

University of Tennessee
ES 422 - Biomechanics of Human Movement
Course Outline (Summer, 2001)

Instructor:	Song-Ning Zhang, Ph.D.
Office:	337 HPER
Contact:	974-4716 (email: szhang@utk.edu)
Office Hour:	1:30 - 3:00, Wednesday & Friday or by appointment
Lecture Time:	10:30 - 12:15*, M-F
Lab Time:	Once a week (see schedule below for details)
Class Location:	318 HPER
Lab Location:	135 HPER, Biomechanics/Sports Medicine Lab or a Computer lab on campus
TA:	Bill Evans, Rm 135B, 974-2901, wevans2@utk.edu Kurt Clowers, Rm 144, 974-8768, kclowers@utkux.utcc.utk.edu
Class Web Site:	http://web.utk.edu/~szhang/es422/es_422.htm

*: The actual class time may be less for the most of days (10:30 - 11:45). Labs may last longer than lecture.

Textbook

- Required:
1. Hall, S.J.: Basic Biomechanics, 3rd Edition, WCB McGraw-Hill, 1999.
 2. Lab Packet: must be purchased at the Campus Copy Center on the Cumberland Ave.
- Reference:
- Kreighbaum, E. and Barthels, K.M.: Biomechanics: A Qualitative Approach for Studying Human Movement. Allyn and Bacon, 1996.

Course Description

Study of biomechanics and its application to the analysis of human movement. Emphasis on quantitative and qualitative analysis of human movement. **Prerequisite: ES 332, Physics 221, and ES majors must have a cumulative 2.5 GPA.**

Objectives

- The purpose of the course is to provide students with the basic and necessary knowledge to undertake a systematic, biomechanical approach to the analysis of human movement. To achieve this objective, students will:
1. Develop an appreciation of the scope and nature of biomechanics.
 2. Develop an understanding of the basic terms and knowledge to describe linear and angular motion (kinematics).
 3. Develop a knowledge of Newton's laws and their application in motion analysis.
 4. Develop an understanding of the causes that determine linear and angular motion (kinetics).
 5. Develop the appreciation and knowledge of Biomechanical methods and equipments in motion and force analyses.
 6. Develop an understanding of the structures and mechanical properties for bones and muscles
 7. Develop a working knowledge of common computation and spreadsheet skills.
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Tentative Course Contents and Schedule

Date	Content	Date	Content
7/5	1. Chap 1 - Introduction 2. Chap 2 - Kinematic Concepts I 3. Math Review Problems (take home)	7/6	1. Chap 2 - Kinematic Concepts II 2. Chap 3 - Kinetic Concepts
7/9	1. Chap 4 - Bone Biomechanics I	7/10	1. Chap 4 - Bone Biomechanics II 2. Chap 5 - Muscle Biomechanics I
7/11	<i>Lab One:</i> Video Data Collection & Processing	7/12	1. Chap 5 - Muscle Biomechanics II
7/13	1. Chap 10 - Linear Kinematics I	7/16	1. Chap 10 - Linear Kinematics II
7/17	<i>Lab Two:</i> Spreadsheet and Kinematics (Computer Lab)	7/18	1. Chap 10 - Linear Kinematics III 2. Review for Exam 1
7/19	1. Exam 1	7/20	1. Chap 11 - Angular Kinematics I
7/23	1. Chap 11 - Angular Kinematics II	7/24	<i>Lab Three:</i> Force Platform Data Collection and Processing
7/25	1. Chap 11 - Angular Kinematics III 2. Chap 12 - Linear Kinetics I	7/26	1. Chap 12 - Linear Kinetics II
7/27	1. Chap 12 - Linear Kinetics III	7/30	1. Chap 13 - Equilibrium I
7/31	1. Chap 13 - Equilibrium II	8/1	<i>Lab Four:</i> Center of Gravity - Reaction Board
8/2	1. Chap 13 - Equilibrium III 2. Chap 14 - Angular Kinetics II	8/3	1. Chap 14 - Angular Kinetics II
8/6	1. Chap 14 - Angular Kinetics III	8/7	Review for Exam 2
8/8	Exam 2		

Laboratory:

- 1) **Under no circumstances a lab should be missed.** There will be no makeup for any missed labs. If there is an unusual circumstance, it is the student's responsibility to make proper arrangements with TA prior to the lab. In such cases, additional work will be assigned in addition to making up the missed lab.
- 2) Late lab assignments will be given a lesser grade depending on the numbers of late days (1 point per day). If a lab is late for more than four days, no points will be awarded for it.
- 3) Lab will take place in either the Biomechanics/Sports Medicine Lab (HPER 135) or a computer lab on the campus (to be announced).
- 4) Lab instructions and assignments for each lab are provided in the lab packet for this class. Please read the lab instructions and materials before the lab.

Homework Problem: The homework problems are the suggested problems from the textbook at the end of each chapter. It is imperative for you do these problems to be successful in the class. However you are not required to turn them in (no credit granted). The questions for each chapter are given below.

Quiz: There will be 3 - 4 pop quizzes in this semester. The actual contents and date will be announced in class prior to the quiz.

Exam: The second exam (final exam) will be “comprehensive” (to be explained in class).

Grading:	Laboratory	15 %
	Quizzes	10 %
	Exam 1	35 %
	Exam 2	40 %

Homework Problems (Hall's text):

Ch 2	Problems (p56-58): Intro. - 2, 3, 4, 9; Additional - 1, 2, 6, 10
Ch 3	Problems (p86-89): Intro. - 1, 2, 3, 4, 5, 10; Additional - 2, 3, 5, 10.
Ch 4	Problems (p111-112): Intro - 4, 7, 10; Additional - 1, 3, 8, 8, 10
Ch 6	Problems (p160-162): Intro - 1, 2, 4, 5, 9; Additional - 5, 9
Ch 10	Problems (p361-363): Intro - 1, 2, 5, 7, 9; Additional - 1, 3, 5, 7
Ch 11	Problems (p390-393): Intro - 1, 3, 4, 7, 8, 9, 10; Additional - 1, 3, 5, 8, 10
Ch 12	Problems (p429-431): Intro - 1, 2, 3, 4, 9, 10; Additional - 1, 2, 3, 6, 8, 10
Ch 13	Problems (p470-473): Intro - 1, 3, 4, 6, 8, 9, 10; Additional - 1, 2, 3, 5, 6, 7, 8, 10