Lecture 2F03: Fundamentals of neuroscience

Classes begin Monday May 2, 2005 and end Wednesday June 15, 2005. The class is scheduled to be taught Mondays and Wednesdays from 6:30 to 9:30-pm in room PC-237.

**Instructor** = Guillaume Rousselet, PhD.  
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**Office hour:** by appointment

The goal of the course is to provide students with a relatively detailed description of the brain at a cellular scale. By the end of the course students should be able to describe the different cellular components of the brain, the structure of a neuron and how neurons interact with each other. I will also cover topics such as synaptic plasticity, the organization of small neuronal networks in real and simulated neurons, brain imagery in humans and brain development.

I will not cover all the chapters from the book and I will present material from many other sources (other books, journal articles and web pages) so I recommend you make notes during the lectures. PDF files of the PowerPoint slides used during the lectures will be made available on the psychology department Lecture web-page.

**Assessment:** There will be a mid-term exam (1 hour - 25 points) and a final exam (3 hours – 75 points). See course outline below for details.

Students taking this course do not need to have a background in biology. However, for those with no background at all and those who might need to revise the basics, you should at least read the material from the following websites:

Check the chemistry, organic chemistry and biochemistry, cells, membranes, energy and enzymes, cellular respiration, protein synthesis links at this address:  
http://faculty.clintoncc.suny.edu/faculty/Michael.Gregory/files/Bio%20101/bio_1_menu.htm

A good starting point to learn about the brain:  
http://faculty.washington.edu/chudler/introb.html#bb

And explore the web; it is full of useful resources! You should try to google all the terms you don’t understand.
First part

Lecture 1 (Mon May 2) = Introduction to the functional aspects of the nervous system.
Assignment: textbook chapter 1.

Assignment: textbook chapters 8 & 13.
http://sun.menloschool.org/~cweaver/cells/index.html
http://www.cellsalive.com/cells/animcell.htm

Lecture 3 (Wed May 11) = Ion channels and cell membranes.
Assignment: textbook chapters 2, 3 & 4.

Lecture 4 (Mon May 16) = Resting potential, action potential and electricity conduction in neurons.
Assignment: textbook chapters 5, 6, 7.

Lecture 5 (Wed May 18) = Direct and indirect synaptic transmission and transmitter release.
Assignment: textbook chapters 9, 10 & 11.

Lecture 6 (Mon May 23) = Action potential simulator (computer labs R403 & R416).
This will be a good time to check and improve your knowledge of neuronal communication and ask questions before the mid-term exam.
Assignment: revise lectures 1-5.

Lecture 7 (Wed May 25) = Synaptic plasticity + Mid-term evaluation on Lectures 1-6 (1 hour, 25 points).
Assignment: textbook chapter 12.
Second part

Lecture 8 (Mon May 30) = Neurotransmitters.
Assignment: textbook chapters 13 & 14.

Lecture 9 (Wed June 1) = Integrative mechanisms and synaptic organization of the brain.
Assignment: textbook chapters 19, 20 & 21.

Lecture 10 (Mon June 6) = The synthetic approach: an introduction to computational neuroscience.
Assignment: provided later

Lecture 11 (Wed June 8) = Neuroimagery in humans: PET, fMRI, EEG, MEG.
Assignment: provided later

Lecture 12 (Mon June 13) = Development of the nervous system and denervation / regeneration of synaptic connections.
Assignment: textbook chapters 23 & 24

Lecture 13 (Wed June 15) = **Final evaluation on Lectures 1-12 (3 hours, 75 points)**.
McMaster’s Grading Scale:

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

The instructor reserves the right to adjust the final marks up or down, on an individual basis, in the light of special circumstances and/or the individual’s overall performance in the Lecture.

Academic Dishonesty:

Academic dishonesty consists of misrepresentation by deception or by other fraudulent means and can result in serious consequences, e.g. the grade of zero on an assignment, loss of credit with a notation on the transcript (notation 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. For information on the various kinds of academic dishonesty please refer to the Academic Integrity Policy, specifically Appendix 3, located at http://www.mcmaster.ca/senate/academic/ac_integrity.htm. The following illustrates only three forms of academic dishonesty: (1) Plagiarism, e.g. the submission of work that is not one’s own or for which other credit has been obtained. (2) Improper collaboration in group work. (3) Copying or using unauthorized aids in tests and examinations.