

**UNIVERSITY OF MASSACHUSETTS
DEPARTMENT OF EXERCISE SCIENCE**

EXERCISE SCIENCE 732 - Advanced Biomechanics

Spring, 2004

INSTRUCTOR : Joseph Hamill, Ph.D.
OFFICE : Totman 110
OFFICE HOURS : 9:00-10:00 Monday, Wednesday or by appointment.
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COURSE PREREQUISITES

Exercise Science 531 or permission of instructor.

OBJECTIVES

This course is designed to fulfill the following objectives:

- 1) To provide an introduction to the quantitative techniques used in biomechanics.
- 2) To provide the student with the background to allow him/her to be competent and informed in the use of most of the major types of laboratory equipment. These include:
 - High-speed videography (both 2-D and 3-D)
 - Force platforms
 - Accelerometry
 - Pressure-recording devices
- 3) To provide the student with the background in basic numerical methods (i.e. data smoothing, Fourier Transforms, etc.).
- 4) To provide an introduction to microcomputers as a data acquisition and analysis device.
- 5) To provide an introduction to some of the key literature.

COURSE REQUIREMENTS

1. Mid term examinations	50 points
2. Final examination	50 points
3. Assignments	<u>200 points</u>
Total	300 points

All assignments must be turned in on the designated due date or they will not be accepted. No excuses will be accepted.

GRADING

The grading for this course will follow the University of Massachusetts standard. That is:

A+	>94
A	90> <93
A-	86> <89
B+	80> <85
B	75> <79
B-	70> <74
F	less than 69

SUGGESTED READING

There is no specific textbook for this class. However, the following books are suggested as complimentary readings for the class:

Winter, D.A. *Biomechanics of Human Motion (2nd Edition)*. New York, NY: John Wiley Publishers, 1990.

Winter, D.A. *The Biomechanics and Motor Control of Human Gait: Normal, Elderly and Pathological*. Waterloo, Canada: University of Waterloo Press, 1989.

Vaughan, C.L., Davis, B.L., O'Connor, J.C. *Dynamics of Human Gait*. Champaign, IL: Human Kinetics, 1992.

Nigg, B.M., Herzog, W. (Eds.). *Biomechanics of the Musculo-Skeletal System (2nd Edition)*. New York, NY: John Wiley & Sons, 1999.

COURSE CONTENT

Classroom lectures on the following topics will be held periodically throughout the semester. After the lectures, students will undertake their projects. Individual meetings and data collection sessions may take place during scheduled class meetings. This protocol will be repeated for each instrumentation set-up with varying amounts of class time interspersed between data collection sessions.

1. Introduction
2. High-speed videography - 2-D and 3-D
3. Force platform
4. Joint moments - 2-D and 3-D
5. Accelerometry and electrogoniometry
6. Plantar pressure measurement