

# CELLULAR NEUROBIOLOGY

## BIPN 140

### Winter 2019

### SYLLABUS

**Professor:** Matthew R. Banghart

**Location:** Tata Hall Auditorium; Tu & Th 12:30 – 1:50 pm.

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

DATE	LECTURE TOPIC	TEXT	ARTICLE
Jan	8 1 Neurons and Glia	Ch. 1	Microglia eat synapses
	10 2 Electrical Signaling	Ch. 2	Molecularly defining cell types
	15 3 Ion Channels and Currents	Ch. 2 & 3	Photoswitchable ion channel blockers
	17 4 Combinations of Currents I	Ch. 3	TBD
	22 5 Combinations of Currents II	Ch. 3 & 4	TBD
	24 6 Channel Structure & Function	Ch. 4	K <sup>+</sup> channel gating
	29 <b>1st MIDTERM EXAM</b>		
	31 7 Synaptic Transmission I	Ch. 5	TBD
	Feb	5 8 Synaptic Transmission II	Ch. 5 & 6
7 9 Neurotransmitters/Receptors		Ch. 6	GABA/Glu co-release
	12 10 Intracellular Signaling	Ch. 7	Endocannabinoids and DSI
	14 11 GPCRs	tbd	Gq-GPCRs activate PKA
	19 12 Synaptic Plasticity I	Ch. 7 & 8	Structural plasticity & LTP
	21 13 Synaptic Plasticity II	Ch. 8	Engineering memory with LTP
	26 <b>2nd MIDTERM EXAM</b>		
	28 14 Synapse formation	Ch. 22 & 23	Glutamate drives spine formation
March	5 15 Sensory transduction I	Ch. 9-15	Vision restoration w/ChRs
	7 16 Sensory transduction II	(selections tbd)	Piezo and mechanosensation
	12 17 Cell biology of addiction	none	rTMS for cocaine addiction
	14 18 Parkinson's disease	none	
	19 <b>FINAL EXAM</b>		
	<i>11:30 am-2:30 Tues of exam week</i>		

**Problem Sets:** Problem sets will be distributed almost every week from the class website. They will cover the previous week's material. They are for practice only: they will not be graded, but you may be called upon in discussion section to answer them. Answers will be available on the class website the week after they are discussed.

**Discussions:** Start the week of Jan <sup>14th</sup>. Attendance and participation will count towards 5% of your total grade.

<b>Grading:</b>	Discussion	5%
	1st Midterm	20%
	2nd Midterm	25%
	Final Exam	50%

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

**Texts:**

**Required**

*Neuroscience*, Purves et al. (6<sup>th</sup> edition, Sinauer Associates Publishers)

A 180 day eBook is available through TritonEd via the RedShelf tool for ~1/2 price.

Copies are placed on reserve at the Geisel and Biomedical libraries

**Supplemental**

*The Neuron*, Levitan and Kaczmarek (any edition)

*Principles of Neural Science*, Kandel and Schwartz

*Ionic Channels of Excitable Membranes*, Hille

**Class website:** TritonEd

**Instructional Assistants & Office Hours:**

Vi Dang, vpdang@ucsd.edu, Sections 962125 (A02), 962126 (A03) OH Fri 9-10 am @ Middle of Muir Coffee

Kimi Taira, kgtaira@ucsd.edu, S962124 (A01), OH Mon 4:30-5:30 pm @ Biomedical Library (BLB) 2nd Floor

Anika Balse, abalse@ucsd.edu, Sections 962127 (A04), OH Thur 11 am-12 pm @ Art of Espresso

**GENERAL INFORMATION**

**INSTRUCTOR:** Matthew Banghart, 203 Center for Neural Circuits & Behavior, mbanghart@ucsd.edu, 858-822-3241

**HANDOUTS:** Handouts will occasionally be provided on TritonEd to supplement lectures and readings. This information will be on problem sets and exams. Problem sets & exam questions from previous years will be on TritonEd. Lecture slides will usually be available before class. Lecture audio will be podcast.

**PROBLEM SETS:** These 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 exams. **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.** They will not be graded, but will be discussed in section. The answers will be available on the class website after the week in which they are discussed.

**DISCUSSION SECTIONS:** Sections will meet starting the 2nd week of the quarter - there will be no section meetings 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). One unexcused absence will be granted with no points lost (*i.e.* you must attend 8 sections to receive full credit). The sections are useful opportunities to ask questions about the lectures, handouts & readings and will be structured around working through solutions to the problem sets. Students may switch sections but this must be approved by both IAs and students must attend their (re)assigned discussion section - drifting between sections is not allowed.

**OFFICE HOURS:** Dr. Banghart's office hours will be held in the Center for Neural Circuits & Behavior Small Conference Room (1st floor, East Side), Mon, 2-3 pm Jan 14 - March 11. An additional pre-exam session will be held on Fri. March 15, time and location TBA.

**EXAMS:** The grade in the course depends on discussion attendance and participation, two midterm exams and a comprehensive final exam. Discussion section is worth 20 points. Midterm 1 is worth 80 points, Midterm 2 is worth 100 points and the final is worth 200 points. Midterm exams will consist of short essays and problems. The final exam will consist of the equivalent of an hour exam on the new material since the 2<sup>nd</sup> midterm, and a comprehensive exam that covers the whole course.

The exams will cover material from lectures, assigned reading, handouts and problem sets. The lectures are important since they highlight matters of particular significance and discuss issues that may be complex. The text is important since this reading provides further background and the instructor does not cover all of the material in lecture. The handouts are important because they cover information that is not provided in lecture or readings, and/or they summarize key components of the readings. Information in handouts will show up on exams. The problem sets are important since they provide excellent practice in working out exam questions and some of the questions on the exams will be drawn from the problem sets. Supplemental reading sources are provided for your further edification only; there will be no test questions drawn from this material. Articles will be discussed briefly in lecture to put lectures in context and their core content will appear in bonus questions on the exams.