BIPN 142

Systems Neurobiology

Winter Quarter 2006-7

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Class Meetings: Tuesday & Thursday, 12:30 – 1:50 PM, in Center 214

Sections: REQUIRED. All sections meet FRIDAYS from 3-4 PM, beginning in the FIRST week of class.

Web Site: www.biology.ucsd.edu/~dfeldman/BIPN142.html

Midterm Exam: February 13, in class.

Final Exam: Monday, March 20, 11:30 AM to 2:30 PM
Goals of this course

The nervous system participates in every aspect of our lives from simple bodily functions to our most abstract thoughts. How do brain cells (neurons) work together to control these processes? How do complex behaviors and perceptions emerge from biological building blocks made of protein, fat, and salt? We will discuss how networks of neurons function, and how these networks mediate sensation, movement, memory, and higher functions like language and emotion. We will focus largely on mammals, but will also discuss key examples from invertebrates and lower vertebrates. The primary goal of the course is to understand how neurons, assembled into complex circuits, mediate animal and human behavior.

The nervous system determines how we perceive the world and interact with it, but it does not always provide an accurate representation of external physical events. Our ears only hear a small subset of the acoustic information in the environment. Our eyes do not see the same world as the eyes of a honeybee, or a horseshoe crab. Our brains alter sensory signals based on evolutionary and learned expectations, making us see and hear things that are not there. A secondary goal of the course is to illustrate how the wiring of our brains influences our most basic perceptions and motor abilities.

This course assumes basic knowledge of the cell biology and physiology of single neurons. This material is introduced in BILD 1 and 2, and covered in more detail in BIPN 100 (Mammalian Physiology I) and BIPN 140 (Cellular Neurobiology). We will conduct a short review of this material in the first few lectures, but it will not be a major focus of this course.

The third goal of the course is to provide serious training for undergraduates in how to think critically about biology, how to construct scientific arguments, and how to reason about neuroscience. To this end, the course has extensive required readings, discussions, and writing assignments, in addition to the lectures. You will be graded, in part, on these assignments. Completion of reading and writing assignments, and active participation in weekly sections, is absolutely essential to success in this course.

My Philosophy of Teaching and Expectations for this Class

To me, the fun of learning biology is in developing an intuitive understanding for biological systems and how they accomplish interesting functions. In neurobiology, this requires learning two things – first, a set of basic facts about the structure, components, and functions of specific neurons and brain areas. Second, we must synthesize, from many such facts, general principles for how neurons and brains work. In systems neuroscience, these principles attempt to answer questions like “How do neurons encode sensory information?”, “How does a network of neurons work together to store information during learning?”, and “How do motor areas of the brain produce coordinated movements?”
In this class, we will learn both specific facts and general principles. Many of these principles are on the cutting edge of neuroscience research, and therefore represent hypotheses that are still being tested, discussed, and revised. I expect students to be able to discuss neuroscience at both levels—facts and principles, and to use both to reason about brain function. **Exams will cover both levels of knowledge.**

In addition, to teach students how to think critically and to construct logical scientific arguments and defend them, the course will involve periodic writing assignments (take-home essays based on assigned readings and concepts discussed in lectures), as well as **active participation in section discussions**. Much of the learning in this course will take place in small-group (20-25 student) discussion sections, led by graduate student TAs and myself. Section attendance is mandatory.


Prerequisites: BILD 1 and BILD 2, and either BIBC 100 or BIBC102.

Sections: Sections are required. Each section is led by a graduate TA, who will lead discussions on writing assignments and required readings. New material, not covered in lecture, will be presented each week in sections. The goal of the sections is to provide in-depth, detailed discussion of facts and concepts, and to guide each student in learning how to think critically about the material. Active section participation will count 20% towards the final grade. Sections begin in the FIRST week of class. Sections run concurrently so that I can circulate between them, offering guidance and answering questions.

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<tr>
<th>Section</th>
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<tr>
<td>A01:</td>
<td>Friday</td>
<td>3-4 PM</td>
<td>Center 201</td>
<td>Erik</td>
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<td>A02:</td>
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<td>Norma</td>
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<td>A04:</td>
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<td>Ronnie</td>
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Grading Policy: Final grades will be whole letter grades only (A-F, no + or –). **Active section participation** (not just mere attendance) counts for 20% of the course grade. Writing assignments count for 10% of the grade. Writing assignments must be turned in on time, no exceptions. **The Midterm Exam** counts for 25% of the course grade. The **Final Exam**, which will be inclusive of all material, counts for 45% of the course grade. Exams will consist of multiple choice and short essay questions.
How to succeed

Lectures. Lectures will cover substantially more material than the textbook chapters. Therefore, lecture attendance is absolutely essential. You will not do well in this course if you stay home and read the textbook. Required readings. This class involves a lot of reading. It is extremely helpful to read the overview readings, which are chapter(s) from the textbook, before attending each lecture. This lets you be actively engaged and think about the material during lecture, rather than waiting until just before the exam. Additional readings will be assigned each week for discussion in sections, or as the basis for take-home writing assignments. Sections. Active participation in sections is required, and counts for 20% of the course grade. Choose one section and attend it regularly. Discussions in section will be highly interactive, and TAs will require that all students be involved. Therefore, you must do the reading and writing assignments prior to section. Writing assignments will be discussed and handed in at section.

Difficulty of Course:

This is a difficult course that requires a high level of commitment to succeed. You will be expected to know a large number of basic facts, and will be required to synthesize these facts to form abstract concepts about brain function. Furthermore, a major component of your grade will be your ability, at the end of the course, to make logical, compelling arguments about brain function based on the material you learn in class. You will not do well in this class if you simply memorize facts; you must also learn to express those ideas, and synthesize new ideas, in discussions and in writing.

Regrades:

Requests for exam regrades must be made in writing to the instructor or to the head TA within one week after the exam is returned. On a separate sheet of paper, please explain concisely why you deserve more credit. We cannot honor verbal requests for regrades. Only exams written in non-erasable pen will be eligible for regrades.

Cheating:

Cheating will not be tolerated. If you obtain or provide information in an exam or for a writing assignment, or if submit an altered exam for regrading, you will be given an F in the course and reported to the dean. Exams will be closed-book and closed-notes. Graded exams are routinely photocopied for comparison with submitted regrades.

Missed exams and assignments.

The only valid excuse for missing an exam is a medical reason or family emergency. Appropriate documentation is required. Make-up exams will be conducted orally at a time arranged with the instructor. Writing assignments must be turned in on time, so that grades can be assigned fairly to all students. I’m sorry, no exceptions can be made to this policy.