ENGG3150
Engineering Biomechanics - Winter 2012

Instructor Information

Professor: Dr. Michele Oliver, P.Eng., Office: Room 1335, Thornbrough Building, Phone: (519) 824-4120 (Extension 52117), Fax: (519) 836-0227, E-Mail:moliver@uoguelph.ca

Office Hours: by appointment (to arrange one see me before or after class or send me an email)

Laboratory Coordinator: Ms. Carly Genn Office: Room 3403, Thornbrough Building, Phone: (519) 824-4120 (Extension 56676), E-Mail:gennc@uoguelph.ca

Teaching Assistant: Ms. Danielle Boucher, Office: Thornbrough Building, E-Mail: dboucher@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: Tues./Thurs. – 10:00-11:20 am, MACN Room 118

Laboratory: Monday 2:30-4:20 pm, Wednesday 3:30-5:20 pm, or Friday 3:30-5:20 pm - Thornbrough Room 2193.

Text: None; required reading material can be accessed 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

Approximate 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	
2	General data collection and processing techniques		Introduction to Matlab™	Computer
3	Importance of calibration, instrumentation limitations, error/uncertainty analysis techniques, Human ethics approval process	(Intro to Critiquing Journal Articles: M. Oliver Cigarette Smoking: an underused tool in high-performance endurance training)	Data processing using Matlab™ (lab #1)	Computer
4	Kinematics analysis and data collection techniques	Kinematics (Student Group #1)	Calibration, determination of joint angles using goniometers (lab #2)	Biomech
5	Kinetics analysis and data collection techniques	Kinetics (Student Group #2)		
6	Clinical applications of motion capture	Clinical Motion Capture (Student Group #3)	Motion capture and joint angle determination using VICON™ and goniometers (lab #3)	Biomech
	February Break	February Break	February Break	February Break
7	Electromyography and muscle mechanics	Surface Electromyography		
8	Clinical applications of electromyography and advanced processing techniques	Clinical Applications of Electromyography (Student Group #4)	Surface electromyography and VICON™ (lab #4)	Biomech
9	Biomechanical modeling	Biomechanical models (Student Group #5)		
10	Occupational biomechanics	Occupational biomechanics (Student Group #6&7)	Computer simulations using 'real' data (lab #5)	Computer
11	Special topics	Special topics (Student Group #8&9)	None	
12	Special topics	Special topics (Student Group #10)	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 groups of 4 students)	10%
Participating in discussions of research articles	5%
Midterm Exam Thursday March 1, 2012 10:00-11:20 am (MACN Room 118)	20% or 0% (which ever provides the highest course grade)
Final Exam – Tuesday April 18, 2012 8:30-10:30 a.m. (Location TBA)	25% or 45% (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 45% 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 Dr. Oliver as well as Ms. Danielle Boucher to complete a make-up lab. You will not pass the course without attending and completing the laboratories.

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 and joint angle determination using VICON™
6. Computer simulations using 'real' data

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 be 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 lab/tutorial write-ups must be submitted for marking to Ms. Danielle Boucher by 4 p.m. one week after the laboratory is performed.

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.