CELLULAR NEUROBIOLOGY
BIPN 140
Winter 2020
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
Jan	**7**	(1) Neurons and Glia	Ch 1	Glia, Cytoskeleton & Axonal Transport
	9	(2) The Passive Membrane I	Ch 2	Passive Membrane Ephys Basics
	14	(3) The Passive Membrane II	Ch 2-3	
	16	(4) The Active Membrane I **(Q)**	Ch 3	
	21	(5) The Active Membrane II	Ch 3-4	K+ and Cl- channels
	23	(6) Channel Structure & Function **(Q)**	Ch 4	Amino Acids
	28	**MIDTERM EXAM 1 (Lec 1-6)**		
	30	(7) Synaptic Transmission I	Ch 5	
Feb	**4**	(8) Synaptic Transmission II	Ch 5-6	
	6	(9) Neurotransmitters/Receptors	Ch 6	
	11	(10) Intracellular Signaling **(Q)**	Ch 7	
	13	(11) GPCRs		
	18	(12) Synaptic Plasticity I	Ch 7-8	
	20	(13) Synaptic Plasticity II **(Q)**	Ch 8	
	25	**MIDTERM EXAM 2 (Lec 7-13)**		
	27	(14) Synapse formation	Ch 22-23	
Mar	**3**	(15) Sensory transduction I	Ch 9-15 (selections)	
	5	(16) Sensory transduction II	Ch 9-15	
	10	(17) Cell biology of addiction **(Q)**	-	
	12	(18) Parkinson's disease	-	
	19	**FINAL EXAM (Comprehensive)**	3-6pm	

Grading:

Discussion Attendance	5%	(20 pts)
In-class Quizzes	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:

Instructors:

Professor: Dr. Matthew Banghart (mbanghart@ucsd.edu)
Office Hours: Monday 4-5 pm, Center for Neural Circuits & Behavior (CNCB), Small Conference Room (1st floor, East Side), Jan 13- Mar 9. An additional pre-exam session will be held on Fri Mar 13, 4-6pm in the CNCB Farquar Auditorium (large seminar room)

Please only use Canvas to contact Dr. Banghart. Please do not use email.

Instructional Assistants (IAs):

IA	Email	Discussion	Office Hours
Jenny He	xih174@ucsd.edu	Fri 3-4 pm HSS 2321 (998049) Fri 4-5 pm HSS 2321 (998050)	Th 4-5 pm, 2nd Fl BLB
Alexander Keim	apkeim@ucsd.edu	Mon 2-3 pm APM 2301 (998047) Mon 3-4 pm APM 2301 (998048)	T 3:30-4:30, Art of Espresso (Mandeville Coffee Cart)

Required text book:
Neuroscience, Purves et al. (6th edition, Sinauer Associates Publishers)
    5th edition is insufficient
2 copies are on reserve at Geisel Library and 1 copy at 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 for $66.79. Hardback is $145.95. Questions: *textbooks@ucsd.edu, RedShelf Solve,* Inclusive Access FAQ page. *You will have until **Saturday, January 18th 2020** to opt-out in Canvas.*

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). About half of the course material will be written on the board, thus, attendance is critical, and podcasts will be insufficient alone to acquire the course content.

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 provide further background on lecture material and often offer a more comprehensive treatment of the topic. In general, 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 subsequent exam questions, may indeed derive directly from the text rather than lecture. Supplemental reading sources are provided for your further edification only; there will be no test or quiz questions drawn exclusively from this material.

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. *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.

Discussions:
Discussion sessions will start the week of **Jan 13th**. There will be **no discussion sessions during the first week**. 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 several 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 on Wednesdays (or Tuesdays when possible) and will generally cover material from the previous Thurs and Tues lectures. 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, but will be discussed in section on Friday and Monday. The answer key will be posted after the Monday discussion sections. **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. 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:
We will be using clickers in this course, and ***they are required***. They will primarily be used for in-class quizzes and in-class example problems.

Quizzes:
As indicated in the syllabus, 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. Clickers will be used to take in-class quizzes. Bring calculators to class. *Anyone caught cheating on in-class quizzes, to anyone's benefit, will receive an F in the course, and will face discinplinary action.*

Exams:
Midterm exams will consist of short essays and problems and be administered in class (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.

Final Words:
Many students report this 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. Students often note that other courses are not structured this way and feel unprepared. Problem solving 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.*