EPE 610 Advanced Topics in Biomechanics
Course Syllabus, Spring 2003

INSTRUCTORS: Dr. Rick Hinrichs (PEBE 206, 480-965-1624, hinrichs@asu.edu)
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RH Office hours: Monday 2:00-3:00 PM, Wednesday 9:40-11:00 AM, and Friday 7:30-8:30 AM. ← Please use the sign-up sheet on RH office door.

PV Office hours: Monday 5:30-6:30 PM and 9:30-10:00 PM only on nights he is teaching.

Class web page: www.public.asu.edu/~hinrichs/classes/epe610/

COURSE DESCRIPTION AND OBJECTIVES

The purpose of this course is to cover selected advanced topics in biomechanics for students who have already completed EPE 510. The emphasis will be on three-dimensional methods and advanced data processing algorithms. The student is expected to be familiar with one or more of the following programming languages: Basic, FORTRAN, C/C++, LabVIEW, or MatLab. After taking this course, students should be much better prepared to do a thesis/dissertation involving 3D methodology.

COURSE REQUIREMENTS AND EVALUATION

Grading will be done primarily on the basis of lab reports, an independent research project, and (possibly) a final exam. The lab reports will involve analysis of data collected as a group. The independent project will involve the completion of a small 3-D study involving a limited number of subjects and will be different for each student (see below). The approximate weightings will be: lab reports (at least 40%), independent research project (at least 50%), and final exam (at most 10%).

GUIDELINES FOR INDEPENDENT RESEARCH PROJECT

The project must involve 3-D data collection and data analysis methodology. A well-planned project could serve as a pilot study for one's thesis or dissertation. The project must also involve some original computer programming on the part of the student. In the past, several students have taken incompletes in order to finish their projects especially if the project required a fair amount of writing original computer code. This semester there will be no incompletes. Instead, course grades will reflect heavily the level of success that the student achieves in this one semester. Course grades of "A" will be reserved for those students who complete quality projects before the end of the semester. In order to accomplish this, each student will work with the instructors to plan an appropriate project. A two-page proposal for this project must be approved by the instructors on or before March 3.

TEXTBOOK AND OTHER READINGS

There is no textbook required for this course. Readings will come from a variety of sources including chapters of textbooks, journal articles, and the instructors' lecture handouts. There will be an assigned reading list distributed for each new section of the course. Most assigned readings will be made available for the students to photocopy. Some will require searching through the library.

COURSE OUTLINE

I. Three-dimensional cinematography/videography
   A. Direct linear transformation (DLT) method
   B. Multiphase DLT method
   C. Non-linear transformation (NLT) method
   D. Lab: Comparison of methods

II. Smoothing and differentiation methods
   A. Overview of major methods
   B. Lab: Comparison of methods

III. Body segment inertial properties
   A. Overview of major studies
   B. Lab: Comparison of prediction methods

IV. Three-dimensional analysis techniques
   A. Kinematics
   B. Kinetics
      1. Linear and angular momentum
      2. Resultant joint forces and moments