



Neuroscience 145: Introductory Neuroscience

Location
Loras College

Science Hall 208
MWF 1:30-2:20

Lab:
Science Hall 014
T/TH 3:30 – 5:20
Spring 2017

Neuroscience Program

Instructor: Jake Kurczek, PhD
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Office Hours: By appointment

Textbook: Purves, D. (2012) *Neuroscience* (5th Ed). Sunderland, MA: Sinauer Associates Inc.

Cooley, R. (2001). *Sheep Brain: A Basic Guide* (Ed. 1). London, ON: A.J. Kirby Co.

Class Website: You will be able to find PDFs of the lectures and discussions posted on eLearn

Course Goals and Overview

In this course, you will:

- Gain factual knowledge that includes brain anatomy, neuron function, neurotransmitters, and hormones
- Apply the course material through exploration of sheep brain anatomy
- Explore current topics in neuroscience through critical review of the primary literature
- Develop collaborative scientific skills through laboratory research projects
- Gain behavioral testing experience through laboratory experiments with live rodent subjects

Learning Outcomes

- Students will be able to identify biological/neural structures and their associated functions
- Students will demonstrate critical thinking about the role of the brain in everyday functioning
- Students will gain an understanding of the depth and breadth of the field of neuroscience
- Students will enhance their ability to communicate scientific information through discussions and written assignments

Course Requirements/Policies/Assignment Details

Assignments

This course is based on an interactive lecture format where students will be expected to contribute to class discussions, brainstorming sessions, and small group work. Assessment of student learning will be determined as follows (see descriptions below):

Lecture Quizzes (6 @ 50 pts)	300
Neuroanatomy Practical	100
Research Paper	250
Hypotheses/Sources	(50)
Methods	(30)
Stats	(20)
Final	(100)
Research Presentation	(50)
News Updates (2 @ 25)	50
Literature Critiques (2 @ 50)	100
Participation	50
Group evaluations	50
TOTAL	900

Late Work. Late assignments will be docked 10% from original total for every day after the assigned due date.

Quizzes

At the beginning of the semester you will be divided into small groups (2-3). In these groups you will take quizzes, conduct literature critiques (details to follow), and complete laboratory exercises (details to follow). Quizzes will review material from the preceding lecture(s) and should be used as a guide – both in terms of the materials that will be tested in exams, and in terms of the depth of knowledge I expect from you. Group members are encouraged to discuss their answers within the group and come to a consensus prior to giving a final answer. You should *not* plan to “take turns” with your group member(s) on quizzes. That is, it is not recommended that one group member study for the first quiz, and the second study for the second quiz, etc.

Literature Critiques

One of the most important skills to acquire in any scientific field is the ability to think critically about a given topic. At two points in the semester you will be assigned journal articles from peer-reviewed sources to critique. You have the option to turn in a rough draft for each critique in order to receive feedback on your work, and those drafts are due one week prior to the final deadline. In your small group, you will be expected to:

- 1) Read the article
- 2) Conduct any necessary background reading and research in order to gain a more complete understanding of the central topics of the article

- 3) Write up a 5-page (double spaced) critique of the research that includes: a) a brief summary of the article, b) a review of the strengths and weaknesses of the work, and c) suggestions for how the work could be improved based on your background reading. Alternatively, if there are no suggestions for improvement, describe a follow-up study to the one described in the article.

Critiques will be graded on the group's ability to:

- 1) Identify and describe the main findings of the work
- 2) Identify and describe the strengths and weaknesses of the work
- 3) Demonstrate expertise in the area of research by suggesting ways to improve the work
- 4) Write effectively and concisely
- 5) Cite additional references to support your arguments

Neuroanatomy Practical

Laboratory exercises during the first half of the semester will involve extensive dissections of sheep brains. Sheep brains are excellent tools for learning human neuroanatomy because they are very similar in structure to human brains (with the exception of being about half the size). Dissections will be conducted in small groups, and all group members are expected to participate. It is highly recommended that you “study” while in these laboratory sessions. That is, don't try to cram the night before the practical. Use the time that you have in lab, with the actual brains to review, rather than trying to study from pictures and other resources. Students (i.e. not groups) will be expected to identify neuroanatomical structures and functions that will be labeled in dissected sheep brains.

Laboratory Paper

For most of the second half of the semester we will be spending our laboratory sessions in the rodent facility in the Science Hall. Before those lab sessions lab groups will be responsible for designing an experiment that you will carry out in the rodent facility (see Hypothesis, Sources, and Study Design, Methods below). Following the work with the mice, you will be responsible for compiling and analyzing a data set to determine whether your hypothesis is supported or not (see Results, Statistics below). Finally, you will write a report that describes the study hypothesis, methods, results, and interpretation, and this report should mirror the style, outline, and depth seen in a typical peer-reviewed journal article. As indicated in the grading scheme, you will receive partial credit and feedback on various components of the paper:

- 1) Hypothesis, Sources: The first component of the paper that you will submit is a research question. The best research questions are based on prior knowledge in a given field. As such, along with your research question, you will submit a preliminary References section that will include ten (10) articles from the primary literature that are relevant to your question. These ten sources should include only peer-reviewed research articles. If, in addition to the ten peer-reviewed articles, you would like to include non-scientific sources as well, feel free.
- 2) Study Design, Methods: The second component that you will submit should describe *how* you intend to answer your question. How many mice will you need? What behavioral tests will you run? What is your experimental manipulation? What statistical tests will you use to evaluate your data once it is collected? Be as specific as possible with this section: the more detail you provide, the easier your data collection will be.

- 3) Results, Statistics: The third component should be a report of your findings. Did your manipulation change the behavior? Is the change statistically significant? You may choose to generate figures (graphs, charts) to illustrate your results.
- 4) Final Paper: The last part of this assignment will be to synthesize the previous components. You will need to write a scientific article, as close to the caliber of the scientific articles you read throughout the semester as you can make it. It should include an Introduction, Methods, Results, and Discussion section. In addition you should provide citations where appropriate, and list the sources in a Reference section at the end of the paper.

News Updates

Students will be asked to give 2 presentations of 2-4 minute each on topics of their choice across the semester. These presentations will give students an opportunity to summarize either a current event or research finding and discuss how it relates to neuroscience.

Group Evaluations

A significant portion of your grade will be determined by group assignments (e.g. quizzes, literature critiques, lab paper), and it is critical that all members of a group participate to the best of their abilities. At the end of the semester, you will evaluate your group members (and they will evaluate you) on their contribution to these assignments. After attempting to resolve any group conflicts on your own, please bring any continuing conflicts to my attention as quickly as possible.

Schedule*

Day	Topic	Reading	Assignment
1/30	Course Intro		Course Intro
Lab	Orientation, Safety, External Neuroanatomy		
2/1	Electrical Signaling	CH 2	Syllabus Signed
2/3	Electrical Signaling	CH 2	
2/6	Voltage-Dependent Membrane Permeability	CH 3	
Lab	Midsagittal Dissection		
2/8	Voltage-Dependent Membrane Permeability	CH 3	
2/10	Quiz		
2/13	Channels and Transporters	CH 4	
Lab	Horizontal Dissection		
2/15	Channels and Transporters	CH 4	
2/17	Synaptic Transmission	CH 5	
2/20	Synaptic Transmission	CH 5	
Lab	Coronal Dissection		
2/22	NT/Receptors	CH 6	
2/24	NT/Receptors	CH 6	Literature Critique 1
2/27	Molecular Signaling w/i Neurons	CH 7	
Lab	Neuroanatomy and Function Review		
3/1	Molecular Signaling w/i Neurons	CH 7	
3/3	Quiz		
3/6	Somatic Sensory System	CH 9	Hypotheses/Sources
Lab	Neuroanatomy and Function Review		
3/8	Somatic Sensory System	CH 9	
3/10	Vision	CH 11	
3/13	Vision	CH 12	
Lab	Neuroanatomy Practical		

3/15	Auditory System	CH 13	
3/17	Quiz		
3/20	Vestibular System	CH 14	
Lab	Rodent Lab Introduction		
3/22	Chemical Senses	CH 15	
3/24	Quiz		
3/27	LMN	CH 16	Methods
Lab	Rodent Lab		
3/29	UMN	CH 17	
3/31	Basal Ganglia	CH 18	
4/3	Cerebellum	CH 19	Literature Critique 2
Lab	Rodent Lab		
4/5	Motor Integration	CH 20	
4/7	Quiz		
4/10-4/17	No Class	Easter Break	
Lab	Rodent Lab		
4/19	Brain Development	CH 22	
4/21	Brain Development	CH 22	
4/24	Neural Circuits	CH 23	
Lab	Data Analysis		
4/26	Neural Circuits	CH 23	
4/28	No Class		Jake at MUPC
5/1	Experience Dependent	CH 24	Stats
Lab	Scientific writing, editing		
5/3	No Class	Legacy Symposium	
5/5	Experience Dependent	CH 24	
5/8	Plasticity	CH 25	Presentations Due
Lab	Group Evaluations, "post" quiz		
5/10	Plasticity	CH 25	
5/12	Quiz		Group Evals

FINALS			Final Paper
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*Instructor reserves the right to modify this syllabus and schedule when necessary. Modifications will be made following notification via e-mail, eLearn, and/or in class announcement

Note: The Neuroscience Club is pairing with Psi Chi to host *Brain Games: Neuronal Fun for All Ages!* on March 15th during common time (11AM-12:15PM) in the ACC Ballrooms. You are invited to either help host the event or to attend. Please let me know if you would like to help out or plan to attend.