

# **NROC69: Synaptic Organization & Physiology of the Brain**

University of Toronto Scarborough

Winter 2022

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### **Course Instructor:**

Marie Gadziola, PhD (*she/her*)

Pronounced: gad-zee-oh-la

marie.gadziola@utoronto.ca

**Course email:** [nroc69.gadziola@gmail.com](mailto:nroc69.gadziola@gmail.com)

**Course site:** Quercus

**Course delivery:** Online – asynchronous; exams may be in-person

**Office hours:** Fridays 12-1pm (drop-in; Zoom)

### **Course TAs:**

Sankirthana Sathiyakumar

Junior Steininger

## I. Course Overview

### Instructor

Dr. Gadziola is a part-time Teaching Stream faculty member in the Department of Psychology. She received her PhD in Neuroscience from Kent State University, followed by postdoctoral research at Case Western Reserve University. Her research and teaching interests are in sensory systems, and the neural mechanisms that underlie the detection and evaluation of salient stimuli influencing motivated behaviours.

### 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.

### Pre-requisites

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

### 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.

## II. Course Schedule

This outline may be subject to minor revisions with advance notice from the Instructor.

### Tentative Lecture Schedule

WEEK	DATE	LECTURE TOPIC	IMPORTANT DATES
1	<b>Jan 10</b>	Course Introduction Neurophysiology Fundamentals (Part I)	
2	<b>Jan 17</b>	Neurophysiology Fundamentals (Part II)	
3	<b>Jan 24</b>	Synaptic Modulation	
4	<b>Jan 31</b>	Synaptic organization of the basal ganglia	<b>Article Discussion 1</b>
5	<b>Feb 7</b>	Synaptic organization of the thalamus	
6	<b>Feb 14</b>	<b>MIDTERM* (Weeks 1-5)</b>	Article Critique assigned
		<i>Reading Week</i> <i>Feb 22-25</i>	
7	<b>Feb 28</b>	Synaptic organization of the amygdala	<b>Article Critique due March 4<sup>th</sup></b>
8	<b>Mar 7</b>	Synaptic organization of the hippocampus	
9	<b>Mar 14</b>	Synaptic plasticity and learning	<b>Article Discussion 2</b>
10	<b>Mar 21</b>	Synaptic organization of the neocortex	Essay prompt assigned
11	<b>Mar 28</b>	Synaptic mechanisms of sleep	
12	<b>Apr 4</b>	Review week / Finish Essay	<b>Essay due April 8<sup>th</sup></b>
	TBD	<b>FINAL EXAM** (Weeks 7-11)</b>	

\*The midterm will be scheduled by the Registrar. I have requested for it to occur in Week 6.

\*\*The final exam will be scheduled by the Registrar during the exam period.

### III. Assigned Readings

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* (6<sup>th</sup> ed.). Cary, NC: Oxford University Press.  
*\*The 5<sup>th</sup> edition of this textbook is acceptable as an alternative*
- or-
2. Martin et al. *From Neuron to Brain* (6<sup>th</sup> ed.). New York, NY: Oxford University Press.  
*\*The 5<sup>th</sup> edition of this textbook is acceptable as an alternative*

A print copy of these textbooks have been placed in the Library's Course Reserves.

### IV. Assessments

Course assessments have been broken down into 3 major categories:

#### 1. 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.

#### a) Midterm Exam (30%)

The midterm exam will be scheduled by the Registrar, and has been requested to occur in Week 6. It is expected that the midterm will include lecture content covered in weeks 1-5, as well as any assigned readings.

#### b) 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.

## 2. Reading and 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.

### a) **Small Group Article Discussion (2 x 1.5%; combined total 3% of final grade)**

To provide additional opportunities for you to engage with the assigned articles and connect with your peers, you will be randomly assigned to a smaller class group on Piazza 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%).

### b) **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 6 and due by **Friday, March 4<sup>th</sup>**. 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.

Due Date: March 4<sup>th</sup>, 11:59PM

### c) **Final Essay (15% of final grade)** Essay prompts covering different topics presented in lectures will be given to you *two weeks in advance*. 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.

Due Date: April 8<sup>th</sup>, 11:59PM

## 3. Reflection/Self-Assessments

### a) **Pre-post course reflections (2% of final grade)**

You will be asked to complete two self-assessments via Quercus – one at the beginning of the semester and one towards the end. The purpose of these reflections is to allow us to understand where your skills are at coming into this class and encourage you to actively reflect on your skill development and learning process across the course. There are no “correct answers”, but you must provide full responses for full marks.

Pre-course Survey Due Date: Jan 17<sup>th</sup>, 11:59PM

Post-course Survey Due Date: April 8<sup>th</sup>, 11:59PM

### b) **Self-Assessment & Feedback Quiz (optional extra credit, up to 2% bonus of overall grade)**

After each lecture, you will have the opportunity to participate in a self-assessment and feedback (SAF) quiz. SAFs consist of a few practice questions related to content covered in lecture that week. These questions will help you assess your comprehension of the lecture material and prepare you for the types of questions you might see on the exams. SAFs also incentivize staying on pace with readings and course preparation.

The last question each week will provide an open textbox for you to highlight any areas of confusion. This will help you evaluate your own areas of weakness, and help me assess whether there are common concerns that should be addressed on Quercus.

This learning strategy is most effective if you make a genuine attempt at answering the questions on your own, and keep up to date with the lecture material. You will not be graded on the accuracy of the answers you provide on the SAF; instead, the aim is to provide feedback to *yourself* about your own understanding.

At the start of each week, an SAF quiz will be made available and you must submit your answers by the end of the week (**no later than Friday 11:59PM**), at which time the SAF link will become unavailable. You will only be able to receive feedback on correct answers if you submit the SAF on time.

There will be 10 SAF opportunities throughout the term. If you complete 3-6 SAFs on time, you will receive a 1% bonus to your overall grade at the end of the term. If you complete 7 or more SAFs then you will receive a 2% bonus to your overall grade at the end of the term.

#### Course Grading Rubric

A+	A	A-	B+	B	B-	C+	C	C-	D+	D	D-
90%+	85-89	80-84	77-79	73-76	70-72	67-69	63-66	60-62	57-59	53-56	50-52

## V. Communication

**Quercus messaging.** Please do not contact your Instructor or TAs using the Quercus messaging system. Decide if your question is most appropriate for the discussion board or course email (see below).

**Piazza.** This term we will be using Piazza for all of our general course inquiries and content-related discussions. The system is highly catered to getting you help fast and efficiently from classmates, the TAs, and myself. Rather than emailing questions to the teaching staff, I encourage you to post your questions on Piazza.

**Email policy.** Email should be reserved for correspondence that requires privacy (e.g., accommodations, grading concerns), and should be sent to the course email ([nroc69.gadziola@gmail.com](mailto:nroc69.gadziola@gmail.com)). Emails must be sent from your university email account. In most cases, e-mails will be answered within 48 hours of receipt (excluding weekends and holidays).

Emails should have an informative subject title that includes some detail related to your question. Please keep your emails professional, concise, and clear. Your email should include your full name and student ID number so that we know who you are. A short email based around a single question, with some level of effort to explain the issue, will likely be most effective. If you are not familiar with writing professional emails, you may find this resource helpful: <https://tinyurl.com/kysxwtx>.

**Office hours.** Office hours will be hosted using Zoom (meeting link and passcode found on the Quercus homepage), unless notified otherwise. General office hours will be an open, drop-in format. More than one student may be in the room at the same time, and students are welcome to ask questions and/or

stay to listen to peer questions. Individual appointments can be requested by email if the questions/concerns are more appropriate to be addressed privately.

Office hours are a valuable resource for you to learn more about the class and/or other important things related to (but outside of) the class. You should consider attending Dr. Gadziola's office hours if you would like to (1) discuss course content, (2) if you have an issue with course performance or progress, or (3) you would like to discuss the field of psychology/neuroscience and how to get more involved.

## VI. Course Policies

**Equity, Diversity, and Inclusion.** The University of Toronto welcomes and includes students, staff, and faculty from a wide range of backgrounds, cultural traditions, and spiritual beliefs. The NROC69 teaching team proudly supports U of T's commitment to equity, human rights and respect for diversity, and we aspire to uphold these values as priorities in this course. 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. We stand with U of T against discrimination or harassment against any persons or communities.

**Land Acknowledgement.** We 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 most recently, the Mississaugas of the Credit. Scarborough is also located on the traditional lands of the Anishnabeg, the Chippewa, and the Haudenosaunee peoples. 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.

**Classroom etiquette.** Whether we are together in a physical or virtual classroom, our learning environment is a place where you should always feel safe and respected. It is also a place that is conducive to learning and intellectual curiosity. To help create this learning environment, we ask that you always use respectful language and strive to create an atmosphere of mutual respect. We should all recognize and respect diversity of opinions; it's okay to disagree and engage in scientific discourse, but inappropriate to disrespect or be offensive to others. It is expected that you also respect the privacy of your classmates, by never copying or distributing the contents of an online discussion thread or course videos that may include their participation.

**Slides and pre-recorded videos.** For your convenience, lecture slides will be posted along with each pre-recorded video, where appropriate. Lecture slides on their own are not considered a suitable substitute for listening to the full recorded video; slides are not exhaustive and we may cover important material that extends beyond them during recorded videos. The notes section will appear below each lecture slide, which contains expanded information that you are responsible for.

**Copyright notice.** All of the course videos and materials belong to your instructor, the University, and/or other sources depending on the specific facts of each situation, and are protected by copyright. In this course, you are permitted to download session videos and materials for your own academic use, but you should not copy, share, or use them for any other purpose without the explicit permission of the instructor.

**Contesting a grade.** All requests for a re-grade must be submitted in writing to the course email within two weeks of the day the grade is received. Only requests that include adequate written justification of

an error in the original grading will be considered. Where possible, a legitimate request will result in the entire assignment being re-graded. Your overall grade may be raised, lowered, or stay the same.

**Late submissions.** Late submissions will not be accepted for SAF quizzes. Assignments submitted after the deadline, and without being granted missed term work accommodations, will receive a -10% penalty per day late. All deadlines are set according to Toronto time.

**Changes to the syllabus.** There may be minor changes to the syllabus during the term. You will be notified of these changes ASAP and no changes will be instituted that dramatically affect your ability to reasonably prepare for a class or assessment.

## VII. AccessAbility

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 approach me and/or the AccessAbility Services Office as soon as possible.

AccessAbility Services staff (located in Rm SW302, Science Wing) are available by appointment to assess specific needs, provide referrals and arrange appropriate accommodations 416-287-7560 or email [ability@utsc.utoronto.ca](mailto:ability@utsc.utoronto.ca). The sooner you let us know your needs the quicker we can assist you in achieving your learning goals in this course.

## VIII. Academic Integrity

Academic integrity is essential to the pursuit of learning and scholarship in a university, and to ensuring that a degree from the University of Toronto is a strong signal of each student's individual academic achievement. As a result, 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/Assets/Governing+Council+Digital+Assets/Policies/PDF/ppju\\_n011995.pdf](http://www.governingcouncil.utoronto.ca/Assets/Governing+Council+Digital+Assets/Policies/PDF/ppju_n011995.pdf)) outlines the behaviours that constitute academic dishonesty and the processes for addressing academic offences. Potential offences include, but are not limited to:

In papers and assignments:

- 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:

- Using or possessing unauthorized aids;
- Looking at someone else's answers during an exam or test;
- Misrepresenting your identity; and
- When you knew or ought to have known you were doing it.

In academic work:

- Falsifying institutional documents or grades;
- Falsifying or altering any documentation required by the University, including (but not limited to) doctor's notes; and
- When you knew or ought to have known you were doing so.



All suspected cases of academic dishonesty will be investigated following procedures outlined in the Code of Behaviour on Academic Matters. If students have questions or concerns about what constitutes appropriate academic behaviour or appropriate research and citation methods, they are expected to seek out additional information on academic integrity from their instructors or from other institutional resources.

Note: You may see advertisements for services offering grammar help, essay editing and proof-reading. Be very careful. If these services take a draft of your work and significantly change the content and/or language, you may be committing an academic offence (unauthorized assistance) under the *Code of Behaviour on Academic Matters*.

It is much better and safer to take your draft to the Writing Centre as early as you can. They will give you guidance you can trust. Students for whom English is not their first language should go to the English Language Development Centre.

If you decide to use these services in spite of this caution, you must keep a draft of your work and any notes you made before you got help and be prepared to give it to your instructor on request.

**Plagiarism detection.** Normally, students will be required to submit their course essays/assignments 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>).

This class may be important to you, but not so important as to gamble with your academic career by cheating. If you find yourself wondering if something constitutes academic misconduct, I encourage you to investigate the subject more thoroughly before acting – not knowing that something is considered academic misconduct does not protect you from trouble! Knowing is half the battle! Consider visiting <http://uoft.me/academicdishonesty>.

## IX. Psychology Department Missed Term Work Policy, WINTER 2022

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

- 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: <http://www.utsc.utoronto.ca/registrar/missing-examination>
- Instructors cannot accept term work any later than five business days after the last day of class. Beyond this date, you would need to file a petition with the Registrar's Office: <https://www.utsc.utoronto.ca/registrar/term-work>

### **Accommodations for Illness or Emergency:**

For missed work due to ILLNESS OR EMERGENCY, complete the following **three-step** process:

1. Complete the [Request for Missed Term Work Accommodations Form](#)

2. **Declare your absence** on [ACORN](#) (Profile & Settings > Absence Declaration)
3. **Email both the Request for Missed Term Work Accommodations Form AND a screenshot of your Self-Declared Absence on ACORN** to the email address provided by your instructor on the course syllabus **WITHIN 2 BUSINESS DAYS** of the missed work.

*Note:* If you are unable to submit your documents within 2-business days, **you must still email your instructor within the 2-business day window** to explain the nature of the delay, and when you will be able to provide your documents. Exceptions to the documentation deadline will only be made under **exceptional circumstances**.

*Note:* For this semester, we do not require any additional supporting documentation (e.g. medical notes) to support your missed term work accommodation request.

### **Accommodations for Academic Conflicts:**

For missed term work due to an ACADEMIC CONFLICT (i.e. two midterms scheduled at the same time), please complete the following process:

1. Complete the [Request for Missed Term Work Accommodations Form](#), choosing “Other” and explaining the conflict in the space provided.
2. Take screenshots of your course homepages that demonstrate the conflict.
3. Email the form and screenshots to your course instructor **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.

*Note:* Multiple assignments due on the same day are not considered conflicts. Accommodations may only be possible in the case of quizzes and tests that are both scheduled during the same discrete period. Back-to-back tests/quizzes are not considered conflicts.

*Note:* Students are responsible for keeping their course timetables conflict-free. Students who choose to register in two synchronous courses with overlapping lecture/tutorial/lab schedules will not be accommodated.

### **Accommodations for Religious Conflicts:**

For missed term work due to a RELIGIOUS CONFLICT, please complete the following process:

1. Complete the [Request for Missed Term Work Accommodations Form](#), choosing “Other” and noting “Religious conflict” in the space provided.
2. Email the form to your course instructor **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.

### **Accommodations for Students Registered with AccessAbility Services:**

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

- **Contact your AccessAbility consultant** and have them email your instructor 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 your instructor, 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 your instructor 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 for accommodation. **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 an instructor response to resume work on your assignment.** Extension accommodations may be as short as one business day, depending on the nature of the illness/emergency. You should complete your assignment as soon as you are able and email it your instructor.

For an anticipated event (e.g. scheduled surgery or an illness with a prolonged recovery period), submit a [Verification of Illness Form](#) completed by your doctor, AND this form to your instructor if you would like to request accommodations in advance of the assignment deadline or midterm date. **Declare your future absence on [ACORN](#) (absences can be declared up to 14 days in the future).**

### **Missed Accommodations**

If an accommodation is granted but a continued illness/emergency prevents you from meeting the requirements of your accommodation, 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.** For example, if you are given an extension but are still sick and need more time, or if you miss a make-up midterm, you must submit another request '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 be provided.

### **Questions?**

If you have any questions about this Missed Term Work policy, please contact Dr. Gadziola at course email **well before** the date of the test / assignment deadline to describe your circumstances and inquire about procedures.

## **X. Course-specific Accommodation Policies for Missed Term Work**

Missed term work not granted accommodations will receive a 0% grade. Always submit your missed work to the Quercus assignment link as soon as you are able to; do not wait for an instructor response first to resume your work.

**SAF quizzes.** Accommodations will not be granted for the optional SAF quizzes. Keep in mind that you can receive full bonus credit for completing at least 7 of 10 quizzes through the term.

**Final essay.** The final essay is due on the last day of the term, which means that the maximum possible extension we can accommodate is 5 business days. Any accommodations that require more time than this will need to be petitioned through the Registrar's Office.

**Missed midterm.** There will be only one makeup midterm opportunity, specific date and time TBD. If you are unable to attend the make-up midterm and granted accommodations, your final exam will then be cumulative and worth 65% of your final grade.