

Neural Circuits

Instructors

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All class-related email must:

- include “3SN3 2016” in the subject line
- originate from McMaster accounts
- use proper forms of address
- be free of inappropriate abbreviations

Email that does not conform to these guidelines will not be answered. Please do not send email from Avenue if you expect an answer. Responses will normally be made within 24 hours.

Course logistics

Lectures: Mondays 14:30-17:30; PC 335
Office hours: Wednesdays 12:30-14:30, PC 310
TA office hours: by appointment
Course website: Avenue

Course description

Neural Circuits is an introductory course in neural circuits and systems neuroscience. During the first few weeks of the term students will review and extend key neuroscience concepts and techniques needed to read original articles in systems neuroscience. In the latter (“modules”) portion of the course, students will learn about model neural circuits and will explore specific areas of circuit and systems neuroscience in greater depth by reading and discussing original research articles.

Course Objectives

This course aims to introduce students to concepts and techniques in neural circuits/systems neuroscience and to give students tools for critical reading, discussing, and thinking about original work in the field. After successfully completing the course, students should be able to:

- explain how neurons may be connected to perform specific types of tasks
- describe commonly used techniques in systems neuroscience
- logically present arguments from experimental systems neuroscience
- read and intelligently discuss original articles in systems neuroscience
- clearly and concisely present experimental data from original neuroscience articles
- propose appropriate experimental approaches for basic questions in neuroscience

Materials

Required Texts A) Coursepack, available at Campus Store
 B) 3SN3 Writing Guide (posted on Avenue)
 C) 3SN3 Presentation Guide (posted on Avenue)
 D) Original research articles (≤ 12). In the second part of the course, students will read review articles and original research articles linked from the course website and freely available through the university servers.

Calculator The McMaster Standard Calculator (Casio FX-991) will be permitted in tests and in class.

Evaluation

Distribution of marks

In-class exercises	10%	group
Quizzes/homework	10%	individual-group
Discussion	10%	individual
Written work	15%	individual
Midterm examination (individual and collaborative sections)	20%	individual-group
Final examination	35%	individual

In-class exercises (ICE)

Each lecture session includes one or more ICE questions, designed to help students think more deeply about the context or ramifications of the current topic. After the ICE question is posed in class, students may think about the question for a few minutes, discuss in small groups, and finally submit written answers as a group. ICE questions are typically debriefed in class.

Discussion

Each student will make brief (<3 min) oral presentations during the modules section of the course. Oral presentations will be evaluated by peers, the TA, and the instructor. Additionally, students will be evaluated for the quality and relevance of their contribution(s) to the general discussion.

Quizzes/homework

At the beginning of each class session, students will submit homework or take a short quiz covering the assigned reading for the current or immediately previous session. The lowest mark of these will be dropped. Students are encouraged to discuss homework questions with other students, but must submit their own answers to these questions, and must identify other students with whom they collaborated on the homework questions.

Written work

Within the modules section of the course, students will submit short, focused written assignments related to the articles under discussion. Written work will be marked based on content, organization, and clarity. Some written assignments may also be used for anonymous peer-editing. Students will have the choice of re-writing one previously submitted assignment for re-marking.

Midterm

Covering content from lectures and readings up through the previous class session, the midterm will consist of 3 sections: 1) brief definition/short answer, 2) intermediate answer (4-8 sentences or simple diagram), and 3) long answer (calculation/diagram, multi-part answer, or explanation). Upon submitting the midterm, students will have the opportunity to re-write the midterm collaboratively, with the collaborative test mark counting for 20% of the midterm grade if higher than the individual mark.

Final

A cumulative exam, of the same format as the midterm (without the collaborative section), covering material from class lectures and required readings. Students may bring to the final exam clean copies of the primary research articles; these copies must be surrendered at the conclusion of the exam.

Appeals

Students may appeal any mark within one week of the date on which the marked copy is made available by submitting a written request that justifies why re-marking is warranted.

If the request is judged sufficient, the entire task will be marked by the instructor (not TA); students should be aware that their marks may therefore increase or decrease.

The instructor reserves the right to adjust final marks up or down, in light of special circumstances and/or overall performance.

Missed Work

Late work will be assessed a 10% penalty for each day (or portion thereof) overdue. All requests for academic relief for missed work must be accompanied by a McMaster Student Absence Form or other notification from the appropriate Faculty or Program office. Missed in-class work for which university approval is presented may be replaced with the average of other in-class work. If a student misses a test and has obtained appropriate university approval, the grade may be redistributed or a make-up test may be given, at the discretion of the instructor. Students must contact the instructor promptly to discuss relief for missed work, or logistics for make-up tests. Note that a missed test may be replaced by a test of a different format, including possibly a recorded oral exam in the presence of the instructor and a TA.

Academic Integrity (approved language)

We expect university students to follow the highest standards of academic integrity at all times. Note that, according to the McMaster University Academic Integrity Policy, Section 17, “Academic dishonesty is to knowingly act or fail to act in a way that results or could result in unearned academic credit or advantage.” Students who engage in academic dishonesty will receive a zero on the relevant test or assignment and will be reported to the Office of Academic Integrity. This can result in more serious consequences including loss of credit with a notation on the transcript, “Grade of F assigned for academic dishonesty,” and even suspension/expulsion from the university.

It is your responsibility to understand what constitutes academic dishonesty and to avoid any appearance of academic dishonesty. Three examples of academic dishonesty include: plagiarism, improper collaboration, and copying or using unauthorized aids. For additional information and clarification, consult the Academic Integrity Policy at <http://www.mcmaster.ca/academicintegrity>.

Schedule

January 11	Introduction to neural circuits Channels, transporters, V_m , AP Dissecting neural pathways
18	Neurotransmitters The presynaptic terminal Measuring neuronal activity I
25	Synaptic transmission/integration Short-term plasticity Measuring neuronal activity II
February 1	Long-term synaptic plasticity Classic circuits

	Stimulating neurons
8	Midterm review Reading, thinking, and writing about science
15	Reading Week – no class
22	Midterm (2 hrs) Module I: Building neuronal circuits: Axon guidance
29	Module I: Discussion Circuits I: Retinal circuits
Mar 7	Module II: Building neural circuits: Developmental plasticity Circuits II: Escape circuits
16	Module II: Discussion Circuits III: Sound localization
23	Module III: Refining neural circuits: audiovisual maps in the optic tectum Circuits IV: Bat echolocation
30	Module III: Discussion Circuits V: Regulatory circuits
April 4	Module IV: Addiction + Discussion Circuits VI: Central pattern generators
TBA	Final Exam

Notes

- 1) The instructor and university reserve the right to modify portions of the course or course schedule, depending on special circumstances, including student performance/interest. Any such changes will be announced in class and posted on the course website. It is each student's responsibility to check the course website on Avenue regularly for updates.
- 2) Students who wish to audio or video record any part of the class must obtain the consent of all individuals present prior to recording the session; such consent must be obtained for each instance. Students found to be in violation will be asked to leave the class session.
- 3) Students are asked to refrain from using devices such as cellphones and computers for texting, WhatsApp, Facebook, and otherwise communicating with individuals outside of class during the class session. In addition to distracting the person using them – and much more importantly – use of these apps is distracting to other students in the classroom. Students are encouraged to step out of the room if they must message; those who choose to message within the class will be asked to leave the session. Repeated infringement may affect the Discussion/ Participation mark.
- 4) The material distributed for this course and posted on the website is copyrighted and is to be used solely by students registered in this course. Dissemination of course materials to anyone other than students currently registered in this course is a breach of copyright, and may also constitute a reportable breach of academic integrity.