Bioengineering 110:
Biomedical Physiology for Engineers
Spring 2021

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Lectures: Tuesdays and Thursdays, 3:30 – 5:00 via Zoom

Discussion Sections: M 2 – 3
M 3 – 4

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.

   Note: This book is available as an eBook from the Library

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

Course Website:

This course will utilize bCourses for posting news, assignments, and grades.

Course Requirements:

Students will be graded based on their performance on problem sets, 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. To reduce stress, you will get credit for turning in your assignments to bCourses but they will not be graded. We will provide solution sets for the assignments.

Exams

There will be three exams (two 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. How these test will be administered is still a question that is being debated around campus.

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.

DATE	TOPIC	READING 5th Ed (3rd & 4th Ed)
January 19 (T)	Course Overview Cellular Physiology	 Chapter 1: 1-5 (1-5)
January 21 (Th)	Cellular Physiology	Chapter 1: 5-15 (5-15)
January 26 (T)	Cellular Physiology	Chapter 1: 15-24 (15-24)
January 28 (Th)	Cellular Physiology	Chapter 1: 15-24 (15-24)
February 2 (T)	Cardiovascular Physiology	Chapter 4: 111-125 (111-125)
February 4 (Th)	Cardiovascular Physiology	Chapter 4: 125-137 (125-138)
February 9 (T)	Cardiovascular Physiology	Chapter 4: 138-148 (138-148)
February 11 (Th)	Cardiovascular Physiology	Chapter 4: 148-166 (148-166)
February 16 (T)	Cardiovascular Physiology	Chapter 4: 166-179 (166-178)
February 18 (Th)	Respiratory Physiology	Chapter 5: 183-192 (183-191)
February 23 (T)	Midterm I Review Session	
February 25 (Th)	**Midterm I**	
March 2 (T)	Respiratory Physiology	Chapter 5; 192-202 (191-202)
March 4 (Th)	Respiratory Physiology	Chapter 5: 202-211 (202-209)
March 9 (T)	Respiratory Physiology	Chapter 5: 211-211 (209-217)
March 11 (Th)	Respiratory Physiology	Chapter 5: 217-226 (217-226)

March 15 (T)	Renal Physiology	Chapter 6: 235-244 (235-245)
March 18 (Th)	Renal Physiology	Chapter 6: 244-257 (245-257)
March 23 (T)	**No class – Spring Break**	
March 25 (Th)		
March 30 (T)	Renal Physiology	Chapter 6: 257-265 (257-264)
April 1 (Th)	Renal Physiology	Chapter 6: 265-275 (264-276)
April 6 (T)	Renal Physiology	Chapter 6: 275-286 (276-285)
April 8 (Th)	Renal Physiology	Chapter 6: 286-296 (285-295)
April 13 (T)	Midterm II Review Session	
April 15 (Th)	**Midterm II**	
April 20 (T)		
April 22 (Th)	Acid-Base Physiology	Chapter 7: 299-306 (299-309)
April 27 (T)	Acid-Base Physiology	Chapter 7: 310-323 (306-312)
April 29 (Th)	Final Exam review session Course Evaluations	

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

RRR Week: May 3-7, 2016
Final Exam: Group 15: Thursday, May 12, 2016 3-6P