Neurobiology

BIOL 430, 3 cr. hrs. (& BIOL 430L, 1 cr. hr.)

Black Hills State University

Spring, 2009

**Course Meeting Time and Location:**

lecture - 9:00-9:50 MWF, BJA 303

lab - 3:00-4:50 Th, BJS 160 (first lab meets Thur., Jan. 22)

# Instructor’s Contact Information:

## Dr. Charles Lamb

Office - JS 150

Office hours – MWF 1-2, Th 8-9

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# Course Description :

This course involves a study of the vertebrate nervous system, with an emphasis on humans. It is specifically designed to prepare students for advanced study in professional or graduate school programs.

# Course Prerequisites:

This course requires prior completion of BIOL 151/151L & 153/153L and one year of college chemistry, and I would recommend BIOL 325/325L (physiology) and 381/381L (vertebrate anatomy) as well. As far as student preparation, I will announce the required reading for each meeting in advance, and I expect each student to read the material before coming to class. Falling behind in this course is easy to do and difficult to remedy, so it is the responsibility of each student to be prepared.

# Description of Instructional Methods:

### This course will be taught using a combination of lecture presentations, laboratory dissection and experiments, and computerized instruction formats.

### **Course Requirements:**

## Required textbook(s) and other materials:

lecture - *"Neuroscience* *"*, by Purves et al. (4th Ed.);

lab - *“The Sheep Brain: a Photographic Series”*, by Vanderwolf & Cooley

(plus additional materials to be distributed by instructor)

Supplementary text:

*“The Human Brain Coloring Book”*, by Diamond *et al.*

(This is no joke, this book really helps in understanding neural structures!)

Class attendance policy:

Attendance is the responsibility of each student and is not mandatory, with the exceptions noted below. You will not be penalized for missing lectures (other than having to depend on your fellow students for the material covered that day), but you will lose points for missing exams or laboratories. You should remember that I will be supplementing the material provided in your textbook (Purves) with additional information about non-human vertebrates where I think it better illustrates physiological concepts, so attendance and attention are vital to your success in this course.

Cheating and plagiarism policy:

Each student should be familiar with the guidelines for Personal Identification and Representation as stated in the Student Handbook. The following passage is particularly relevant:

*"A student who, in connection with his or her studies, disrupts a class, plagiarizes, cheats, or otherwise violates reasonable standards of academic behavior may, at the discretion of the faculty member involved, have his or her enrollment cancelled and/or be given a reduced or failing grade."*

You're investing your money and your time in order to get a quality education, so I expect all of you to act as responsible adults.

Make-up policy:

(see below)

# Course Learning Goals or Objectives:

We will be learning how neurons and nervous systems function in the vertebrate body. You should come out of this course with a detailed knowledge of the cellular and systemic organization of the nervous system as it applies to humans and other vertebrates.

**Evaluation Procedures:**

#### Total points -

There will be 600 points possible in this course, and final grades will be determined roughly on a scale of:

90-100% (540-600 pts) - A

80-89% (480-539 pts) - B

70-79% (420-479 pts) - C

60-69% (360-419 pts) - D

<60% (0-359 pts) - F

There will be four (4) lecture exams worth 100 pts each (given during the laboratory period and the final exam time), and a final laboratory exam worth 100 pts. The remaining 100 pts will involve a research paper/presentation to be completed by the student. Each student will select a topic in neurobiology, and will complete a literature review, an outline, a rough draft, a finished paper (3-6 pages, typewritten, single-spaced), and an oral presentation of their topic to the class (10-15 min). The instructor will help each student with their topic selection, outline, and rough draft prior to their presentation and final draft.

###### Lecture -

Each of the four lecture exams will cover only material presented during that section of the course. You must notify me, in advance, if some unavoidable crisis prevents you from taking a test at the scheduled time so we can make appropriate arrangements. Unexcused absences will result in zero points for that test. Missing more than one midterm will result in the loss of 100 pts, regardless of the excuse (your highest likely grade would then be a C, so don't miss exams!).

Labs -

The laboratory will be used to compliment the lecture material, and the points you earn in lab will be combined with those for lecture (thus, you will receive the same grade for lecture and lab). The lab will consist of physiological exercises during the first few weeks of the course and dissections of the sheep brain during the rest of the semester. There will also be human central nervous system material to study. Students will be expected to come to each lab prepared to maximize the short time we have available. There will be a laboratory final, on April 28th, covering the dissections of the sheep brain and prosections of the human brain and spinal cord.

**ADA Statement:**

*“Reasonable accommodations, as arranged through the Disabilities Services Coordinator, will be provided students with documented disabilities. Contact the BHSU Disabilities Services Coordinator at 642-6099 (Jacket Legacy Room in the Student Union) for more information.”*

**Academic Freedom and Responsibility (must be used verbatim):**

*“Under Board of Regents and University policy student academic performance may be evaluated solely on an academic basis, not on opinions or conduct in matters unrelated to academic standards.  Students should be free to take reasoned exception to the data or views offered in any course of study and to reserve judgment about matters of opinion, but they are responsible for learning the content of any course of study for which they are enrolled.  Students who believe that an academic evaluation reflects prejudiced or capricious consideration of student opinions or conduct unrelated to academic standards should contact the chair of the department in which the course is being taught to initiate a review of the evaluation.”*

**Tentative Course Outline/Schedule:**

Section 1 - Chapters 1-8 in Purves;

Exam on Thurs., **Feb. 12**.

Section 2 - Chapters 9-15 in Purves;

Exam on Thurs., **Mar. 19**.

Section 3 - Chapters 16-21 in Purves;

Exam on Thurs., **Apr. 09**.

Section 4 - Chapters 22-31 (?) in Purves;

Exam on Fri., **May 08** (11:30-1:00).

**Human Brain Coloring Book**

**BIOL 430**

**Chapter in Text Coloring Plate**

**1) Organization of the Nervous System**

Nerve Cells 2-1 / 2-5

Neuroglial Cells 2-6

Neural Circuits 9-1 / 9-13

Neural Systems

Subdivisions of the CNS 1-4

Anatomy of the Spinal Cord 4-1 / 4-3

Anatomy of the Brain 1-1 / 1-3, 6-1, 9-11 / 9-12

Meninges 9-10

Blood Supply to the Brain and Spinal Cord 9-1 / 9-9, 9-13

**8) Somatic Sensory System**

Receptors 2-9

Proprioception 2-10, 2-11

Ascending pathways 4-4

**9) Pain**

Nociceptors

Spinothalamic tract 4-5, 4-6

Central Modulation 5-34

**10) Vision: Eye**

Anatomy of the eye 6-6

Retinal structure

**11) Vision: CNS**

Visual fields 6-7, 6-8

Lateral geniculate nucleus 5-16 / 5-18

Visual cortex

Superior colliculus 5-9 / 5-11

**12) Auditory System**

Ear: 6-17

external

middle

inner

Hair cells and cochlear function

Central auditory pathways 6-18

**13) Vestibular System**

Vestibular hair cells 6-19

Semicircular ducts (ampullae)

Saccule and utricle (maculae)

Central vestibular pathways 6-20

**14) Chemical Senses**

Olfaction: 6-5

Gustation: 6-16, 6-21, 6-23

Common Chemical Sense: 6-11, 6-12

**16) Upper Motor Neurons & Motor Control**

Descending control of spinal cord circuitry 4-9 / 4-13

Balance and posture

Initiation of complex movements

Functional organization of the primary motor cortex

**17) Basal Ganglia**

Afferents to the basal ganglia 5-24, 5-25

Basal ganglia efferent projections

Intrinsic circuitry

**18) Cerebellum**

Organization of the cerebellum 5-13, 5-14

Afferents 5-15, 4-7, 4-8

Efferents

Intrinsic circuitry

**28) Emotion** 5-20 / 5-22, 5-26 / 5-27

**30) Human Memory** 5-21, 5-22, 5-27 / 5-28

**21) Early Brain Development** 3-1 / 3-12