Bioengineering 110:
Biomedical Physiology for Engineers
Spring 2017

Lecturer
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Office Hours: Tuesdays and Thursdays 2-3PM

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Lectures: Tuesdays and Thursdays, 12:30-2PM, 159 Mulford Hall
Discussion Sections: M 2-3PM, 9 Lewis Hall (JA), W 3-4PM, 251 Leconte Hall (XP)

Course Overview

This course introduces students to the physiology of human organ systems, with an emphasis on quantitative problem solving, engineering-style modeling, and applications to clinical medicine. The course will begin with a review of basic principles of cellular physiology, including membrane transport and electrophysiology, and then take a system-by-system approach to the physiology of various organ systems, including the cardiovascular, pulmonary, and renal systems, as well as the roles of these systems in pH homeostasis. Throughout, the course will feature extensive discussions of clinical conditions associated with dysfunction in specific physiological processes as well as the role of medical devices and prostheses. This course is geared towards upper-division bioengineering students who wish to solidify their foundation in physiology, especially in preparation for a career in clinical medicine or the biomedical device industry.

Prerequisites

This course is intended for junior- and senior-level undergraduates in the physical sciences and engineering. The prerequisite for this course is either Bio 1A or BioE 10 (or an equivalent college-level biology course), as well as either Math 53 or 54.

Goals:

1. To introduce students to quantitative descriptions of the basic principles that govern the physiology of the cardiovascular, pulmonary, and renal systems.
2. To provide students examples of clinical conditions in which the clinical manifestations are directly tied to dysfunction in specific aspects of organ and tissue physiology.
3. To provide students examples of medical devices and prostheses designed to directly correct or compensate for physiological deficits.

4. To give students adequate didactic background to take graduate or medical school-level courses in physiology and medical devices.

Course Textbooks:
1. Physiology, 5th Edition, Linda S. Costanzo, Saunders-Elsevier 2009. Note that the 3rd - 5th editions of the text are largely identical, and any will suffice for this course.

2. Supplementary reading from the literature as identified by instructor.

Course Website:
This course will utilize BCourses as much as possible for announcements, assignments, grades, and exams.

Course Requirements:
Students will be graded based on their performance on two midterm exams and a final exam. The relative contribution of each component will be as follows:

Midterm I	30%
Midterm II	30%
Final Exam	40%

Assignment of Grades:
Students who earn 90% of all available points will receive at least an A-, and students who earn at least 80% will receive at least a B-. At the discretion of the instructor, the final grading scheme may be adjusted at the end of the semester to reflect the actual performance of the class (i.e., a curve).

Problem Sets
Problem sets and solutions will be posted to BCourses approximately every 2 weeks and will be based on both the lectures and the textbooks. While working through problem sets is very highly recommended for learning the material and preparing for exams, they are entirely optional and will not be collected or graded.

Exams
There will be three exams (two in-class midterms and a scheduled final). *All material covered in lecture and assigned readings until the date of the exam is "fair game,"* with an emphasis on material that has been discussed in lecture since the most recent exam. Students are on their honor to work *completely independently* on exams, and neither help nor receive help from others (including electronic communication of any kind). Exams are closed-book, except that students may bring one double-sided, hand-written page of notes to the first midterm exam, two such sheets to the second midterm exam, and three to the final exam. Calculators are required for exams, but laptops and communications devices of any kind are prohibited.

Regrade Policy
We strive to be fair in grading exams and make every effort to give you the benefit of the doubt. That said, we do have an appeal process if you feel you deserve more points than have been given. All appeal requests must adhere to the following criteria:

- Accompanied by a <1p description of why additional points are merited
- Involve at least 5% of the points at stake on the assignment
- Be submitted within one week of the exam being returned

Please note an appeal will trigger regrading of the *entire* exam, such that it is possible you may lose points. By submitting a regrade request you attest that you have not modified the exam. We photocopy a random selecton of exams, and evidence of modification will be subject to referral to the Office of Academic Misconduct.

Statement on Academic Misconduct

This class adheres to the campus honor code: *As a member of the UC Berkeley community, I act with honesty, integrity, and respect for others.* Behavior inconsistent with this code may be referred to the Center for Student Conduct or other appropriate authorities.

Lecture Schedule

Readings refer to Chapter numbers in Costanzo text. Please note that lectures do not comprehensively cover the readings, in order to allow us time for group discussions and coverage of special topics.

DATE	TOPIC	READING 4th Ed (3rd Ed)
January 17 (T)	Course Overview Cellular Physiology	 Chapter 1: 1-5 (1-5)
January 19 (Th)	Cellular Physiology	Chapter 1: 5-15 (5-15)
January 24 (T)	Cellular Physiology	Chapter 1: 15-24 (15-24)
January 26 (Th)	Cellular Physiology	Chapter 1: 15-24 (15-24)
January 31 (T)	Cardiovascular Physiology	Chapter 4: 111-125 (111-125)
February 2 (Th)	Cardiovascular Physiology	Chapter 4: 125-137 (125-138)
February 7 (T)	Cardiovascular Physiology	Chapter 4: 138-148 (138-148)
February 9 (Th)	**Guest Lecture - TBD**	
February 14 (T)	Cardiovascular Physiology	Chapter 4: 148-166 (148-166)
February 16 (Th)	Cardiovascular Physiology	Chapter 4: 166-179 (166-178)
February 21 (T)	Respiratory Physiology	Chapter 5: 183-192 (183-191)

February 23 (Th)	**Midterm I review session**	
February 28 (T)	**Midterm I**	
March 2 (Th)	Respiratory Physiology	Chapter 5; 192-202 (191-202)
March 7 (T)	Respiratory Physiology	Chapter 5: 202-211 (202-209)
March 9 (Th)	Respiratory Physiology	Chapter 5: 211-211 (209-217)
March 14 (T)	Respiratory Physiology	Chapter 5: 217-226 (217-226)
March 16 (Th)	Renal Physiology	Chapter 6: 235-244 (235-245)
March 21 (T)	Renal Physiology	Chapter 6: 244-257 (245-257)
March 23 (Th)	Renal Physiology	Chapter 6: 257-265 (257-264)
March 28 (T) March 30 (Th)	**Spring Break**	
April 4 (T)	Renal Physiology	Chapter 6: 265-275 (264-276)
April 6 (Th)	Renal Physiology	Chapter 6: 275-286 (276-285)
April 11 (T)	Renal Physiology	Chapter 6: 286-296 (285-295)
April 13 (Th)	Acid-Base Physiology	Chapter 7: 299-306 (299-306)
April 18 (T)	**Midterm II**	
April 20 (Th)	Acid-Base Physiology	Chapter 7: 306-312 (306-312)
April 25 (T)	Acid-Base Physiology	Chapter 7: 312-323 (312-323)
April 27 (Th)	**Final Exam Review Session**	

All dates/topics subject to change at instructor's discretion, including exams.

RRR Week: May 1-5, 2017
Final Exam: Thursday May 11, 2017, 3-6pm, Location TBD