BE 4323 / IE 4465: Biomechanics for Engineers, Spring 2013

Catalog Description of Course: 3 credit hours. Mechanical behavior of the human musculoskeletal system and component tissue when physical work is performed; engineering mechanics applied to the activities; fundamental knowledge of human anatomy and physiology; workplace design.

Revised Course Description: Analysis of the mechanics governing and affecting biological and biomedical systems, from the molecular to the organismal level. Concepts of forces and moments from static and dynamic situations will be applied to human anatomical system, components, and biomedical equipment. Considerations of the adaptive response to these forces and biological materials will be made. Topics to be discussed include: anatomy, anthropometry, bone and muscle physiology, orthopaedic implants, biomaterials, artificial organs, biomedical equipment and diagnostic techniques, tissue engineering, molecular motors.

Note that in the past this course placed emphasis on biomechanics of human performance and workplace ergonomics. Since there are now excellent courses covering human factors engineering, those topics will be discussed only cursorily in this course.

Prerequisites: CE2450 Statics; BE students should have completed BE4303 Properties of Biological Materials, CE3400 Mechanics of Materials, and ME3133 (or equivalent) Dynamics. Because this course rapidly fills up, students are encouraged to take this course in their final year.

Objectives:

1. To apply the principles of statics, dynamics and mechanics to force systems in living systems.
2. To become familiar with some instrumentation and terminology in biomedical engineering.
3. To make an oral presentation on a thorough analysis of a biomechanical application used in the research, biotechnology or healthcare fields.

Instructor: Dr. Todd Monroe, P.E., Associate Professor
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Office Hours: TBA

Text: *Introductory Biomechanics: From Cells to Organisms*, by C. Ross Ethier and Craig A. Simmons. Publisher: Cambridge University Press; 1st edition (April 2007). Hardback (ISBN: 9780521841122) Also available in eBook format from: http://www.ebooks.com/ebooks/book_display.asp?IID=288552 Required partial notes and electronic documents from other texts will be provided in class or through the course website.

Criteria for determining grade:

Midterm and Final exams	50%
Lab Reports	15%
Homework and Quizzes	15%
Project	20%

The final course grade will be determined from the following scale:
A = (100 - 90)%, B = (89 - 80)%, C = (79 - 70)%, D = (69 - 60)%, F = (59 - 0)%.

Grading Criteria for Graduate Credit:
Graduate students wishing to receive graduate credit for this course will be required to perform an in-depth study of a particular biomechanical topic and present their findings to the class in the form of a graduate seminar oral presentation. This project will be graded and will serve as an additional grade in the "exams" category of the course grade.

Regulations and Procedures

Class preparedness, attendance and participation are required. Students are encouraged to check their email and the course website before each class for announcements and posted material. Homework and lab assignments will be made periodically throughout the semester. Assignments turned in after the due date will receive no credit unless permission is obtained from a physician or the dean of the college. Exams will not be made up unless prior approval is obtained from the instructor, or in the case of **extremely** mitigating circumstances.

Academic Misconduct:

Academic Misconduct, as defined in the Code of Student Conduct, will not be tolerated in this course. It is my responsibility as the instructor to report such incidents to the Department of Judicial Affairs. It is your responsibility to understand the Code of Student Conduct and make sure your actions and perceived actions are not considered as misconduct. Ignorance of these rules will not be an adequate defense in such cases. Go to http://appl003.lsu.edu/slas/judicialaffairs.nsf/index for a copy of the current Code of Student Conduct.

I am available for questions outside of class. If I am busy and do not have time to meet with you, I will tell you and we can schedule an alternate time. If you have trouble finding me, you can always make an appointment. I also check email frequently, and this may be an easier way of contacting me than by using the phone. If we make an appointment and you cannot attend, please call and cancel as soon as you can.

Course Topics:

Musculoskeletal Physiology
Finding and Evaluating Biomedical Peer-Reviewed Literature
Electromyography
Anthropometrics
Musculoskeletal Equilibrium
Musculoskeletal Dynamics
Gait Analysis
Joint Analysis & Replacement
Biomaterials
Bone and Muscle Physiology
Biocompatibility
Bone Mechanics
Crash Test Video Analysis
Cardiovascular Dynamics
Cellular Mechanics
Molecular Mechanics