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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 (*new*)

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.

Weekly Discussions

A portion of this course is dedicated to understanding and evaluating 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 students to read, and a corresponding weekly discussion will be held that will be lead 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.

Biology and Biochemistry Basics Quiz

A “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 administered on the Wednesday of week two of the course (1/17/18). Content will come from chapters 2 and 3 from MBC.

Course Evaluation

10% Biochemistry Basics Quiz, 45% Midterm, and 45% Final. Midterm and final exams are “open book and notes.” Use of previous exams and answer keys as your “notes” is prohibited. Use of the internet is prohibited.

Homework

Homework will be posted on TED several times throughout the quarter and can be turned into TAs by the due date listed for comment on your answers. However, it will not be graded and should be used as practice for exams. Solutions will also be posted on TED after the homework due date. No late homework will be accepted for comment.

“Regrade,” Exam, and Academic Misconduct Policies

Students are encouraged to write all final answers in pen. If there is a grade discrepancy, submit 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
1/07/19	Introduction; Techniques (I)	8-9
1/09/19	Techniques (II)	8-9
1/11/19	<i>Discussion Section: Biochem Refresher</i>	
1/14/19	Techniques (III)	8-9
1/16/19	Techniques (IV); Biochem Quiz (9am start time)	8-9
1/18/19	<i>Discussion Section: MACS Technique Paper; Bio-AFM Paper</i>	
1/21/19*	Structure-Function: Membranes (I)	10
1/23/19	Structure-Function: Membranes (II)	10
1/25/19	<i>Discussion Section: Lipid Raft Paper</i>	
1/28/19	Structure-Function: Organelles (I)	12, 14
1/30/19	Structure-Function: Organelles (II)	12
2/01/19	<i>Discussion Section: Mitochondria Paper</i>	
2/4/19	Structure-Function: Organelles (III)	13,15
2/6/19	Structure-Function: Organelles (IV)	13
2/8/19	<i>Discussion Section: Exam Review</i>	
2/11/19	MIDTERM EXAM	
2/13/19 [§]	Structure-Function: Nucleus	4, 12
2/15/19	<i>Discussion Section: Nucleus in Cancer Paper</i>	
2/18/19*	Structure-Function: Cytoskeleton (I)	16
2/20/19	Structure-Function: Cytoskeleton (II)	16
2/22/19	<i>Discussion Section: Actin "Comets" Paper; Actin Assembly Paper</i>	
2/25/19	Structure-Function: Cytoskeleton (III)	16
2/27/19	Structure-Function: Cytoskeleton (IV)	16
3/01/19	<i>Discussion Section: Dynein Paper</i>	
3/04/19	Structure-Function: Cell-ECM (I)	19
3/06/19 [§]	Structure-Function: Cell-ECM (II)	19
3/08/19	<i>Discussion Section: Tensegrity Paper; Durotaxis Paper</i>	
3/11/19	Specialized Cell Types: Stem Cells	22
3/13/19	Specialized Cell Types: Cancer	20
3/15/19	<i>Discussion Section: Exam Review</i>	
3/20/19**	FINAL EXAM	

Optional Discussion Sections are in *ITALICS*

[§]Possible TA-lead lecture

*Class optional due to MLK and President's Day Holiday (Lecture audio will be available on TritonEd)

**Final Exam: 3/20/19 from 8:00-11:00am in Fung Auditorium