

MCELLBI C130/NUSCTX C130 | 4 Units

Cell Biology: from Discovery to Disease

Course Description

This course will investigate a wide range of topics in cell biology, focusing on modern and classic experimental approaches that have provided important insights, and the relevance of their findings to understanding human health and disease. We will emphasize the importance of quantitative understanding in research topics that are current areas of discovery. We aim to convey an understanding of how cellular structure and function arise as a result of the properties of macromolecules and how understanding the behavior of molecules is needed to explain how cells and organisms operate. This understanding thus also explains what happens when normal cellular functions are impacted, leading to cellular dysfunction and disease.

Welcome! Lectures will be held in 125LKS.

The three midterms will be held on **Feb. 15th, March 20th, and April 28th, and the final will be on May 9th**. We currently expect that these exams will be held in person. **Each midterm exam will be for 50min in class, while the final will take 170min. If the virus situation forces us to offer exams virtually, they will be offered through bCourses.** We do not allow early or late exam scheduling but accommodations can be made on rare occasions if we are informed early enough.

The first discussion section meetings are held during the **second** week of class. Attendance is taken in discussion sections and points will be assigned for participation. **There will be also be three in-section quizzes over the semester.**

We understand that we are still living in unusual times and that some of you may be impacted by complex family and health situations. It is our goal to provide an enriching course, while also accommodating difficult situations that may arise. If something happens during the semester that impacts your ability to participate in the course, please let us know as soon as possible so that we can do our best to find a solution.

COURSE RESOURCES

Your most important resource, outside lectures, will be the information and files posted on bCourses

Text: There is no required textbook for this class. Your most useful resource will be the information uploaded by your instructors on the bCourses website.

However, the textbook "[Molecular Biology of the Cell](#)" by Alberts et al. is a useful reference. Equally suitable books are "[Molecular Cell Biology](#)" by Lodish et al. and "[Cell](#)

Biology” by Pollard and Earnshaw. For the systems biology portion, a useful reference is “An Introduction to Systems Biology: Design Principles of Biological Circuits” by Alon.

Please note that the emphasis in this course is on the material covered in lecture and in the lecture notes.

Any of the major cell biology textbooks is useful for several courses and can be used for a reference for many years. A biochemistry course such as MCB 102 or MCB 100 is required background.

Lecture Notes:

Lecture notes are available on bCourses.

Office Hours:

Kevin’s office hours will be on Friday 9-11am on the first floor of LKS (next to the whiteboard).

Professors Brar will have office hours from 2-4pm on Friday at <https://berkeley.zoom.us/j/5258784885> (Professor Brar) [Links to an external site.](#)

Professor Olzmann will have office hours from 3-5pm on Friday at <https://berkeley.zoom.us/j/5083374115> [Links to an external site.](#)

Professor Drubin will have office hours from 4-5PM on Wednesdays 1:30-3PM on Fridays at <https://berkeley.zoom.us/j/909372253> [Links to an external site.](#)

Professor office hours will only be during weeks that they teach, and there will be no office hours the first week of class.

An important element in doing well in this class is keeping up to date. Reviewing the uploaded lecture notes before the next lecture and looking at the assigned reading the same day as the lecture has proven to make an enormous difference in the final result. Do not hesitate to ask the instructors questions. **Each lecture in turn uses the material from previous lectures.** Because we assume you have mastered the previous material, it is easy to get left behind if you do not master the material presented to you as we go along.

Please ask questions in section and office hours. We will be happy to answer them. The best time to ask them is after reviewing your notes – we highly recommend reviewing your lecture notes soon after each lecture. **Email is best for administrative purposes, not for questions on course content.**

Letters of recommendation:

Any of the three instructors may be approached for a letter of recommendation. We all are quite willing to provide a written evaluation for this purpose. So that we may prepare effective evaluations we ask that you follow the procedure outlined here. Be sure to attend at least 2 of the instructor's office hours. In addition, ask your discussion section GSI to write a brief note about your participation in section to the instructor. Sometime after the end of the course, request an interview with the instructor and bring a copy of your complete transcript, your CV and Personal Statement along with any recommendation forms that need to be filled in.

COURSE MECHANICS

Grading: 300 points total.

In **Discussion Section**, there will be 2 problem sets and one quiz **for each third (section) of the course**:

2 problem sets + participation	=	10 pts	
1 quiz	=	10 pts	
Total	=	20 pts	x 3 sections = 60 points.

The timing of these quizzes is entirely at the discretion of your GSI. There are no make-ups or re-grades for these quizzes.

Midterms:

50 points each (150 total). The three midterms are on announced firm dates. These are given in the regular class period. **Makeup Midterm tests** will only be given at the discretion of the instructor and for extraordinary documented reasons that require advance notice **before the original scheduled time of the test (with the exception of medical emergencies)**. Professional or Medical school interviews should not be arranged for midterm dates since makeup exams will not be granted for this reason.

Final:

75 points. The final includes material from all sections of the course.

Lecture participation:

5 points each Professor (15 total). Participation in lecture can be achieved through spoken questions/comments, questions in the chat, or questions after class.

Accommodations for Students with Disabilities:

The purpose of academic accommodations is to ensure that all students have a fair chance at academic success. If you have Letters of Accommodations from the Disabled Students' Program or another authorized office, please share them with me as soon as possible, and we will work out the necessary arrangements. While individual circumstances can vary, requests for accommodations often fall into the categories listed on the Academic Calendar and Accommodations website (<https://teaching.berkeley.edu/academic-calendar-and-student-accommodations-campus-policies-and-guidelines>). The campus has well-developed processes in place for students to request accommodations, and you are encouraged to contact the relevant campus offices listed on the Academic Accommodations Hub (<https://evcp.berkeley.edu/programs-resources/academic-accommodations-hub>). These offices, some of which are confidential, can offer support, answer questions about your eligibility and rights, and request accommodations on your behalf, while maintaining your privacy.

Please inform us of any accommodations needed during the first two weeks of the course so that we can work out the necessary arrangements.

Re-grading:

Any regrades will be comprehensive for the full exam, rarely result in an increased score, and may result in a lower overall score.

Academic Integrity and Cheating:

You are a member of an academic community at one of the world's leading research universities. You should keep in mind that as a member of the campus community, you are expected to demonstrate integrity in all of your academic endeavors and will be evaluated on your own merits. **The consequences of cheating and academic dishonesty—including a formal discipline file, possible loss of future internship, scholarship, or employment opportunities, and denial of admission to graduate school—are simply not worth it and may exceed student expectations.** For example, please be aware that, in addition to other consequences, any cheating found will result in loss of ability of the student to graduate with honors.

We know that most students are honest and do not cheat and our policy is designed to protect these students. **Thus, cheating of any type will not be tolerated.** UC Berkeley's cheating policy (<http://bulletin.berkeley.edu/academic-policies/#studentconductappealstext>) will be followed. Please note that although remote exams make it easier to cheat, they also make detection and documentation of cheating much easier. **If exams will have to be administered virtually, this will include safeguards to prevent cheating and measures to detect it.** Quizzes and midterms must be completed individually. Evidence that students have communicated information about these exams during or afterwards by any means will result in zeros for all parties involved and reporting to the Office of Student Conduct. If any other type of cheating is found, the student will automatically be assigned a zero for that test and the Office of Student Conduct will be notified. Our department has been proactive about detection of cheating and implementation of anti-cheating policies. As a result, hundreds of students have been referred to the Office of Student Conduct by MCB since the pandemic started.

Incompletes:

These requests are rarely granted and only for exceptional cases of prolonged illness or truly exceptional documented family emergencies, which extend over long periods of time. If an incomplete has been granted you can obtain an "I" Grade Report Form and instructions on their use MCB UG advising office.

Statement on Classroom Climate:

We are all responsible for creating a learning environment that is welcoming, inclusive, equitable, and respectful. The expectation in this class is that we all live up to this responsibility, even during vigorous debate or disagreement, and that we will intervene if exclusionary or harassing behavior occurs. If you feel that these expectations are not being met, you can consult your instructors or seek assistance from campus resources. The classroom, lab, and workplace 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](tel:5106437985), email ask_ophd@berkeley.edu, or go to <http://survivorsupport.berkeley.edu/Links to an external site.>

Lecture Schedule MCB130

1.	Jan 18 (W)	GB1	Intro to Cell and Systems Biology
2.	Jan 20 (F)	GB2	Components of a cell
3.	Jan 23 (M)	GB3	Systems cell biology: Significance of cell-to-cell variability
4.	Jan 25 (W)	GB4	Synthesis and degradation in information flow
5.	Jan 27 (F)	GB5	High-throughput sequencing
6.	Jan 30 (M)	GB6	Measuring information flux and physical interactions
7.	Feb 1 (W)	GB7	Measuring information flux and physical interactions (II)
8.	Feb 3 (F)	GB8	Receptor-ligand interactions and signaling
9.	Feb 6 (M)	GB9	Receptor-ligand interactions and signaling (II)
10.	Feb 8 (W)	GB10	Properties of Membranes
11.	Feb 10 (F)	GB11	Cellular sorting I: the nuclear pore
	Feb 13 (M)	GB12	Cellular sorting II: the secretory pathway /Review
12.	Feb 15 (W)	Midterm 1	-----
	Feb 17 (F)	DD1	Dynamic nature of cellular processes
13.	Feb 20 (M)	Holiday	-----
14.	Feb 22 (W)	DD2	Imaging cell structure and dynamics: cellular length scales
15.	Feb 24 (F)	DD3	Generating and sensing force in cell biology
16.	Feb 27 (M)	DD4	Dynamic structure of the microtubule cytoskeleton
17.	Mar 1 (W)	DD5	Microtubule motors
18.	Mar 3 (F)	DD6	Chromosome structure and dynamics
19.	Mar 6 (M)	DD7	Mechanics of mitotic chromosome segregation 1
20.	Mar 8 (W)	DD8	Mechanics of mitotic chromosome segregation 2
21.	Mar 10 (F)	DD9	Dynamic structure of the actin cytoskeleton
22.	Mar 13 (M)	DD10	Myosin ATPase cycle, single molecule studies and muscle contraction
23.	Mar 15 (W)	DD11	Cell motility: Actin assembly and myosin motors
24.	Mar 17 (F)	DD12	Cell behavior: Signaling control of cell adhesion, motility and polarity
	Mar 20 (M)	Midterm 2	-----
25.	Mar 22 (W) Zoom	JO1	An overview of metabolism
26.	Mar 24 (F) Zoom	JO2	Lipids: Membranes and fatty acids
	March 27 (M)	Spring Break	-----
	March 29 (W)	Spring Break	-----
	March 31 (F)	Spring Break	-----
27.	Apr 3 (M)	JO3	Making, breaking, and storing lipids
28.	Apr 5 (W)	JO4	Organizing lipids: Contact sites and lipid transfer
29.	Apr 7 (F)	JO5	Monitoring and sensing lipids
30.	Apr 10 (M)	JO6	Protein quality control and metabolism I
31.	Apr 12 (W)	JO7	Protein quality control and metabolism II
32.	Apr 14 (F)	JO8	Diverse pathways of cell death
33.	Apr 17 (M)	JO9	Ceramide signaling and apoptosis

34.	Apr 19 (W)	JO10	Oxidative lipid damage and ferroptosis
35.	Apr 21 (F)	JO11	Reactive oxygen species and protective mechanisms
36.	Apr 24 (M)	JO12	Exogenous and endogenous antioxidants
37.	April 26 (W)	JO13	Review
	April 28 (F)	Midterm 3	-----
	May 1-5	RRR week	
	May 9 (T)	Final Exam	7-10pm