

Fundamentals of Neuroscience (PSYCH 2F03)

Term 1, 2008

Instructor

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Open office hour: Mondays 4:00 - 6:00 PM. (Psychology Bldg., room 413).

Teaching Assistants (TA) and Neuroscience Consultants (NC)

Elana Bojman (TA)

- Open office hour: Fridays, 2:00 - 3:00 PM. (Psychology Bldg., room 311).
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Dan Case (TA)

- Open office hour: Wednesdays 10:00 - 11:00 AM. (Psychology Bldg., room 311).
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Crystal Chung (NC)

- Open office hour: Tuesdays, 5:00 - 6:00 PM. (Psychology Bldg., room 311).
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Ryan Peters (TA)

- Open office hour: Tuesdays, 11:00 AM - 12:00 PM. (Psychology Bldg., room 311).
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Raagula Sivayoganathan (NC)

- Open office hour: Wednesdays, 5:00 - 6:00 PM. (Psychology Bldg., room 311).
- Email: raagula12@hotmail.com

Help Outside the Classroom: Office Hours and Tutorial

Day	Time	Place	Resource
Monday	4:00 - 6:00 pm	PC 413	Dr. Goldreich, office hrs

Tuesday	11:00 am - 12:00 pm 5:00 - 6:00 pm	PC 311 PC 311	Ryan Peters, office hr Crystal Chung, office hr
Wednesday	10:00 - 11:00 am 5:00 - 6:00 pm	PC 311 PC 311	Dan Case, office hr Raagula Sivayoganathan, office hr
Thursday	6:00 - 7:00 pm	BSB 147	Tutorial
Friday	2:00 - 3:00 pm	PC 311	Elana Bojman, office hr

The instructor is available for drop-in consultation (no appointment needed) for 2 hours per week (see above). Each teaching assistant (TA) and neuroscience consultant (NC) is available one hour per week for drop-in meetings (no appointment needed), as well as one additional hour that can be scheduled by appointment. Please schedule an appointment with a TA or NC only if you are unable to make any of the drop-in times.

In any email you send to the instructor, TAs, or NCs, please include "Psych 2F03" in the subject line.

Note: Please do not email the TAs, NCs, or instructor with specific neuroscience questions; we will not answer such questions by email. Instead, specific neuroscience questions should be asked in office hours, in the tutorial sessions, or in class. In addition, students are strongly encouraged to post any such questions on the Heads-Together forum, where other students can help to answer them.

Description

Following an introduction to the organization of the nervous system, this course describes the electrical and chemical properties of the fundamental unit of the nervous system, the neuron, and how neurons communicate with one another. It then surveys the physiology and functional anatomy of touch, vision, audition, vestibular sensation, movement, and memory. Both the normal functioning and particular pathologies of these systems will be discussed. The course also surveys important neuroscience investigative techniques.

This course meets once per week in the evenings (Wednesdays, 7:00 - 10:00 PM, in TSH / B128). An optional tutorial is held each week (Thursdays, 6:00 - 7:00 PM, in BSB / 147). Students are strongly encouraged to attend the tutorials in order to clarify their understanding of the course material.

Lectures will be interspersed with critical thinking activities called Brain Teasers, which collectively account for 15% of the course grade. In addition, students will be graded on weekly homework exercises (15% of the course grade), two midterm tests (each worth 20% of the course grade), and one comprehensive final exam (30% of the course grade).

The course web site (<http://psych.mcmaster.ca/2f03/>) plays an important role in this course. The web site contains the most up-to-date syllabus and course schedule, as well as links to the homework assignments, a form for anonymous feedback to the instructor, and a password-protected system for students to check their marks. The web site also contains "Heads-Together," an online forum that students may use to discuss the course material. The course web site is password-protected. You must be enrolled in the course to obtain the password. The password will be announced at the first class meeting. If you miss that meeting, please send an email to the instructor with your name and student number, to request the web site password.

Objectives

Upon completion of this course, the student will understand the:

- structure and subdivisions of the nervous system, and fundamental organizing principles of

- functional neuroanatomy, such as contralaterality, topography, and bilateral symmetry.
- anatomical and functional scales of the nervous system, such as the numbers and sizes of neurons, the density of sensory receptors, etc., and how to generate order-of-magnitude estimates using back-of-the-envelope calculation to explore these scales.
 - special electrical properties of the fundamental unit of the nervous system, the neuron, and how these properties result in electrical impulse formation and conduction
 - electrochemical events that occur at the site of inter-neuronal communication, the synapse.
 - the modification of the synaptic strength (synaptic plasticity) by the processes of habituation, sensitization, and long-term potentiation
 - fundamental neurophysiological processes of the sensory systems, such as transduction and adaptation, and the relevance of these processes to perception.
 - functional neuroanatomy of the somatosensory system, including pathways for light touch and pain/temperature sensation.
 - functional neuroanatomy and neurophysiology of the retina, including the biochemistry of phototransduction and adaptation in the rod and cone systems, and how these contribute to various attributes of human vision.
 - functional neuroanatomy of the central visual pathways, how these pathways are thought to contribute to the perception of form, color, and motion, and the functional deficits that arise from injuries to and abnormal development of these pathways.
 - functional neuroanatomy of the auditory system, including mechanisms of acoustoelectric transduction and azimuthal sound localization.
 - functional neuroanatomy of the vestibular system and the etiology of common vestibular disorders
 - functional neuroanatomy of lower and upper motor control circuits, and the etiology of common motor pathologies.
 - neuroanatomy of language comprehension and production, evidence for language lateralization revealed by split-brain and other patients, and common language deficits (aphasias) that result from stroke.
 - brain areas involved in memory acquisition and storage, and mechanisms of synaptic plasticity suspected to underlie learning and memory.
 - most important histological, electrophysiological, and imaging techniques used to reveal the anatomy and functioning of the nervous system.

Materials

Required Textbook: Purves, D. et al. (2007) *Neuroscience, 4th Ed.* Sunderland, MA: Sinauer

Required Calculator: The McMaster Standard Calculator (Casio FX-991) is permitted in exams and for in-class Brain Teaser exercises. This calculator is available at the McMaster Bookstore. No other calculator is permitted.

Textbooks for optional reading on course reserve (Mills Library):

Neuroscience : Exploring the Brain / Mark F. Bear, Barry W. Connors, Michael A. Paradiso.
Principles of Neural Science / edited by Eric R. Kandel, James H. Schwartz, Thomas M. Jessell.
From Neuron to Brain / John Nicholls et al.

Schedule

The table below shows weekly topics, assigned readings, and homework assignments. Students are encouraged to read the assigned textbook chapters prior to each class period. The day before each class, the instructor will link the topic description to a PDF file containing the majority of the slides to be shown in lecture.

Week	Date	Topic	Homework	Reading
1	Sept. 10	Nervous System Organization; Language	--	Chs. 1, 26 (p. 664-666); 27
2	Sept. 17	Electrophysiology	Assignment 1	Chs. 2, 3
3	Sept. 24	Synaptic Transmission	Assignment 2	Chs. 4, 5
4	Oct. 1	Midterm Test 1 (7:00 PM, TSH / B128)	--	
5	Oct. 8	Somatosensory Systems	--	Chs. 9, 10
6	Oct. 15	Eye & Retina	Assignment 3	Ch. 11
7	Oct. 22	Central Vision	Assignment 4	Chs. 12, 24 (p. 616-629)
8	Oct. 29	Auditory & Vestibular	Assignment 5	Chs. 13, 14
9	Nov. 5	Midterm Test 2 (7:00 PM, TSH / B128)	--	
10	Nov. 12	Neuroscience Techniques	--	p. 16-21, 42, 63, 163-4, 297, 715-17
11	Nov. 19	Motor Systems	Assignment 6	Chs. 16, 17
12	Nov. 26	Synaptic Plasticity & Memory	Assignment 7	Chs. 8, 31
	TBA	Final Exam (comprehensive)		

Note: The course schedule may be modified during the semester, at the discretion of the instructor. Modifications will be made directly to the table above and announced in class.

Evaluation

Any material covered in class (lectures and brain teasers) and in homework assignments may appear on tests. Questions based on this material will account for at least 90% of each test's points. In addition, each test will include several questions drawn from material in the assigned textbook chapters that is not covered in class or homework. These questions will be worth no more than 10% of the test's points.

The student's course percentage score is a weighted average of the following five items:

Item	Weight
Homework Assignments	15%
Brain Teaser Exercises	15%
Midterm Test 1	20%
Midterm Test 2	20%
Comprehensive Final Exam	30%

Homework

- Homework assignments will be linked from the schedule table (above).
- Each homework assignment is due at the beginning of the corresponding class period. Late homework returns will not be accepted.
- Students are encouraged to type their answers whenever possible.
- Students may collaborate on homework assignments, if they wish, and collaborating students may choose to submit a single, group answer (maximum group size: three students). If this is done, then the name (typed) and signature of each contributing student must appear on the homework submission. Each student in the group will receive the same mark on that homework assignment. Students may change groups throughout the semester, or choose to submit their assignments individually.
- The relative point value of each question will be indicated on the homework assignment. The score for the entire homework assignment will always be reported on a 0-to-100% scale. For example, suppose an assignment has three questions, worth 10, 10, and 20 points. If a student earns half credit on the first question, full credit on the second, and half credit on the third, then the student's score will be $5 + 10 + 10 = 25$, and the score will be reported as 62.5% (i.e., $25 / 40$).
- The student's homework assignment scores are reported online in the Check Marks system.
- At the end of the term, the student's lowest homework assignment score will be dropped. The average of the student's remaining homework assignment scores will then be calculated. This is the student's course homework score.
- Students must complete the plagiarism tutorial and submit a signed acknowledgment of understanding along with their first homework assignment.

Brain Teasers

- The brain teasers are in-class exercises designed to encourage critical thinking about neuroscience.
- Some of the Brain Teaser exercises will require a calculator; the student should bring the McMaster Standard calculator (Casio FX-991) to class.
- At least one brain teaser will be given in each class; the number of brain teasers will not usually exceed 3 per class period.
- Unless otherwise announced, each brain teaser exercise is worth 2 points. Each answer will receive either zero, half, or full-credit (0, 1, or 2 points).
- The student's brain teaser percentage score is the number of brain teaser points earned divided by the total number of points possible. For example, suppose that, in the first two weeks of the course, 4 brain teaser exercises are given, worth 2 points each. If a student earned 1, 2, 2, and 1 on these four brain teasers, respectively, then the student's brain teaser percentage score after two weeks will be 6 out of 8, or 75%.
- The student's brain teaser score is reported online in the Check Marks system.

Tests and Exams

- The tests and exams contain multiple choice questions, as well as some questions requiring drawings and short written answers.
- A few questions will require calculations; the student should bring the McMaster standard calculator (Casio FX-991) to all exams. Only the McMaster standard calculator will be allowed.
- Any material covered in class (lectures and brain teasers) and in homework assignments may appear on tests. Questions based on this material will account for at least 90% of each test's points. In addition, each test will include several questions drawn from material in the assigned textbook chapters that is not covered in class or homework. These questions will be worth no more than 10% of the test's points.
- Midterm test 1 covers material from the first three course topics (weeks 1-3). Midterm test 2

covers material from the next four course topics (weeks 5-8). The final exam is comprehensive; it covers material from all course topics.

- Each test / exam is given a mark on a scale from 0 - 100%.
- The test marks are reported online in the Check Marks system.
- Create-a-Question: As an optional exercise, students are encouraged to try to generate an excellent test or exam question of their own. Please email the instructor your proposed question and answer. Questions that are carefully and articulately worded, and that probe student understanding of important concepts, will be considered for inclusion. The instructor will not inform you in advance of the test whether your question will be used, and will not provide feedback as to whether your answer is correct. If it is used on a test, your name will not be attached to the question, but a note will indicate that the question was student-generated. If it is used, your question may be edited and/or otherwise modified by the instructor.

Extra Credit

There are two ways for students to earn extra credit points in this course:

I. Help-a-Peer Point. Students who provide an excellent, original answer on the Heads-Together forum, in response to another student's question regarding the course material, will earn an extra credit point.

- An excellent answer is one that correctly and articulately explains a conceptually challenging topic. The answer is original if no similar answer has yet been posted by another student.
- Each student can earn a maximum of one Heads-Together extra credit percentage point per week. The teaching assistants will read the forum each week in search of excellent original answers, and bring these to the attention of the instructor for final evaluation.
- The student's extra credit points, if any, are reported online in the Check Marks system.
- The extra credit points will be applied to the student's next exam score. For example, a student with 3 extra credit points, who scores 80% on an exam, will receive an exam mark of 83%. Extra credit points are added to the exam score up to a maximum of 100% on the exam. Any remaining points are then held over to the next exam. For example, if a student with 3 extra credit points scores 98% on an exam, then the exam score will be recorded as 100%, and the student's remaining extra credit point will be held over for the next exam.

II. Stump-the-Prof Point. If, in class, a student raises an excellent question that the professor cannot answer, the professor may nominate the question for a Stump-The-Prof exercise.

- If the student who asked the question is able to find a documented answer to the question, and email the answer to the professor, the student will earn an extra credit point.
- Each student can earn a maximum of one Stump-The-Prof extra credit percentage point per week.
- Like Help-a-Peer extra credit points, Stump-The-Prof extra credit points will be applied to the student's next exam score.

Course Percentage Score Calculation Formula

Each student's course percentage score will be calculated according to the formula:

Course percentage score = (course homework score)(0.15) + (course brain teaser score)(0.15) + (midterm test 1 score) (0.2) + (midterm test 2 score) (0.2) + (final exam score) (0.3)

Students' letter grades will then be determined from their course percentage scores, as follows:

Course Letter Grade	Course Percentage Score
A+	90-100
A	85-89
A-	80-84
B+	77-79
B	73-76
B-	70-72
C+	67-69
C	63-66
C-	60-62
D+	57-59
D	53-56
D-	50-52
F	0-49

Missed Work

If a student misses a class period, homework assignment, or test due to illness, personal circumstances, or late registration, it is the student's responsibility to notify the instructor and to submit appropriate documentation (e.g. physician's note documenting the student's illness) to the appropriate Faculty/Program office. A mark of zero will be entered for all missed Brain Teaser exercises, homework assignments, and tests until the Faculty/Program office verifies that the absence was for valid reasons.

If a student is unable to attend a class, but has been able to complete the homework assignment, then the student should submit the homework assignment by email, prior to the start of the class period, to the instructor. Late email submissions will not be accepted.

It is the student's responsibility to learn all material that the student has missed for any reason. This can be done by reading the posted lecture notes and assigned textbook chapters, by consulting with classmates, and by attending office hours and tutorial.

Tests missed due to illness or personal circumstances (as verified by the Faculty/Program office) may be made up, or the course grade may be redistributed such that more weight is applied to the other test/exam, at the discretion of the instructor. Make-up tests may differ in format and specific content from the original. For example, an original test that includes both multiple choice and written answers may be replaced by a make up test with written answers only, or with both written and oral components (i.e., an oral question / answer test period in the instructor's office).

Academic Integrity

As a student, you are expected to behave honestly and ethically at all times.

According to McMaster University's Academic Integrity Policy, you are engaging in academic dishonesty if you "knowingly act or fail to act in a way that results or could result in unearned academic credit or advantage" (Academic Integrity Policy, p. 6).

This behaviour can result in serious consequences, such as a grade of zero on an assignment, loss of credit with a notation on the transcript that reads "Grade of F assigned for academic dishonesty," and/or suspension or expulsion from the university.

It is your responsibility to understand what constitutes academic dishonesty. The following are just three forms of academic dishonesty:

1. Plagiarism.
2. Improper collaboration.
3. Copying or using unauthorized aids in tests and examinations.

For more information on academic dishonesty and academic integrity, please read the Academic Integrity Policy: <http://www.mcmaster.ca/academicintegrity>

For specific information on plagiarism and how to avoid it, please complete the plagiarism tutorial. Once you have completed the tutorial, you must print out and sign your acknowledgment of understanding. Your signed acknowledgment of understanding must be submitted along with your first homework assignment.

Online Privacy

This course makes use of an online discussion forum. You should be aware that your chosen forum user name will be apparent to all other students in the course. The technology used in the course web pages is designed to keep private all additional information you provide (your name, email address, password, etc.). However, you should be aware that submission of such information on this or any other web site always carries some risk that the information will become public (for example, if the web site is "hacked" unlawfully). Your continuation in this course will be interpreted to indicate that you consent to the disclosure of your chosen user name in the online forum, and that you accept the risk of submitting the additional requested information. If you have any questions or concerns about the privacy of your information, please discuss these with the instructor.
