NROC69
Synaptic Organization and Physiology of the Brain

University of Toronto Scarborough
Winter 2014

Tuesday 11AM-1 PM, MW 170

Instructor: Sherri Thiele - Office hours: Tuesday 1:30-2:30PM (Portable 103 room 123)
TAs: Cole Tolledo - Office hours (Lectures 1-5): Thursday 1:30-2:30PM (SW ___)
David Nguyen - Office hours (Lectures 6-10): Thursday 1:30-2:30PM (SW ___)
Website: Blackboard
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* Please post course/content related questions to relevant blackboard discussion forum for the benefit of other students. All questions must be sent to nroc69.utsc2014@gmail.com. Please note that emails

COURSE OVERVIEW

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 the whole neuron and multi-neuronal and local circuits characteristic of a given brain region, then explore the interactions between various circuits forming a neural system, right up to the 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 knowckdowns in rodents to establish causal functions of specific receptors, optigenetic 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 OBJECTIVES

By the end of the course:

- You will understand the core principles of how the brain is organized at the system, circuit, and synaptic level to achieve complex information processing.
- You will understand how electrical signals are generated, and transmitted through the brain.
- You will understand how synaptic organization in a particular brain area is related to a particular function
- You will understand the methodologies (some of which are very current) used in the field of cellular neurobiology.
- You will be able to read critically, and appreciate at a sophisticated level articles written in the field of cellular neurobiology.

COURSE READING

The lecture will be loosely based on the primary course text, Synaptic Organization of the Brain (Gordon M Shepard, 5th Edition). There will also be assigned readings for each lecture, most of which will be original empirical articles pertaining to the lecture topic. Reading these papers will serve as excellent preparation for the final exam. There will be two randomized 'pop' quizs (multiple choice) based on the empirical article from the previous week.

Date	Topic
Jan 7	Organization principles of the mammalian brain
Jan 14	Pre-synaptic and post-synaptic mechanisms of neurotransmission
Jan 21	Synaptic integration and neuromodulation
Jan 28	Basic and cutting edge techniques in neuroscience - Critique paper assigned
Feb 4	**Midterm test on lectures 1-4**
Feb 11	Synaptic organization of the thalamus
Feb 18	**Reading week - no class!** **-** **Critique paper due**
Feb 25	Synaptic organization of the basal ganglia
Mar 4	Synaptic organization of the cortex
Mar 11	Synaptic organization of the hippocampus
Mar 18	**Midterm test on lectures 5-8**
Mar 25	Synaptic plasticity and learning
April 1	Synapses in networks: network oscillations
Final exam	**Date TBA by registrar (3 hrs)**

RESOURCES

Lecture slides and PDFs of papers will be posted on the course website in the 'content' section by **midnight at the latest** the night before the lecture. Other resources will become available throughout the course to supplement the lecture slides.

SCHEDULING CONFLICTS

A web option will not be offered for the course, so it will be your responsibility to ensure you are able to attend all the lectures. **We will not answer emails related to scheduling conflicts.**

EVALUATION

The tests will be based on the materials covered in class, textbook, and empirical articles.

Randomized quiz (5% overall grade): There will be **two randomized 'pop' quiz's** during the semester, they will be based on the assigned empirical articles from the previous week.The quiz will occur at the beginning of class and will consist of 10 questions, that may consist of multiple choice, matching, or short answer. **Please make sure to keep-up with the assigned readings.**

Critical analysis assignment (10% overall grade): You will be provided with an empirical article, and you will required to write a critique on the assigned paper. The article will be assigned the week of January 21st and will be due Feb 18th. 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.

MIdterm tests 1 & 2 (20% overall grade each)
Each test will consist of multiple-choice questions and short answer questions on the indicated lecture material.

Final exam (45% overall grade)
The exam will have 3 sections:

1) **Multiple choice questions (10% overall grade):** on lectures 9, 10
2) **Short essay (15% overall grade):** Five essay questions covering different topics presented in lectures 1-7 will be given to you two weeks in advance. In the final exam itself, you will be presented with 3 of the 5 questions you have prepared, of which you will only have to answer 1 question. The essay must have an introduction, main body and conclusion.
3) **Critical analysis of empirical paper (20% 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 questions that are designed to test your understanding of the paper as well as the research topic.

The best strategy is for the final exam is to learn the material for lecture 9, 10, and then select 3 or 4 of the earlier lectures that most interest you to revise in detail. **It is also essential that you read the assigned papers from each lecture and become familiar with the format of scientific writing.**

COURSE POLICIES

Missed exams

You are expected to make every effort to take required mid-terms/exams and submit assignments on time. Absence from a mid-term/exam will only be granted for genuine legitimate reasons, including a documented family emergency or severe illness. If you miss the first mid-term, **your second midterm will be a cumulative exam based on lectures 1-8.** If you miss the 2nd midterm, **there will be one make-up exam the week of March 25th. However, please note that this exam will be very close to your final exam, and will take away from the important time you need for revising for the final exam material. Mid-terms/exam that are missed without a genuine legitimate reason will receive a mark of 0%**.

Grading

Numerical mark	Letter grade	Grade point average
90-100%	A+	4.0
85-89%	A	4.0
80-84%	A-	3.7
77-79%	B+	3.3
73-79%	B	3.0
70-72%	B-	2.7
67-69%	C+	2.3
63-66%	C	2.0
60-62%	C-	1.7
57-59%	D+	1.3
53-56%	D	1.0
50-52%	D-	0.7

Guidelines
A+ Outstanding performance, exceeding even the A described below
A Exceptional performance: strong evidence of original thinking; good organization, capacity to analyze and synethesize; superior grasp of subject matter withsound crtiical evaluations; evidence of extensive knowledge base.
B Good performance: evidence of grasp of subject matter; some evidence of critical capcity and analytical ability; reasonable understanding of relevant issues; evidence of familiarity with the literature
C Intellectually adequate performance: student who is profiting from the university experience; understanding of the subject matter and ability to develop solutions to simple problems in the material.
D Minimally acceptable performance: some evidence of familiarity with subject matter and some evidence that critical and analytical skills have been developed.
F Inadequate performance: little evidence of superficial understanding of the subject matter; weakness in critical and analytical skills; with limited or irrelevant use of literature

Note: For all written work, consistently poor spelling/grammar will be penalized. Please make sure to use the UTSC writing centre if you feel you need additional help with writting or want to further develop your writing skills: http://ctl.utsc.utoronto.ca/twc/.

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 exam or assignment being re-graded. Your overall grade may be raised, lowered, or stay the same. If there is an error in the arithmatic, please let us know and we will immediately re-calcular your grade (no written request necessary). **Arbitrary requests for grade changes will not be entertained.**

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

Copyright of lecture material
As protection of copyright, unauthorized copying, use, or uploading of any lecture slides, handouts, is strictly prohibited.

Accessibility
Students with diverse learning styles and needs are welcome in this course. In particular if you have a disability/health consideration that may require accommodation please feel free to approach me or the AccessAbility Services Office as soon as

possible. I will work with you and the AccessAbility service to ensure you can achieve your learning goals in this course. Enquiries are confidential. The UTSC AccessAbility staff (located S 302) are available by appointment to access specific needs, provide referrals and arrange appropriate accomodations (416) 287-7560 or ability@utsc.utoronto.ca.

Academic integrity

Academic integrity is essential in the pursuit of learning and scholarship at university, and to ensure that a degree from the University of Toronto is a strong signal of each students individual achievement, As a result the university treats cases of cheating and plagiarism very seriously. The University of Toronto Code of Behaviour on Academic Matters (http://www.governingcouncil.utoronto.ca/policies/behavac.htm) outlines the behaviours that consitute academic dishonesty and the processes for addressing academic offerences. Potential offenses include but are not limited to:

On tests and exams:

- Using or possessing unauthorized aids
- Looking at someone else's answer during an exam
- Misrepresenting your identity

In academic work:

- Falsifying institutional documents or grades
- Falsifying or altering documentation required by the University

All suspected cases of academic dishonesty will be investigated following the procedures outlined in the Code of Behaviour on Academic Matters. If you have any questions or concerns about what constitutes appropriate academic behaviour, appropriate research and citation methods, you are expected to seek out additional information on academic integrity from your instructor or from the institutional resources (http://www.utoronto.ca/academicintegrity/).