BIPN 145 Neurobiology Laboratory
Fall 2020

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Instructional Assistants
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(Virtual) office hours
Mondays 1-2 pm on Zoom (link on Canvas, waiting room enabled)

Lectures: Mostly recorded, watched on your own time.
Discussion: Mondays, 11-11:50 AM.
Synchronous Lab Open Sessions: WF from 1-3:30 pm

Course learning objectives:

- **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
- **Communicate** research to peers as well as a broader audience

Notes on our how class will work remotely

Lectures will be recorded and shared, in line with the syllabus. You are expected to watch these lectures on your own time.

"Discussions" will happen on Mondays, from 11-11:50 am. You should plan on being present, with at least a microphone on, during this time. Please let us know if that is not possible, and we will make alternate arrangements. You can join discussions with the password **glia**.

You may complete the lab activities with your lab group on your own time, but I encourage you to complete them during our synchronous **lab sessions** (WF 1-3:30 pm), when the teaching staff will be available to offer assistance. You can join lab sessions with the password **neuron**.

If you need additional help getting online, please check out this resource from the Teaching+Learning Commons. There are many more resources listed here to help you thrive this quarter. If there is anything you think we can help you out with, please feel free to reach out to the IAs or Dr. J.

Tools for this class

Canvas

This course will be using Canvas to manage content and grades. You can log in by going to http://canvas.ucsd.edu. It's recommended that you **avoid Safari** for Canvas quizzes and exams (Firefox or Chrome works great). If you need any technical assistance with Canvas, please alert your instructor and send an email to servicedesk@ucsd.edu.

LabChart Reader

If you can, please download LabChart Reader on your personal computer. We'll be using this to analyze previously collected data.

Spike Recorder

Please download Spike Recorder on your personal computer, tablet, or smartphone. We'll be using this to collect and analyze recordings from a cockroach leg.

DataHub

We'll be using the UCSD DataHub for coding exercises and to run analysis code. Check your login at http://datahub.ucsd.edu.

Textbook

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

Microsoft Office

It will be really useful to have Microsoft Office in this course. You can find it here: https://blink.ucsd.edu/technology/computers/software-acms/available-software/microsoft-individual.html.

Grading

Please note that there are **no exams in this class**. Instead, you'll be completing a mix of lab reports, online (open book) quizzes that accompany our smaller labs, and writing assignments (see Grading below).

- **Laboratory reports** (300 pts): To write these reports (three, 100 pts each), you'll collect some of your own data as well as work with data collected by previous BIPN 145 students.

- **Take Home Quizzes** (150 pts): Open-book Canvas quizzes that you should complete individually. For each of these quizzes, you'll have an allotted amount of time to complete them in one sitting.

- **Assignments** (200 pts): Includes discussion activities, smaller lab write-ups, and Canvas quizzes.

- **Neuroscience in Pop Culture Writing Assignment** (100 pts)

- **Grant Proposal** (250 pts): Design a neuroscience experiment! You'll be asked to develop a feasible and interesting experimental question, and determine the steps to address this question.

  - **Project Sketch** (25 pts): Quick worksheet to give the teaching staff a chance to give you feedback on your initial idea.
  - **Written proposal** (75 pts): Short, two page proposal about your experiment that will allow us to give you more feedback before your presentation.
  - **Presentation** (150 pts): This will be a ~5 minute video that you produce with your group and share to the class about your proposed experiment.

Additional notes on grading
- Lab reports, essays, and assignments will lose -10% for each day they are late.
- 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.

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/

Course schedule Subject to change. Does not include *all* deadlines. Check Canvas for the most updated information.

Date		Topic	Due/Reading
Week 0			
Oct 2	Lecture	#1: Introduction to BIPN 145	Prepare to introduce yourself over video! 👋
		No lab on this day	Fill out the Incoming Survey
Week 1			
Oct 5	Discussion	#2: Neurons & Nervous Systems Organize into lab groups	READ Scientific American Plants Article
Oct 7	Lab	**Lab #1:** RC Circuits [protocol]	WATCH #3: Passive potentials & modeling neural activity
Oct 9	Lab	**Lab #2**: Introduction to Jupyter Notebooks & Comparing Cell Features	WATCH #4: The Action Potential COMPLETE DataQuest "Programming in Python" and "Variables and Data Types" lessons. DUE @ 5 pm: RC Circuit "Quiz"
Week 2			
Oct 12	Discussion	#5: Animal models & ethics	READ Expanding Neuroscience's Menagerie of Model Animals DUE @ 5 pm: Comparing Cell Features
Oct 14	Lecture Lab	#6 Recording from the Nervous System & Cockroach Lab Preparation **Lab #3:** Cockroach Leg Recording	READ Cockroach Lab Protocol & WATCH Introduction to Cockroach Labs
Oct 16	Lab	**Lab #3:** Cockroach Leg Stimulation (continued)	PREPARE your leg stimulation protocol
Week 3			

Oct 19	Discussion	#7 Writing Lab Reports	~~DUE @ 5 pm Electrophysiology Fundamentals (Canvas Takehome Quiz)~~
Oct 21	Lab	**Lab #3:** Cockroach Lab (analysis)	WATCH #8: Signal processing & spike sorting DUE @ 5 pm Electrophysiology Fundamentals (Canvas Takehome Quiz)
Oct 23	Lab	**Lab #4:** Statistics	WATCH #9: Statistics for Neuroscientists

Week 4

Oct 26	Discussion	#10 C. Elegans Nervous System	READ "The Quest for Action Potentials in C. Elegans" (PDF also in Files on Canvas) DUE @ 5 pm: Cockroach Lab Report
Oct 28	Lab	**Lab #5**: Reaction Time Lab	WATCH #11: The Speed of the Nervous System DUE @ 5 pm: Statistics Assignment
Oct 30	Lab	**Lab #6:** Allen Institute Cell Types Coding Lab	WATCH #12: Intrinsic physiology & neural computation Allen Institute Patch Clamping DUE @ 5 pm: C. Elegans Assignment

Week 5

Nov 2	Discussion	Lab groups present Cell Types analysis	WATCH #13: Intracellular recording DUE @ 11 am: Cell Types Data Slide
Nov 4	Lab	**Lab #7**: Leech Virtual Lab in HHMI	WATCH #14: Leech Physiology & Cell Types & JoVE Leech Video
Nov 6	Lab	**Lab #7** (continued): Analyzing Leech Data for your Lab Report	WATCH #15: Analyzing leech data in LabChart Reader DUE @ 5 pm: Leech HHMI activity

Week 6

Nov 9	Discussion	**#16: Introduction to Grant Proposals**	

Nov 11		*No class — Veterans Day*	

Nov 13	Lab	**Lab #8:** Visualizing the nervous system (Eyewire) & **Project planning**	**WATCH** #17: Visualizing the nervous system & EyeWire TED talk
			DUE @ 5 pm: Leech Lab Report

Week 7

Nov 16	Discussion	#18: Recording brain activity in humans (Part I)	**DUE @ 5pm**: Project Sketch

Nov 18	Lab	**Lab #9:** EEG Data Analysis	**WATCH** #19: EEG signal processing
			DUE @ 5 pm: Electrophysiology (Part II) and Visualizing the Nervous System Take Home Quiz (covers weeks 4-6 of lecture)

Nov 20	Lab	**Lab #9 (continued):** EEG Data Analysis	**WATCH** #20**:** Analysis for EEG lab reports

Week 8

Nov 23	Discussion	Drosophila Behavior	**WATCH** #21: Genetics, optogenetics, and behavior (in *Drosophila*)
			DUE @ 5 pm: Written proposals

Nov 25	Lab	**Lab #10:** Comparative Neuroanatomy	**WATCH** #22: Neuroanatomy & **expectations for proposal videos**

Nov 27		*No class — Thanksgiving Break*	**DUE @ 5 pm**: Comparative Neuroanatomy Data (bit.ly/BIPN145_comparative)

Week 9

Nov 30	Discussion	EMG & Movement Disorders	**#23**: Recording brain activity (Part 2)
			DUE @ 5 pm: EEG Lab Report & Spectral Analysis Quiz

Dec 2	Lab	IA Research Talks (~30 minutes) **Integrate written proposal feedback and work on videos**	**WATCH** Genetic engineering, circuits, and behavior
Dec 4	Lab	**Lab #11**: Mouse brain connectivity	**WATCH** Mapping neural circuits

Week 10

Dec 6	Lecture	#24 Careers in neuroscience	**DUE @ 5 pm**: Mouse Brain Connectivity
Dec 8	Lab	**Lab #12:** Visual perception in a mouse	**WATCH** #25 Two-photon calcium imaging & the visual system **DUE DEC 9th @ 5 pm**: Proposal Video
Dec 10			**DUE @ 5 pm**: **a2** Visual Perception in a Mouse
	Lab	**Watch everyone's videos!**	
			DUE DEC 14th @ 5 pm: Neuroscience in Pop Culture