

ENGG3150

Engineering Biomechanics - Winter 2005

Instructor Information

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Office Hours: by appointment (see me before or after class or via email)

Laboratory Coordinator: Ms. Mary Leunissen Office: Room 227, Thornbrough Building, Phone: (519) 824-4120 (Extension 56141), E-Mail:mleuniss@uoguelph.ca

Teaching Assistant: Mr. Joel Jack (rjack@uoguelph.ca)

Course and Schedule Information

Course Description: Basic concepts of biological material structure, properties, adaptation and remodeling; viscoelasticity in biological materials and techniques for modeling viscoelastic material behaviour; 2-dimensional and 3-dimensional joint kinematic analysis techniques; muscle mechanics and optimization techniques; current techniques in laboratory instrumentation and biomedical applications.

Prerequisites: ENGG 2150 or ENGG 2160

Class Time: Lecture: Mon./Wed./Fri. - 10:30-11:20 am, Room 209, MACS

Laboratory: Thurs. 10:00-11:50 am, see course schedule for location, Thornbrough.

Text: None; required reading material will be provided in class OR through the library

Learning Objectives

Upon successful completion of this course, students will have an understanding of:

- The breadth and depth of the field of biomechanics
- Selected data collection, processing and analysis techniques for biomechanics data
- How to critically assess the published biomechanics literature

Schedule of Topics

Week	Approximate General Lecture Topic for the Week of Lectures	Journal Article Topic Area	Lab/Tutorial	Lab/Tutorial Location
1	Introduction to biomechanics	None	None	
2	General data collection and processing techniques	None	Introduction to Matlab	Computer
3	Importance of calibration, instrumentation limitations, error/uncertainty analysis techniques, Human ethics approval process, library tour	One of the topics covered in this week's classes (M. Oliver)	Data processing using Matlab (lab #1)	Computer
4	Kinematics analysis and data collection techniques	Kinematics (Students 1&2)	Calibration, determination of Joint Angles using goniometers - Group 1 (lab #2)	Biomech
5	Kinetics analysis and data collection techniques	Kinetics (Students 3&4)	Calibration, determination of joint angles using goniometers - Group 2 (lab #2)	Biomech
6	Clinical applications of motion capture	Clinical Motion Capture (Students 5&6)	Motion capture and joint angle determination using VICON and goniometers - Group 1 (lab #3)	Biomech
	February Break	February Break	February Break	February Break
7	Electromyography and muscle mechanics	Surface Electromyography (M. Oliver - Special class with Phys7570)	Motion capture and joint angle determination using VICON and goniometers - Group 2 (lab #3)	Biomech
8	Clinical applications of electromyography and advanced processing techniques	Clinical Applications of Electromyography (Students 7&8)	Surface electromyography and VICON - Group 1 (lab #4)	Biomech
9	Biomechanical modeling	Biomechanical models (Students 9&10)	Surface electromyography and VICON - Group 2 (lab #4)	Biomech
10	Occupational biomechanics	Occupational biomechanics (Students 11&12)	Computer simulations using 'real' data (lab #5)	Computer
11	Special topics	Special topics (Students 13&14)	None	
12	Special topics	Special topics (Students 15&16)	None	

Marking

Activity	Percentage of Final Grade
Laboratory write-ups (5)	40%
Choosing a research article and leading a critical discussion of the article (done in pairs of students)	5%
Participating in discussions of research articles	5%
Midterm Exam Wednesday March 2, 2005 10:30-11:20 am (Room 209, MACS)	20% or 0% (which ever provides the highest course grade)
Final Exam - Friday April 15, 2005 7-9 p.m. (Location TBA)	30% or 50% (which ever provides the highest course grade)

If a student does not write the midterm exam, the percentage weighting will be shifted to the final exam such that the final exam will be worth 50% of the student's final grade.

In order to pass the course, students must pass both the laboratory/assignment and exam course portions. Students must obtain a grade of 50% or higher on the exam portion of the course in order for the laboratory write-up/assignment portions of the course to count towards the final grade. Similarly, students must also obtain a grade of 50% or higher on the laboratory/assignment portions of the course in order for the examination portion of the course to count towards the final grade. Students must attend and complete all laboratories in order to pass the course. If a laboratory is missed due to illness or other appropriately documented extenuating circumstance, arrangements must be made with Mr. Joel Jack and Ms. Mary Leunissen to complete a make-up lab. You will not pass the course without attending and completing the laboratories. It should be noted, however, that if a student does not feel comfortable being a subject for one of the laboratories, non-participation as a subject will not affect that student's grade in any way.

Laboratory Experiments/Tutorials

Six laboratory/tutorial sessions have been scheduled:

1. Matlab Tutorial - Introduction
2. Matlab Tutorial - Data processing
3. Instrumentation calibration and joint angle determination using goniometers
4. Motion capture and joint angle determination using VICON and goniometers
5. Surface electromyography
6. Electromyography and joint angle determination

Specific instructions for the preparation of laboratory reports are contained in the laboratory handout. Please note that this is a Microsoft Excel free class...all data analysis and processing will done using Matlab. Though students will perform the laboratories in groups, lab write-ups and assignments will be done as individuals.

General Policies Regarding Laboratories

All labs must be submitted for marking to Mr. Joel Jack by 14:00 h one week after the laboratory is performed (labs which are due on Thanksgiving Monday can be handed in on Tuesday October 12th by 14:00 h).

Grading Scale (as per the 2004-2005 University of Guelph Undergraduate Calendar)

Letter Grade	Percent Range
A+	90-100%
A	85-89%
A-	80-84%
B+	77-79%
B	73-76%
B-	70-72%
C+	67-69%
C	63-66%
C-	60-62%
D+	57-59%
D	53-56%
D-	50-52%
F	0-49%

Disclaimer

The instructor reserves the right to change any or all of the above in the event of appropriate circumstances, subject to the University of Guelph Academic Regulations.