



BIPN 145 Neurobiology Laboratory

Spring 2021

Instructor

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Instructional Assistants

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(Virtual) office hours

Wednesdays 11 am - 12 pm on Zoom (link on Canvas)

Synchronous Discussion: Mondays, 11-11:50 am

Lectures: Pre-recorded and posted at least one day before class

Synchronous Lab Sessions: WF from 12:30-3 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 would strongly encourage you to complete them during our synchronous **lab sessions**, when the teaching staff will be available to offer assistance. You can join lab sessions with the password **neuron**.

I realize that it is tough to stay engaged and motivated during a global pandemic. 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.

Course Management & Texts

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.

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](#).

Software for this class

Since we're relying on your personal computers (rather than our lab computers), there are also various programs you'll be asked to install and use throughout the quarter. If you have any issues with these or would prefer not to download anything onto your personal computer, you are welcome to rely on a teammate or reach out to us for additional accommodations.

Microsoft Office

It will be really useful to have Microsoft Office in this course. You can find it [here](#).

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.

Grading

There are **no major, closed book exams in this class**. Instead, you'll be completing a mix of assignments associated with lab activities, lab reports, online (open book) quizzes, and project components. All told, grades are computed from 1000 points.

- **Laboratory reports** (300 pts): To write these reports (three, 100 pts each), you'll [collect some of your own data](#) (that's why we asked for your mailing address!) as well as work with data collected by previous BIPN 145 students.
- **Take Home Exams** (200 pts total, 100 pts each): 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** (250 pts): Includes discussion activities, smaller lab write-ups, and Canvas quizzes worth 5-30 points each. Early assignments will prepare you to write your first full lab report.
- **Grant Proposal** (250 pts): Design a neuroscience experiment! You'll be asked to work with your lab group 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=90-100%, B=80-89.99%, C=70-79.99%, D=60-69.99%, and F=0-59.99%. 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.
- Final scores are as you see them on Canvas, once all of your assignments are graded. There is no rounding up to the closest score.

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 1: An Introduction to Nervous Systems			
Mar 29	Lecture	#1 Introduction to BIPN 145	Prepare to introduce yourself! 🙌 Fill out the Incoming Survey
Mar 31	Lab	Organize into lab groups	WATCH #2 Neurons & nervous systems READ Scientific American Plants Article
April 2	Lab	Lab #1: Introduction to Jupyter Notebooks	DUE @ 5 pm: Lab Group Plan WATCH #3 Coding in Neuroscience COMPLETE (Optional) DataQuest "Programming in Python" and "Variables and Data Types" lessons.

Week 2: Passive Neural Membrane Properties

April 5	Discussion	How to Find & Read Scientific Papers	DUE @ 5 pm: Introduction to Jupyter Notebooks
April 7	Lab	Lab #2: RC Circuits	WATCH Passive potentials & modeling neural activity & SUBMIT RC Circuit Prelab DOWNLOAD (Optional) Neuronify DUE @ 5 pm: Paper Scavenger Hunt
April 9	Lab	Lab #3: Comparing Cell Features	WATCH The Action Potential DUE @ 5 pm: RC Circuit “Quiz”

Week 3: Statistics

April 12	Discussion	Preparing for cockroach labs & Neuralink Discussion	DUE @ 5 pm: Comparing Cell Features <i>Cockroaches shipped to you!</i>
April 14	Lab	Lab #4: Statistics Jupyter Notebook	WATCH Statistics for Neuroscientists
April 16	Lab	Lab #5: Reaction Time Lab	WATCH The Speed of the Nervous System DUE @ 5 pm: Statistics Lab

Week 4: Extracellular Recordings in Cockroaches

April 19	Discussion	Writing Lab Reports	DUE @ 5 pm: Reaction Time Lab
April 21	Lab	Lab #6: Cockroach Leg Recording	READ Cockroach Lab Protocol INSTALL Spike Recorder WATCH Recording from the nervous system
April 23	Lab	Lab #6: Cockroach Leg Stimulation (continued)	PREPARE your leg stimulation protocol

Week 5: Advanced electrophysiology

April 26	Discussion	<i>C. Elegans</i> Nervous System	READ “ The Quest for Action Potentials in C. Elegans ” (PDF also in Files on Canvas)
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April 28	Lab	Lab #6: Cockroach Lab (analysis)	WATCH Signal processing & spike sorting
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April 30	Lab	Lab #7: Cell Types Coding Lab	WATCH Intrinsic physiology & neural computation & Allen Institute Patch Clamping video DUE @ 5 pm: C. Elegans Assignment
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Week 6: Intracellular Recordings in Leeches

May 3	Discussion	Lab groups present Cell Types analysis	DUE @ 5 pm: Cockroach Lab Report WATCH: Intracellular recording DUE @ 11 am: Cell Types Data Slide (Lab #7 Part I)
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May 5	Lab	Lab #8: Leech Virtual Lab in HHMI	WATCH Leech Physiology & Cell Types & JoVE Leech Video DUE @ 5 pm: Lab #7 Part II
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May 7	Lab	Lab #8 (continued): Analyzing Leech Data for your Lab Report	DOWNLOAD LabChart Reader WATCH Analyzing leech data in LabChart Reader DUE @ 5 pm: Leech HHMI activity
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Week 7: Visualizing the Nervous System

May 10	Discussion	Guest lecture: Movement Disorders	WATCH Introduction to Grant Proposals DUE @ 5 pm: Take Home Midterm
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May 12	Lab	Lab #9: Visualizing the nervous system (Eyewire) & project planning	WATCH Visualizing the nervous system & EyeWire TED talk DUE @ 5 pm: Movement Disorders
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May 14	Lab	Lab #10: Comparative Neuroanatomy	DUE @ 5 pm: Leech Lab Report DUE @ 5 pm: Eyewire WATCH Comparative Neuroanatomy
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Week 8: Electroencephalography

May 17		Recording Brain Activity in Humans	DUE @ 5pm: Project Sketch
May 19	Lab	Lab #11: EEG Data Analysis & project planning	WATCH Analyzing EEG signals and EEG lab reports DUE @ 5 pm: Recording brain activity in humans discussion activity
May 21	Lab	Lab #11 (continued): EEG Data Analysis	DUE @ 5 pm: Spectral Analysis Quiz

Week 9: Neuroscience in the 21st century

May 24	Discussion	Careers in Neuroscience	DUE @ 5 pm: Comparative Neuroanatomy Data (bit.ly/BIPN145_comparative)
May 26	Lab	Lab #12: Mouse brain connectivity	WATCH Mapping neural circuits DUE @ 5 pm: Movement Disorders DUE @ 5 pm: Written proposals
May 28	Lab	IA Research Talks (~30 minutes) Integrate written proposal feedback and work on videos	WATCH Genetic engineering, circuits, and behavior DUE @ 5 pm: EEG Lab Report & DUE @ 5 pm: Mouse Brain Connectivity

Week 10: Wrap-Up

May 31		<i>No class – Memorial Day</i>	
June 2	Lab	Lab #13: Visual perception in a mouse	WATCH Two-photon calcium imaging & the visual system DUE JUNE 3rd @ 5 pm: Proposal Video
June 4	Lab	Watch everyone's videos!	DUE @ 5 pm: Visual Perception in a Mouse DUE JUNE 8th @ 5 pm: Take Home Final