BIPN 145 Neurobiology Laboratory | Spring 2019

Instructor
Ashley Juavinett, PhD
ajuavine@ucsd.edu
Office hours: Mondays 3-5 pm
(or scheduled via email)
York 4070C

Instructional Assistants
Jennifer Grundman
jagrundm@ucsd.edu

Staff Research Associate
Brandon Chechile
bmchechile@ucsd.edu

Lecture: MWF 11-11:50 AM in Sequoyah Hall 147
Lab: WF 12-3:20 PM in York 1310

Course website: https://sites.google.com/ucsd.edu/bipn145

Course learning objectives:

- **Collect** and **evaluate** neural data from various organisms
- **Apply** principles of neural communication to multiple model systems
- **Describe** the breadth of techniques in neuroscience and the experimental questions they are suited to answer
- **Develop** an appreciation for and practical insight into the process of research
- **Communicate** research to peers as well as a broader audience

Grading

Laboratory reports (400 pts)
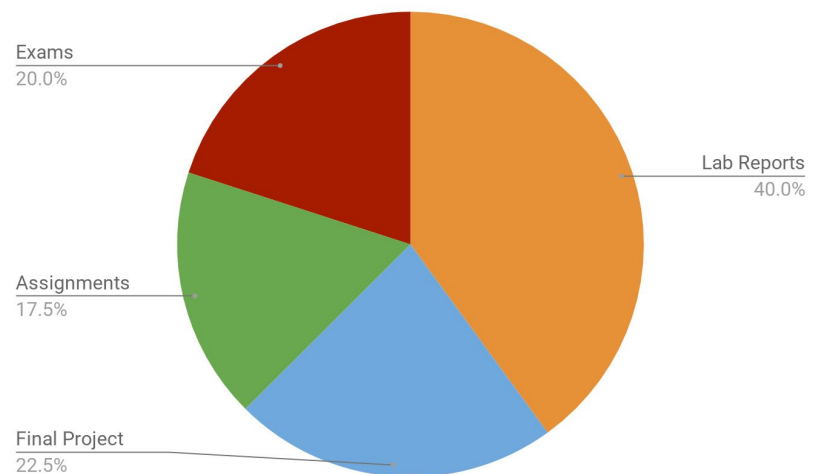- Two full reports & two partial reports

Assignments (175 pts)
- Includes smaller lab write-ups & class participation

Final group project (225 pts)
- Project proposal, presentation, and written report

Two midterms (100 pts each)

Assignments turned in late will lose -10% for each day they are late.

Exams 20.0%
Lab Reports 40.0%
Assignments 17.5%
Final Project 22.5%

Final scores will be converted to letter grades, where A=100-90%, B=89-80%, C=79-70%, D=69-60%, and F=59-0%. For positive and minus grades, A+ = 97-100, A = 93-96.99, A- = 90-92.99, B+ = 87-89.99, B = 83-86.99, B- = 80-82.99, and so on.

<u>Note</u>: **Add/Drop deadlines** are different for lab courses than lecture courses. Students who drop a Biology lab class after the end of the second class meeting will be assigned a "W". Additional details: http://biology.ucsd.edu/go/ug-labs.

Course Philosophy

A note on our course's environment
We'll be working together to create an equitable and inclusive environment of mutual respect, in which we all feel comfortable to share our moments of confusion, ask questions, and challenge our understanding. Everyone should be able to succeed in this course. If you do not feel that is the case please let me know.

Course accommodations
If you need accommodations for this course due to a disability, please contact the Office for Students with Disabilities (osd@ucsd.edu) for an Authorization for Accommodation letter. Please speak with me in the first week of class if you intend to apply for accommodations. For more information, visit http://disabilities.ucsd.edu.

This course, and the work it entails, is for *you*
So, you won't benefit if others do your work. Cases of academic dishonesty or cheating will be first handled by me, and then by the Academic Integrity Office. If you become aware of cheating in this class, you can anonymously report it: https://academicintegrity.ucsd.edu/

Class attendance
BIPN 145 is a laboratory course, which means that almost every session will require hands-on experimentation and data collection. If you will be missing many class meetings, it will be tough to succeed in this course. Course lectures will not be podcasted, but I will provide substitute reading/videos, and you should also work with your classmates to find out what you missed. Enrolled and waitlisted students <u>must</u> attend the first lab session. Additional details: http://biology.ucsd.edu/go/ug-labs.

Safety is important
Enrolled and waitlisted students must successfully complete the Biology Lab Safety Training and Assessment <u>before</u> the first lab session: https://biolabclass-safetyquiz.ucsd.edu/introduction. Please note that courses offered by other departments (Chemistry, for example) may have additional safety training requirements. If you arrive at the <u>first</u> lab session having not passed the safety assessment, you'll be only be able to observe the lab. **You will *not* be allowed into the lab for the second lab session unless you have successfully passed the safety assessment**.

Course Resources

This course will be using an online learning management system (LMS) to manage content and grades. Currently, there are two LMSs, TritonEd and Canvas. This particular course will be managed using **Canvas**, our newest LMS, while some of your other courses may appear in TritonEd. The Course Finder page (coursefinder.ucsd.edu) will display all of your TritonEd *and* Canvas courses. Therefore, it is recommended that you use the Course Finder page to access your classes. Select the login button and enter your Active Directory credentials.

If you have not used Canvas before, refer to the student help guides and videos, which are located on the left-side menu's help section (the question mark icon). Should you need any technical assistance with Canvas, please alert your instructor and send an email to servicedesk@ucsd.edu. In the header of the email, please write "Canvas". Make sure to include your name, course title and section, as well as your contact information in the email body. A representative will get back to you within 48 hours (Monday through Friday).

Textbook

There is no mandated textbook for this course, but most of the background material can be found in Purves et al. (2018) *Neuroscience*. A PDF of this book can be found under Resources on Canvas.

We'll also use Carter & Shieh (2015) *Guide to Research Techniques in Neuroscience*, which can be found online here (link is also under *Resources* on Canvas): https://www.sciencedirect.com/book/9780128005118/guide-to-research-techniques-in-neuroscience.

In addition, for each module I have curated resources that will be useful to you. You can find these on Canvas, or on the course website: https://sites.google.com/ucsd.edu/bipn145/resources

Course schedule * subject to change

Date		Topic	Reading/Due
Week 1			
April 1	Lecture	Introduction to the course and experimental approaches in neuroscience	
April 3	Lecture	Introduction to instrumentation & recording from the nervous system	Complete lab safety training
	Lab	**Experiment #1:** String nervous systems	**DUE at the end of lab** String data
April 5	Lecture	Modeling neural activity	
	Lab	**Experiment #2:** RC Circuits	

Week 2

April 8	Lecture	The action potential	**READ** Hodgkin & Huxley (1939)
April 10	Lecture	Earthworm physiology	**DUE APRIL 9th @ 11:59 pm** RC Circuit Problem Set
	Lab	**Experiment #3:** Earthworm Experiments	
April 12	Lecture	The speed of the nervous system	
	Lab	**Experiment #3** (continuation of Earthworm Experiments)	

Week 3

April 15	Lecture	**Writing lab reports & statistics for biologists**	
April 17	Lecture	Motor circuits & EMG	
	Lab	**Experiment #4:** EMG lab (Earthworm Repeat Day, if needed)	**DUE April 17th @ 11:59 pm** EMG Lab
April 19	Lecture	Coding in neuroscience & introduction to the Allen Brain Institute datasets	Complete Python3 CodeAcademy Tutorial
	Lab	**Computer Lab #1:** Electrophysiological signatures of cell types in mouse & humans	**DUE APRIL 19th @ 11:59 pm** Earthworm Lab Report

Week 4

April 22	Lecture	Intrinsic physiology & neural computation	
April 24	Lecture	Visualizing the nervous system	
	Lab	**Experiment #5:** Tiny things under microscopes	**DUE at the end of lab** Microscope lab worksheet
April 26	Lecture	Intracellular recording	
	Lab	**Experiment #6:** Intracellular Equipment	

Week 5

April 29	Lecture	Earthworm Lab Report Recap & details for Midterm #1	
May 1	Lecture	Leech Physiology & Cell Types	
	Lab	**Experiment #7:** Recording from the Retzius Cell of the Leech	

| May 3 | Lecture | Chemical neurotransmission | |
| | Lab | **Experiment #8**: Filling a cell in the leech | |

Week 6

May 6	Lecture	**Midterm #1**	
May 8	Lecture	Ethology & behavior	**READ** Ed Yong (2017) "How Brain Scientists Forgot that Brains Have Owners"
	Lab	**Experiment #9:** The Case of the Mislabeled Vials	
May 10 ([drop date](#))	Lecture	Drosophila genetics & optogenetics	**DUE MAY 9th @ 11:59 pm** Leech Lab Report
	Lab	**Experiment #10:** The Case of the Missing Methods	**WATCH** Re-Engineering the Brain (Gero Misenboeck TED Talk)

Week 7

May 13	Lecture	Drosophila lab presentations & **Introduction to final projects**	**DUE MAY 12th @ 11:59 pm** Drosophila Presentation & Report
May 15	Lecture	Recording brain activity in humans & signal processing	
	Lab	**Experiment #11:** Measuring EEG activity in humans	
May 17	Lecture	Perception as prediction	
	Lab	**Experiment #12**: Human perception lab	

Week 8

May 20	Lecture	Circuits & behavior	**DUE MAY 20th @ 11:59 pm** Initial Project Proposals
May 22	Lecture	Mapping neural circuits	**READ** Rabies on the brain (*Scientific American* 2018)
	Lab	**Computer Lab #2**: Mouse brain connectivity	
May 24	Lecture	Two-photon calcium imaging & the mouse visual system	**DUE MAY 23rd @ 11:59 pm** EEG Lab report

| | Lab | **Computer Lab #3:** Two-photon imaging data | |

Week 9

May 27		No class (Memorial Day)	DUE MAY 27th @ 11:59 pm Computer Lab #3
May 29	Lecture	Expectations for final projects	
	Lab	**Work on final projects**	
May 31	Lecture	Review for Midterm #2	
	Lab	**Work on final projects**	

Week 10

June 3	Lecture	**Midterm #2**	
June 5	Lecture	Giving presentations in BIPN 145	
	Lab	Work on final presentations	
June 7	Lecture & Lab	Final project presentations	

DUE JUNE 10th at 11:59 pm:
Final project lab report