BE 230B **Cell and Molecular Biology** **W 2021**

Class Lectures: TR 9:30 AM – 10:50 AM (Via Zoom)
TA Office hours: F9-11 (Via Zoom)

Instructor: Professor Adam J. Engler
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Office: SCRM 2005
Office Hours: M 1pm-2pm (Via Zoom) and by appointment (SCRM 2005)
Teaching Assistants: Erin LaMontagne (elamonta@eng.ucsd.edu) Anvita Komarla (aekomarl@eng.ucsd.edu)
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Text: Molecular Biology of the Cell (Alberts et al), 6th edition (a.k.a. MBoC)

Course Objectives

BENG230B is an intermediate level graduate course designed to introduce students to the molecular components and physiological mechanisms that underlie the structure and function of cells. The course is designed to be an in-depth survey covering general concepts in cell biology and to emphasize these concepts within the context of current research questions and technical applications. Lectures will focus on: (i) basic biochemistry in cell biology, (ii) cellular and molecular biology techniques, (iii) structure-function relationships within and outside the cell, and (iv) specialized cell types. However, the format and content of the course overall will convey both the details of what is known in cell biology as well as how to apply it to fundamental and still unanswered questions.

Background Preparation

If the life sciences, even when taught from a quantitative perspective, seems daunting to you, I would suggest some of the following resources to help in your preparation. First, our textbook MBoC comes in a lite version called “Essential Cell Biology.” This is still a somewhat comprehensive, graduate level textbook but is much more accessible to an introductory audience. Should not be an appropriate entry point to this material, I would further suggest the “AP® Biology” course at the Khan Academy, which is an online, free tutorial/instructional website. Please avoid sections on the history of biology and plant biology; those are not relevant for this course. Since this site has broken down the background material into digestible section, it is also a great tool as a targeted refresher should you feel that you need it.

TA Office Hours

During office hours, TAs will primarily discuss homework questions, exam answers, and clarify any concepts from lecture. However, a portion of this course is dedicated to understanding and critically evaluating scientific literature in cell biology, especially the engineering tools used to solve problems within biology. A recently published paper in cell biology will be suggested for you to read, and a corresponding weekly discussion will be held that will be led by the TAs. This discussion is not intended to be additional lecture time and is completely optional. However, it should provide an opportunity to apply course concepts, design experiments, and propose engineering approaches to cell biology. If you are unable to attend, all content is accessible online and virtual discussion sections are available via CANVAS.

Lecture A/V

To facilitate learning, all slides and lecture audio will be posted on CANVAS. Slides will be available at least 24 hours in advance and Zoom A/V posted shortly after class. Please note that this do NOT replace class attendance.

Course Evaluation

1) Biochemistry Basics "Quiz" (0%), 2) Midterm (30%), and Final (30%), and 3) two homework projects (20% each for a total of 40%). Extra credit as outlined below will be awarded for participation in class.

1) Biology and Biochemistry Basics Quiz

Working knowledge of the common language in biochemistry is essential for cell biology. To ensure that everyone has the vocabulary for cell and molecular biology, a closed book/notes quiz on relevant molbio and biochemistry terminology will be provided to you during Week 2 of the course. Content will come from MBoC chapters 2 and 3. In this online class format, THIS WILL NOT BE GRADED. Answers will be posted 1-2 days after the quiz.

2) Exams

Midterm and final exams are “open book and notes.” Use of previous exams and answer keys as your “notes” is prohibited. Old questions are *not* reused but the question format will be identical to old HW and exams. Use of the internet is prohibited outside of using Zoom to contact TA's and Dr. Engler during appointed times. Each exam will be administered during a 24 hour window to ensure students maximal time to complete the exam. All exams will be turned in via CANVAS. An alternate turn in method will be direct email to Dr. Engler (although CANVAS is preferred).

3a) Homework

At least two homework problem sets will be distributed via CANVAS along with answers prior to each exam. These will *not* be graded. If you would like feedback on your answers, it can be provided by TAs on the "due date," but for feedback, we would appreciate knowing where guidance is most needed.

3b) Homework Projects
As a team-based way to prepare for exams and to hopefully reduce stress in preparing for exams, teams (of up to 4 students) will create their own exam prompt and set of questions and answers before the midterm and final exams (two assignments). Prompts must be one page in length and provide scientific experiments that must be applied to a set of questions asked by the team in order to answer them. A "Peer Assessment" paragraph will also be required for each student to describe their contribution as well as those of their teammates. A rubric will be provided for grading along with the assignment. To sign up with your teammates, please go to this Google Form Link. (Links to an external site.)

4) Extra Credit
Online learning is not always conducive to class participation, but participation is vital to developing the level of critical thinking required in graduate school. We will use a variety of interactive methods, including Kahoot!-based Q&A for class-wide participation, individual-based Q&A for impromptu questions in class, and "thought experiments." Students participating via these methods in a majority of class lectures will (10 or more of 19 lectures) will receive 2% on top of their final class average.

"Regrade," Exam, and Academic Misconduct Policies
Students are encouraged to write all final answers in pen or to type answers. If there is a grade discrepancy, submit (electronically) the original exam written in pen along with a written re-grade request to a TA within ONE WEEK of the date that the assignment was returned. Except for simple errors in adding points together for a final exam score, the entire assignment is subject to re-grading. Exams may not be missed without prior approval from the instructor. Academic dishonesty will not be tolerated. Any suspected incident will be dealt with in accordance with UCSD policy, which includes reporting the misconduct.

Date	Topic	Chapters
1/04/21	*Dr. Engler's Office Hours*	
1/05/21	Techniques (I)	8-9
1/07/21	Techniques (II)	8-9
1/09/21	*TA Office Hours: Biochem Refresher*	
1/11/21	*Dr. Engler's Office Hours*	
1/12/21	Techniques (III)	8-9
1/14/21	Techniques (IV); *Biochem Quiz Released*	8-9
1/15/21	*TA Office Hours: MACS Technique Paper*	
*1/18/21**	*Dr. Engler's Office Hours*	
1/19/21	Structure-Function: Membranes (I)	10
1/21/21	Structure-Function: Membranes (II)	10
1/22/21	*TA Office Hours: Bio-AFM Paper; Lipid Raft Paper*	
1/25/21	*Dr. Engler's Office Hours*	
1/26/21	Structure-Function: Organelles (I)	12, 14
1/28/21	Structure-Function: Organelles (II)	12
1/29/21	*TA Office Hours: Mitochondria Paper*	
2/01/21	*Dr. Engler's Office Hours*	
2/02/21	Structure-Function: Organelles (III)	13, 15
2/04/21	Structure-Function: Organelles (IV); **HW Project #1 Due**	13
2/05/21	*TA Office Hours: Exam Review*	
2/08/21	*Dr. Engler's Office Hours*	
2/09/21	**MIDTERM EXAM (Due: 2/10/21 by 5pm PST)**	
2/11/21	Structure-Function: Nucleus	4, 12
2/12/21	*Office Hours: Exam Answers*	
*2/15/21**	*Dr. Engler's Office Hours*	
2/16/21	Structure-Function: Cytoskeleton (I)	16
2/18/21	Structure-Function: Cytoskeleton (II)	16
2/19/21	*TA Office Hours: Actin "Comets" Paper; Nucleus Paper*	
2/22/21	*Dr. Engler's Office Hours*	
2/23/21	Structure-Function: Cytoskeleton (III)	16
2/25/21	Structure-Function: Cytoskeleton (IV)	16
2/26/21	*TA Office Hours: Dynein Paper*	
3/01/21	*Dr. Engler's Office Hours*	
3/02/21	Structure-Function: Cell-ECM (I)	19
3/04/21	Structure-Function: Cell-ECM (II)	19
3/06/21	*TA Office Hours: Tensegrity Paper; Durotaxis Paper*	
3/08/21	*Dr. Engler's Office Hours*	
3/09/21	Specialized Cell Types: Stem Cells	22
3/11/21	Specialized Cell Types: Cancer; **HW Project #2 Due**	20
3/12/21	*TA Office Hours: Exam Review*	
3/16/21	**FINAL EXAM (Due: 3/17/21 by 5pm PST)**	

All Office Hours are in *ITALICS*
Non-graded Biochem Quiz noted in *ITALICS*
*MLK and President's Days. University is closed but Dr. Engler will still be available via Zoom Office Hours