
BMED 550: Engineering Physiology
Course Syllabus Winter 2008

General Information

Prerequisites

ZOO 331 and 332 or equivalent, graduate standing in biomedical engineering, or consent of the department chair.

Catalog Description

Current topics in biomedical engineering, including medical and industrial applications. Exploration of detailed technical treatment of contemporary issues in biomedical engineering, and examination of technical and societal implications of these subjects.

Course Description

This course will emphasize the integration of physiological systems, experimental physiology as the basis for knowledge generation, and application of physiology to the treatment of disease. To achieve the desired course objectives a Team-Based Learning strategy will be used throughout the quarter.

Class Meetings

Section 01 & 80- Tuesday and Thursday 4:10-6:00pm in 10-124 (Ehart Ag)

Instructor Information

Trevor R. Cardinal, PhD

Office location: Building 192, room 326 (Engineering IV)

Office hours: M 2:10-4:00pm, TR 10:10-11:00pm, W 2:10-3:00 or by appointment

Office phone: 805-756-6244

E-mail: tcardina@calpoly.edu

Learning Skill Objectives:

Through the completion of this course, students will be able to:

1. Independently read and comprehend physiological information from the text
2. Explain physiological concepts to their peers
3. Demonstrate understanding of physiology through written and oral communication
4. Analyze medical or experimental data and construct a sound treatment or interpretation

Course Content Objectives:

Through the completion of this course, students will be able to:

1. Explain the primary function of each system discussed
2. Discuss how various physiological systems function in an integrated fashion
3. Design & interpret experiments in physiology
4. Describe how modifications to physiological function result in disease
5. Apply their understanding of physiology to the treatment of disease

Course Content

1. Cellular Communication
 - a. Responses
 - i. Neural mediated response, membrane receptors, second messengers, protein secretion and/or activation
 - b. Adaptations
 - i. Soluble-factor (endocrine, paracrine, autocrine, junctional) mediated adaptation, membrane receptors, second messengers, gene expression regulation

For the remaining sections of the course, the class will select three systems from within the list of topics below

2. Nutrient Acquisition & Waste Excretion
 - a. **Digestive system**
 - b. Renal system
3. Nutrient & Waste Exchange
 - c. **Pulmonary system**
 - d. **Cardiovascular system**
4. Movement
 - e. Sensory systems
 - f. Musculo-skeletal system
 - g. Motor control system
5. Defense systems
 - h. Immune system
 - i. Integumentary system
6. Reproduction & Repair
 - j. Reproductive system
 - k. Endocrine system
 - l. Bone marrow & stem the cell niche

Text

Medical Physiology by Guyton & Hall, 11th Edition from Elsevier-Saunders

Team-Based Learning

Prior to each section of the course, students will be assigned reading in the course textbook. Comprehension of that reading will be tested during the first class period of each section of the course with a Readiness Assessment Test. In the class periods following the Readiness Assessment Test (RAT) students will complete in-class activities that involve designing and interpreting experiments as well as completing medical case studies. Due to the challenging nature of the in-class activities as well as being tested on the assigned readings prior to any lectures, students will form learning teams, with whom they will retake the RAT (immediately following the completion of individual RAT) and complete the in-class activities.

Evaluations

1. Meet with the course instructor within the first 2 weeks of the term
2. Individual readiness assessment tests (iRAT's) will be given at the beginning of each course section and are designed to test your comprehension of the assigned reading for that section. Knowledge gained from the assigned reading will form the foundation for activities focused on experimental physiology and the treatment of disease.
3. Team readiness assessment tests (tRATS's) will be given following iRAT's and are given to improve your comprehension of the assigned reading through peer instruction.
4. In-class activities will be performed for each physiological system in the class periods following the readiness assessment tests. Activities will be based on experimental physiology and medical case studies.
5. Prepare a 7-page paper (i.e. 7-pages of text, not including illustrations, charts, photographs, etc) focused on biomedical experimentation. Identify a specific question of interest that has yet to be completely answered through biomedical research.
6. Prepare a 10-15-minute team presentation that clearly and accurately explains a specific physiological process of disease. Presentation format cannot be that of an informational lecture and may involve audience participation. Examples of acceptable presentation formats include, but are not limited to, mock-commercials, skits, or musical accompaniments.
7. At the end of the quarter, you will be assigned a peer-evaluation score that your teammates feel is reflective of the extent to which you contributed to their learning and your team's performance.

Evaluations	Grade Weights & Percentages
	within Area of Total
1. Individual Performance.....	25 %
a. Instructor interview.....	5 %
b. Individual readiness assessment tests (4).....	55 %
c. Individual paper (1).....	40 %
2. Team Performance.....	50 %
a. Team readiness assessment tests (4).....	40 %
b. In-class activities (12).....	50 %
c. Team presentation (1).....	10 %
3. Team Maintenance (evaluated by peers) (1).....	25 %

Final Evaluation

<u>Score</u>	<u>Grade</u>	<u>Score</u>	<u>Grade</u>	<u>Score</u>	<u>Grade</u>	<u>Score</u>	<u>Grade</u>	<u>Score</u>	<u>Grade</u>
90-100%	A	87-89%	B ⁺	77-79%	C ⁺	67-69%	D ⁺	≤ 59%	F
		83-86%	B	73-76%	C	63-66%	D		
		80-82%	B ⁻	70-72%	C ⁻	60-62%	D ⁻		

Policies

Attendance will not be taken during class. However, due to the large number of team, in-class evaluations, students are highly encouraged to attend all class sessions.

Classroom conduct: while in class, students are expected to conduct themselves in a manner that is both conducive to learning as well as respectful of their peers and instructor. Examples of inappropriate behaviors include tardiness, cell-phone usage, newspaper reading, etc.

Academic Integrity: students are encouraged to share their intellectual views and discuss freely the principles and applications of the course material. However, graded work must be the product of a single person or single team, where appropriate. Students are expected to adhere to the Cal Poly Standards for Student Conduct as described by the Office of Student Rights & Responsibilities, which can be found at <http://www.osrr.calpoly.edu/41301.html>. Submitting the work of another student or team will result in 0-50% of the points available on the assignment.

Student success in this course as well as at Cal Poly in general can be aided by Student Academic Services (SAS, <http://sas.calpoly.edu/index.html>). SAS addresses student needs related to tutoring, adjusting to Cal Poly & San Luis Obispo, improving study skills and test taking, as well as a variety of other topics.

Special Needs and Accommodations: students needing special accommodations or special services should contact the Disability Resource Center at <http://drc.calpoly.edu>. The appropriate office must document the need for accommodations, such as extended testing times.

Subject to change: policies are subject to change with advanced notice, as deemed appropriate by the instructor.

Special Procedures for Distance Learning Students

Readiness Assessment Tests (RATs)- Scantrons for individual RATs and IF-ATs for team RATs will be mailed to St. Jude Medical (SJM) at the beginning of the quarter. Following the completion of each RAT, SJM students must mail the completed test forms back to the instructor using the following address

Trevor Cardinal
Biomedical & General Engineer Department
Cal Poly State University
San Luis Obispo, CA 93407-0365

In-class Activities: during Experimental Physiology Activities and Disease Treatment Activities you may use the Blackboard Collaboration tool to ask specific questions of the instructor, as it can be difficult to communicate orally through the video-conferencing system when the on-site students are working on the activities.

To Access the Collaboration tool, select Communication from the left option panel. Then select Collaboration; then join the Lecture Hall session. With this internet messaging tool you can ask questions of the instructor even if the classroom is noisy.

Distance learning students may also call the instructor in the classroom to ask questions of the instructor during in-class activities. The phone number for the classroom is .

Office hours- Distance learning students should phone the instructor during office during office hours if they have questions that cannot be addressed over email.

**Course Topics for BMED 550
Winter 2008**

Class session	Topics	Evaluations	Readings
Tues 8-Jan	Course goals & strategy, team selection, practice RATs		
Thur 10-Jan	Principles of Physiology		
Tues 15-Jan	Approaching medical case studies- by Dr. Robert Turbow		
Thur 17-Jan	Content selection & grade weights		
Cellular Communication & Signaling- Responses & Adaptations			
Tues 22-Jan	Readiness Assessment Tests	RATs	Ch 45, 74, & 3
Thur 24-Jan	Experimental physiology or disease treatment activity	Activity/Paper topic due	
Tues 29-Jan	Experimental physiology or disease treatment activity	Activity	
Thur 31-Jan	Experimental physiology or disease treatment activity	Activity	
Nutrient & Waste Exchange- Cardiovascular System			
Tues 5-Feb	Readiness Assessment Tests	RATs	Ch 14, 17, & 18
Thur 7-Feb	Experimental physiology or disease treatment activity	Activity	
Tues 12-Feb	Experimental physiology or disease treatment activity	Activity/Paper draft due	
Thur 14-Feb	Experimental physiology or disease treatment activity	Activity	
Nutrient & Waste Exchange- Pulmonary System			
Tues 19-Feb	Readiness Assessment Tests	RATs	TBA
Thur 21-Feb	Experimental physiology or disease treatment activity	Activity	
Tues 26-Feb	Experimental physiology or disease treatment activity	Activity	
Thur 28-Feb	Experimental physiology or disease treatment activity	Activity	
Nutrient Acquisition & Waste Excretion- Digestive			
Tues 4-Mar	Readiness Assessment Tests	RATs	TBA
Thur 6-Mar	Experimental physiology or disease treatment activity	Activity	
Tues 11-Mar	Experimental physiology or disease treatment activity	Activity	
Thur 13-Mar	Experimental physiology or disease treatment activity	Activity / Papers due	
Thur 20-Mar	Final Exam- Team presentations	Presentation	