

NROC69: The Synaptic Organization and Physiology of the Brain

University of Toronto Scarborough
Fall Term, 2017

Instructor Information

Dr. Marie Gadziola (“gad-zee-oh-la”)
PO103, Room 123
Office Hours: Tuesdays 2-3PM

Course Information

Lecture Time: Tues 11:00-13:00
Location: MW160
Email: nroc69.2017.uts@gmail.com

TA Information:

Laurie Hamel, BSc
SW625B

I. Your Course Team



Dr. Gadziola is a Sessional Instructor 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, neuromodulation, and cellular mechanisms of information processing in the CNS.



Laurie is a PhD candidate in Psychology working in the Ito Lab. She has a BSc from Concordia University, where she specialized in Behavioural Neuroscience. Her research focuses on limbic-striatal circuits involved in motivation and decision-making.

II. Course description, pre-requisites and learning outcomes

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: NROB60. Although not a formal requirement, previous experience reading and analyzing primary articles is strongly recommended.

Learning outcomes: After successful completion of this course, you will be able to:

1. Describe the core principles of information processing in the brain, including how brain organization relates to function across the systems, circuit, and synaptic levels.
2. Explain how & why different methodologies are used in contemporary cellular neuroscience.
3. Read and critically evaluate primary research articles in the field of cellular neuroscience.
4. Demonstrate the ability to thoughtfully communicate ideas and summarize research articles in written form.

III. Tentative Course Schedule

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

Date	Topic	Chapter Reading
Sep 5	Organizational principles of the mammalian brain	1, 2,3
Sep 12	Pre-synaptic and post-synaptic mechanisms of neurotransmission	4, 5, 6
Sep 19	Synaptic integration and neuromodulation	5,6
Sep 26	Basic and cutting edge techniques in cellular neuroscience	Pg. 42, 59
Oct 3	In-class Midterm test on lectures 1-4 (1hr 50min)	
<i>Oct 10</i>	<i>Reading Week – no class!</i>	
<i>Oct 17</i>	Synaptic organization of the basal ganglia	18
Oct 24	Synaptic organization of the thalamus Critical analysis paper assignment due 27th Oct	Pg. 732-733
Oct 31	Synaptic organization of the hippocampus	31
Nov 7	Synaptic plasticity and learning	8
Nov 14	In-class Midterm test on lectures 5-8 (1hr 50min)	
Nov 21	Synaptic organization of the neocortex	26
Nov 28	Synapses in networks: network oscillations	
Final exam	Date TBA by Registrar (3hrs)	

IV. Course Readings

Required textbook: Purves D, Augustine GJ, Fitzpatrick D, Hall WC, LaMantia AS, & White LE (Eds.). (2012). *Neuroscience* (5th ed.). Sunderland, MA: Sinauer Associates, Inc.

You are responsible for reading any assigned chapter readings. Note that a 180-day eBook rental is available for purchase online at a reduced cost at www.redshelf.com.

You are also responsible for reading all lecture notes and assigned readings of primary articles, which will be posted on Blackboard.

V. Blackboard

Blackboard Portal will house important course-related announcements (cancellations of class, etc), lecture slides (to be posted the day before each lecture), empirical articles, discussion boards, course marks, and more. I expect that you will check it regularly throughout the term. For your convenience, three discussion forums will be created to improve information flow in our course.

Forum 1 – Practical Questions: A space to ask logistical or related questions to Dr. Gadziola that other students might benefit from knowing (i.e., not of a personal nature). Content questions will not be answered on this thread, and should be addressed before/after class or during office hours.

Forum 2 – Empirical Papers: A space to discuss the lecture-related empirical papers with your fellow classmates. Use this space to ask questions, test your understanding, and exercise your critical analytical skills. The more each student contributes here, the more you will all benefit. The more you practice with the assigned papers, the better prepared you will be for the assignment and exam responses. Discussions here will not be moderated by the course instructors, but rather this is to be used like a study group. **Please note that you are NOT allowed to post about the critical analysis paper assignment here!** You must complete your assignment independently, without help from others. Violation of this policy will be treated as academic misconduct.

Forum 3 – Peer-to-Peer Discussion: A space to direct questions to your fellow classmates to clarify a concept, form a study group, etc. Discussions here will not be moderated by the course instructors. **Please note that you are NOT allowed to post class notes on the discussion boards.**

VI. Course requirements and grading

The tests will be based on the materials covered in lecture and empirical papers.

In-class Midterm Tests 1 & 2 (50% overall grade - 20% Midterm 1, 30% Midterm 2)

Each midterm test will consist of both multiple-choice (MC) questions and short-answer (SA) questions, with similar weighting, based on the material covered in the preceding 4 weeks.

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. MC questions will be drawn from lecture, chapter readings, and empirical papers.

SA questions may require a one or several sentence response based on 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. SA questions will be drawn from lecture, chapter readings and empirical papers. SA questions will be weighted based on relative difficulty, 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).

Acceptable calculators are permitted on midterm exams. Guidelines will be provided for what is considered an “acceptable calculator”.

For superior performance, you will need to develop a clear understanding of both the lectures and the readings. Rote memorization of lectures and articles will not guarantee you a high mark; rather, I expect you to not only learn definitions and key concepts, but also why it is relevant, and how/why it is used, as appropriate.

Critical Analysis Assignment (15% overall grade):

Learning how to consume and critically analyze primary literature is an absolutely essential skill in the field of neuroscience. For this assignment you will be provided with an empirical article, and you will be required to write a critique of the assigned paper. The article will be assigned the week of Sept 26th and will be due **Oct 27th (Friday)**. This will give you practice in developing your analytical and scientific writing skills for the final exam and give you the opportunity to get feedback on areas that require improvement.

The paper must be a maximum of 5 pages, excluding references, double-spaced, in Times New Roman font, font size 12, with 1" margins. References must be cited using Journal of Science format. Details of the content of the assignment will be posted on Blackboard early in the term.

Submitting your assignment on Blackboard: You are required to submit **TWO COPIES** of your critical analysis assignment on Blackboard prior to the deadline. Submit the same file in PDF format both times; submitting different files constitutes a violation of academic integrity. First, submit your PDF to the Turnitin link, where it will be reviewed for textual similarity and detection of possible plagiarism. Second, submit your PDF to the Evaluation Copy link for grading purposes.

Final Exam (35% overall grade)

This exam will be scheduled by the Registrar during exam week. This exam will have 3 sections:

- 1) **Multiple-choice questions (5% overall grade)** only on lectures 9 and 10.
- 2) **Short essay (15% overall grade):** Four essay questions covering different topics presented in lectures 1-8 will be given to you *two weeks in advance*. In the final exam itself, you will be presented with 2 of the 4 questions that you have prepared, of which you will only have to answer 1 question. The essay must have an introduction, main body, and a conclusion. A guideline for essay writing will be posted on blackboard.
- 3) **Critical analysis of empirical paper (15% overall grade):** You will be provided with an empirical paper to read two weeks before the final exam date. In the exam, you will be required to answer SA questions that are designed to test your understanding of the paper, as well as the research topic.

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

After each lecture, you will have the opportunity to participate in a self-assessment and feedback (SAF) exercise. SAFs consist of a few practice questions related to content covered in lecture or text 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 class attendance and staying on pace with readings and prep.

Each SAF also has an open textbox to provide feedback on lecture content and 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 BB or in class.

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 (i.e. don't just cram the week before the midterm). You will not be graded on the accuracy of the answers you provide on the SAF; instead, the aim is to provide feedback *to you* about your own understanding.

At the end of each lecture, an SAF “test” will become available on Blackboard (in the left-side navigation pane). 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. To motivate you further, you will only receive correct answers and feedback 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. Remember: the extra credit opportunity is for participating, not getting the correct answers.

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

VII. Course policies

Classroom conduct.

Our classroom 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 I ask that you always use respectful language, minimize potential distractions during lectures (e.g., off-topic chatting, Facebook), show up to class on time, support your peers, and genuinely try your best everyday.

Email policy.

All course-related correspondence should be sent to nroc69.2017.utsc@gmail.com. Emails should not be sent to our personal email addresses.

In most cases, e-mails will be answered within 48 hours of receipt (not including weekends and holidays). Please keep your emails professional, concise, and clear: start with an informative subject title that includes the course name and some detail on your question (i.e., “C69 - question about exocytosis”). The start of 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 your understanding or where you are stuck, will likely be most effective. If you are not familiar with writing academic emails, you may find this resource helpful:

<https://tinyurl.com/kysxwtx>

Lecture Slides and Attendance.

For your convenience, lecture slides will also be posted prior to each class (typically by 10PM the evening before a lecture). They will be posted in PDF format in two versions only (1 slide and 3 slides per page).

You should know that the lecture slides are not a suitable substitute for attending lecture. Lecture slides are not exhaustive and we will regularly cover important material that extends beyond them during lecture. I strongly recommend using lecture slides and adding your own additional notes, and I will be pacing class on the assumption that students do so. If you miss a lecture, I encourage you to contact a classmate to find out what you missed.

Copyright of lecture material.

Instructional materials (lecture slides, handouts, articles) are only for the purpose of learning in this course and must not be distributed or used for any other reason whatsoever. As protection of copyright, the unauthorized use, copying, or uploading on the internet of lecture handouts is strictly prohibited.

Video and Auditory Recording.

For reasons of privacy as well as protection of copyright, unauthorized video or audio recording in classrooms is prohibited. This is outlined in the Provost's guidelines on *Appropriate Use of Information and Communication Technology*. Note, however, that these guidelines include the provision that students may obtain consent to record lectures and, "in the case of private use by students with disabilities, the instructor's consent must not be unreasonably withheld."

Contesting a grade. All requests for a re-grade must be submitted in writing 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. A legitimate request will result in the entire assignment being re-graded. Your overall grade may be raised, lowered, or it may stay the same. Arbitrary requests for grade increases will not be entertained (e.g., "I need to get into grad school, so could you please give me a higher grade?").

Office hours.

Office hours are a valuable resource for you to learn more about the class and/or important things related to (but outside of) the class. You should consider visiting 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 neuroscience and how to get more involved.

Your TA will hold office hours the weeks before and after midterm tests to support students as they prepare and debrief from the tests. Midterms will be viewable with the TA only, and will not be released outside of office hours under any circumstances. You are NOT allowed to take notes or photographs of the exams and violation of this policy will be treated as academic misconduct. If you would like to view your midterm, you must first send an email requesting to do so and confirming the time you will attend.

Syllabus changes.

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.

Scheduling conflict.

A web option will not be offered for this course, so it is your responsibility to ensure that you are able to attend all the lectures. Given the nature of the material and course, attendance is critical to your success. If you have an ongoing conflict with lecture time, you should strongly consider dropping the course or adjusting your schedule to allow you to attend. Accommodations are not possible for scheduling conflicts. We will not answer emails concerning scheduling conflict.

VIII. 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 feel free to 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. The sooner you let us know your needs the quicker we can assist you in achieving your learning goals in this course.

IX. 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/ppjun011995.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.

TurnItIn: Normally, students will be required to submit their course essays/assignments to Turnitin.com 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 Turnitin.com reference database, where they will be used solely for the purpose of detecting plagiarism. The terms that apply to the University's use of the Turnitin.com service are described on the Turnitin.com web site.

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>.

X. Missed Term Work due to Medical Illness or Other Emergency.

All students citing a documented reason for missed term work must bring their documentation to the Psychology Course Coordinator in SW427C **within three (3) business days** of the assignment due date. You must bring the following:

- (1.) A completed [Request for Missed Term Work form](http://uoft.me/PSY-MTW) (<http://uoft.me/PSY-MTW>), and
- (2.) Appropriate documentation to verify your illness or emergency, as described below.

Appropriate Documentation:

In the case of missed term work due to **illness**, only an **original copy** of the official [UTSC Verification of Illness Form](http://uoft.me/UTSC-Verification-Of-Illness-Form) will be accepted (<http://uoft.me/UTSC-Verification-Of-Illness-Form>). Forms are to be **completed in full**, clearly indicating the start date, anticipated end date, and severity of illness. The physician's registration number and business stamp are required.

In the case of **medical emergency**, an original copy of the record of visitation to a hospital emergency room should be provided.

In the case of a **death of a family member**, a copy of a death certificate should be provided.

In the case of a **disability-related** concern, an email communication should be sent directly to the Course Coordinator (psychology-undergraduate@utsc.utoronto.ca) from your Disability Consultant at AccessAbility Services, detailing the accommodations required. The Course Instructor should also be copied on this email.

For U of T **Varsity athletic commitments**, an email communication should be sent directly to the Course Coordinator (psychology-undergraduate@utsc.utoronto.ca) from a coach or varsity administrator, detailing the dates and nature of the commitment. The email should be sent **well in advance** of the missed work.

Documents covering the following situations are **NOT acceptable**: medical prescriptions, anything related to personal travel, weddings/personal/work commitments.

Procedure:

Submit your (1.) [request form](#) and (2.) [medical](#)/other documents in person **within 3 business days** of the missed test or assignment. Forms should be submitted to **SW427C between 9 AM - 4 PM**, Monday through Friday. If you are unable to meet this deadline for some reason, you must contact the Course Coordinator via email (psychology-undergraduate@utsc.utoronto.ca) within the three business day window. Exceptions to the documentation deadline will only be made under exceptional circumstances.

Within approximately one week, you will receive an email response from the Course Instructor / Course Coordinator detailing the accommodations to be made (if any). You are responsible for checking your official U of T email and Blackboard course announcements daily, as accommodations may be time-critical. The Course Instructor reserves the right to decide what accommodations (if any) will be made for the missed work.

If you are granted accommodations for missing the first midterm, **your second midterm will be a cumulative exam** (based on lecture materials 1-8). If you are granted accommodations for missing the second midterm, there will be **one makeup exam in the week of Nov 21st**. However, please note that this exam will be very close to your final exam, and will take away from important time that you could be revising for the final exam. **Missed midterms that are not granted accommodations will receive a 0% mark.**

Failure to adhere to any aspect of this policy may result in a denial of your request for accommodation.

Note that this policy applies only to missed term work (assignments and midterms). Missed final exams are handled by the Registrar's Office (<http://www.utsc.utoronto.ca/registrar/missing-examination>)