Molecular Biology: Macromolecular Synthesis and Cellular Function
Fall, 2020
MCB 110 MWF 10:10-10:59 AM Zoom

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 Hours: Tuesday and Thursday 5:00-6:00 PM (subject to change to adapt time differences)

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

Instructor Name: Prof. Qiang Zhou
Office Hours (Starting 10/2/2020): Mondays 11:00-12:00 noon; Fridays 3:00-4:00 PM

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

Instructor Name: Prof. James Hurley
Office Hours (Starting 11/2/2019): Mondays, 3:00-4:00 PM; Thursdays 4:00-5:00 PM

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

		office hours time
Madeline Zoltek		Thursday 4-5pm
Claire Goul		Weds, 11 am - noon
Anthony Rodriguez-Vargas		Tuesday, 12 - 1 pm

DIS 101	Mondays 11:10-11:59 AM	Claire Goul
DIS 102	Mondays 12:10-12:59 PM	Claire Goul
DIS 103	Tuesdays 9:10-9:59 AM	Anthony Rodriguez-Vargas
DIS 104	Tuesdays 10:10-10:59 AM	Anthony Rodriguez-Vargas
DIS 105	Wednesdays 2:10-2:59 PM	Madeline Zoltek
DIS 106	Wednesdays 3:10-3:59 PM	Madeline Zoltek

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 on line course reader entitled "MCB 110" ***is required*** and available from Copy Central (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

  The reader can be purchased using the following link:
https://copycentral.redshelf.com/book/1613892/mcb-110-macromolecular-synthesis-and-cellular-function-1613892-none-isabelle-le-blanc-qiang-zhou-and-james-hurley

- **Piazza**: Piazza a fun and effective tool for promoting engagement and interaction in the classroom. **You will receive an invitation to join the Piazza MCB 110 Fall 2020 site for section 3 (Hurley)**. Piazza generates a student engagement score which will contribute to 10% of your section 3 grade.

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. Bear in mind that we have newly switched to open book/open notes exams, which is not reflected in our past closed book exams. 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.
- Bcourses. You will receive an invitation to the bcourses site. Course announcements, including the zoom links for the lectures, discussion sections, and office hours, will be distributed via bcourses.
- **Zoom practices. Lecture.** Log in to the main lectures using your real name as listed on your Cal ID as your Zoom screen name. Do not share your login credentials. Login in muted and with video off. Screen sharing by participants will be disabled. In Le Blanc and Zhou section, ask question using the zoom chat tool. In Hurley section, ask questions through Piazza. The recorded lectures will be posted to bcourses.
- **Zoom practices. Discussion sections and office hours.** Log in to the main lectures using your real name as listed on your Cal ID as your Zoom screen name. You are encouraged but not required to leave your video on, if the wifi capability at your location supports it. You may ask questions by simply unmuting and asking the question at a suitable pause, unless the GSI

or professor requests you to use chat or raise hand.

- Participation: The GSIs will record discussion section 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: Administered on line in Gradescope. You will received login information ahead of the exam. Open book and open notes. You will have a 2 hour window within the 24 hour period of the date below, between 00:00 and 23:59 on the date, Pacific time (please note that if you start the exam after 20:01 on that date, you will have less than 2 hour to finish).
  Midterm 1 (Sec. 1) Thursday, Oct. 2
  Midterm 2 (Sec. 2) Thursday Oct. 29
  Final Exam (Sec. 3) Monday, Dec. 14

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. Exams are open book and open notes however, consulting others and copying answers is forbidden and is considered cheating. Exam answers will be monitored for copying. If evidence is found of matching answers on multiple exams, the students involved will automatically be assigned a zero for that entire test and the Office of Student Conduct will be notified. 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 Piazza 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. **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, 2021 - ask while the professor still remembers! Letters will be kept on file and can be sent later as needed at different programs.

VI. **Grading Policy**

Points	Description
20	Lecture section 1 quizzes (5)
80	Midterm 1 (section 1)
100	Midterm 2 (Section 2)
30	Discussion section Quizzes (all Sections)
3	Discussion section Participation (all Sections)
10	Piazza engagement (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.

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.
  Due to remote learning and the open book exam, the exam structure may be different than usual. Therefore, the practice exams may not reflect the midterms and final exam.

- The content presented in the lectures will be used as the basis for exam questions. The exam will focus on understanding, not memorization, of content. As background, pages from the reader will be indicated for each lecture.

Topic Outline/Schedule

Week	Date	Topic	Instructor	Readings
1	8/26 (WED)	Nucleic Acids and Protein-DNA recognition	Le Blanc	41-49; 72-74; 794-795
	8/28 (FRI)	DNA packing and topological constraints	Le Blanc	49-53; 122-132; 216-218
2	8/31 (MON)	DNA replication: the polymerases	Le Blanc	200-213;
	9/2 (WED)	DNA replication: unwinding, protection and priming	Le Blanc	52-53; 213-221; 224-231
	9/4 (FRI)	Replication factors: Processivity, progression and ligation	Le Blanc	
3	9/7 (MON)	LABOR DAY HOLIDAY		
	9/9 (WED)	DNA replication: origin, initiation, regulation	Le Blanc	120-121; 166-175; 221-224, 231-235; 238-243;
	9/11 (FRI)	Telomeres and Telomerases	Le Blanc	235-236
4	9/14 (MON)	Damages and repairs I	Le Blanc	139-140; 587-600; 627-630
	9/16 (WED)	Damages and repairs II	Le Blanc	
	9/18 (FRI)	DNA end joining, homologous repair and homologous recombination	Le Blanc	630-633; 637-639; 643-659
5	9/21 (MON)	Mobile DNA and recombination	Le Blanc	668-699; 706-718
	9/23 (WED)	Molecular Biology and genomic engineering	Le Blanc	789-791; 808-809; 821; 831-832
	9/25 (FRI)			
6	9/28 (MON)	Review	Le Blanc	
	9/30 (WED)	Prokaryotic transcription	Zhou	

Week	Date	Topic	Instructor	Readings
	10/1 (THU)	**Midterm 1**	**Le Blanc**	
	10/2 (FRI)	Prokaryotic transcriptional regulation	Zhou	
7	10/5 (MON)	Eukaryotic transcription I	Zhou	Craig: 296-327
	10/7 (WED)	Eukaryotic transcription II	Zhou	
	10/9 (FRI)	Eukaryotic transcriptional regulation by chromatin I	Zhou	Craig: 319-323, 330-340, 360-365
8	10/12 (MON)	Eukaryotic transcriptional regulation by chromatin II	Zhou	
	10/14 (WED)	Transcriptional regulation by pausing and elongation	Zhou	
	10/16 (FRI)	Eukaryotic transcriptional regulation by upstream signals	Zhou	
9	10/19 (MON)	mRNA processing	Zhou	Craig: 385-405
	10/21 (WED)	mRNA splicing I	Zhou	
	10/23 (FRI)	mRNA splicing II	Zhou	
10	10/26 (MON)	RNA interference I	Zhou	Craig: 410-415
	10/28 (WED)	RNA interference II	Zhou	
	10/29 (THU)	**Midterm 2**	**Zhou**	
	10/30 (FRI)	The genetic code	Hurley	Craig: 421-430
11	11/2 (MON)	Translation I	Hurley	Craig: 431-438
	11/4 (WED)	Translation II	Hurley	Craig: 440-442, 444-445, 448-450
	11/6 (FRI)	Translation III	Hurley	Craig: 450-459

Week	Date	Topic	Instructor	Readings
12	11/9 (MON)	Translational regulation	Hurley	Craig: 487-489, 492-495
	11/11 (WED)	VETERANS' DAY HOLIDAY		
	11/13 (FRI)	Protein folding	Hurley	Craig: 539-543
13	11/16 (MON)	Post-translational modifications	Hurley	Craig: 560-563, 565-567
	11/18 (WED)	Ubiquitination and degradation	Hurley	Craig: 572-573, 576-581
	11/20 (FRI)	Targeting to organelles	Hurley	Alberts: 641-643, 647-655, 658-664
14	11/23 (MON)	Secretion and the ER	Hurley	Alberts: 669-677
	11/25 (WED)	THANKSGIVING BREAK		
	11/27 (FRI)			
15	11/30 (MON)	From ER to Golgi	Hurley	Alberts: 708-711
	12/2 (WED)	Exocytosis and endocytosis	Hurley	Alberts: 695-702
	12/4 (FRI)	Endosomes, lysosomes and autophagy	Hurley	Alberts: 722-728, 732-737
16	Dec 7-11	RRR Week. Review sessions TBA	GSIs	
17	**12/14 (MON)**	**Final Exam**	**Hurley**	