ENGG*3150 Engineering Biomechanics

Fall 2019
Section(s): C01

School of Engineering
Credit Weight: 0.50
Version 1.00 - September 04, 2019

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1 Course Details

1.1 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.

Pre-Requisites: 4.00 ENGG credits, including ENGG*1210

1.2 Course 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.

1.3 Timetable

Lectures:

Monday	11:30 – 12:20 AM	MACN 113
Wednesday	11:30 – 12:20 AM	MACN 113
Friday	11:30 – 12:20 AM	MACN 113

Laboratory:

Tuesday	Sec 01	10:30-12:20 AM	THRN 2135*
		10:30-12:20 AM	THRN 2336#

Friday	Sec 02	1:30PM - 3:20PM	THRN 2135*
		1:30-3:20 PM	THRN 1004#
Thursday	Sec 03	11:30-1:20 PM	THRN 2135*
		11:30-1:20 PM	THRN 1004#
Wednesday	Sec 04	3:30-5:20 PM	THRN 2135*
		3:30-5:20 PM	THRN 2336#

*THRN 2135 is the Biomechanics Lab; #THRN 2336 and #THRN 1004 are computer labs where students will process their data using Matlab™

1.4 Final Exam

Saturday December 7, 2019 11:30-1:30 PM Location TBA

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2 Instructional Support

2.1 Instructional Support Team

Instructor: Michele Oliver
Email: moliver@uoguelph.ca
Telephone: +1-519-824-4120 x52117
Office: THRN 1335

Lab Technician: Ahmed Mezil
Email: amezil@uoguelph.ca
Telephone: +1-519-824-4120 x53729
Office: THRN 2308

2.2 Teaching Assistants

Teaching Assistant: Drew Anderson
Email: dander04@uoguelph.ca

Teaching Assistant: Sarah Dedecker
Email: sdedecke@uoguelph.ca

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3 Learning Resources

3.1 Required Resources

Course Website (Website)
http://courselink.uoguelph.ca
Course material, news, announcements, and grades will be regularly posted to the ENGG*3150 CourseLink site. You are responsible for checking the site regularly.

3.2 Recommended Resources

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) (Textbook)

Any Matlab™ textbook. One example is: S. Attaway. Matlab – A Practical Introduction to Programming and Problem Solving – 3rd Edition. Butterworth-Heinemann (Elsevier), 2013. (Textbook)

3.3 Additional Resources

Lecture Information (Notes)
Selected lecture notes will be posted on CourseLink.

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

Assignments (Notes)
Download the assignments according to the schedule given in this handout.

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

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4 Learning Outcomes

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.

4.1 Course Learning Outcomes

By the end of this course, you should be able to:

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

4.2 Engineers Canada - Graduate Attributes (2018)

Successfully completing this course will contribute to the following:

#	Outcome	Learning Outcome
3	Investigation	1, 2
3.1	Propose a working hypothesis	1, 2
3.2	Design and apply an experimental plan/investigative approach (for example, to characterize, test or troubleshoot a system)	1, 2
3.3	Analyze and interpret experimental data	1, 2
3.4	Assess validity of conclusions within limitations of data and methodologies	1, 2
5	Use of Engineering Tools	1, 2
5.1	Select appropriate engineering tools from various alternatives	1, 2
5.2	Demonstrate proficiency in the application of selected engineering tools	1, 2
5.3	Recognize limitations of selected engineering tools	1, 2
7	Communication Skills	2
7.1	Identify key message(s) and intended audience in verbal or written communication as both sender and receiver	2
7.3	Construct the finished elements using accepted norms in English, graphical standards, and engineering conventions, as appropriate for the message and audience	2
7.4	Substantiate claims by building evidence-based arguments and integrating effective figures, tables, equations, and/or references	2
10	Ethics & Equity	2
10.3	Demonstrate values consistent with good ethical practice, including equity, diversity, and inclusivity	2

5 Teaching and Learning Activities

5.1 Lecture

Topics:

Week of	Approximate General Lecture Topics for week
Sept. 2	Introduction to biomechanics
9	Introduction to biomechanics cont'd; Human ethics approval process
16	General data collection and processing techniques
23	Importance of calibration, instrumentation limitations, error/uncertainty analysis techniques
30	Kinematics analysis and data collection techniques
Oct. 7	Clinical applications of motion capture
14	Kinetics analysis and data collection techniques
21	Electromyography and muscle mechanics
28	Clinical applications of electromyography and advanced processing techniques
Nov. 4	Biomechanical modeling

Week of	Approximate General Lecture Topics for week
11	Occupational biomechanics
18	Special Topics and Group Project Presentations
25	Group Project Presentations

5.2 Lab

Topics:

Week of	Laboratory
Sept. 2	
9	CORE Human Ethics Online Course Introduction to Matlab™
16	Goniometer Calibration and Joint angle determination and Data processing using Matlab™
23	VICON

Week of	Laboratory
30	VICON Data Processing and Visual 3D
Oct. 7	EMG and Force Plate
14	No Laboratories (Fall Study Break)
21	EMG and Force Plate Data Processing
28	Project Data Collection and Data Analysis
Nov. 4	
11	Data Analysis, Project Write-up
18	
25	

5.3 Other Important Dates

Friday, September 6th 2019: First day of class

Monday and Tuesday, October 14th and 15th : Fall Study Break

Friday November 29th, 2019: Last day of class (Classes rescheduled from Monday, October

14th, Monday schedule in effect)

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6 Assessments

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, the CORE completion certificate and the Project Experiment Checklist 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.

6.1 Marking Schemes & Distributions

Name	Scheme A (%)
Completion of CORE Human Ethics Course	2
Goniometer Calibration and Joint Angle Determination One Page Lab Writeup + Matlab Variable Dictionary	6.5
One Page Project Description	5
VICON one page laboratory write-up	6.5
EMG and Force Plate two page laboratory write-up	10
Project Experiment Checklist	5
Presentation	5
Project Write-Up in Journal Format	15
Final Exam	45
Total	100

6.2 Assessment Details

Completion of CORE Human Ethics Online Course (2%)
Date: Mon, Sep 16, 5:00 PM
Learning Outcome: 1, 2
Put Certificate of Completion in Courselink DropBox

(https://tcps2core.ca/welcome)

(http://www.pre.ethics.gc.ca/eng/education/tutorialdidacticiel/)

Please note that you must complete the CORE prior to being allowed to participate in the course labs and project. If you have previously completed the CORE, you do not need to repeat it and will receive 2% towards your course grade. However, to receive the 2.5%, you must submit the CORE Certificate of Completion in the Courselink DropBox prior to the due date and time.

Goniometer Calibration and Joint Angle Determination One Page Lab Write-Up + Matlab Variable Dictionary (6.5%)
Date: Prior to your scheduled lab period during the week beginning September 23rd
Learning Outcome: 1, 2
Submit two electronic copies:

Copy 1: CourseLink Dropbox

Copy 2: Crowdmark

VICON one page laboratory write-up (6.5%)
Date: Prior to your scheduled lab period during the week beginning October 7th
Learning Outcome: 1, 2, 3
Submit two electronic copies:

Copy 1: CourseLink Dropbox

Copy 2: Crowdmark

One Page Project Description (5%)
Date: Fri, Oct 11, 5:00 PM
Learning Outcome: 1, 2, 3
One person from each group should submit two electronic copies:

Copy 1: CourseLink Dropbox

Copy 2: Crowdmark

In addition to one person from each group submitting the electronic copies, all class members must submit a completed Distribution of Effort form (obtained from the class Courselink site) in order to receive a grade for the One Page Project Description.

Group Project Experiment Check-List (5%)

Date: Prior to your scheduled lab period during the week beginning October 21st
One person from each group should submit one electronic copy to Crowdmark.

In addition to one person from each group submitting the electronic copies, all class members must submit a completed Distribution of Effort form (obtained from the class Courselink site) in order to receive a grade for the Group Project Experiment Check-List.

EMG and Force Plate Lab two page laboratory write-up (10%)

Date: Prior to your scheduled lab period during the week beginning October 28th
Learning Outcome: 1, 2, 3
Submit two electronic copies:

Copy 1: CourseLink Dropbox

Copy 2: Crowdmark

Presentation (5%)

Date: Last 4-5 days of Class
Learning Outcome: 1, 2, 3
11 minute presentation describing results of group project (9 minute presentation; 2 minutes questions)

All class members must submit a completed Distribution of Effort form (obtained from the class Courselink site) in order to receive a grade for the Presentation.

Project write-up in journal format (15%)

Date: Fri, Nov 29, 5:00 PM
Learning Outcome: 1, 2, 3
One person from each group should submit two electronic copies:

Copy 1: CourseLink Dropbox

Copy 2: Crowdmark

In addition to one person from each group submitting the electronic copies, all class members must submit a completed Distribution of Effort form (obtained from the class

Courselink site) in order to receive a grade for the Project write-up.

Final Exam (45%)
Date: Sat, Dec 7, 11:30 AM - 1:30 PM, TBA
Learning Outcome: 1, 2, 3

6.3 Note:

Failure to submit a distribution of effort (DOE) form for any group work assessments will result in an incomplete grade for group work course components. 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 may 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.

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7 Course Statements

7.1 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-accomrelig.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 writeup/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, appropriate documentation must be obtained and provided to the course instructor. Arrangements must be made with the TA or Laboratory Technician to complete a makeup lab.

Late Reports: Late submissions of lab reports/assignments/project write-ups, presentations will not be accepted unless academic consideration has been granted.

CORE Human Ethics Online Course: It is mandatory to complete this course prior to beginning data collection for the course project. If a certificate of completion is not handed in, students will not be allowed to be involved in the course project.

8 School of Engineering Statements

8.1 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. Some written lecture notes will be presented only in class. 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 labs.

8.2 Students' Learning Responsibilities

Students are expected to take advantage of the learning opportunities provided during lectures and lab sessions. 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.

8.3 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.

9 University Statements

9.1 Email Communication

As per university regulations, all students are required to check their e-mail account regularly: e-mail is the official route of communication between the University and its students.

9.2 When You Cannot Meet a Course Requirement

When you find yourself unable to meet an in-course requirement because of illness or compassionate reasons please advise the course instructor (or designated person, such as a teaching assistant) in writing, with your name, id#, and e-mail contact. The grounds for Academic Consideration are detailed in the Undergraduate and Graduate Calendars.

Undergraduate Calendar - Academic Consideration and Appeals
https://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-ac.shtml

Graduate Calendar - Grounds for Academic Consideration
https://www.uoguelph.ca/registrar/calendars/graduate/current/genreg/index.shtml

Associate Diploma Calendar - Academic Consideration, Appeals and Petitions
https://www.uoguelph.ca/registrar/calendars/diploma/current/index.shtml

9.3 Drop Date

Students will have until the last day of classes to drop courses without academic penalty. The deadline to drop two-semester courses will be the last day of classes in the second semester. This applies to all students (undergraduate, graduate and diploma) except for Doctor of Veterinary Medicine and Associate Diploma in Veterinary Technology (conventional and alternative delivery) students. The regulations and procedures for course registration are available in their respective Academic Calendars.

Undergraduate Calendar - Dropping Courses
https://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-drop.shtml

Graduate Calendar - Registration Changes
https://www.uoguelph.ca/registrar/calendars/graduate/current/genreg/genreg-reg-regchg.shtml

Associate Diploma Calendar - Dropping Courses
https://www.uoguelph.ca/registrar/calendars/diploma/current/c08/c08-drop.shtml

9.4 Copies of Out-of-class Assignments

Keep paper and/or other reliable back-up copies of all out-of-class assignments: you may be

asked to resubmit work at any time.

9.5 Accessibility

The University promotes the full participation of students who experience disabilities in their academic programs. To that end, the provision of academic accommodation is a shared responsibility between the University and the student.

When accommodations are needed, the student is required to first register with Student Accessibility Services (SAS). Documentation to substantiate the existence of a disability is required; however, interim accommodations may be possible while that process is underway.

Accommodations are available for both permanent and temporary disabilities. It should be noted that common illnesses such as a cold or the flu do not constitute a disability.

Use of the SAS Exam Centre requires students to book their exams at least 7 days in advance and not later than the 40th Class Day.

For Guelph students, information can be found on the SAS website
https://www.uoguelph.ca/sas

For Ridgetown students, information can be found on the Ridgetown SAS website
https://www.ridgetownc.com/services/accessibilityservices.cfm

9.6 Academic Integrity

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 encourages academic integrity. 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 or faculty advisor.

Undergraduate Calendar - Academic Misconduct
https://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-amisconduct.shtml

Graduate Calendar - Academic Misconduct
https://www.uoguelph.ca/registrar/calendars/graduate/current/genreg/index.shtml

9.7 Recording of Materials

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

9.8 Resources

The Academic Calendars are the source of information about the University of Guelph's procedures, policies, and regulations that apply to undergraduate, graduate, and diploma programs.

Academic Calendars
https://www.uoguelph.ca/academics/calendars
