



Psychology

UNIVERSITY OF TORONTO

SCARBOROUGH

NROB61: Neurophysiology

Summer 2024 Syllabus

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Instructor Information
<p>Debra Bercovici (she/her) Pronounced: ber-coh-vitch (yes, it's a silent 'i')</p> <p>Email: d.bercovici@utoronto.ca</p> <ul style="list-style-type: none"> • Please put course code (NROB61) in the subject line for prioritized responding • Replies within ~24 business day hours. <p>Office Hours:</p> <ul style="list-style-type: none"> • By appointment • Book via my Calendly page • Access my Zoom office <p>I'm available to discuss course content, address concerns about the course or your UTSC experience, talk about grad school and non-academic career paths, and find ways to connect you with resources to better support you as a student.</p>

TA Information	
<p>Jennifer Wilkin (she/her)</p> <p>Teaching: PRA0001 (9am to 11am) Email: jennifer.wilkin@mail.utoronto.ca</p>	<p>Hanista Premachandran (she/her)</p> <p>Teaching: PRA0002 (12pm to 2pm) Email: hanista.premachandran@mail.utoronto.ca</p>
<p>Julia Krimberg (pronouns)</p> <p>Teaching: PRA0003 (3pm to 5pm) Email: julia.krimberg@mail.utoronto.ca</p>	<p>Lina Al Halabi (she/her)</p> <p>Teaching: PRA0004 (6pm to 8pm) Email: lina.alhalabi@mail.utoronto.ca</p>

Course Description

Neurophysiology focuses on how electrical signals in our brain allow us to receive and transmit information from the world around us and from our internal states. This occurs within and between neurons, the fundamental processing cell in our brains. Our course, therefore, explores how neurons communicate and process information. Topics include synaptic transmission, synaptic integration, sensory coding, and neuroplasticity. These are foundational topics in neuroscience that will serve you in your future courses. To facilitate understanding, lectures and practical sessions emphasize classic experiments, fundamental principles, modern neuroscience techniques, laboratory skills, and scientific scholarship.

Learning Objectives

By the end of the course, I hope that you will be able to:

1. Understand the structural and functional properties of neurons.
2. Explain the landmark experiments that identified the biophysical properties of membranes and proteins that lead to the generation of neuronal transmission.

- Describe and contrast *in vivo* and *ex vivo* recording techniques that are used to study the electrophysiological properties of cells.
- Describe the circumstances that lead to neuroplasticity at the cellular level.
- Synthesize the course materials to make predictions about how perturbations in neural circuits modify neural communication.
- Become familiar with searching for primary research articles and critically analyze the content to determine if the results support the conclusions.
- Generate testable hypotheses, record neural activity, analyze timeseries data, and communicate experimental results.

Course Logistics

Course Schedule (Lecture topics tentative as of May 1)

Week	Date	Topic	Notes
1	Lec: May 8	Course Introduction + fundamentals	N2B chapter 1
	Lab: May 9	No lab	
2	Lec: May 15	Ion channels and signaling	N2B chapter 4 JOVE: Patch clamping
	Lab: May 16	Introduction and scientific arguments	
3	Lec: May 22	*This is a pre-recorded lecture!!!* Ionic basis of resting membrane potentials	N2B chapter 6
	Lab: May 23	No lab	
4	Lec: May 29	Ionic basis of action potentials	N2B chapter 7
	Lab: May 30	Literature review and referencing in science	
5	Lec: Jun 5	Passive electrical spread in neurons	N2B chapter 8
	Lab: Jun 6	Professional development and building community	
6	Lec: Jun 12	Midterm Exam	Testing weeks 1-5 (practical and lecture)
	Lab: Jun 13	Virtual leech lab	Prep: Background and Protocol
	Jun 17-21	READING WEEK	
7	Lec: Jun 26	Dendritic processing	N2B chapter 8
	Lab: Jun 27	No lab	
8	Lec: Jul 3	Pre & post-synaptic mechanisms of synaptic plasticity	N2B chapter 11 + beginning of chapter 13
	Lab: Jul 4	Extracellular Recording lab I	Prep: Background and Protocol
9	Lec: Jul 10	Synaptic plasticity	N2B chapter 16
	Lab: Jul 11	Extracellular Recording lab II	
10	Lec: Jul 17	Sensory coding and measuring extracellular activity	
	Lab: Jul 18	Article deconstruction I	Prep: Article I

11	Lec: Jul 24	Visual system	N2B chapter 2 + beginning of chapter 22
	Lab: Jul 25	Article deconstruction II	Prep: Article II
12	Lec: Jul 31	Targeted methods to control and record neuronal activity	
	Lab: Aug 1	Optional: Lab report help session	
Final Exam Period	Lec: TBA	Final Exam	Testing weeks 1-12 with an emphasis on 6-12 (practical and lectures)

Practical Component

Your first lab is during the second week of classes on May 17. Labs take place in SW 148 on Thursdays from 9am-11pm (PRA0001), 12pm-2pm (PRA0002), 3pm-5pm (PRA0003), or 6pm-8pm (PRA0004). You must attend your assigned lab section. Any changes must be made through ACORN. *Practical sessions are in-person only due to the nature of the hands-on content. These sessions cannot be recorded and if you miss a session, we are unable to re-offer it to you.*

During the practical sessions, you will work in small groups on tutorial- or lab-based assignments. All lab content can be found in the weekly [Quercus Modules](#).

Note: **Practical sessions are 2 hours**, but your official schedule will list the practical session as 3 hours. This 1-hour buffer exists to give you time to finish and submit your assignments. You will be asked to leave the lab after the 2-hour practical session ends!

Lecture Component

Lectures

You are invited to attend and contribute to classes on Wednesdays in KW120 (formerly MW120) from 9-11am. If you cannot attend in person (e.g. you are sick), a Zoom option is available. You can access the weekly Zoom classroom by going to the [Zoom Tab](#) on Quercus.

Since I will be recording our lectures, your in-person/zoom participation will also be recorded and will be available to students in the course for viewing remotely. Course videos and materials belong to your instructor/University and are protected by copyright. You are permitted to download lecture recordings and materials for your own *academic* use, but you are not permitted to copy, share, or use them for any other purpose without Debra's explicit permission.

Most of the lecture content is derived from the textbook [Martin et al. From Neuron to Brain \(6th ed.\)](#). New York, NY: Oxford University Press. If you feel that you learn best from textbooks, you may find sourcing a copy to be helpful for you. I've listed the relevant chapters in the [lecture schedule](#) using the acronym N2B. Speak to me during office hours if you're having trouble sourcing a copy. The 5th edition is a suitable alternative. Note that this is not necessary, all testable content will be delivered during the lectures.

[Quercus Modules](#)

You can find each weekly module on Quercus. At the top there is a Student Resource tab with links to various campus supports available.

The modules page is also where you will find the base of the weekly lecture content, including lecture slides (posted one week before lectures) and lecture transcripts (posted after lectures). My hope is that lecture transcripts will help students who benefit from having note-taking accommodations.

Evaluation Scheme

Practical Component—35%

- Tutorial assignments (5 x 1.2% = 6%)
 - [Scientific Arguments](#)
 - [Lit review + Referencing](#)
 - [Professional Development](#)
 - [Article Deconstruction I](#)
 - [Article Deconstruction II](#)
- Lab assignments (2 x 4.5% = 9%)
 - [Virtual Leech Lab](#)
 - [Extracellular Recording Lab II](#)
- [Final Lab Report](#) (20%)

Lecture Component—65%

- [Lecture Midterm Exam](#) (27%)
- [Lecture Final Exam](#) (37%)
- [Mid-Semester Survey](#) (1%)

For a detailed description of each graded component, please click on an individual item to go to the associated page on Quercus.

Grades will be posted directly to your [gradebook](#) on Quercus. Note that “final grades” calculated by Quercus may not be accurate and are not considered final. Your final grade is the grade that appears on ACORN at the end of the course.

Submitting work

The midterm exam is an in-person paper/pen exam during class time. The final exam is scheduled by the university during the final exam period. Please note that if you write your tests/exams in pencil, you will not be able to request a regrade if needed. Therefore, **we advise writing in pen.**

All practical assignments are to be submitted on Quercus. Each assignment has a dedicated page which can be accessed from the [Modules](#) (during the week that it is due) or in the [Assignments tab](#). The deadline for all **practical assignments** is the end of your practical session.

Missed Deadlines and Alternate Formats

If you miss your **midterm exam**, please contact Debra as soon as you can to work out an alternate arrangement. You are not required to submit any official UTSC paperwork. My typical policy is a make-up one-on-one **oral exam** during office hours. Once grades have been released to the class (typically within 2 weeks), make-up exams will no longer be permitted.

If you believe that your academic capabilities are not well-represented by standard exam structures (i.e., in-person, timed, multiple choice, short answers), I will consider individual proposals for alternate exam formats at least 2 weeks *before* the exam has taken place.

If you miss a **lab assignment** or **lab report**, please contact Debra as soon as you can to work out an alternate arrangement. Once grades have been released to the class (typically within 2 weeks), alternate arrangements will no longer be possible.

*There are no make-up opportunities for the **tutorial assignments**.* Each of the 5 submissions are worth 1.2%. You are permitted to miss one submission (no questions asked) without penalty and your grade will automatically reshuffle to 4 submissions worth 1.5% each.

Departmental Position on Grade Norms

The Department of Psychology at UTSC is committed to providing fair, consistent, and uniform delivery of its courses from year to year. As part of this commitment, the Department mandates that all B-level courses' final course averages are around 68%. You can expect that the *final class average* for this course will be similar.

Community Building

Inclusivity and Safe Classrooms

Our classroom is a community where students should feel included and are treated equitably. This refers to identities including, but not limited to, gender identity, gender expression, sex, race, ethnicity, socioeconomic background, sexual orientation, political and religious affiliation, disability, neurodivergence, health, and age. If controversial and/or sensitive issues arise, discussion is encouraged. However, students should feel safe to explore ideas without fear of being judged. If a statement or behaviour is likely to offend/alienate/discriminate against others, it should not be shared with the class. Instead, please share it with me during office hours. Any behaviour that compromises the safety of our environment or the belonging of a community member will not be tolerated, and you will be asked to leave the space (Zoom or in-person). If at any point during the semester you feel offended, threatened, or alienated by anything that happens during our class (including by me or a TA), please feel welcome to let me know.

One thing to keep in mind is that we are bound to make mistakes in this space, as does anyone when approaching complex topics. Strive to see your mistakes and others' as valuable elements of the learning process. I am also constantly learning from my mistakes.

A note on masking: I view masking as an example of accessibility, inclusivity, and classroom safety. While it is not a requirement, I encourage wearing a mask in class.

Accessibility

If you have accessibility needs, you are welcome in our classroom community. Here are some ways your teaching team is committed to increasing classroom accessibility:

- Offering online/asynchronous ways of engaging with the lecture portion of this course
- Wearing a mask during all student interactions.
- Accommodating flexibility around exams.
- Upholding classroom safety.
- Creating unambiguous instructions/expectations around grades.
- Sharing classroom content ahead of lectures.
- Honouring accommodations for all students, regardless of diagnosis, disability status, or affiliation with AccessAbility Services.
- Offering virtual one-on-one office hours on multiple days of the week with a flexible online booking system.
- Making closed captioned lectures and lecture transcripts available to all students.
- Including anonymous and non-speaking ways of engaging during lectures.

Seeking accommodations for your needs shouldn't be burdensome. **Accessibility and flexibility are built into the course and are available when needs arise. However, if you require an accommodation that is not automatically available to you, please contact me as soon as possible to work out a suitable arrangement.** You can reach out to me at the start of the semester and as needs arise/change, expected or unexpected. There is no expectation to divulge personal health information. I will advocate for you if you have a need that isn't being met.

Additionally, if there is anything else you can think of that would make this course more accessible to you and your peers, please let me know!

Academic Integrity

Academic integrity is what all members of the UTSC community, from first-year undergraduates to publishing professors, aspire to when they do research. Having academic integrity means taking responsibility for and having pride in your work, especially when it connects through practices such as crediting the work of others.

Having strong academic integrity is a qualifying behaviour that welcomes you as a scholar to the academic community.

Academic Integrity is about being loyal and respectful to those who have created content and about encouraging you to create work independently that you can feel proud of. Working with academic integrity means:

- **Doing your own work:** everything you submit should be completed by you.
- **Avoiding collusion:** this involves working too closely with your peers without authorization.
- **Not sharing materials** provided to you in this course. Please respect the copyright surrounding the work I've put in to offer you this course. If you'd like to share the content I've created, please speak with me first.
- **Engaging** with the ideas of others, both past and present, in a variety of scholarly platforms such as research journals, books by academics, lectures, etc. But also...
- **Explicitly acknowledging** the sources of your knowledge, especially through accurate citation practices

As members of our learning community, I want to invite you to spend some time thinking about what academic integrity means to you. What behaviours can you and your classmates engage in to make sure you are achieving your learning objectives and that your work is something you can be proud to represent.

If you are at risk of breaching academic integrity due to external and extenuating circumstances or a lack of accessibility, please come talk to me about how we can make the classroom a place where these coping mechanisms aren't necessary.

University Code of Behaviour on Academic Matters

If there is a breach in academic integrity, you may face consequences as per the university policy. The [Code of Behaviour on Academic Matters](#) outlines what constitute academic dishonesty and the processes U of T takes for addressing academic offences.

My Teaching Values

Transparency

My intention is never to conceal my motives. If something is unclear, that's my mistake. Please point it out and I'll clarify. Your success in our class should not depend on your ability to “read between the lines” or correctly guess/assume what I am (or the university is) asking of you.

Non-hierarchical learning

I don't like to pretend that I am the expert. I may know more about certain topics than you, but I am confident that in other domains, you hold more knowledge and experience than I do. I invite you to share when I've said something wrong or when you have a better idea than me.

Student/Community-driven learning

If something I'm doing isn't conducive to your learning, I'm open to altering course. You are the ones paying for this education, and you deserve to learn in a way that is best for you.

Land Acknowledgment: The University of Toronto is located on land belonging to the Huron-Wendat, the Seneca, and the Mississaugas of the Credit. The Scarborough campus is also located on land belonging to the Anichnabeg, the Chippewa, and the Haudenosaunee peoples. In addition to settling on stolen traditional and ancestral land, we are occupying it for the purpose of participating in an educational system that was built on and continues to uphold colonial frameworks.

Many of us who are not indigenous have settled on this land because our families have wanted us to grow up in a safer environment with more opportunities. This includes me, Debra, a child of immigrant parents. It is important to me that I reflect on how settling here offers more opportunities for myself, like being a member of a world-renowned university, but comes at the expense of the Indigenous communities we perpetually displace and exclude. I invite you to reflect on your own positionality and what it means for you to be on this land.

To learn more about the land which we are occupying, as well as about land acknowledgements, visit [Native Land.ca](https://www.native-land.ca)

If you have ideas on how we can incorporate Indigenous ways of knowing into our classroom, I would be eager to learn.