

# VERTEBRATE PHYSIOLOGY (BIO365R)

Fall 2009

## Lectures:

MWF 10-11 & 11-12 (RLM 6.104)

## Instructor: Dr. Moon Draper

Email: [maturin@mail.utexas.edu](mailto:maturin@mail.utexas.edu)

Phone: 471.3912

Office Hours: W & F 2-3 *or by appointment, just send an email or see me after class.*

Office: NMS 4.306

Lab: Patterson Labs, Rooms 229

## Discussions:

There are currently eight scheduled discussion sections each week. While these are not required-- you are strongly encouraged to attend discussions and to bring questions. The TAs should be great alternative sources for explanations. The TAs are there to answer questions and to pose their own questions to help you prepare for the exams in the class. Utilise your TAs during the semester.

Students requiring special consideration (borderline cases, hard-luck situations) can only be helped if the TAs and the instructor know who you are.

Discussions: see the schedule on the web for the discussion times and locations

## Teaching Assistants:

Whitney Smith

Office: MBB 2.310

Email: [wsmith@mail.utexas.edu](mailto:wsmith@mail.utexas.edu)

Hours: By appointment. Just email and set up a time to meet.

Dmitriy Verkhoturov

Office: PAT 429

Email: [verkhoturovdm@mail.utexas.edu](mailto:verkhoturovdm@mail.utexas.edu)

Hours: By appointment. Just email and set up a time to meet.

**Textbook:** The COOP has ordered a text book for this course.

**Neuroscience, 4th ed.** Dale Purves et al., Sinauer, 2007

Other good reference texts are:

**Neuroscience: Exploring the Brain, 3rd ed.** Mark Bear, Connors and Paradiso

**Fundamental Neuroscience, 3rd ed.** Larry Squire, et al.

**Principles of Neural Science, 4th ed.** Kandel, Schwartz and Jessel

The library has these books on reserve and the 3rd edition of Purves has been made available on-line. (there is a link to the on-line content on the course website).

The vast majority of the material will be presented on slides, the website, or on the chalk board.

**Online Content:**

I will use the Blackboard system only for a few announcements and for any discussions between students. Grades will be submitted on eGradebook.

Most of the important information is on a separate course website (linked from Blackboard)

<http://www.utexas.edu/courses/bio365r/>

In addition to the course website, there is a wiki available for student submitted material at:

<http://neurowiki.amydala.net>

Lastly, there is a course blog with posts that cover spiffy neurobiology stories at:

<http://neuro.amydala.net/>

**Grading and Exams:** There will be two mid-term exams given during the semester and one final exam.

You must take the exam with the class for which you are registered.

Each exam will count 30% of your grade and the final exam will count for 40% of the final grade.

The final will be comprehensive. We begin with a standard 90-80-70% scale, but then curve.

Exam 1--	30%	150 points	September 28th, 2009
Exam 2--	30%	150 points	November 2nd, 2009
Final --	<u>40%</u>	<u>200 points</u>	<u>December 9th (7-10) or December 15th (9-12)</u>
	100%	500 points	

**Mean nasty rules:**

All exams must be taken in pen; we will not grade exams that have been taken in pencil.

Questions about grading must be taken up with the TA or with Dr. Draper no later than one week after the exam is returned. If you wish to contest your grade, make sure you have ample justification. The reasons for contesting the grading of the question must be put in writing and submitted to the professor. We will then consider whether your reason is sufficiently justified to warrant a change of grade. We reserve the right to lower your exam grade if we find that credit was given for an incorrect answer. All exams will be copied prior to being returned. Any exam having changes of any sort that were not on the exam at the time it was returned will not be considered for a grade increase.

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. If a student fails to contact the instructor prior to the time of the regularly scheduled exam, or fails to provide an acceptable excuse, that exam will be assigned a zero.

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 including flogging.

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.

## Course Outline and Content

In general, the course explores the nervous system and its targets. We start with the molecular basis of membrane potential and carry this concept all the way to complex brain function. You must have completed BIO325 or BIO325H with a grade of C or better to take this course.

- Part I. Molecular and Cellular Neurophysiology
  - Part II. Sensory Systems
  - Part III. Motor Systems and Behaviour
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### **Unit 1 Parts: Molecular and Cellular Neurophysiology**

The first portion of the course is concerned with cellular and biophysical features of the nervous system. During the first section we will consider how individual neurons generate their electrical signals, how those signals are transmitted, and how one nerve cell communicates with other neurons or muscle cells via chemical synaptic transmission. This leads to the idea of simple reflex circuits that involve a sensory neuron, an interneuron, and a motor neuron targeting a muscle.

**Exam 1** covers this material.

### **Unit 2 Input: Sensory Systems**

On this foundation, we then take a tour of the senses– from touch (somatosensory) to vision to hearing and balance (vestibular systems). We will focus on the eye and the circuitry of the retina; and then study how the raw information is processed by various structures of the brain.

A less rigorous approach will be taken for chemical senses, hearing, proprioception and nociception. However, all of the sensory systems have some common ground. It becomes easier at this point to understand general principles and apply them to the complex.

We then look at the bridge between sensations, perception, and decisions and look at the basal ganglia and cerebellum.

**Exam 2** covers this material; and is necessarily cumulative from the first part of the course.

### **Unit 3 Output: Motor Systems and Behaviour**

We then connect the sensory information with the motor pathways and their targets: the muscles and the heart. In many ways, muscles behave similarly to neurons, sharing the underlying mechanisms that regulate membranes. We will continue with a theme that considers how drugs and toxins affect these structures.

We will discuss the basic wiring of the mammalian nervous system, or how nerve cells are connected in the brain. From there, we will consider some of the perceptual and cognitive changes that occur in people who suffer strokes to restricted regions of the cortex. These will illustrate that our awareness of the world is due to constructions made by the brain and will further illustrate that the way the brain constructs reality is completely counter-intuitive. These perceptions lead to fine control of motor output and learned behaviours.

In addition to control of motor responses, the brain also is the site of memory formation, decision making (the so-called executive functions), primal fear, regulation of sleep and other homeostatic functions of the body including emotions. This is the link to the remainder of mammalian physiology: the limbic system.

**Final Exam** Comprehensive for the entire course. Approximately 50% will be from the third unit and the review of the first two units will comprise the remainder. The final often has case-based studies that incorporate your knowledge of neuro-anatomy, neuro-physiology, and the problems that can arise.

More specific lecture topics are outlined on the course website.