

ENGG*3150 Engineering Biomechanics

Winter 2017



(Revision 2.0: December 14, 2016)

1 INSTRUCTIONAL SUPPORT

1.1 Instructor

Instructor: Michele Oliver, Ph.D., P.Eng.
Office: THRN 1335, ext. 52117
Email: moliver@uoguelph.ca
Office hours: TBA on CourseLink or by appointment

1.2 Lab Technician

Technician: TBA
Office: TBA
Email: TBA

1.3 Teaching Assistants

GTA	Email	Office Hours
Diego Gonzalez	gonzaled@mail.uoguelph.ca	TBA on CourseLink
Alex Nolan	nolana@mail.uoguelph.ca	TBA on CourseLink

2 LEARNING RESOURCES

2.1 Course Website

Course material, news, announcements, and grades will be regularly posted to the ENGG*3150 CourseLink site. You are responsible for checking the site regularly.

2.2 Required Resources

None

2.3 Recommended Resources

1. D.G.E. Robertson et al. Research Methods in Biomechanics – 2nd Edition. Human Kinetics, 2014. (one copy has been placed on reserve in the library)
2. Any Matlab™ textbook. One example is: S. Attaway. Matlab – A Practical Introduction to Programming and Problem Solving – 3rd Edition. Butterworth-Heinemann (Elsevier), 2013.

2.4 Additional Resources

Lecture Information: Selected lecture notes will be posted on CourseLink.

Lab Information: The handouts/manual for all the lab sessions will be posted on CourseLink.

Assignments: Download the assignments according to the schedule given in this handout.

Miscellaneous Information: Other information related to Engineering Biomechanics will be posted on CourseLink.

2.5 Communication & Email Policy

Please use lectures and lab help sessions as your main opportunity to ask questions about the course. Major announcements will be posted to the course website. **It is your responsibility to check the course website regularly.** As per university regulations, all students are required to check their <mail.uoguelph.ca> e-mail account regularly: e-mail is the official route of communication between the University and its students.

3 ASSESSMENT

In this course, your instructor will be using Turnitin, integrated with the CourseLink Dropbox tool, to detect possible plagiarism, unauthorized collaboration or copying as part of the ongoing efforts to maintain academic integrity at the University of Guelph.

All submitted work with the exception of exams and the CORE completion certificate will be included as source documents in the Turnitin.com reference database solely for the purpose of detecting plagiarism of such papers. Use of the Turnitin.com service is subject to the Usage Policy posted on the Turnitin.com site.

A major benefit of using Turnitin is that students will be able to educate and empower themselves in preventing academic misconduct. In this course, you may screen your own assignments

through Turnitin as many times as you wish before the due date. You will be able to see and print reports that show you exactly where you have properly and improperly referenced the outside sources and materials in your assignment.

3.1 Dates and Distribution

Activity	Group or Individual	Percentage of Final Grade	Due
Matlab™ Variable Dictionary	Individual	2.5%	Beginning of Week 4 Lab: Submit one paper copy in THRN 2135 at the start of your scheduled lab, and one electronic copy to the CourseLink Dropbox before the start of your scheduled lab for that week
Completion of CORE Human Ethics Online Course (https://tcps2core.ca/welcome) (http://www.pre.ethics.gc.ca/eng/education/tutorial-didacticiel/)	Individual	2.5%	Thursday January 19th at beginning of Class; Hand in Certificate of Completion
★One Page Project Description	Group	5%	Beginning of Week 6: Submit one paper copy in THRN 2135 at the start of your scheduled lab, and one electronic copy to the CourseLink Dropbox before the start of your scheduled lab for that week
Calibration, determination of joint angles using goniometers one page laboratory write-up	Individual	5%	Beginning of Week 5 Lab: Submit one paper copy in THRN 2135 at the start of your scheduled lab, and one electronic copy to the CourseLink Dropbox before the start of your scheduled lab for that week
VICON one page laboratory write-up	Individual	5%	Beginning of Week 6: Submit one paper copy in THRN 2135 at the start of your scheduled lab, and one electronic copy to the CourseLink Dropbox before the start of your scheduled lab for that week

Activity	Group or Individual	Percentage of Final Grade	Due
Force Plate one page laboratory write-up	Individual	5%	Beginning of Week 7 Lab: Submit one paper copy in THRN 2135 at the start of your scheduled lab, and one electronic copy to the CourseLink Dropbox before the start of your scheduled lab for that week
EMG one page laboratory write-up	Individual	5%	Beginning of Week 8 Lab: Submit one paper copy in THRN 2135 at the start of your scheduled lab, and one electronic copy to the CourseLink Dropbox before the start of your scheduled lab for that week
★15 minute presentation describing results of group project (12 minute presentation; 3 minutes questions)	Group	5%	Last 5 days of Class
★Project write-up in journal format	Group	15%	In class, at the beginning of the last class, submit one paper copy. Submit an electronic copy to the CourseLink Dropbox before the start of the last class
Final Exam – Monday April 24 th , 2017 2:30-4:30 PM (Location TBA on WebAdvisor)	Individual	50%	

★Failure to submit a distribution of effort (DOE) form will result in an incomplete grade for this component of the course. Individual grades in a group will only be adjusted by the course instructor if substantial differences in effort are documented in the DOE evaluation coupled with evidence of the steps taken to address the uneven effort. These steps include a group discussion with the presence of the course instructor. It is unacceptable to expect grade adjustment if there is a perception that one or more group members worked harder than someone else. There must be explicit evidence to support the claim.

3.2 Course Grading Policies

Missed Assessments: If you are unable to meet an in-course requirement due to medical, psychological, or compassionate reasons, please email the course instructor. See the undergraduate calendar for information on regulations and procedures for Academic Consideration:

<http://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-ac.shtml>

Accommodation of Religious Obligations: If you are unable to meet an in-course requirement due to religious obligations, please email the course instructor within two weeks of the start of the semester to make alternate arrangements. See the undergraduate calendar for information on regulations and procedures for Academic Accommodation of Religious Obligations:

<http://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-accomreliq.shtml>

Passing grade: In order to pass the course, you must pass both the laboratory 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/project portion of the course to count towards the final grade. Similarly, students must obtain a grade of 50% or higher on the laboratory write-up/assignment/project portion of the course in order for the exam portion of the course to count towards the final grade. If a student does not receive 50% or higher on the exam portion of the course but receives a grade which is 50% or higher on the laboratory write-up/assignment/project portion of the course, their final grade will be whatever they obtained on the exam portion. Similarly, if a student does not receive 50% or higher on the laboratory write-up/assignment/project portion of the course but receives a grade which is 50% or higher on the exam portion of the course, their final grade will be whatever they obtained on the laboratory write-up/assignment/project portion. If the student receives less than 50% on both the exam and the laboratory write-up/assignment/project course portions, their final grade will be the higher of the exam portion and the laboratory write-up/assignment/project portion.

Lab Work: You must attend and complete all laboratories. If you miss a laboratory due to grounds for granting academic consideration or religious accommodation, arrangements must be made with the teaching assistant to complete a makeup lab.

Late Reports: Late submissions of lab reports/assignments/project write-ups, presentations will not be accepted.

4 AIMS, OBJECTIVES & GRADUATE ATTRIBUTES

4.1 Calendar Description

The following topics related to biomechanics are covered in this course: kinematic and kinetic analysis techniques; electromyography; current techniques in laboratory instrumentation and biomedical applications.

Prerequisite(s): ENGG*2160

4.2 Course Aims

This course is an introductory course in engineering biomechanics. The main goals of the course are to (1) introduce students to the language and instrumentation of biomechanics and (2) give them the knowledge and tools to intelligently assess biomechanical problem/questions and then (3) to select the most appropriate techniques and instrumentation to use in order to solve these problems/questions. To consolidate course knowledge, students are exposed to an open ended problem/project of their own choosing in which they have to choose a biomechanical problem, choose what parameters they should measure, and with the available resources, choose the most appropriate measurement and analysis techniques to use.

4.3 Learning Objectives

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

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

4.4 Graduate Attributes

Successfully completing this course will contribute to the following CEAB Graduate Attributes:

Graduate Attribute	Learning Objectives	Assessment
1. Knowledge Base for Engineering	1, 2	Assignments, Labs, Exams
2. Problem Analysis	1,2,3	Assignments, Labs, Exams, Project

3. Investigation	1,2,3	Assignments, Labs, Project
4. Design		
5. Use of Engineering Tools	2	Assignments, Labs, Project, Exams
6. Communication	1,2,3	Labs, Project
7. Individual and Teamwork	1,2,3	Assignments, Exams, Labs, Project
8. Professionalism	-	-
9. Impact of Engineering on Society and the Environment	-	-
10. Ethics and Equity	1,2,3	CORE Human Ethics Course Completion
11. Environment, Society, Business, & Project Management	-	-
12. Life-Long Learning	-	-

4.5 Instructor's Role and Responsibility to Students

The instructor's role is to develop and deliver course material in ways that facilitate learning for a variety of students. Selected lecture notes will be made available to students on CourseLink but these are not intended to be stand-alone course notes. During lectures, the instructor will expand and explain the content of notes and provide example problems that supplement posted notes. Scheduled classes will be the principal venue to provide information and feedback for tests and the project.

4.6 Students' Learning Responsibilities

Students are expected to take advantage of the learning opportunities provided during lectures and laboratories. Students, especially those having difficulty with the course content, should also make use of other resources recommended by the instructor. Students who do (or may) fall behind due to illness, work, or extra-curricular activities are advised to keep the instructor informed. This will allow the instructor to recommend extra resources in a timely manner and/or provide consideration if appropriate.

4.7 Relationships with other Courses & Labs

Previous Courses:

ENGG*2160: Mechanical fundamentals such as stress and strain.

Follow-on Courses:

ENGG*4400: Biomechanical Engineering Design

5 TEACHING AND LEARNING ACTIVITIES

5.1 Timetable

Lectures:

Tuesday 11:30 – 12:50 PM ANNU 156
Thursday 11:30 – 12:50 PM ANNU 156

Laboratory:

Monday Sec 01 8:30-10:20 AM THRN 2135*
8:30-10:20 AM THRN 2336#
Wednesday Sec 02 8:30-10:20 AM THRN 2135*
8:30-10:20 AM THRN 2336#
Tuesday Sec 03 1:30-3:20 PM THRN 2135*
1:30-3:20 PM THRN 2336#
Wednesday Sec 04 11:30-1:20 PM THRN 2135*
11:30-1:20 PM THRN 2336#

*THRN 2135 is the Biomechanics Lab; #THRN 2336 is a computer lab where students will process their data using Matlab™

5.2 Approximate Lecture and Lab Schedule

Week	Approximate General Lecture Topic for the Week of Lectures	Laboratory/Activity	Laboratory/Activity Location (In Assigned Laboratory Section)	Course Deliverables
1	Introduction to biomechanics; Human ethics approval process	CORE Human Ethics Online Course		

Week	Approximate General Lecture Topic for the Week of Lectures	Laboratory/Activity	Laboratory/Activity Location (In Assigned Laboratory Section)	Course Deliverables
2	General data collection and processing techniques	Introduction to Matlab™	Lab Safety - THRN 2135 THRN 2336	CORE Human Ethics Certificate of Completion (https://tcps2core.ca/welcome) (http://www.pre.ethics.gc.ca/eng/education/tutorial-didacticiel/) Due: Thursday January 19 th at the beginning of class
3	Importance of calibration, instrumentation limitations, error/uncertainty analysis techniques	Data processing using Matlab™	THRN 2336	
4	Kinematics analysis and data collection techniques	Calibration, determination of joint angles using goniometers	THRN 2135 THRN 2336 (Data Processing)	Matlab™ Variable Dictionary Due: Beginning of Week 4 Lab in THRN 2135
5	Clinical applications of motion capture	VICON	THRN 2135 THRN 2336 (Data Processing)	Calibration, determination of joint angles using goniometers one page lab report Due: Beginning of Week 5 Lab in THRN 2135
6	Kinetics analysis and data collection techniques	Force Plate Lab	THRN 2135 THRN 2336 (Data Processing)	One Page Project Description Completed as a group Due: Beginning of Week 6 Lab VICON one page lab report Due: Beginning of Week 6 Lab
FEBRUARY BREAK				
7	Electromyography and muscle mechanics	EMG Lab	THRN 2135 THRN 2336 (Data Processing)	Force Plate one page lab report Due: Beginning of Week 7 Lab
8	Clinical applications of electromyography and advanced processing techniques	Project Data Collection and Data Analysis	Thorn 2135 and THRN 2336 (Groups arrange times with Biomedical Engineering Technician, TAs and Prof)	EMG one page lab report Due: Beginning of Week 8 Lab
9	Biomechanical modeling			
10	Occupational biomechanics	Data Analysis, Project Write-up	Thorn 2135 and THRN 2336 (Groups arrange times with Biomedical Engineering Technician, TAs and Prof)	Project Presentations 15 minute group presentations on last five days of class Project write-up in journal format Due: start of class on the last day of class
11	Time Permitting: Special Topics			
12	Time Permitting: Special Topics			

5.3 Other Important Dates

Tuesday, January 10th 2017: First day of class

Monday, February 20th – Friday, February 24th 2017: Winter Break

Friday, March 10th: Drop date – 40th class

Thursday, April 6th 2017: Last day of class

6 LAB SAFETY

Safety is critically important to the School and is the responsibility of all members of the School: faculty, staff and students. As a student in a lab course you are responsible for taking all reasonable safety precautions and following the lab safety rules specific to the lab you are working in. In addition, you are responsible for reporting all safety issues to the laboratory supervisor, GTA or faculty responsible.

If the laboratory rules are not followed, consequences will include removing student's access to the lab. If this results in lab work not being completed, the student will receive a grade of 0.

7 ACADEMIC MISCONDUCT

The University of Guelph is committed to upholding the highest standards of academic integrity and it is the responsibility of all members of the University community faculty, staff, and students to be aware of what constitutes academic misconduct and to do as much as possible to prevent academic offences from occurring. University of Guelph students have the responsibility of abiding by the University's policy on academic misconduct regardless of their location of study; faculty, staff and students have the responsibility of supporting an environment that discourages misconduct. Students need to remain aware that instructors have access to and the right to use electronic and other means of detection.

Please note: Whether or not a student intended to commit academic misconduct is not relevant for a finding of guilt. Hurried or careless submission of assignments does not excuse students from responsibility for verifying the academic integrity of their work before submitting it. Students who are in any doubt as to whether an action on their part could be construed as an academic offence should consult with a faculty member.

7.1 Resources

The Academic Misconduct Policy is detailed in the Undergraduate Calendar:

<http://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-amisconduct.shtml>

A tutorial on Academic Misconduct produced by the Learning Commons can be found at: <http://www.academicintegrity.uoguelph.ca/>

Please also review the section on Academic Misconduct in your [Engineering Program Guide](#).

The School of Engineering has adopted a Code of Ethics that can be found at:

<http://www.uoguelph.ca/engineering/undergrad-counselling-ethics>

8 ACCESSIBILITY

The University of Guelph is committed to creating a barrier-free environment. Providing services for students is a shared responsibility among students, faculty and administrators. This relationship is based on respect of individual rights, the dignity of the individual and the University community's shared commitment to an open and supportive learning environment. Students requiring service or accommodation, whether due to an identified, ongoing disability for a short-term disability should contact the Student Accessibility Services as soon as possible.

For more information, contact SAS at [519-824-4120](tel:519-824-4120) ext. 56208 or email csd@uoguelph.ca or see the website: <http://www.uoguelph.ca/csd/>

9 RECORDING OF MATERIALS

Presentations which are made in relation to course work—including lectures—cannot be recorded or copied without the permission of the presenter, whether the instructor, classmate or guest lecturer. Material recorded with permission is restricted to use for that course unless further permission is granted.

10 RESOURCES

The Academic Calendars are the source of information about the University of Guelph's procedures, policies and regulations which apply to undergraduate, graduate and diploma programs: <http://www.uoguelph.ca/registrar/calendars/index.cfm?index>