Syllabus
Advanced Biomechanics
BIEN 137
Winter 2016

Course Time: TR 9:40 – 11:00 AM, MSE 003 (LEC)
M 7:10 – 8:00 PM, Winston Chung 143 (DIS)

Instructor

Dr. Jin Nam
Email: jnam@engr.ucr.edu
Office: 331 MS&E
Office Phone: 951 827 2064
Office hour: T 11-12
TA: Karen Low

Prerequisites

MATH 046, PHYS 040A, BIOL 005A&B, BIEN110 or equivalents; or consent of instructor

Course Description

Mechanical characterization of biological tissues at the cellular, organ, and system level; exploration of biomechanical factors of physiological and pathological conditions.

Learning Objectives

1. Students will be able to understand biology and physiology, and acquire the capability to apply advanced mathematics (including differential equations and statistics), science, and engineering to solve the problems at the interface of engineering and biology.
2. Students will be able to make measurements on and interpret data from living systems, addressing the problems associated with the interaction between living and non-living materials and systems.
3. Students will be able to derive the governing equations for the 3-parameter viscoelastic solid, and write a computer program to display the response of viscoelastic materials to testing protocols.
4. Students will be able to experimentally determine the Young's modulus and strength of bone.
5. Students will be able to describe the fracture mechanisms of cortical and cancellous bone.
6. Students will be able to generate lists of considerations important in outflow facilities of aqueous humor for regulation of intraocular pressure.

Methodology

Lectures and discussion will be used to facilitate students' learning that will be evaluated by exams, quizzes and homework.

Course Text

Textbook: Introductory Biomechanics: from cells to organisms
C. Ross Ethier and Craig A. Simmons
Cambridge University Press

ISBN 978-0-521-84112-2
Other supplemental materials: Class notes provided by instructor

Evaluation and Grading

Evaluation of Student Performance	
Midterm In-Class Exam	30%
Final In-Class Exam	30%
Homework	15%
Quizzes	10%
Group presentation	15%
Total	100%

Course Policies

Late submisstion of assignments will not be accepted.
Make-up exams can only be requested prior to the exam date with valid proof of excuses
Cheating on exams and/or plagiarism in projects will result in an F grade given for the course.

Final Exam

Friday, March 24, 8:00 a.m. - 11:00 a.m.

Course Outline (subjected to change)

Weeks	Lectures	Chapter	Objectives	Assignments Due
	Topics			
1 (Jan. 2nd week)	Course introduction	Chap 1	Review biomechanics principles	
2 (Jan. 3rd week)	Terrestrial locomotion	Chap 10	Introduce locomotion	Qz1&2 HW1
3 (Jan. 4th week)	Muscles and movement	Chap 8	Discuss Muscle dynamics	Qz3&4 HW2
4 (Jan. 5th week)	Skeletal biomechanics	Chap 9	Discuss cartilage and bone biomechanics	QZ5&6 HW3
5 (Feb. 2nd week)	Cellular biomechanics	Chap 2	Discuss cellular mechanotransduction	QZ7&8 HW4
Midterm				
6 (Feb. 3rd week)	Mechanotransduction in stem cells	Supp.	Discuss mechanotransduction in stem cells	Qz9
7 (Feb. 4th week)	Ocular biomechanics	Chap 6	Discuss ocular biomechanics and its relation to ocular diseases	QZ10&11 HW5
8 (Feb. 5th week)	Circulatory system	Chap 4	Discuss vasculature and heart	QZ12&13 HW6
9 (March 1st week)	Respiratory system	Chap 7	Discuss biomechanics of breathing	QZ14&15 HW7
10 (March 2nd week)	Group presentation and review	Review	Group presentation and Reviews basic biomechanical principles in each system and their application to problem solving	