BIOLOGY 3352/5452—Systems Neuroscience
SPRING 2014

Lectures: Tuesdays and Thursdays 9:30 AM–10:50 AM, room: Barton 409
Instructor: Deb Stull, PhD
Office: BL248C (opposite Bio main office)
Office phone: 1-6140 (on campus); 215-204-6140 (off campus)
Home phone: 215-793-4344 (but please, no calls after 9—I’m not as young as I used to be!)
Office hours: Mondays 9:00 AM – 12:00 PM; happily by appointment.

Required Text

- Bear MF, Connors BW, Paradiso MA. Neuroscience: Exploring the Brain. 3rd ed. Baltimore, MD: Lippincott Williams & Wilkins; 2007. This text will be the major source of readings for lecture. It is on reserve in the Paley Library. Note: can be rented through Barnes and Noble or Amazon.

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.
- Also, information from the following textbook will also be used in class. Although you will get all of the information you need from the slides and the corresponding lectures, if you would like to review the material, this textbook will be available as a reserve in the library (Paley Library). Please note: this book (edition 2) is also available online at: http://www.ncbi.nlm.nih.gov/books/NBK10799/.

Course Description

Neuroscience is hot right now! It is one of the fastest growing areas in biology—it is the center of many of the new concepts and technologies being developed and advanced in the life sciences today. But it is a complex discipline—really an interdisciplinary—a dynamic combination of anatomy, physiology, pharmacology, biochemistry, physics, psychology, behavior, and evolution. It can be challenging and complex—for example, the breadth of neuroscience spans the study of the brain at a molecular level to the integrated study of complex human cognitive functions such as learning and memory. These multiple levels require a true multi-disciplinary approach and a firm foundation and broad background in the principles of neurobiology. Acquiring this foundation, however, cannot be accomplished well in just 1 semester. Therefore, the “old” Bio 352 (Neurobiology) has expanded into 2 courses—this course, which offers a more macro perspective on neuroscience and Bio 3358 (Cellular and Molecular Neuroscience), which takes a more micro approach—to impart the fundamental principles of neurobiology at the biophysical, cellular, anatomical, and systems levels. The goal of both of these courses, however, is to help you acquire a full appreciation for the neuroscience revolution currently underway.
Specifically, this course will explore the structure and function of the central nervous system (CNS) with a focus on helping you understand the functional brain at a systems (eg, network/circuit) level. Questions addressed at the systems level include how circuits are formed and used anatomically and physiologically to produce the physiological functions, such as reflexes, sensory integration, motor coordination, emotional responses, learning and memory. In other words, they address how these neural circuits function and the mechanisms through which behaviors are generated. We will discuss the ins and outs of the major systems of the CNS (eg, sensory, motor) as well as some of the lesser known/defined systems (eg, limbic, autonomic). In addition to examining the areas and mechanisms of the brain that process sensory, motor, and cognitive information under normal circumstances, we will also explore what happens when the circuitry goes awry.

Course Objectives
By the end of this course, you should be able to:
1. Describe the structure, function, and interrelations of basic micro- and macroscopic elements of the nervous system
2. Describe how we sense, move, and feel from a neurobiological perspective
3. Understand the basic pathologies of a few example brain disorders in the context of the normal circuitry of the nervous system

Finally, it is my goal that you will enjoy this class and develop an appreciation for neuroscience!

Course Work/Grading

Overall
Grades will be based on scores on exams and homework assignments. There will be 3 non-cumulative term exams and a cumulative final exam; although all 3 exams will count towards the final exam, the lowest score will be weighted less (see below for details). Exams will consist of short answer and multiple-choice/true-false/fill-in-the-blank questions. See the schedule at the end of this document for the dates for problem sets and exams.

- Homework assignments: 20%
- In-class exams: 50% (20% for highest 2 scores and 10% for lowest score)
- Final: 30%

All exams are required of all students. The exam dates are listed at the end of this document and will not be changed barring extraordinary circumstances, so you can plan accordingly. If you are unable to take an examination as scheduled, it is your responsibility to contact me before the exam because unexcused absences from an exam will result in a score of 0 for that test. If it is an emergency that does not allow you to contact me before the exam, please contact me as soon as possible after the exam. Please note too, that I might request appropriate documentation for the situation. If you have 3 final exams scheduled for the same day and wish to see whether alternative arrangements can be made, you need to contact me by Tuesday, April 29, 2014.

Homework and problem sets that are turned in late will be marked down 5% each day they are late, and they must be turned in before those that were turned in on time are returned (typically on the following Tuesday).
**Grading**
Since I would like to adhere to a strict point system for letter grades but typically have an overall class averages that don't necessarily fall into the strict 10-point scale (A = 90-100; B = 80-89, etc), I am working to find something that will satisfy this requirement but will take into consideration the challenging nature of this course. And so I have constructed the following score/grade table. Please note that this table represents TOTAL score (ie, at the end of the semester)—no letter grades will be given out on individual assignments or exams.

<table>
<thead>
<tr>
<th>Letter grade</th>
<th>Total points</th>
<th>Letter grade</th>
<th>Total points</th>
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</thead>
<tbody>
<tr>
<td>A</td>
<td>900+</td>
<td>C</td>
<td>600–649</td>
</tr>
<tr>
<td>A−</td>
<td>850–899</td>
<td>C−</td>
<td>550–599</td>
</tr>
<tr>
<td>B+</td>
<td>800–849</td>
<td>D+</td>
<td>500–549</td>
</tr>
<tr>
<td>B</td>
<td>750–799</td>
<td>D</td>
<td>450–499</td>
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<tr>
<td>B−</td>
<td>700–749</td>
<td>D−</td>
<td>400–449</td>
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<tr>
<td>C+</td>
<td>650–699</td>
<td>F</td>
<td>&lt;399</td>
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**Graduate students vs undergraduate students**
There will be different expectations for graduate and undergraduate students. Graduate students will be expected to answer additional questions on exams and problem sets and to do a set of problem sets that are specifically for them. Therefore, although the percentages for each section of the course will be similar to what is spelled out above for the undergraduates, the actual point values will be slightly different and will be indicated on each exam/assignment. The overall point total will be scaled to the undergraduate total and applied to the chart above.

**Attendance**
Lecture attendance and punctuality, while strongly encouraged, are not required. Out of respect for your classmates, please try to come to class on time if you plan on coming to class. Also, please keep in mind that in lecture, I may cover some topics in greater detail than in they are covered in your text.

**Format**
In this course, you will learn the fundamentals of neural function at all of these levels through a variety of activities, including lectures, problem sets, and in-class exercises/discussions. 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, and additional materials will be posted online using Blackboard. When available, lecture outlines will be posted. Updates to this syllabus (regarding topics and reading; exams and homework dates will remain fixed as much as possible [barring school closure and the like]) will be posted; please check periodically.
You will also receive important course announcements via your Temple email account. If you do not use your Temple email account, you need to activate it. If you have forgotten your password, you need to go to Computing Services and have them assign you a new password.

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 email me if you have any questions or problems. But please too feel free to call me as well, if you prefer a more personal communication. I am also available during the office hours listed above. If you would like to meet at another time, please don’t hesitate to e-mail or to call, and we can schedule a time to meet.

**Honesty and Civility**

You must abide by Temple's Code of Conduct (http://policies.temple.edu/getdoc.asp?policy_no=03.70.12), 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.

I 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! You are welcome to work together on the problem sets, but I still want to read your own individual work. And if your work requires you to do additional research, I want that to be in your own words too. If you are struggling with the material (say with the articles for problem sets 3 and 4), please come and see me so we can talk through the material so that you are able to put the material in your own words.

**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 (215-204-1280) in Ritter Annex 100 can coordinate reasonable accommodations for students with documented disabilities.

**Academic Rights and Responsibilities**

Freedom to teach and freedom to learn are inseparable facets of academic freedom. The University has adopted a policy on Student and Faculty Academic Rights and Responsibilities (Policy # 03.70.02) which can be accessed through the following link: http://policies.temple.edu/getdoc.asp?policy_no=03.70.02.

**Final Note**

Neuroscience can be an amazingly revealing and rewarding discipline. It can also be tedious and difficult at times. I hope that you enjoy the class (at least some of it, some of the time!) and learn something from it. The topic of neuroscience is very timely and relevant these days, not only for your other courses, but also, perhaps in real life. There’s nothing like contemplating the brain for awhile to truly appreciate the complexities and intricacies of biology!
**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, if possible, and students will be well aware of them—particularly regarding exams.

<table>
<thead>
<tr>
<th>Week</th>
<th>Date</th>
<th>Lecture Topics</th>
<th>Assigned Readings: Bear</th>
<th>Homework Due</th>
</tr>
</thead>
</table>
| 1    | Week of 1/20 | • **Nothing to be nervous about!** neuroscience: past, present, and future; We’ve got nerve(s): neurons and glia  
• **Ions in charge** voltage-gated membrane permeability | • Chapters 1 and 2  
• Chapter 3 |             |
| 2    | Week of 1/27 | • All fired up: the action potential  
• Into the groove: synaptic transmission | • Chapter 4  
• Chapter 5 |             |
| 3    | Week of 2/3  | • **Message in a cell** neurotransmitter systems  
• **Message in a cell** neurotransmitter systems; **A yes brainer** the structure of the nervous system | • Chapter 6  
• Chapters 6 and 7 | • PS 1 (2/6) |
| 4    | Week of 2/10 | • **A yes brainer** the structure of the nervous system  
• **A yes brainer** the structure of the nervous system | • Chapter 7 | • PS 2 (2/13) |
| 5    | Week of 2/17 | • Hungry like the wolf: the chemical senses  
• **EXAM 1** (2/20) | • Chapter 8 |             |
| 6    | Week of 2/24 | • Hungry like the wolf: the chemical senses  
• **Blinded by the light** the eye | • Chapter 8  
• Chapter 9 |             |
| 7    | Week of 3/3  | • **SPRING BREAK** | |             |
| 8    | Week of 3/10 | • **Blinded by the light** the eye  
• Seeing is believing: central visual system | • Chapter 9  
• Chapter 10 | • PS 3 (3/13) |
| 9    | Week of 3/17 | • Seeing is believing: central visual system  
• Invisible touch/new sensation: the somatic sensory system | • Chapter 10  
• Chapter 12 |             |
| 10   | Week of 3/24 | • Invisible touch/new sensation: the somatic sensory system  
• **Walk like an Egyptian** spinal control of movement | • Chapter 12  
• Chapter 13 | • Grad student PS 1 (3/27) |
| 11   | Week of 3/31 | • **Walk like an Egyptian** spinal control of movement; **We like to move it, move it** brain control of movement  
• **EXAM 2** (4/3) | • Chapters 13 and 14 |             |
| 12   | Week of 4/7  | • **We like to move it, move it** brain control of movement  
• All the rage: brain mechanisms of emotion | • Chapter 14  
• Chapter 18 |             |
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<tr>
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<th>Homework Due</th>
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<tbody>
<tr>
<td>13</td>
<td>Week of 4/14</td>
<td>• All the rage: brain mechanisms of emotion; Speaking in brains: language</td>
<td>• Chapters 18 and 20</td>
<td>PS 4 (4/17)</td>
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<tr>
<td></td>
<td></td>
<td>• Speaking in brains: language</td>
<td>• Chapter 20</td>
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<tr>
<td>13</td>
<td>Week of 4/21</td>
<td>• Shock the monkey: attention</td>
<td>• Chapter 21</td>
<td>Grad student PS 2 (4/24)</td>
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<tr>
<td>14</td>
<td>Week of 4/28</td>
<td>• EXAM 3 (4/29)</td>
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<td>• Wrap-up/review</td>
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<tr>
<td>15</td>
<td>Thursday, May 8, 2014 8:00 AM – 10:00 AM</td>
<td>• FINAL EXAM</td>
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