daily**, as accommodations may be time-critical.

For missed assignments, **do not wait for the instructor's response to resume work on your assignment.** Extensions may be as short as one business day, depending on the nature of the illness/emergency. Complete your assignment as soon as you're able, and email it to your instructor.

For an **anticipated absence** (e.g. a scheduled surgery or an illness with a prolonged recovery period), if you would like to request accommodations in advance, submit a Verification of Illness Form completed by your doctor AND the Request for Missed Term Work Accommodations Form to the course email. Absences can be declared up to 14 days into the future on ACORN.

Missed Accommodations

If an accommodation is granted but a continued illness/emergency prevents you from meeting its requirements, you must repeat the missed term work procedure to request additional accommodations. **Please make it clear in your**

subject line that you are requesting a second accommodation. E.g. If you are given an extension but are still sick and need more time, or if you miss a make-up term test, you must submit *another* Request for Missed Term Work Accommodations Form and declare your extended absence on ACORN. *Note: In the case of a missed make-up test, an opportunity to write a second make-up test may not necessarily be provided.

Academic Integrity

The University treats cases of cheating and plagiarism very seriously. The University of Toronto's Code of Behaviour on Academic Matters (http://www.governingcouncil.utoronto.ca/policies/behaveac.htm) outlines the behaviours that constitute academic dishonesty and the processes for addressing academic offences.
Potential offences in papers and assignments include using someone else's ideas or words without appropriate acknowledgement, submitting your own work in more than one course without the permission of the instructor, making up sources or facts, obtaining or providing unauthorized assistance on any assignment.
On tests and exams cheating includes using or possessing unauthorized aids, looking at someone else's answers during an exam or test, misrepresenting your identity, or falsifying or altering any documentation required by the University, including (but not limited to) doctor's notes.

Religious Accommodations

The University has a commitment concerning accommodation for religious observances. I will make every reasonable effort to avoid scheduling tests, examinations, or other compulsory activities on religious holy days not captured by statutory holidays. According to University Policy, if you anticipate being absent from class or missing a major course activity (like a test, or in-class assignment) due to a religious observance, please let me know as early in the course as possible, and with sufficient notice (at least two to three weeks), so that we can work together to make alternate arrangements.

Course Outline

Date	Topic
Sept 7	Course Intro & Neurophysiology Fundamentals (Part 1)
Sept 14	Neurophysiology Fundamentals (Part 2)
Sept 21	Synaptic Modulation **Article 1 Discussion (Sept 23)**
Sept 28	Synaptic Organization of the Basal ganglia
Oct 5	Synaptic Organization of the Thalamus
Oct 12	**READING WEEK**
Oct 19	**Midterm**
Oct 26	Synaptic Organization of the Hippocampus **Article Critique due (Oct 26)**
Nov 2	Synaptic plasticity and learning
Nov 9	Synaptic Organization of the Amygdala **Article 2 Discussion (Nov 11)**
Nov 16	Synaptic Organization of the Neocortex
Nov 23	Synaptic Mechanisms of sleep **Final Essay due (Nov 25)**
Nov 30	Review for Final/ Finish Essay
TBD	**Final Exam (TBD)**

Final exam: During exam period, it is the student's responsibility to be available for the entire exam period.