Molecular Biology: Macromolecular Synthesis and Cellular Function
Fall, 2017
MCB 110 MWF 10:00 AM 2040 VLSB

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: Prof. Kathleen Collins
Office Location: 522 Barker Hall
Office Hours: Fridays, 11:00 AM - 1:00 PM, or by appointment
E-mail: kcollins@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: Fridays, 11:00 AM - 1:00 PM, or by appointment
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 10/30/2017): Mondays at 2:00 PM & Thursdays at 3:00 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)

Paige Diamond, paige.diamond@berkeley.edu
DIS 101 Mondays 9:00 AM, 103 GPBB
DIS 103 Tuesdays 1:00 PM, Location TBD

Erika Lopez-Alfonzo, emla@berkeley.edu
DIS 102 Mondays 11:00 AM, Location TBD
DIS 104 Wednesdays 11:00 AM, 110 Barker Hall

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

- Text: 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

- 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.

- Piazza: You will receive an invitation to register for Piazza, which is an on-line discussion tool. You are encouraged to post questions related to the course content. You are also encouraged to answer questions from your peers. The GSIs and professor will monitor Piazza and attempt to answer questions within one working day.

- Reader for Section 3: Background for lectures 5-13 of Section 3 is available in the reader entitled “MCB 110 Sec 3” from Copy Central (2576 Bancroft Way, 510-848-8649, Readers@CopyCentral.com) The content is also available as chapters 12, 13, and 16 of The Molecular Biology of the Cell, 6th Ed. Alberts et al., Garland Science (2015)

- iClicker for Section 3: 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, so you are responsible for bringing your remote to each class, beginning with the first lecture of Section 3 (October 27). 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 and it includes technical problems. There are no individualized make-ups for technical problems.

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. Most discussion sections are near capacity. Switching discussion sections is strongly discouraged and allowed only in exceptional situations by permission from both GSIs.

- Exams:

Midterm 1 (Sec. 1)	Thursday, Sept. 28	7:00 - 9:00 PM	145 Dwinelle
Midterm 2 (Sec. 2)	Monday, Oct. 30	7:00 - 9:00 PM	145 Dwinelle
Final Exam (Sec. 3)	Tuesday, Dec. 12	3:00 - 6:00 PM	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

Two options are possible. You must inform the instructor of record (Hurley) of your choice during the first week of class.

1. 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, discussion participation and iClicker points.
2. Retake the entire course, including discussion participation and iClicker points. You will get a new grade based only on your performance this semester. Most students choose this option.

V. **Electronics Policy (Section 3)**

The cumulative evidence shows that accessing electronics in class has a negative effect on knowledge retention (see the first three pages of the Section 3 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 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, in-class discussion and/or on-line discussions in Piazza. Any individual Prof. will also contribute to and co-sign a GSI-written letter for students who have participated substantially and constructively in faculty office hours, in-class discussions in lecture, and/or on-line discussions in Piazza. Prof. Hurley suggests that requests to write recommendation letters should be made to him not later than Jan. 31, 2018 - 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)
15	Discussion Participation (all Sections)
10	iClicker participation (Section 3)
90	Final Exam (Section 3)
315	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 0-5 participation points awarded for each of the three Sections for a total of 15 points for the entire course. Participation will be awarded on the basis of both attendance and active participation in discussions.

Exams. Each third of the lecture portion of the course will have 100 points towards the total of 315. 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.

Section 3 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 in a class. 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 textbook and/or reader will be indicated for each lecture.

Topic Outline/Schedule

Week	**Topic**	**Readings (from Craig unless noted otherwise)**	**Activities**
8/23	DNA and RNA structure and recognition	Lecture 1: 41-49, 53-55, 139-140, 795 Lecture 2: 49-53, 122-128, 131-132, 216-218	
8/28	DNA replication	Lecture 3: 200-213, 789-791, 821, 831-832 Lectures 4-5: 213-221, 224-231	
9/5	DNA replication initiation and repair	Replication initiation: 120-121, 221-224, 231-235, 238-243, 793-794 DNA repair: 587-600, 627-630	
9/11	DNA repair and recombination	Recombination: 637-639, 647-659, 808-809	
9/18	Mobile elements, genome engineering, adaptive immunity	668-699, 706-718, 714-717	
9/25	Promoters, polymerase and prokaryotic transcriptional control	340-345; 352-355	Review Session, Midterm 1
10/2	Eukaryotic transcriptional apparatus and methods for analyzing	296-327	

	transcription		
10/9	Eukaryotic transcriptional control	319-323; 330-340; 360-365	
10/16	RNA Processing: Mechanism and Controls	385-405	
10/23	RNA interference and degradation	410-415	Review Session, Midterm 2
10/30	The genetic code	421-431, Reader 3-5	
11/6	The ribosome and translation	431-445, 448-460, 472-474, 479-486, 492-495	
11/13	Protein folding, secretion, and modifications	539-554, 557-563, 566-567, 572-573, 576-582, Reader (Alberts textbook page numbers) 669-682	
11/20	Protein degradation and subcellular targeting	Reader 641-656, 658-664	
11/27	Protein and membrane transport	Reader (Alberts textbook page numbers) 695-716, 720-721, 722-728, 730-737, 741-748, 889-896, 898-910, 925-929, 936-939	
12/4	RRR week		Review Sessions