BI 610 Advanced Cellular Neuroscience Fall 2012
Tuesday & Thursday 2:00 - 3:20 pm

Instructors
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Shawn Lockery 305 Huestis 346-4590 shawn@uoregon.edu

Website
https://blackboard.uoregon.edu/ All assignments, course materials and announcements will be posted on Blackboard. There is no textbook and nothing to purchase.

Office hours
Roberts – Tuesday and Thursday after class (3:20-4:20 pm), or by appointment. Send me an E-mail or call to set up appointment. I can also answer questions by Google chat, E-mail or over the phone. Lockery – Same (but no chat).

Prerequisites
This is an advanced course for graduate students. It is assumed that you know the basics already (for example, how action potentials are produced, what the Nernst equation is, or what the Golgi apparatus does, what synaptic vesicles do). If you don't, there are standard texts you can use to catch up (see below).

Useful refs (not required)
(1) Nicholls, Martin,Wallace & Fuchs, From Neuron to Brain (in the bookstore).
(2) Hille, Ion Channels of Excitable Membranes (possibly in the bookstore).
(3) Kandel et al, Principles of Neural Science (in the bookstore).
(4) Johnson and Wu, Foundations of Cellular Neurophysiology

Instructional philosophy
This course is primarily a literature reading course. We believe this format is particularly appropriate for PhD students preparing themselves for a research career. The main goal is to explore the experimental evidence behind some of the major advances in Neurobiology since 1950 by reading the original research reports. The main focus will be on the questions: What is the experimental evidence that supports each hypothesis or theory? How well does the evidence support the conclusion? Are there viable alternative explanations?

Most of the course will be spent covering the two topics that are the main focus of neuroscience research: (1) signaling mechanisms in individual neurons (e.g., action potentials) and (2) synaptic transmission between neurons. Because this course is concerned with how scientific knowledge progresses, the topics will be covered chronologically (more-or-less). These two topics have distinctly different characters. The main questions concerning action potentials were solved by the 1980's, while research into synaptic transmission continues.

Reading the original literature is difficult. Unlike textbooks, which strive to package information in the most palatable form possible, the original literature reflects the authors' struggle to understand Nature. You will likewise have to struggle understand the assigned papers. Although I have tried to select papers that can be grasped (at least the main points) by anyone who has completed the prerequisites, probably no one in the class (including myself) will have the background to understand every detail in the assigned papers. Pleas don't let this discourage you. It is an unpleasant reality of life, which we must face all the time. Your goal should be to carefully read the assigned papers and try to understand as much as you can. The lectures should then provide the important missing pieces. In the end, I believe that you will find the result worth the effort.

Class time
About 2/3 of the class time will be lectures, with time for discussion. The remaining class time will be devoted to discussion of the reading assignments, problem sets, previous lectures, etc.

Reading
Assignments will be posted on Blackboard. I will assume that students come to each lecture having read the required readings. It is highly recommended that you take notes while reading and bring them to class to aid in discussions.

Grading
Two take-home midterm exam, worth (40% each) plus 10% for the electricity problem set, and 10% for class participation (which will be hard unless you have done the reading). There is no final exam.

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Date	**Lecture topic**
Oct 1	Statistics
Oct 2	Ion channels and feedback
Oct 8	Nernst equation and resting potentials
Oct 10	Electric circuits and the membrane model
Oct 15	GHK equation & HH model 1
Oct 17	HH model 2 & Molecular biology of V-gated ion channels
Oct 22	Molecular structure of ion channels
Oct 24	Cell biology of neurons & pathfinding
Oct 29	Biophysics of bursting neurons
Oct 31	Purkinje cells, Ca spikes
Nov 5	Optogenetics
Nov 7	Nerve-muscle synapse
Nov 12	Cable theory
Nov 14	Quantal transmission
Nov 19	Mol bio of fast synapses
Nov 21	Inhibitory synaptic transmission
Nov 26	Slow synaptic transmission and modulation
Nov 28	Thanksgiving
Dec 3	Hebb and LTP 1
Dec 5	Hebb and LTP 2
Dec 9	Exam week