

CELLULAR NEUROBIOLOGY

BIPN 140

Fall 2021

SYLLABUS

INSTRUCTOR: Matthew R. Banghart, Ph.D.

LOCATION: Tata Hall Auditorium, Tu & Th 2:00-3:20pm

TEXTBOOK: *Neuroscience*, Purves et al. 6th edition, Sinauer Associates Publishers

| DATE | | LECTURE TOPIC (Q=quiz) | TEXT | Handouts |
|------|-------|--|----------------------|---|
| Sept | 23 Th | (1) Questions and Approaches in Neuroscience | Ch 1 | |
| | 28 Tu | (2) Cell Biology of a Neuron | Ch 1 | Glia, Cytoskeleton & Axonal Transport |
| Oct | 30 Th | (3) The Passive Membrane I | Ch 2 | Passive Membrane Ephys Basics |
| | 5 Tu | (4) The Passive Membrane II | Ch 2-3 | |
| | 7 Th | (5) The Active Membrane I (Q) | Ch 3 | |
| | 12 Tu | (6) The Active Membrane II | Ch 3-4 | K ⁺ and Cl ⁻ channels |
| | 14 Th | (7) Channel Structure & Function (Q) | Ch 4 | Amino Acids |
| | 19 Tu | MIDTERM EXAM 1 (Lec 1-7) | | |
| | 21 Th | (8) Synaptic Transmission I | Ch 5 | |
| | 26 Tu | (9) Synaptic Transmission II | Ch 5-6 | |
| | 28 Th | (10) Neurotransmitters/Receptors (Q) | Ch 6 | |
| Nov | 2 Tu | (11) Intracellular Signaling | Ch 7 | |
| | 4 Th | (12) GPCRs | Ch 7 | |
| | 9 Tu | (13) Synaptic Plasticity I (Q) | Ch 8 | |
| | 11 Th | Veterans Day: No Class | | |
| | 16 Tu | MIDTERM EXAM 2 (Lec 7-12) | | |
| | 18 Th | (14) Synaptic Plasticity II | Ch 8 | |
| | 23 Tu | (15) Synapse formation | Ch 22-23 | |
| | 25 Th | Thanksgiving: No Class | | |
| | 30 Tu | (16) Sensory transduction I | Ch 9-15 (selections) | |
| Dec | 2 Th | (17) Sensory transduction II (Q) | Ch 9-15 | |
| | 9 Th | FINAL EXAM (Comprehensive) | 3-6pm | |

Grading:

| | | |
|-------------------------------|-----|-----------|
| Discussion Attendance/PS | 5% | (20 pts) |
| In-class Quizzes (via Canvas) | 10% | (40 pts) |
| Midterm Exam 1 | 20% | (80 pts) |
| Midterm Exam 2 | 25% | (100 pts) |
| Final Exam | 40% | (160 pts) |

The class is graded on a curve. See CAPES to get a sense of the average grades in this course.

GENERAL INFORMATION:

Instructor:

Professor: Dr. Matthew Banghart

Office Hours: Thursday 4-5 pm, Center for Neural Circuits & Behavior (CNCB), Small Conference Room (1st floor, East Side), Sept 30 - Dec 2. This could move to Zoom at any time. Nov 11 office hours will be held on zoom. No office hours on Nov 25. A Final Exam review session will be held on Friday Dec 3, 4-6 pm in the CNCB Marilyn Farquar Auditorium (1st floor, north side).

Please only use Canvas to contact Dr. Banghart. Please do not use email so that your messages are not overlooked and lost.

Public service announcement regarding emailing your professor:

<https://medium.com/@lportwoodstacer/how-to-email-your-professor-without-being-annoying-af-cf64ae0e4087> Based on my experience, this is accurate and constructive. I only disagree with Element 4, as this is a waste of everyone's time. Please keep emails concise and to the point.

Instructional Assistants (IAs):

| IA | Email | Discussion | Office Hours |
|-------------|--|--|--|
| Jo-Hsien Yu | joyu@uscd.edu | Th 5-5:50 pm CENTR217A (58222) Fri 9-9:50 am HSS 1305 (58225) | Fri 10-10:50 am Art of Espresso |
| Jean Yung | j1yung@ucsd.edu | Fri 4-4:50 pm HSS 1315 (58223) Fri 5-5:50 pm HSS 1315 (58224) | Tu 4-4:50 pm Town Square (near Student Services) |

Students may attend office hours hosted by either IA. Both are outdoors.

Text book:

Neuroscience, Purves et al. (6th edition, Sinauer Associates Publishers)

**5th edition is fine, as you are not tested directly on assigned readings*

Copies are on reserve at Geisel Library and Biomedical Library (BLB)

Free access to the ebook is provided for the first two weeks of class (until drop/add ends) via RedShelf in Canvas. At that time students **can opt out** of purchasing the ebook. Hardback is at least twice the price. Questions: textbooks@ucsd.edu, [RedShelf Solve](#), [Inclusive Access FAQ page](#).

Supplemental texts

The Neuron, Levitan and Kaczmarek (any edition)

Principles of Neural Science, Kandel and Schwartz (any edition)

Ionic Channels of Excitable Membranes, Hille (any edition)

Lecture Notes:

A pdf of the lecture slides will be posted on Canvas immediately before the lectures. Lectures will be podcast (audio and slides). Although traditionally, about half of the course material is written on the board, due to the ongoing COVID-19 situation, all material will be presented on slides, allowing in-person attendance for lectures to be optional.

If you have questions concerning how to access course materials on Canvas, please contact Academic and Computing Services: <http://acms.ucsd.edu/>.

Assigned Readings:

Reading assignments from the textbook (Purves, *Neuroscience* 6th ed.) provide further background on lecture material and often offer a more comprehensive treatment of the topic. They are not "required" in that you will not be tested on reading material directly. You will not be tested (exam or quiz) on material in the readings that is not also covered either in lecture or in a problem set (*i.e.* do not memorize every new fact in the book in preparation for a quiz or exam). Problem set questions, and only then subsequent exam questions, may indeed derive directly from the text rather than lecture. Supplemental texts are provided for your further edification only; there will be no test or quiz questions

drawn directly from this material. Students often state that the readings go into much greater detail than lecture, do not follow it perfectly, do not show up on exams, and are thus a waste of time. Yet the students who *do* complete the readings perform best in the course. Coincidence? Perhaps an optimal approach is to not attempt to absorb every section in each chapter but instead focus on those that are closely related to the lecture and handouts. The reinforcement of key concepts and facts, as well as the depth of understanding the readings provide, should improve overall course performance.

Handouts:

Handouts will occasionally be provided on Canvas to supplement lectures and readings. **This information will be on problem sets, quizzes and exams.** Problem sets & exam questions from previous years will also be posted on Canvas for practice. Consider handouts to be even more critical than textbook readings – they are essential. Additional handouts not already listed on the syllabus may be provided as the course progresses.

Articles:

Primarily research articles will be periodically discussed in class to demonstrate the significance of the lecture material. Aspects of the articles covered in class will appear in bonus questions on the exams. Articles will be posted on Canvas.

Discussion Sections:

Discussion sessions will start the week of **Monday Sept 27th**. There will be **no discussion sections during the first week. Participation is required for full credit.** Discussion sections are dedicated to going over the most recent problem set. Although in-person attendance results in the most effective learning, due to Covid concerns, students may opt to turn in their problem sets to their IA by Canvas Mail in order to obtain credit for attendance. In this scenario, credit will be allocated based on *genuine* effort. Attendance at each session is worth 2 points and general participation across all discussions is worth up to 2 points (9 sessions x 2 points + 2 participation points = 20 points total; this equates to 5% of the final grade). The sections are useful opportunities to ask questions about the lectures, handouts, & readings, and will be structured around working through solutions to key questions on the problem sets. Students may switch sections but this must be approved by both IAs. Students must attend their (re)assigned discussion section - drifting between sections is not allowed.

Problem Sets:

Problem sets will be released at the end of each week (Friday-Monday) and will generally cover material from the previous Tuesday and Thursday lectures. They will be covered during discussion the Thursday and Friday after their release. The key will be released after the last discussion section on Friday. They consist of sets of questions that will help you evaluate your understanding of the material covered in the lectures and the reading. They are very similar to questions you will have to answer on exams. To get the most out of them, treat them like assignments. They will not be graded. **In the past there has been an excellent correlation between those who worked through the problem sets and those who received high grades in the course. Even moreso than with the readings. Conversely, those students who show up at discussion having not worked earnestly on the problem sets clearly perform the most poorly.** Waiting for the key and showing up at discussion to “absorb” the answers simply doesn’t work. The only reliable way to prepare for exams is to work through the problem sets without looking at the answer key.

Clickers:

No clickers this year. In-person lecture attendance is optional.

Quizzes:

As indicated in the syllabus (**note the dates**), there will be 5 in-class quizzes, each worth 8 pts, or 2% of your total grade. Questions will be based strictly on material covered since the previous quiz, and will be very similar to questions on the problem sets and exams. The quizzes are intended to encourage you to review the lecture material frequently, rather than cramming before the exam, and to actually work on the problem sets, as the assigned problem sets will help with the quizzes. This is critical, as the course material is challenging and builds on itself. If you miss a concept from a lecture, you may be unable to keep up in a subsequent lecture and risk falling behind and getting lost. Most students report appreciating this quiz structure because it forces them to keep up.

Quizzes will be administered through Canvas at the beginning of class during a fixed time window. If you attend in person, bring a laptop or phone for taking your quiz. There will not be a 2nd time window for students who choose not to attend lecture in person. Anyone caught cheating on in-class quizzes, to anyone's benefit, will face disciplinary action.

Exams:

Currently, the plan is to hold all exams in person. Midterm exams will consist of short essays and problems and will be administered during class (in Tata Hall) as indicated (1 hr 20 min). The final exam (3 hr) will be distributed proportionally such that ~1/3 covers new material since the 2nd midterm, and 2/3 consists of a comprehensive exam that covers the entire course. The exams will cover material from lectures, quizzes, handouts and problem sets and exam questions will closely resemble questions in quizzes and problem sets. Calculators are required.

The exams may change during the quarter to an online format. The Covid situation, unfortunately, is *still* evolving. Policies for missed exams are determined on a case-by-case basis. If you end up missing multiple exams in this course (or any course), you should contact the Dean of your College to have a discussion with Dr. Banghart about how to salvage the quarter in a way least detrimental to your academic record.

Academic Integrity:

Students are expected to adhere to the [UCSD Policy on Integrity of Scholarship](#). Students suspected of cheating will be reported to the Academic Integrity office and dealt with accordingly. Do not use material from prior years or other versions of BIPN140 that is not provided directly by the instructors this quarter to prepare for this course. Do not use notes when taking quizzes (or exams) online unless specifically directed to do so.

Covid-19 Considerations:

This course has one critical **in-person** component: **exams**. In-person attendance at discussion sections and lectures is optional. At least one office hour is being held remotely to accommodate students who are quarantined. **In-person attendance at lecture is optional.** Inside classrooms, masks **MUST** be worn at all times (no eating or drinking in class) and students are asked to occupy every other seat to facilitate social distancing.

Please do not come to any in-person component of this class, including exams, if you are sick, even if Covid negative. Again, lectures will be podcast. If you cannot participate in an online quiz, in-person discussion section, or in-person exam, immediately contact Dr. Banghart to make alternative arrangements. Efforts will be made, within reason, to accommodate precarious situations that will inevitably arise. These instances will be dealt with according to the situation at hand – there is no one-size-fits-all policy.

Final Words:

Many students report BIPN140 to be *THE MOST* challenging course they take. Furthermore, exams are based primarily on problem solving. Memorization of facts and keywords alone doesn't amount to much in this class. In the first third of the course, basic concepts from electromagnetism (physics) are covered in the context of biology, and very simple algebra is required (yes you are expected to have retained basic algebra when taking college science courses). Students often note that other courses are not structured this way and feel unprepared. Problem solving (often with basic math) is how the real world works. It would be unfair to students to *not* be evaluated on problem solving in an upper-division course while obtaining a science degree, as such an education would leave them unprepared for a career in the real world. Do the problem sets.