Molecular Biology: Macromolecular Synthesis and Cellular Function
Fall, 2019
MCB 110 MWF 10:00 AM 390 Hearst Mining

Instructors' Information

This course centers on understanding the mechanisms that underlie the central dogma of molecular biology: DNA makes RNA makes protein. The three faculty co-instructors have divided the course into three Sections:

Section 1. DNA recognition, replication, repair, and recombination

Instructor Name: Dr. Isabelle Le Blanc
Office Location: 100C Li Ka Shing Hall
Office Hours: Fridays, 11:00 AM - 1:00 PM, or by appointment
E-mail: ileblanc@berkeley.edu

Section 2. Gene transcription and the control of RNA processing and stability

Instructor Name: Prof. Qiang Zhou
Office Location: The “office hour space” next to the entrance on the first floor of LKS
Office Hours (Starting 10/2/2019): Wednesdays, 1:30-2:30 PM; Fridays, 11:00 AM 12:00 PM
E-mail: qzhou@berkeley.edu

Section 3. Translation, folding, sorting, and degradation of proteins

Instructor Name: Prof. James Hurley
Office Location: 321 Stanley Hall
Office Hours (Starting 11/4/2019): Mondays, 3:00-4:00 PM; Thursdays 4:00-5:00 PM
E-mail: jimhurley@berkeley.edu

GSI Names, Emails, Discussion Sections and Office Hours (Discussion Sections and Office Hours start with the first full week of class)

	email	office hours location	office hours time
Chloe McCollum	cmccollum@berkeley.edu	TBD	TBD
Sue Sim	sueim.sim@berkeley.edu	TBD	TBD
Jennifer Hill	jennifer.hill@berkeley.edu	TBD	TBD

DIS 101	Mondays 9:00 AM,	243 Dwinelle	GSI TBD
DIS 102	Mondays 12:00 PM,	242 Dwinelle	GSI TBD
DIS 103	Tuesdays 1:00 PM,	9 Evans	GSI TBD
DIS 104	Wednesdays 1:00 PM,	70 Evans	GSI TBD
DIS 105	Tuesdays 2:00 PM,	2038 VLSB	GSI TBD
DIS 106	Wednesdays 12:00 PM,	155 Barrows	GSI TBD

Course Description

Molecular biology of prokaryotic and eukaryotic cells and their viruses. Mechanisms of DNA replication, transcription, translation. Structure of genes and chromosomes. Regulation of gene expression. Biochemical processes and principles in membrane structure and function, intracellular trafficking and subcellular compartments, cytoskeletal architecture, nucleocytoplasmic transport, signal transduction mechanisms, and cell cycle control.

Course Resources

- **bCourses**: Lecture slides, practice exams and answer keys, and other useful information will be posted to the bCourses website. Course material is copyrighted and reposting to third party sites or any other form of redistribution is prohibited.

- **Reader**: The course reader entitled "MCB 110" ***is required*** and available from Copy Central (2411 Telegraph Ave., 510-848-8649, Readers@CopyCentral.com) The content is from the following texts:

  Molecular Biology: Principles of Genome Function
  Authors: Nancy Craig, Rachel Green, Carol Greider, Gisela Storz, Cynthia Wolberger, and Orna Cohen-Fix
  Oxford University Press, 2nd edition (June 10, 2014)
  ISBN 10: 0198705972 ISBN 13: 9780198705970

  The Molecular Biology of the Cell
  6th Ed. Alberts et al., Garland Science (2015)
  ISBN : 9780815344322

- **iClicker**: The iClicker is a fun and effective tool for promoting engagement and interaction in the classroom. iClicker is an audience response system that allows you to respond to questions that are posed during class, and you will be graded on that feedback and on your in-class participation. **You are required to purchase an iClicker remote for in-class participation**. iClickers will be used in every class meeting for Section 3. Graded questions will begin on Nov. 1. You are responsible for bringing your registered and functioning remote to each class from Nov. 1 through the end of the course. It is recommended to bring two spare AAA batteries.

  You will need to register your iClicker remote online. If you bought your iClicker used or borrowed it, it will probably have been registered to the previous owner. You need to re-register it in your name. iClicker registration is found near the bottom of the menu on the left-hand side of the main MCB 110 bCourses page, just above "Settings". The remote ID is the series of numbers and sometimes letters found on the bottom of the back of your iClicker remote. The iClicker frequency used in this class will be "BB", but this may be subject to change.

  iClicker technical support. Do not ask the professor or GSIs for technical assistance or for repairs as they do not have the expertise. If your iClicker is defective, it is your responsibility to have it repaired or replace it. The UCB student iClicker information page is at https://www.ets.berkeley.edu/discover-services/clickers/students-getting-started. The automatic make-up policy is described below.
- ***There are no make-ups for missed i-clicker questions.***

Policies & Grading

How to Succeed in this Course

The Profs want students to integrate an understanding of general concepts and principles covered in class to address biological problems inspired by real experimental questions. All three of us will also post practice questions and/or past exams before the end of our respective Sections so that students can become familiar with the exam styles. The practice exams from each professor are your best guide for what to expect on that professor's exam this semester. If you find that you have any trouble keeping up with assignments or other aspects of the course, make sure you let the Prof and/or GSI instructors know as early as possible. Attend Prof and GSI office hours with your questions and to think about those from other students.

Course Requirements

- Lecture and Discussion Attendance: Discussions and office hours start in the SECOND week of class.

- Participation: The GSIs will take attendance and record participation. Switching discussion sections is strongly discouraged and allowed only in exceptional situations by permission from the GSIs from both sections.

- Research papers, quizzes, or other items that need to be completed: A total of 6 quizzes will be administered in the discussion sections, with two for each of the three Sections of the course. Each quiz will be worth 6 points. ***There are no make-ups for missed quizzes***. However, when the score is totaled, the lowest-scoring quiz will be dropped. Thus, any student may miss one quiz with no penalty. The maximum score to be earned from the combined quizzes is therefore 30 points.

- Exams:

Midterm 1 (Sec. 1)	Thursday, Oct. 3	7:00-9:00 PM	100 GPB & 159 Mulford
Midterm 2 (Sec. 2)	Friday, Nov. 1	7:00-9:00 PM	2050 VLSB
Final Exam (Sec. 3)	Monday, Dec. 16	9:00 - 11:00 AM	Location TBD

Course Policies

I. **Safe, Supportive, and Inclusive Environment**
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.

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** We support our DSP students. Please inform your instructor by email of any accommodations needed during the first week of the course.

III. **Cheating**
Cheating will not be tolerated. UC Berkeley's cheating policy (http://bulletin.berkeley.edu/academic-policies/#studentconductappealstext) will be followed. This course has a zero-tolerance policy for cheating. For Section 3, using someone else's iClicker is considered cheating by both the user and the owner of the iClicker. GSIs will monitor for multiple iClicker use. Test papers are routinely randomly photocopied before they are handed back. If an alteration is found on an exam question for which a correction is requested the student will automatically be assigned a zero for that entire test and the Office of Student Conduct will be notified. Copying another student's answers during an exam and other forms of cheating including plagiarism will result in the same penalties.

IV. **Incomplete Policy**
If you miss the final exam for an unexpected health reason, it must be validated by a signed, dated, detailed letter from a doctor transmitted to Prof. Hurley or a GSI within 24 hours of the

missed exam, to receive a grade of Incomplete**.**

Making up an Incomplete from a previous MCB 110 course
Take only the final exam. Your score will be pro-rated and combined with your previous midterm exam scores to compute your grade. You do not need to make up quiz, discussion participation and/or iClicker points. The process will not occur automatically. In order to get credit, you must inform the instructor of record for this course (Hurley) and the one being made up that you are making up an incomplete.

V. **Electronics Policy**
The cumulative evidence shows that accessing electronics in class has a negative effect on knowledge retention (see the NYT article, "The case for banning laptops in the classroom" in the reader) and diminishes student engagement. Therefore, cell phones, tablets, and laptops must be turned off and stored during class. A first violation will lead to a warning, and any further violations to successively larger points penalties. Analog audio recorders are permitted for the personal use of the owner of the recorder only. Redistribution of audio recordings is prohibited. The only digital electronics permitted are iClickers. Do bring a notebook (or a print out of the slides from bcourses) and pen or pencil to take notes.

VI. **Letters of Recommendation** Professor-written recommendation letters will be based on course performance as indicated by the course grade and on outstanding participation in faculty office hours and in-class discussions. Any individual professor will also contribute to and co-sign a GSI-written letter for students who have participated substantially and constructively in faculty office hours and in-class discussions in lecture. Prof. Hurley suggests that requests to write recommendation letters should be made to him not later than Jan. 31, 2019 - ask while the professor still remembers! Letters will be kept on file and can be sent later as needed at different programs.

VII. **Grading Policy**

Points	Description
200	Midterm 1 & Midterm 2 (Sections 1 & 2)
30	Quizzes (all Sections)
3	Discussion Participation (all Sections)
10	iClicker questions (Section 3)
90	Final Exam (Section 3)
333	Total Points Possible

Regrade requests can be submitted for the two midterm exams but not the final exam per University policy. A regrade request form must be downloaded from the course website; the exam with the regrade request stapled to the front must be handed to your GSI by one week after the graded exams are returned to the class. This course has a zero-tolerance policy for cheating.

Grade Determination
Discussion Participation. There will be 0-3 participation points awarded as follows. More than 6 absences: 0 points. Present but rarely participates: 1 points. Frequent participation, with average understanding of subject: 2 points. Frequent participation with good understanding of subject: 3 points.

Exams. Each third of the lecture portion of the course will have 100 points towards the total of 333. Each exam will cover ONLY the preceding one-third of the course (each Professor writes a separate exam). If you have a scheduling conflict (another midterm, an interview, any other professional commitment), please notify the Professor in charge of the exam as soon as possible. If you miss one of the first two exams for an unexpected health reason validated by a signed, dated, detailed letter from a doctor transmitted to a professor or GSI within 24 hours of the missed exam, you can complete an individualized make-up exam that is oral and/or written at the Instructor's discretion. If you miss the final exam for a similarly validated reason, you can receive a grade of Incomplete; otherwise, the exam grade will be entered as a zero. The final exam (Section 3) grade will consist of 90 exam points, which will be combined with the 10 iClicker points awarded during the lectures.

iClicker Participation. For answering a question during class, 0.25 point will be awarded irrespective of the answer (participation), having chosen the correct answer will result in the award of an additional 0.25 point (total 0.5 points). A maximum of 10 points can be reached in Section 3 using iClicker participation. You may monitor your progress on bCourses. The iClicker points will be combined with 90 possible points from the final exam for a total of 100 for lecture Section 3.

There are no make-ups for missed iClicker questions. However, at least 25 questions (nominally worth 12.5 points) will be asked during Section 3 to mitigate the problem of faulty/misplaced iClickers or occasional absences. No more than 10 points can actually be earned. In this way, any student can miss up to 5 questions/2.5 points for any reason with no penalty.

Special rules for iClicker questions: conversing with others about iClicker questions is not only permitted, it is *encouraged*. However, you must submit your own answer with your own registered iClicker. **Using someone else's iClicker is considered cheating by both the user and the owner of the iClicker. GSIs will monitor for multiple iClicker use**.

Course Structure

- Lecture slides, practice exams and answer keys, and other useful information will be posted to the bcourses website. Professors and GSIs have weekly office hours. There will be review sessions hosted by the GSIs prior to each exam.

- The content presented in the lectures will be used as the basis for exam questions. As background, pages from the reader will be indicated for each lecture.

Topic Outline/Schedule

Week	Date	Topic	Instructor	Readings
1	8/28 (WED)	Nucleic Acids and Protein-DNA recognition	Le Blanc	Craig: 41-49, 53-55, 139-140, 795 NY Times op ed on electronics policy
	8/30 (FRI)	Chromosomes	Le Blanc	Craig: 49-53, 122-128, 131-132, 216-218
2	9/2 (MON)	LABOR DAY HOLIDAY		
	9/4 (WED)	DNA replication and DNA polymerase	Le Blanc	Craig: 200-213, 789-791, 821, 831-832
	9/6 (FRI)	DNA replication	Le Blanc	Craig: 213-221, 224-231
3	9/9 (MON)	Replication factors I	Le Blanc	Craig: 120-121, 221-224, 231-235, 238-243, 793-794
	9/11 (WED)	Replication factors II	Le Blanc	
	9/13 (FRI)	Initiation of DNA replication	Le Blanc	
4	9/16 (MON)	Cell cycle control	Le Blanc	
	9/18 (WED)	Telomeres	Le Blanc	
	9/20 (FRI)	DNA damage and repair	Le Blanc	Craig: 587-600, 627-630
5	9/23 (MON)	DNA recombination	Le Blanc	Craig: 637-639, 647-659, 808-809
	9/25 (WED)	Mobile genetic elements	Le Blanc	Craig: 668-699, 706-718, 714-717
	9/27 (FRI)	Adaptive immunity	Le Blanc	
6	9/30 (MON)	Genome engineering and editing	Le Blanc	
	10/2 (WED)	Prokaryotic transcription	Zhou	Craig: 340-345, 352-355

Week	Date	Topic	Instructor	Readings
	10/3 (THU)	**Midterm 1 7:00 - 9:00 PM, 100 GPB and 159 Mulford**	**Le Blanc**	
	10/4 (FRI)	Prokaryotic transcriptional regulation	Zhou	
7	10/07 (MON)	Eukaryotic transcription I	Zhou	Craig: 296-327
	10/09 (WED)	Eukaryotic transcription II	Zhou	
	10/11 (FRI)	Eukaryotic transcriptional regulation by chromatin I	Zhou	Craig: 319-323, 330-340, 360-365
8	10/14 (MON)	Eukaryotic transcriptional regulation by chromatin II	Zhou	
	10/16 (WED)	Transcriptional regulation by pausing and elongation	Zhou	
	10/18 (FRI)	Eukaryotic transcriptional regulation by upstream signals	Zhou	
9	10/21 (MON)	mRNA processing	Zhou	Craig: 385-405
	10/23 (WED)	mRNA splicing I	Zhou	
	10/25 (FRI)	mRNA splicing II	Zhou	
10	10/28 (MON)	RNA interference I	Zhou	Craig: 410-415
	10/30 (WED)	RNA interference II	Zhou	
	11/1 (FRI)	**Midterm 2 7:00 - 9:00 PM, 2050 VLSB**	**Zhou**	
	11/1 (FRI)	The genetic code	Hurley	Craig: 421-430
11	11/4 (MON)	Translation I	Hurley	Craig: 431-438
	11/6 (WED)	Translation II	Hurley	Craig: 440-442, 444-445, 448-450
	11/08 (FRI)	Translation III	Hurley	Craig: 450-459

Week	Date	Topic	Instructor	Readings
12	11/11 (MON)	VETERANS' DAY HOLIDAY OBSERVED		
	11/13 (WED)	Translational regulation	Hurley	Craig: 487-489, 492-495
	11/15 (FRI)	Protein folding	Hurley	Craig: 539-543
13	11/18 (MON)	Post-translational modifications	Hurley	Craig: 560-563, 565-567
	11/20 (WED)	Ubiquitination and degradation	Hurley	Craig: 572-573, 576-581
	11/22 (FRI)	Targeting to organelles	Hurley	Alberts: 641-643, 647-655, 658-664
14	11/25 (MON)	Secretion and the ER	Hurley	Alberts: 669-677
	11/27 (WED)	THANKSGIVING BREAK		
	11/29 (FRI)			
15	12/02 (MON)	From ER to Golgi	Hurley	Alberts: 708-711
	12/04 (WED)	Exocytosis and endocytosis	Hurley	Alberts: 695-702
	12/06 (FRI)	Endosomes, lysosomes and autophagy	Hurley	Alberts: 722-728, 732-737
16	Dec 3-7	RRR Week. Review sessions TBA	GSIs	
17	**12/16 (MON)**	**Final Exam 9:00 - 11:00 AM, Room TBA**	**Hurley**	