HPHY 684 Kinematics of Human Movement – Fall 2014

University of Oregon, Department of Human Physiology

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Meeting: Tuesday and Thursday, 10-11:50 pm, Gerlinger 303

Textbook: *Research Methods in Biomechanics* by Robertson, et al.

Course Description: This course is the first of a two-course sequence in graduate biomechanics that also includes HPHY 685 (Kinetics of Human Motion). This course will provide students with both theoretical and applied knowledge required to perform a kinematic analysis of human motion. By the completion of this course, students should have a working understanding of the entire process of 2D and 3D kinematics, including data collection, filtering, analysis and modeling.

Course Learning Objectives
Upon successful completion of this course, each student should be able to:

1) Outline the kinematic data collection process and appraise the differences between systems.
2) Given marker data, perform a 2D kinematics analysis.
3) Analyze a data signal in the frequency domain and design a digital filter to remove noise.
4) Compute a 3D coordinate system from marker data (assuming rigid body motion).
5) Calculate anatomic and neutral coordinate system from marker data.
6) Calculate joint angles using Euler Angle and Helical Axis models of motion.
7) Evaluate how skin motion artifact introduces errors and explain how it can be minimized
8) Perform learning objectives 2-6 with LabView.

Blackboard We will be making extensive use of this on-line system at blackboard.uoregon.edu. Please check often for class updates.

Course Readings: You are responsible for the assigned readings from the text and any other materials that may be assigned. It is suggested that you come to class having already read the assigned reading as this will make the lectures more informative for you.

Attendance Policy: Consistent attendance reflects professional behavior and it is expected that students attend class on a regular basis. In the event of an emergency or illness, students should notify the Course Director. Students are responsible for all missed course content and assignments.

Course Preparation: Although there are no formal prerequisites for this class, it is expected that students have foundational knowledge of biomechanics, physics and mathematics. Students are encouraged to review relevant content for successful completion of this course.

Accessibility The University of Oregon is working to create inclusive learning environments. Please notify me if there are aspects of the instruction or design of this course that result in disability related barriers to your participation. You are also encouraged to contact the Accessible Education Center (formerly Disability Services) in 164 Oregon Hall at 346-1155 or uoaec@uoregon.edu.

Academic Misconduct The University Student Conduct Code (available at conduct.uoregon.edu) defines academic misconduct. Students are prohibited from committing or attempting to commit any act that constitutes academic misconduct. By way of example, students should not give or receive (or attempt to give or receive) unauthorized help on assignments or examinations without express permission from the instructor. Students should properly acknowledge and document all sources of information (e.g. quotations, paraphrases, ideas) and use only the sources and resources authorized by the instructor. If there is any question about whether an act constitutes academic misconduct, it is the students' obligation to clarify the question with the instructor before committing or attempting to commit the act. Additional information about a common form of academic misconduct, plagiarism, is available at http://library.uoregon.edu/guides/plagiarism/students/index.html.

If a student is found responsible for academic misconduct, the HPHY Department will "…impose an appropriate academic sanction up to and including a grade of "N" or "F" and report the incident to the Office of Student Conduct and Community Standards." (OAR571-021-0215: UO Academic Misconduct Procedures).

Grading Criteria: Grades will be determined from an equal weighting of the following:

Mid-term exam
Final exam
Final project
Homework assignments

The course will be graded on the following scale

A+ = 98 – 100%	A = 92 – 97.9%	A– = 90 – 91.9%
B+ = 88 – 89.9%	B = 82 – 87.9%	B– = 80 – 81.9%
C+ = 78 – 79.9%	C = 72 – 77.9%	C– = 70 – 71.9%
D = 60 – 69.9%		
F = Below 60%		

Course Outline and Readings

Overview
Introduction

Data Collection
1st edition – Chapter 1 (9-19, 22-23, 31-33) and Chapter 2 (37-38)
2nd edition – Chapter 1 (9-19, 21-22, 30-32) and Chapter 2 (35-36)

2D Kinematics
1st edition – Chapter 1 (19-34)
2nd edition – Chapter 1 (18-33)

Signal Processing
1st edition – Chapter 1 (22) and Chapter 11
2nd edition – Chapter 1 (21) and Chapter 12

Rigid Body Formation
1st edition – Chapter 2 (42-43) and Appendices D and E
2nd edition – Chapter 2 (45-47) and Appendices D and E

Anatomic/Neutral Coordinate System
1st edition – Chapter 2 (43-45)
2nd edition – Chapter 2 (36-44)

Modeling of Motion
1st edition – Chapter 2 (45-52), Zatsiorsky chapter and journal articles
2nd edition – Chapter 2 (50-59), Zatsiorsky chapter and journal articles

Skin Motion Artifact
1st edition – Chapter 2 (39-41) and journal articles
2nd edition – journal articles