VERTEBRATE PHYSIOLOGY (BIO365R)

Spring 2013

T.Th 11:00 - 12:30   BUR 216
T.Th 12:30 - 2:00   BUR 216

Instructors

Prof. Kimberly Raab-Graham
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(Office Hours: T,Th 3:00-4:00 pm)

Prof. Ila Fiete
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(Office Hours: Th 10-11, Th 2-3)

Teaching Assistants
Natasha Sosanya
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Emily Workman
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Discussion Sections: Attendance in discussion sections is not mandatory and is left to the discretion of each student. You may attend any of the following discussion sections.

50335   F 800 to 900 a  ETC 2.102
50340   F 900 to 1000a  ETC 2.102
50345   M 1100 to 1200p RLM 7.112
50350   M 1200 to 100p  RLM 6.114
50355   M 800 to 900a   ETC 2.102
50360   M 900 to 1000a  ETC 2.102
50365   F 1200 to 100p  WAG 308
50370   F 100 to 200p   BIO 301
Course Outline and Content

Part I. Cellular Neurobiology
Part II. Systems Neurobiology

The course is divided into two parts, each about 7 weeks. The first portion of the course is concerned with cellular and biophysical features of the nervous system. During the first six weeks we will consider how individual nerve cells, or neurons, generate their electrical signals, how those signals are transmitted along their processes, or axons, and how one neuron communicates with other neurons or muscle cells via chemical synaptic transmission. We also will consider how neurons control muscular contractions. The second part of the course is concerned with integrative neuroscience, or how systems of neurons are organized and how nervous systems work. We will discuss the basic wiring of the mammalian nervous system (how neurons are connected in the brain), with emphasis on the cerebral cortex. We will consider some of the perceptual and cognitive changes that occur in people who suffer damage to restricted regions of the cortex. These will illustrate that our awareness of the world is due to constructions made by the brain. We will consider how the brain accomplishes these constructions by considering how the eye first breaks up the visual world and how the visual world is then reconstructed, in very surprising ways, by the visual portions of the cortex. We will conclude with a survey of how the brain processes spatial information for navigation through the world.

Prof. Raab-Graham will present the lectures for the first half of the course and Prof. Fiete will present the lectures for the second half.

Textbook/Homework:
Neuroscience by Purves, Augustine, Fitzpatrick, LaMantia and McNamara, fifth edition.

Additional handouts and required reading material, for example primary research articles, will be posted on Blackboard.

We expect you to have read the assigned reading prior to the specified class period.

Posted reading and designated textbook sections are required parts of the course and will be fair game for exam questions.

There will be no additional formal homework. However, class will begin with questions and answers on the reading for that day and from the previous lecture. Please come prepared with questions to be shared with the class, and post questions on Google docs:

https://accounts.google.com/ServiceLogin?service=wise&passive=1209600&continue=https://drive.google.com/?pli%3D1%26authuser%3D0%23shared-with-me&followup=https://drive.google.com/?pli%3D1%26authuser%3D0&tmpl=drive

(Or, you can find Google docs simply by Googling “Google docs”.)
Sign in by entering:
email: bio365Rdocs@gmail.com
password: RaabGraham

Grading and Exams: There will be three midterms and one final given during the semester. Each midterm will count for 18% of your grade and the final will count for 36%. The final should be viewed as a midterm on material covered in the last quarter of the semester (18%), combined with a cumulative test of the full semester’s material (18%). Final grades will be assigned based on total class scores, with grading on a curve as needed. Midterm exams are in-class. You must take the exam with the class you are assigned to.

******Questions about your score on an exam given during the semester must be taken up with your TA no later than one week after the exam is returned. Mistakes happen, so check the addition and the key soon after the exam is returned.

Class participation makes up 10% of your total class score: this difference might bump you from an B+ to an A- or an A- to an A. Class participation will be scored through use of the iClicker in class.

Make-up Exams: No written make-up exams will be given. In the event that a student cannot take a regularly scheduled exam, an oral exam will be given by the instructor. The oral make-up exam must be taken no later than one week after the regularly scheduled exam. If a student cannot attend the exam, it is the student's responsibility to contact the instructor prior to the time of the regular examination and obtain permission to miss the exam. Only those students with a verifiable medical excuse, or death in the family, will be permitted to take a make-up exam.

Final Exam:
TTH 11:00–12:30 pm: Friday, May 10, 9:00-12:00 noon
TTH 12:30–2:00 pm: Saturday, May 11, 7:00-10:00 pm

The final will be given during the scheduled final exam period. You must take the exam for the class you are assigned to.

iClicker: We will use iClickers for student feedback and interaction during the class. Having a registered iClicker is mandatory to receive a class participation score. If you are present at class and answer >75% of the questions asked, you will receive a full participation score for the class. These can be purchased at the CO-OP, if you do not already own one from another class. You are responsible for making sure your clickers are registered correctly within 2 weeks of the beginning of class.

Cheating: We have been requested by our Dean to inform all students, in writing, that cheating is against University rules and will not be tolerated. Any student caught
cheating will be reported to the Dean's office and we will make all efforts to see that those students will receive the maximum penalty permitted under University regulations.

**Contacting instructors by email:** With the advent of email, students have come to rely on rapid responses to questions posted electronically. However, since this is an upper division course, much of the confusing material is best discussed in person. Additionally, other students will likely have similar questions and will benefit from hearing the answers. For these reasons, students with questions should bring these up during discussion, in the classroom, or in office hours. Failing this, Blackboard offers an opportunity to post questions to the class at large, this will also benefit all of the students. Please contact the instructors by email only for urgent course business or emergency situations.

**Classroom Etiquette:** Laptops are allowed in class for the sole purpose of taking notes. Note that **powerpoint lectures will be posted immediately after class.** Cell phones should turned off or on silent mode. Text messaging, social networking, etc. during class is prohibited.

**Students with Disabilities:** The University of Texas at Austin provides upon request appropriate academic accommodations for qualified students with disabilities. For more information, contact the Office of the Dean of Students at 471-6259, 471-4641.

**LECTURE AND EXAM SCHEDULE FOR BIO 365R**
**Spring 2013**

**Date, Topic and Related Reading**

**Lecture 1-Jan. 15 (Raab-Graham)**
Course organization, overview,
Introduction to the nervous system
Purves textbook, Chapter 1
Scientific American Article
Genes Expressed in the Brain

**Lecture 2-Jan. 17 (Raab-Graham)**
Electrical and chemical principles and resting potential I
Purves, Chapter 2

**Lecture 3-Jan. 22 (Raab-Graham)**
Resting Potentials II
Purves, Chapter 2

**Lecture 4-Jan. 24 (Raab-Graham)**
Action Potentials
Purves, Chapter 3
Lecture 5 - Jan. 29 (Raab-Graham)
Ionic basis of the action potential
Purves, Chapter 3

Lecture 6 – Jan. 31 (Raab-Graham)
Behavior of channels and Conduction of Action Potentials
Purves, Chapter 4

Lecture 7- Feb. 5 (Raab-Graham)
Introduction to synapses, neural integration, and Review
Purves, Chapter 5

FIRST EXAM – Feb 7

Lecture 8 - Feb. 12 (Raab-Graham)
Synaptic transmission
Purves, Chapter 5

Lecture 9 - Feb. 14 (Raab-Graham)
Introduction to Neurotransmitters and Their Receptors
Purves, Chapter 6

Lecture 10 - Feb. 19 (Raab-Graham)
Synaptic Plasticity I
Purves, Chapter 8

Lecture 11- Feb. 21 (Raab-Graham)
Synaptic Plasticity II & Signaling through G Proteins
Purves, Chapter 7,

Lecture 12 – Feb. 26 (Raab-Graham)
Second messengers and their targets
Purves, Chapter 7

Lecture 13 - Feb. 28 (Raab-Graham)
Muscle

Lecture 14 – March 5 (Raab-Graham)
Cardiac and Smooth Muscle and Review

SECOND EXAM- Mar. 7

SPRING BREAK
**Lecture 15 - Mar. 19 (Fiete)**
Introduction to systems neurophysiology - the stretch reflex and gross organization of the nervous system  
Ch. 1, pp. 10-21; Ch. 16, pp. 358-367; (Ch. 9, pp. 198-201).

**Lecture 16 - Mar. 21 (Fiete)**
Major sensory pathways: somatosensory system  
Ch. 9, pp. 198-201.

**Lecture 17 - Mar. 26 (Fiete)**
Somatosensation, cortical maps and plasticity  
Ch. 9, pp 198-207.  
Articles: V. Ramachandran and Buonomano, Merzenich

**Lecture 18 - Mar. 28 (Fiete)**
Motor pathways, oculomotor control, and neural prosthesis for motor control  
Ch. 20, pp. 435-446; Ch. 17, pp. 380-389.

**Lecture 19 - Apr. 2 (Fiete)**
Introduction to the cerebral cortex and association cortex  
Ch. 26 pp. 591-605.

**Lecture 20 - Apr. 4 (Fiete)**
Structure of the cortex I  
Ch. 26 pp. 587-591.

**THIRD EXAM - April 9**

**Lecture 21 - Apr. 11 (Fiete)**
Structure of the cortex II; Eye: the retina  
Ch. 26 pp. 663-686; Ch. 11, pp. 253-271

**Lecture 22 - Apr. 16 (Fiete)**
Neural processing in the retina  
Ch. 11, pp. 272-287

**Lecture 23 - Apr. 18 (Fiete)**
Visual cells in the brain  
Ch. 12, pp. 289-311

**Lecture 24 - Apr. 23 (Fiete)**
Functional organization and higher functions of visual cortex  
Ch. 12, pp. 289-311
Lecture 25 - Apr. 25 (Fiete)
Development of the visual system
Ch. 24, pp. 616-629

Lecture 26 - Apr. 30 (Fiete)
Spatial Navigation and spatial cognition I: homing, head direction cells, place cells

Lecture 27 – May. 2 (Fiete)
Spatial Navigation and spatial cognition II: grid cells