

NROC69H3 F

Synaptic Organization and Physiology of the Brain

Fall 2024 Syllabus

Course Meetings

NROC69H3 F

Section	Day & Time	Delivery Mode & Location
LEC01	Thursday, 7:00 PM - 9:00 PM	In Person: SW 128

Refer to ACORN for the most up-to-date information about the location of the course meetings.

Course Contacts

Instructor: Junior Steininger

Email: junior.steininger@utoronto.ca

Office Hours and Location: Office TBA and By Appointment.

Additional Notes: Please include course code in the subject line. Please allow 24-48 business hours for a response.

Course Overview

The course will provide an in-depth examination of neural circuits, synaptic connectivity and cellular mechanisms of synaptic function. Similarities and differences in circuit organization and intrinsic physiology of structures such as the thalamus, hippocampus, basal ganglia and neocortex will also be covered. The goal is to engender a deep and current understanding of cellular mechanisms of information processing in the CNS.

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.

Course 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.

Prerequisites: BIOB10H3 and NROB60H3 and NROB61H3 and [(PSYB01H3) or (PSYB04H3) or PSYB70H3] and [PSYB07H3 or STAB22H3] and [PSYB55H3 or (PSYB65H3)]

Corequisites: None

Exclusions: None

Recommended Preparation: None

Credit Value: 0.5

Course Materials

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.

(2023). Neuroscience (7th 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.

Marking Scheme

Assessment	Percent	Details	Due Date
Midterm Test	30%	<p>The midterm exam will occur on October 10. It is expected that the midterm will include lecture content covered in weeks 1-5, as well as any assigned readings. 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.</p>	2024-10-10

Article Critique	15%	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 4 and due by Monday October 14. 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.	2024-10-14
-------------------------	-----	--	------------

<p>Final Essay</p>	<p>15%</p>	<p>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 15th. 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, September 29 so alternate arrangements can be made.</p>	<p>2024-11-15</p>
---------------------------	------------	---	-------------------

<p>Discussion Post 1 and 2</p>	<p>5%</p>	<p>There will be two of these posts required, one will be due September 20 and the other on October 25. 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%)</p>	<p>2024-09-20,2024-10-25</p>
---------------------------------------	-----------	---	------------------------------

<p>Final Exam</p>	<p>35%</p>	<p>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. 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.</p>	<p>Final Exam Period</p>
--------------------------	------------	--	--------------------------

Late Assessment Submissions Policy

Department of Psychology Missed Term Work Policy

Procedure:

1. Complete the Request for Missed Term Work Accommodations Form ("MTW Form").
2. Email BOTH your MTW Form and Supporting Documentation to <junior.steininger@utoronto.ca> according to the instructions specified below.

Reason for Missed Work	Documentation required for a <i>first absence in the term</i>	Documentation required for <i>subsequent absences in the term</i>	Deadline for submitting MTW form and supporting documentation
Illness or Injury	ACORN Absence Declaration	UofT Verification of Illness Form	<u>within 2 business days</u> of the missed work
Bereavement	ACORN Absence Declaration	A death certificate or funeral announcement	<u>within 2 business days</u> of the missed work
University-sponsored athletic or artistic obligation at the varsity/provincial/national level	ACORN Absence Declaration	A note from a university staff member (advisor, coach, residence staff, etc.) who can substantiate the obligation, sent directly to the course email	<u>10 business days IN ADVANCE</u> of the missed deadline

For missed *TERM TESTS*,

- **Contact your AccessAbility consultant** and have them write to the course email detailing the accommodations needed.

For missed *ASSIGNMENTS*,

- 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), send your **Accommodation Letter** to the course email and specify how many days extension you are requesting. **PREFERABLY IN ADVANCE of the missed work, or as soon as possible**
- 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), **contact your AccessAbility**

consultant and have them write to the course email detailing the accommodations needed.

Academic Conflict

(e.g. two midterms at the same time)

Screenshot from Quercus demonstrating the conflict.

10 business days IN ADVANCE of the missed work

Religious Conflict

None required

Notes:

- The following reasons are not considered sufficient for missed term work: social activities, recreational travel, technological issues, avoidance of assessments or deadlines, work commitments
- [Missed Final Exams](#) are handled by the Registrar's Office and should be declared on eService.
- For ACORN absence declarations, the date you declare the absence is required to fall within the seven-day declaration period (i.e.) the absence cannot be submitted proactively or retroactively.
- 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](#).
- If you are unable to submit your request within the specified number of business days, you must still email your instructor within that window to explain the nature of the delay. Exceptions to the deadlines are made only under exceptional circumstances.
- Multiple assignments due on the same day are not considered academic conflicts. Students are expected to manage their time effectively to meet assignment deadlines.
- Back-to-back tests/quizzes are not considered academic 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.

Next Steps:

After submitting your documentation, you will receive a response from your instructor or TA. The course instructor reserves the right to decide what accommodations 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.

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.** Examples: If you were granted an extension for a paper but are still unable to meet the new deadline, or if you miss a make-up term test, you must submit *another* MTW form and supply documentation according to the “subsequent absences” column in the chart above. *Note: In the case of a missed make-up test, an opportunity to write a second make-up test may not necessarily be provided.

Course Schedule

Week	Description
Week 1 Sept 5	Course Intro & Neurophysiology Fundamentals (Part 1)
Week 2 Sept 12	Neurophysiology Fundamentals (Part 2)
Week 3 Sept 19	Synaptic Modulation
Week 4 Sept 26	Synaptic Organization of the Basal ganglia
Week 5 Oct 3	Synaptic Organization of the Thalamus
Week 6 Oct 10	Mldterm
Week 7 Oct 17	Synaptic Organization of the Hippocampus
Week 8 Oct 24	Synaptic plasticity and learning
Week 9	Synaptic Organization of the Amygdala

Nov 7	
Week 10 Nov 14	Synaptic Organization of the Neocortex
Week 11 Nov 21	Synaptic Mechanisms of sleep
Week 12 Nov 28	Review for Final/ Finish Essay

Policies & Statements

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.

Equity, Diversity and Inclusion

The University of Toronto is committed to equity, human rights and respect for diversity. All members of the learning environment in this course should strive to create an atmosphere of mutual respect where all members of our community can express themselves, engage with each other, and respect one another's differences. U of T does not condone discrimination or harassment against any persons or communities.

The University of Toronto is a richly diverse community and as such is committed to providing an environment free of any form of harassment, misconduct, or discrimination. In this course, I seek to foster a civil, respectful, and open-minded climate in which we can all work together to develop a better understanding of key questions and debates through meaningful dialogue. As such, I expect all involved with this course to refrain from actions or behaviours that intimidate,

humiliate, or demean persons or groups or that undermine their security or self-esteem based on traits related to race, religion, ancestry, place of origin, colour, ethnic origin, citizenship, creed, sex, sexual orientation, gender identity, gender expression, age, marital status, family status, disability, receipt of public assistance or record of offences.

University Land Acknowledgement

I wish to acknowledge this land on which the University of Toronto operates. For thousands of years, it has been the traditional land of the Huron-Wendat, the Seneca, and the Mississaugas of the Credit. Today, this meeting place is still the home to many Indigenous people from across Turtle Island and we are grateful to have the opportunity to work on this land.

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 web site (<https://uoft.me/pdt-faq>).

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 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 416-287-7560 or email ability.uts@utoronto.ca. The sooner you let us know your needs the quicker we can assist you in achieving your learning goals in this course.

Use of Generative Artificial Intelligence Tools

Students may use artificial intelligence tools, including generative AI, in this course as learning aids or to help produce assignments. However, students are ultimately accountable for the work they submit.

Students may not use artificial intelligence tools for taking tests, writing research papers, creating computer code, or completing major course assignments. However, these tools may be useful when gathering information from across sources and assimilating it for understanding.

The knowing use of generative artificial intelligence tools, including ChatGPT and other AI writing and coding assistants, for the completion of, or to support the completion of, an examination, term test, assignment, or any other form of academic assessment, may be considered an academic offense in this course.

Recording of Classroom Material by Students

Recording or photographing any aspect of a university course - lecture, tutorial, seminar, lab, studio, practice session, field trip etc. – without prior approval of all involved and with written approval from the instructor is not permitted.