

BIOLOGY 650 (credit 2 hours)
Animal Physiology LABORATORY
Spring 2011

Instructor: ROBIN COOPER , Ph.D.

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Class time

Tues and Thurs 5PM to 8 PM

Room 202

Office hours: 4PM to 5 PM Tues and Thurs.

Required Texts

None. Handouts and www based content.

Supplementary Materials

Readings from the primary literature will be assigned on occasion. These articles will be posted on Blackboard for you to download and print.

Course Description

The course will focus on the experimentation in primarily advanced neurophysiology. Generation of receptor potentials in sensory neurons will be measured as well as action potentials in axons. Pharmacological experimentation of ionotropic and metabotropic receptors subtypes and second messengers signaling will be conducted. The key role of ion channels and transporters in regulation of the membrane potential will be covered in great detail. The concept of electrochemical equilibrium will be introduced and quantitative description of the equilibrium membrane potential will include discussion of Goldman and Nernst equations and their applications. The mechanisms of action potential generation, as a result of synaptic and receptor stimulation within a neural cell, will be measured in terms of voltage gated ion channels.

The mechanisms of neuron-neuron communication through electrical and chemical synapses will be examined in live preparations. The historical introduction of the quantal hypothesis and its experimental conformation will be covered. Synaptic plasticity will be covered up to the latest discoveries in the field.

Course Objectives

By the end of this course, you should:

1. Have a conceptual understanding of the information processing in the nervous system.
2. Understand the molecular mechanisms that enable signal transmission in the nervous system in terms of receptor potentials, synaptic potentials and action potentials.
3. Know what are the cellular specializations and the molecular machinery involved in the neuron-neuron communication at the state of the art level.
4. Develop a basic knowledge of the sensory processing.
5. Be able to understand and critically analyze research papers in the field of Neuroscience.
6. Be able to develop new ideas and suggest future research directions in the field of Neuroscience.

The overall objective of the course is to develop insightful understanding of the neurological processes at molecular and cellular level by experimentation. The course will complement other courses offered within the new Neuroscience Major we are establishing on campus.

Course Work/Grading

Overall

Grades will be based on exams, homework assignments, and class participation. There will be two exams and the final is cumulative (although the information covered on this exam will be weighted towards the new material). Homework due dates and exam dates are listed in the schedule at the end of this document.

- Class participation: **10%** (includes attendance, adding to the discussion during lectures and journal clubs, and actively participating in in-class exercises such as problem solving and other activities)
- Conducting all laboratory exercises **30%**
- Homework/problem sets: **20%**
- Lab report **20%** (submitted in a journal publication format)
- Exam 1: **10%**
- Exam 2: **10%**

All exams are required of all students. If you are unable to take an examination as scheduled, it is your responsibility to contact me before the exam. There will be no make-up exams; students with excused absences will have their point total for the course pro-rated. Unexcused absences from an exam will result in a score of zero for that test. Homework and problem sets that are turned in late will be marked down a point each day they are late, and they must be turned in before those that were turned in on time are returned.

Scale

A= 89.5 and up
B= 79.5 to 89.4
C= 69.5 to 79.4
Fail < 69.5

Quizzes

Quizzes will be assigned to each topic. The quizzes score will be used as an extra credit toward your exam score.

Attendance

Required for all laboratory sessions.

Format

In this course, you will learn the fundamentals of neural processing through a variety of activities, including lectures, problem sets, independent/group study, and in-class exercises. Please note that you are responsible for all the material in the assigned chapters, including figures, summaries, and “boxes,” regardless of whether it is covered in lectures. Thus, you will be responsible for covering some material from the text or readings on your own.

Blackboard/Class Communications

Course announcements, assignments, lecture outlines and additional materials will be posted online using Blackboard. Exams and homework dates will remain fixed. Updates to this syllabus

(regarding topics and reading) will be posted; please check periodically. You will also receive important course announcements via your UK e-mail account. If you do not use your UK e-mail account, you need to activate it. It is strongly recommended that you check your e-mail regularly. I may send messages—sometimes with attachments—to the class using this medium. You should also feel free to e-mail me if you have any questions or problems. Feel free to call me as well, if you prefer a more personal communication. I am also available during the office hours. If you would like to meet with me at another time, please don't hesitate to e-mail or to call, and I can schedule a time to meet.

Honesty and Civility

You must abide by UK's Code of Conduct, which prohibits:

1. Academic dishonesty and impropriety, including plagiarism and academic cheating.
2. Interfering or attempting to interfere with or disrupting the conduct of classes or any other normal or regular activities of the University.

We take plagiarism and other forms of cheating very seriously. If you have any questions as to whether something is plagiarism, please ask me, or, if that's not possible, assume that it is and don't do it!

Disabilities

Any student who needs accommodation because of a disability should contact me privately to discuss the specific situation as soon as possible. The Office of Disability Resources and Services. They can coordinate reasonable accommodations for students with documented disabilities.

TOPICS AND READINGS—TENTATIVE SCHEDULE

Please note that this is a tentative schedule and may be modified depending on how the course is progressing. All changes will be announced in advance, and students will be well aware of them—particularly regarding what is going to be included on exams.

Week Date Lecture Topics Student-driven In-class Activities

- 1 Week of 1/19 • Teaching basic equipment and software use.
 - 2 Week of 1/26 • Electrical signals of nerve cells
 - 3 Week of 2/2 • Voltage-gated membrane permeability • Research paper discussion
 - 4 Week of 2/9 • Channels and transporters • Research paper discussion
 - 5 Week of 2/16 • Review • **EXAM 1** • Research paper summary
 - 6 Week of 2/23 • Synaptic transmission • Research paper discussion
 - 7 Week of 3/2 • Neurotransmitters and their receptors • In-class problem sets
 - 8 Week of 3/16 • Molecular signaling within neurons with pharmacology
 - 9 Week of 3/23 • Synaptic Plasticity with pharmacology
 - 10 Week of 3/30 • Vision in invertebrates
 - 11 Week of 4/6 • Sensory-CNS-motor circuits • Research paper summary
 - 12 Week of 4/13 • Skeletal Muscle physiology • measures of force
 - 13 Week of 4/20 • Heart and GI physiology • Research paper summary
 - 14 Week of 4/27 • Review. Research presentations. In class 15 minute presentations.
- May 7 **FINAL EXAM (exam 2)**