

Cellular and Molecular Neurobiology
MCB 160

Fall 2020

M,W,F 10am-11am (PT)

Online via Zoom

Instructors' Information

Instructor Name: Prof. Ehud Isacoff

Office Hours Location: Online via Zoom

Office Hours (Time and Day): Thursdays 4pm-5pm during EI instructional weeks

Instructor Name: Prof. Helen Bateup

Office Hours Location: Online via Zoom

Office Hours (Time and Day): Wednesdays 11am-12pm during HB instructional weeks

Instructor Name: Prof. Daniel Feldman

Office Hours Location: Online via Zoom

Office Hours (Time and Day): TBD

Instructor Name: Prof. Gian Garriga

Office Hours Location: Online via Zoom

Office Hours (Time and Day): Wednesdays 11am-12pm during GG instructional weeks

Discussion sections:

Section number	Day and Time (PT)	GSI
DIS 101	Thurs 9am-10am	Julian
DIS 102	Tues 11am-12pm	Julian
DIS 103	Wed 1pm-2pm	Giovanni
DIS 104	Thurs 10am-11am	Adrian
DIS 105	Thurs 1pm-2pm	Kaeli
DIS 106	Thurs 2pm-3pm	Kaeli
DIS 107	Fri 9am-10am	Adrian
DIS 108	Fri 11am-12pm	Giovanni

Course Description

MCB 160 is a comprehensive introductory survey of cellular and molecular neuroscience, including cellular neurophysiology, ion channel function, synaptic function and plasticity, sensory transduction, and brain development. We will discuss topics at 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. Try to preview the slides before lecture and during lecture focus on understanding the big picture and major take home messages, rather than on detailed note-taking. Exam questions will come exclusively from material presented during lecture. The book chapter readings are designed to reinforce the lecture material and not all topics covered in lecture will be in the textbook(s). We encourage students to regularly attend faculty and GSI office hours; please bring your questions and think about those from other students. If you find that you have trouble keeping up with assignments or other aspects of the course, make sure to let your GSI or instructor know as early as possible.

Course Requirements

- Lecture and Discussion Attendance: While we will be recording lectures and discussion sections and posting them after the class meetings, students should make every effort to attend lectures “live” and are encouraged to ask questions via the chat function in Zoom. We will post the responses to any questions not answered during lecture time.

Attendance in discussion section is mandatory and will be monitored and count towards your grade. If you anticipate having difficulty attending discussion section at the scheduled time, please contact your GSI as soon as possible to make arrangements.

- Quizzes: Three quizzes will be given periodically throughout the year (announced in advance) and will count towards your discussion section grade.
- Exams: There will be **three mid-term exams** taken at the end of each section of course, as listed in the course schedule below. We will *not* have a comprehensive final exam this year. The specific exam format will be announced a few weeks prior to each exam. The exams will comprise short-answer questions that test your knowledge of the concepts presented.

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, please inform us immediately. Please email your GSI and instructor within the first week of class to let us know of any specific needs.

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

Due to the large class size, there will be 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 at least one week prior to the exam date for known conflicts or one week after the exam in the case of an emergency 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. 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
50	Discussion section grade - determined by quiz scores (3 quizzes worth 10 points each) and participation/attendance score worth 20 points
100	Mid-term 1
100	Mid-term 2
100	Mid-term 3
350	<i>Total Points Possible</i>

Grade Determination

Grades will be determined by calculating the percentage of points earned out of 350. Letter grades will be assigned using the standard grading scale as a guideline. Specifically, if you score within the ranges below you will earn at least the grade indicated. Cut-offs for + and – grades will be determined at the end of the semester. No standardized curve will be applied.

100-90% = A range

89-80% = B range

79-70% = C range

69-60% = D range

59% and below = F range

MCB 160 Fall 2020 Course Schedule *(subject to change)*

Prof	Class Date	Lecture #	<u>Lecture Topic</u>	<u>Reading (Luo)</u>	<u>Reading (Kandel)</u>	<u>Optional reading (Hille)</u>
EI	W Aug. 26	1	Introduction to the nervous system	Chapter 1	Chapters 1, 3 & 4	
			MEMBRANE BIOPHYSICS			
EI	F Aug. 28	2	Plasma membrane, channels, pumps	Chapter 2.1-2.4	Chapter 5	Chapter 1
EI	M Aug. 31	3	Passive electrical properties & equivalent circuits	Chapter 2.5-2.8	Chapter 6, Appendix A	Chapter 2
EI	W Sep. 2	4	Selective permeability and membrane potential	Chapter 2.5-2.8	Chapter 6, Appendix A	Chapters 10, 11 & 14
EI	F Sep. 4	5	The action potential	Chapter 2.9-2.11	Chapter 2	Chapters 10, 11 & 14
	<i>M Sep. 7</i>	<i>Labor Day</i>	<i>No lecture</i>			
EI	W Sep. 9	6	Voltage-gated ion channels I	Chapter 2.9-2.16	Chapter 7	Chapters 3, 4 & 13
EI	F Sep. 11	7	Voltage-gated ion channels II	Chapter 2.9-2.16	Chapter 7	Chapters 5 & 19
EI	M Sep. 14	8	Action potential propagation	Chapter 2.9-2.16	Chapter 7	Chapter 2
EI	W Sep. 16	9	Spontaneous activity and pacemaking	<i>Handout</i>		
			PRESYNAPTIC FUNCTION			
EI	F Sep. 18	10	Synaptic transmission I (presynaptic function)	Chapter 3.1-3.11	Chapters 8 & 12	
EI	M Sep. 21	11	Synaptic transmission II (presynaptic function)	Chapter 3.1-3.11	Chapters 8 & 12	
EI	W Sep. 23	12	Presynaptic plasticity	Chapter 3.1-3.11	Chapters 8 & 12	
EI	F Sep. 25	13	Optical methods in neurobiology	Chapter 13.22-13.26	Chapters 10, 50, 64	
			NEUROTRANSMITTERS AND RECEPTORS			
HB	M Sep. 28	14	Cell type diversity in the brain/Neurotransmitters I	Chapter 1.4-1.6	Chapter 2	
EI	W Sep. 30		MIDTERM 1			
HB	F Oct. 2	15	Neurotransmitters II	Chapter 3.11	Chapter 13, 63	
HB	M Oct. 5	16	Ionotropic receptors	Chapter 3.12-3.17	Chapter 10	

HB	W. Oct. 7	17	Metabotropic receptors and G protein signaling	Chapter 3.18-3.22	Chapter 11	
			SYNAPTIC PLASTICITY AND LEARNING			
HB	F Oct. 9	18	Dendrites and spines	Chapter 3.16, 3.24-3.25	Chapter 10	
HB	M Oct. 12	19	Cellular basis of learning and memory	Chapter 10.1-10.3	Chapter 66, 67	
HB	W Oct. 14	20	Molecular mechanisms of long-term synaptic potentiation	Chapter 10.4-10.8	Chapter 66, 67	
HB	F Oct. 16	21	Signaling from the nucleus to synapse and back	Chapter 3.23 and 2.1-2.3	Chapter 66, 67	
HB	M Oct. 19	22	Long-term synaptic depression	Chapter 10.9-10.10, 10.12	Chapter 66, 67	
HB	W Oct. 21	23	Structural plasticity	Chapter 10.13	Chapter 66, 67	
HB	F Oct. 23	24	Homeostatic plasticity		Chapter 66, 67	
HB	M Oct. 26	25	Excitatory-Inhibitory (E-I) balance and disorders of synaptic function	Chapter 3.25, 10.11, 11.24-11.27	Chapters 10, 50, 64	
HB	W Oct. 28		MIDTERM 2			
			SENSORY TRANSDUCTION			
DF	F Oct. 30	26	Phototransduction	Chapter 4		
DF	M Nov. 2	27	Olfaction and taste	Chapter 6		
DF	W Nov. 4	28	Somatosensory transduction (touch and pain)	Chapter 6		
DB* Guest lecturer	F. Nov 6	29	Auditory transduction and cochlea	Chapter 6		
DF	M Nov. 9	30	Vestibular sensation	Chapter 6		
	W Nov. 11	<i>Veteran's Day</i>	<i>No lecture</i>			
			NEURAL DEVELOPMENT			
GG	F Nov. 13	31	Early neural induction and specification of regional identity	Chapter 7	Chapter 52	
GG	M Nov. 16	32	Specification of cell fates I	Chapter 7	Chapter 53	
GG	W Nov. 18	33	Specification of cell fates II	Chapter 7	Chapter 53	

GG	F Nov. 20	34	Trophic factors and cell death	Chapter 7	Chapter 53	
GG	M Nov. 23	35	Axon guidance I	Chapter 7	Chapter 54	
	W Nov. 25	<i>Thanksgiving</i>	<i>No lecture or discussion sections</i>			
	F Nov. 27	<i>Thanksgiving</i>	<i>No lecture or discussion sections</i>			
GG	M Nov. 30	36	Axon guidance II	Chapter 7	Chapter 55	
GG	W Dec. 2	37	Synapse formation	Chapter 7	Chapter 56	
GG	F Dec. 4	38	Activity-dependent synaptic refinement during development	Chapter 7	Chapter 56	
	Dec. 7-11	<i>RRR week</i>	<i>No lectures</i>			
	M Dec 14 8am-11am		MIDTERM 3			