Biology 46400: Introduction to Neurobiology **Spring 2007 Syllabus**
Tues, Thurs 9:30-10:20, Room MR-702 Tues 2-5:50, Room MR-707

Instructor: Jonathan Levitt MR-731 Tel: 212.650.8539 Email: jlevitt@ccny.cuny.edu Office hours M:9-10 and by appt.

Designation: Elective course

Catalog Description:
Introduction to the physiology and organization of the nervous system. Topics include membrane potentials, action potentials, synaptic transmission, sensory and motor systems, development, neural basis of learning, memory, and cognition.

Prerequisites: Bio 20700 or Bio 20900 or Bio 22900 **Co-requisites:** None
Hours/Credits: 6 hours per week, 4 cr.; 2 hr. lect., 4 hr. lab
Lecture is given twice per week.

Textbook: Neuroscience, 3rd ed, edited by Dale Purves, George J. Augustine, David Fitzpatrick, William C. Hall, Anthony-Samuel LaMantia, James O. McNamara, and S. Mark Williams. 2004. ISBN - 0-87893-725-0

Course objectives:
This course is an upper-level elective consisting of lecture and laboratory components that are integrated to provide a comprehensive introduction to modern neuroscience. The laboratory component allows students to make basic neurophysiological, anatomical, and perceptual measurements for themselves. Students also solve problem sets, write 2 small review papers on current topics in the field, and discuss papers from the primary neuroscience literature. At the end of this course students should understand how nerve cells work individually and collectively to control behavior, should be able to plot and understand data, to explain data from their own experiments or the primary literature to others, and to write a clear and concise summary of research on a topic.

After completing this course, students should be able to:	**Dept outcome letters**
1. Understand and explain basic concepts in neurophysiology	B1,D4,E1,E2
2. Understand and explain general organization of the nervous system	B1,D4,E1,E2
3. Solve simple neurophysiological problems (such as calculation of Nernst, resting, or reversal potentials)	E1
4. Write a laboratory report including data and analysis.	A1,A2,A4-6,C4,D1
5. Work in a group to conduct a variety of experiments, including accurate recording of results	C4
6. Analyze and present experimental neurophysiological and perceptual data using computers.	D3
7. Communicate concepts and solve problems of neurobiology that have been presented in lecture.	E1,E2
8. Use internet search engines such as PubMed or Web of Science	C1
9. Explain motivation for/results from published scientific papers	B1,C1,D4,E1,E2
10. Write clear and concise summary of published research papers	B1,C1,E1,E2

	Tuesday lecture J702	Reading (Chapters)	Thursday lecture J702	Reading (Chapters)	Laboratory/Tutorial
Week 1 Lec 1&2	1/30 Intro: Top-down vs bottom-up	1	2/1 Basic Biology / Overview	1	**Lab 1**: Electrical principles
Week 2 Lec 3&4	2/6 Resting potentials & membrane channels 1	2	2/8 Resting potentials & membrane channels 1	2,4	**Lab 2**: Computer simulations of membrane potentials
Week 3 Lec 5	2/13 Action potentials 1	3	2/15 **No class Monday schedule**		**Lab 3**: Crayfish muscle resting potential
Week 4 Lec 6&7	2/20 Action potentials 2	3	2/22 Passive / cable properties	3	Tutorial 1: Problem set 1

			Topic & Review article for paper1 due		
Week 5 Lec 8&9	2/27 Neurotransmitter release	5	3/1 Postsynaptic effects	5	**Lab 4**: Roach leg action potentials
Week 6 Lec 10&11	3/6 Neurotransmitters & receptors	6	3/8 2nd messengers & synaptic integration	7	**Exam 1** (thru lec 9) **Paper 1/1st draft due**
Week 7 Lec 12&13	3/13 Sensory systems	Handout	3/15 Somatosensation 1	8	Tutorial 2**:** Problem set 2
Week 8 Lec 14&15	3/20 Somatosensation 2	8	3/22 Audition	12	**Lab 5**: Receptive field simulations and psychophysics **Paper 1 due**
Week 9 Lec 16&17	3/27 Chemical Senses	14	3/29 Vision 1: Transduction	10	Tutorial 3: Sensory paper presentations
Week 10	4/3 **No class** **Spring recess**		4/5 **No class** **Spring recess**		**No lab**
Week 11 Lec 18	4/10 **No class** **Spring recess**		4/12 Vision 2: Retina **Topic & Review article for paper2 due**	10	**No lab**
Week 12 Lec 19&20	4/17 Vision 3: Brain	11	4/19 Motor 1: Motor units & Spinal Cord	15	**Exam 2** (thru lec 18)
Week 13 Lec 21&22	4/24 Motor 2: Brain	16	4/26 Development 1	21	Tutorial 4: **Paper 2/1st draft due**
Week 14 Lec 23&24	5/1 Development 2	22	5/3 Learning	Handouts	**Lab 6**: Sheep brain dissection
Week 15 Lec 25&26	5/8 Synaptic plasticity of development	23	5/10 Synaptic plasticity of learning	24	Tutorial 5: Neural plasticity papers **Paper 2 due**
Week 16 Lec 27&28	5/15 Cognitive Neuroscience	Handouts	5/17 Cognitive Neuroscience **Last class**	Handouts	Review

I will expect you to have read the assigned reading from the text for each lecture *before* class, since the lectures will typically assume that you have read the material. You will probably wish to read the assigned material again more carefully after the lecture. You will be responsible on the exams *both* for material covered in class and in the readings. In other words, I expect you to come to class and to do the readings.

Grading (all weighted approximately equally)
Quizzes
Lab/tutorial performance
Paper 1
Paper 2
Exam 1
Exam 2
Exam 3: Final Exam

Text
Neuroscience (3rd ed.)
Dale Purves et al.
Sinauer, 2004

Supplementary texts and readings will be made available in class, online, or in the Biology Resource Center J502

Exams & quizzes: There will be 3 exams, in weeks 7 and 12 plus a final exam. Each exam will cover topics since the start of the course or previous exam (i.e. are non-cumulative). In addition there will be a brief quiz at the start of class each Tuesday; these will be brief (fewer than 4 questions), and will start *promptly* at the start of each lecture. The quiz will consist mainly of questions on the new readings assigned that week (I might ask you to explain a figure from the reading). Missed quizzes cannot be made up, but I will drop the lowest few quiz grades.

Papers: This course satisfies the requirements of a City College writing course. You will write 2 short papers (roughly 5-8 pages) for this course. I will discuss the format in more detail in class, but each paper will be in a topic directly related to the material covered in the course that interests you (e.g. "The role of hair cells in the process of auditory transduction"), and will consist of a summary and critique of readings you choose, at least 2 or 3 of which should be primary sources (i.e. a journal article). Before choosing the primary sources, you should read at least one review article concerning the topic you are writing about. I will give you a brief tutorial about using the library and the Internet to find such primary sources. I will also help you decide on your topic. By week 4 I will expect you to have decided on a topic for your first paper, and given me the topic and the full reference of a review article you have read in choosing your readings for that paper. I will then expect you to give me a draft version of your paper on the draft due date (2 weeks ahead of the final submission date); I will read your draft and give it back to you with comments so you can improve your paper, and obtain a better grade. The scientific community relies on being able to accept at face value what is written in journals; the most serious act of dishonesty is to present something as being written by you when it has in fact been written by someone else. In this course I will use the standard that if more than a sentence is copied verbatim or text longer than a paragraph paraphrased without being given a source, that will be considered plagiarism, and will lead to a failing grade in the assignment or course.

Laboratory reports: There will be 5 laboratories in this course that involve experiments on people or animals. For each of these I expect you to submit graphs of the data you collected (both raw data and summaries) together with text describing, explaining, and summarizing these results, in the manner of a Results section of a lab report or scientific paper. Remember always to graph and discuss the data you actually obtained, not what you thought you "should have" gotten. Your report should not only summarize your data, but also note such discrepancies (if they arise), and discuss possible sources of errors or differences. I will discuss the format of the lab report more fully in class. I will not accept handwritten submissions.

Tutorials: Several of the laboratory sessions will be devoted to problem-solving sessions, or of how to read and understand primary scientific sources, i.e. journal articles. Each is centered around a different specific theme, and will deal with subject matter from lectures in more depth and breadth. This skill will prove useful in the writing of your papers for the course. The class will be devoted to a discussion of the journal readings, in the style of a journal club, in which different groups will take turns leading discussion of the paper or problem set. Discussion should cover not only simple questions about the contents of the manuscript - such as what was the question under investigation, what were the methods used, what did the data show, what did the authors conclude - but also trickier questions such as were the methods used appropriate for the question posed, did the authors really answer the questions they set out to answer, what else could they have done?… *Everyone* will be responsible for having read the assigned papers. Prior to each tutorial, please answer the questions posed in the handout, and hand in the answers. Keep a photocopy to use during other groups' leading of discussion. Presentation and participation in class discussion will be assessed and contribute to final grade. I will guide discussion, but will give neither mini lectures nor model answers.