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
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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
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 submission 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)

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