Cellular and Molecular Neurobiology
MCB 160

Fall 2019 M,W,F 10-11am Hearst Field Annex A1

Instructors' Information

Instructor Name: Prof. Ehud Isacoff
Office Hours Location: 247 LSA
Office Hours (Time and Day): Wednesdays 11-12 and Thursdays 2-3 during EI instructional weeks
E-mail: ehud@berkeley.edu

Instructor Name: Prof. Helen Bateup
Office Hours Location: 247 LSA
Office Hours (Time and Day): Wednesdays 11-12 during HB instructional weeks
E-mail: bateup@berkeley.edu

Instructor Name: Prof. Daniel Feldman
Office Hours Location: 189 LSA
Office Hours (Time and Day): Wednesdays 11-12 during DF instructional weeks
E-mail: dfeldman@berkeley.edu

Instructor Name: Prof. Gian Garriga
Office Hours Location: TBD
Office Hours (Time and Day): Wednesdays 11-12 during GG instructional weeks
E-mail: garriga@berkeley.edu

GSI Names, Sections, Emails, and Office Hours
Erin Aisenberg, Sections 102 and 107, erinaisenberg@berkeley.edu, Wed. 9-10 in 349 LSA
Julia Bleier, Sections 101 and 105, bleier@berkeley.edu, Mon. 11-12 in 349 LSA
Katie Cording, Sections 103 and 104, kcording@berkeley.edu, Wed. 4-5 in 349 LSA
Sonali Mali, Sections 106 and 108, smali@berkeley.edu, Thurs. 4-5 in 349 LSA

Extra office hours and review sessions will be held by the instructors & GSIs prior to each exam

Course Description

Comprehensive introductory survey of cellular and molecular neuroscience, including cellular neurophysiology, ion channel function, synaptic function and plasticity, sensory transduction, and brain development. Analysis from the level of molecules to cells to simple circuits.

Prerequisites: Biology 1A and 1AL. Prerequisite or co-requisite: Physics 8B

Course Resources

- Required Text: Principles of Neurobiology, 1st edition by Liqun Luo (ISBN: 9780815345336)

- Recommended Text: Principles of Neural Science, 5th edition by Kandel et al
  Available as a free e-book, from computers on the campus network (including AirBears2): http://neurology.mhmedical.com/book.aspx?bookID=1049

  From off-campus locations: install the Library proxy server: http://www.lib.berkeley.edu/using-the-libraries/proxy-server, then click on the link from the library catalog to access the e-book.

- Optional Text: Ion Channels of Excitable Membranes by Bertil Hille (ISBN: 9780878933211)

- Website/Online Resources: **bCourses** will be used to post all course material including handouts and lecture slides.

Policies & Grading

How to Succeed in this Course

This class covers a lot of material, and emphasizes both facts and principles. Bring a copy of the lecture slides to class with you, so you can take notes on them. Focus in class on understanding the material, rather than on note-taking. Exam questions will come from material presented during lecture. Attend Faculty and GSI office hours; bring your questions and think about those from other students. If you find that you have any trouble keeping up with assignments or other aspects of the course, make sure you let your instructor know as early as possible.

Course Requirements

- Lecture and Discussion Attendance: Students are expected to attend all lectures and their assigned discussion section. Attendance in discussion section will be monitored and will count towards your grade.

- Quizzes: Quizzes will be given in discussion section periodically throughout the year (announced in advance) and will count towards your discussion section grade.

- Exams: There will be two mid-terms exams and a comprehensive final exam. Mid-term exams will take place during class time, as listed on the lecture schedule. The final exam time is also listed on the lecture schedule.

Course Policies

I. **Safe, Supportive, and Inclusive Environment**
   a. Whenever a faculty member, staff member, post-doc, or GSI is responsible for the supervision of a student, a personal relationship between them of a romantic

or sexual nature, even if consensual, is against university policy. Any such relationship jeopardizes the integrity of the educational process.

b. Although faculty and staff can act as excellent resources for students, you should be aware that they are required to report any violations of this campus policy. If you wish to have a confidential discussion on matters related to this policy, you may contact the Confidential Care Advocates on campus for support related to counseling or sensitive issues. Appointments can be made by calling (510) 642-1988.

   The classroom, lab, and work place should be safe and inclusive environments for everyone. The Office for the Prevention of Harassment and Discrimination (OPHD) is responsible for ensuring the University provides an environment for faculty, staff and students that is free from discrimination and harassment on the basis of categories including race, color, national origin, age, sex, gender, gender identity, and sexual orientation. Questions or concerns? Call (510) 643-7985, email ask_ophd@berkeley.edu, or go to http://survivorsupport.berkeley.edu/.

II. **DSP Students**

If you need disability-related accommodations in this class, if you have emergency medical information you wish to share with us, or if you need special arrangements in case the building must be evacuated, please inform us immediately. Please see the instructor privately after class or send an email within the first week of class.

Students who need accommodations, should request them from the Disabled Students' Program, 260 César Chávez Center, 642-0518 (voice), dsp@berkeley.edu. DSP is the campus office responsible for verifying disability-related need for academic accommodations, assessing that need, and for planning accommodations in cooperation with students and instructors as needed and consistent with course requirements.

III. **Cheating**

Cheating will not be tolerated. UC Berkeley's cheating policy (http://bulletin.berkeley.edu/academic-policies/#studentconductappealstext) will be followed.

IV. **Policy for missing an exam**

There are no make-up exams. The only excuses for missing an exam are a documented medical reason, family emergency, or other official school activity (athletic event, medical school interview, or conference presentation). In this case, you must notify the instructors within one week of the exam date and provide documentation. In excused cases, the scores from the other two exams will be weighted and averaged to determine the final grade. It is not possible to miss more than one exam or the final exam. If this happens due to excused reasons, students will be assigned an incomplete.

V. **Letters of Recommendation**

Any of the three instructors may be approached for a letter of recommendation. If you

plan on asking for a letter it is recommended that you regularly attend lectures, office hours and discussion section so that we can provide the most informative evaluation. Your GSI is also an important point of contact who will provide input for the letter. Please note that some instructors get asked for letters from many students and will only be able to accommodate a certain number of requests.

Grading Policy

Points	**Description**
40	Discussion section grade: determined by quiz scores and participation score
100	Mid-term 1
100	Mid-term 2
160	Comprehensive final exam
400	*Total Points Possible*

Grade Determination

Grades will be determined by calculating the percentage of points earned out of 400. Letter grades will be assigned using the standard grading scale as a guideline:

A	100-90%	D	69-60%
B	89-80%	F	59-00%
C	79-70%		

Re-grade Policy

If you would like a regrade for a question(s) on a mid-term exam, a one page hard copy written request explaining why you believe you deserve credit is due to the instructor or GSI within **seven days** after the exams are handed back. The instructor will examine the request and the entire exam is subject to regrading. Only exams completed in pen are eligible for regrades.

Course Schedule

Prof	Class Date	Lecture #	Lecture Topic	Reading (Luo)	Reading (Kandel)	Optional reading (Hille)
EI	W Aug. 28	1	Introduction to the nervous system	Chapter 1	Chapters 1, 3 & 4	
			MEMBRANE BIOPHYSICS			
EI	F Aug. 30	2	Plasma membrane, channels, pumps	Chapter 2.1-2.4	Chapter 5	Chapter 1
	M Sep. 2	*Labor Day*	*No lecture*			
EI	W Sep. 4	3	Passive electrical properties & equivalent circuits	Chapter 2.5-2.8	Chapter 6, Appendix A	Chapter 2
EI	F Sep. 6	4	Selective permeability and membrane potential	Chapter 2.5-2.8	Chapter 6, Appendix A	Chapters 10, 11 & 14
EI	M Sep. 9	5	The action potential	Chapter 2.9-2.11	Chapter 2	Chapters 10, 11 & 14
EI	W Sep. 11	6	Voltage-gated ion channels I	Chapter 2.9-2.16	Chapter 7	Chapters 3, 4 & 13
EI	F Sep. 13	7	Voltage-gated ion channels II	Chapter 2.9-2.16	Chapter 7	Chapters 5 & 19
EI	M Sep. 16	8	Action potential propagation	Chapter 2.9-2.16	Chapter 7	Chapter 2
EI	W Sep. 18	9	Spontaneous activity and pacemaking	*Handout*		
			NEUROTRANSMITTERS AND RECEPTORS			
HB	F Sep. 20	10	Cell type diversity in the brain/Neurotransmitters I	Chapter 1.4-1.6	Chapter 2	
HB	M Sep. 23	11	Neurotransmitters II	Chapter 3.11	Chapter 13, 63	
HB	W Sep. 25	12	Ionotropic receptors	Chapter 3.12-3.17	Chapter 10	
HB	F Sep. 27	13	Metabotropic receptors and G protein signaling	Chapter 3.18-3.22	Chapter 11	
HB	M Sep. 30		***MIDTERM 1***			
			SYNAPTIC PLASTICITY AND LEARNING			
HB	W Oct. 2	14	Dendrites and spines	Chapter 3.16, 3.24-3.25	Chapter 10	
HB	F Oct. 4	15	Cellular basis of learning and memory	Chapter 10.1-10.3	Chapter 66, 67	
HB	M Oct. 7	16	Molecular mechanisms of long-term synaptic potentiation	Chapter 10.4-10.8	Chapter 66, 67	

HB	W Oct. 9	17	Signaling from the nucleus to synapse and back	Chapter 3.23 and 2.1-2.3	Chapter 66, 67	
EI	F Oct. 11	18	Optical methods in neurobiology	Chapter 13.22-13.26	Chapters 10, 50, 64	
HB	M Oct. 14	19	Long-term synaptic depression	Chapter 10.9-10.10, 10.12	Chapter 66, 67	
HB	W Oct. 16	20	Structural plasticity	Chapter 10.13	Chapter 66, 67	
HB	F Oct. 18	21	Homeostatic plasticity		Chapter 66, 67	
HB	M Oct. 21	22	Excitatory-Inhibitory (E-I) balance and disorders of synaptic function	Chapter 3.25, 10.11 11.24-11.27	Chapters 10, 50, 64	
			PRESYNAPTIC FUNCTION			
EI	W Oct. 23	23	Synaptic transmission I (presynaptic function)	Chapter 3.1-3.11	Chapters 8 & 12	
EI	F Oct. 25	24	Synaptic transmission II (presynaptic function)	Chapter 3.1-3.11	Chapters 8 & 12	
EI	M Oct. 28	25	Presynaptic plasticity	Chapter 3.1-3.11	Chapters 8 & 12	
EI	W Oct. 30		***MIDTERM 2***			
			SENSORY TRANSDUCTION			
DF	F Nov. 1	26	Phototransduction	Chapter 4		
DF	M Nov. 4	27	Olfaction and taste	Chapter 6		
DF	W Nov. 6	28	Somatosensory transduction (touch and pain)	Chapter 6		
DF	F. Nov 8	29	Auditory transduction and cochlea	Chapter 6		
	M Nov. 11	*Veteran's Day*	*No lecture*			
DF	W Nov. 13	30	Vestibular sensation	Chapter 6		
			NEURAL DEVELOPMENT			
HB	F Nov. 15	31	Early neural induction and specification of regional identity	Chapter 7	Chapter 52	
GG	M Nov. 18	32	Specification of cell fates I	Chapter 7	Chapter 53	
GG	W Nov. 20	33	Specification of cell fates II	Chapter 7	Chapter 53	
GG	F Nov. 22	34	Trophic factors and cell death	Chapter 7	Chapter 53	
GG	M Nov. 25	35	Axon guidance I	Chapter 7	Chapter 54	
	W Nov. 27	*Thanksgiving*	*No lecture*			

	F Nov. 29	*Thanksgiving*	*No lecture*			
GG	M Dec. 2	36	Axon guidance II	Chapter 7	Chapter 55	
GG	W Dec. 4	37	Synapse formation	Chapter 7	Chapter 56	
DF	F Dec. 6	38	Activity-dependent synaptic refinement during development	Chapter 7	Chapter 56	
	Dec. 9-13	*RRR week*	*No lectures*			
	M Dec 16		***FINAL EXAM 8-11am***			