



# ENGG\*4400 Biomechanical Engineering Design

Fall 2017

Sections(s): C01

School of Engineering

Credit Weight: 0.75

Version 1.00 - September 05, 2017

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## 1 Course Details

### 1.1 Calendar Description

This course covers concept development, design, modeling, manufacture and testing of biomechanical devices including athletic equipment, assistive devices, medical implants and tools. Other topics include the biomechanical factors influencing design, regulatory issues, current development trends, and the possible future direction of design and technology.

**Pre-Requisite(s):** 6.00 ENGG credits including ENGG\*3150, ENGG\*3170

### 1.2 Timetable

**LECTURES:** MCKN 225 Tuesday & Thursday 8:30-9:50 AM

**LABS:** THRN 2135

Lab times are as follows:

0101	Wednesday	1:30 - 3:20 PM
0102	Tuesday	3:30 - 5:20 PM
0103	Monday	2:30 - 4:20 PM

Attendance is expected for all lectures and for your assigned lab sections. Students are responsible for all information presented in the class and labs and student participation is highly encouraged. There will be certain lab periods where guests and material will be made available for the design project. This material and the guests may only be available on a limited basis. It is the responsibility of the students to ensure they are present during these times.

### 1.3 Final Exam

Location: TBA Friday December 8, 2:30-4:30 PM

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## 2 Instructional Support

### 2.1 Instructor(s)

**Scott Brandon**

Email: scott.brandon@uoguelph.ca

Telephone: +1-519-824-4120 x52875

Office: THRN 2415

Office Hours: By appointment

### 2.2 Teaching Assistant(s)

Name	Details
Patrick Egan	pegan@mail.uoguelph.ca Please use lab hours and by appointment

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## 3 Learning Resources

### 3.1 Required Resources(s)

**Course Website (Website)**

<http://courselink.uoguelph.ca>

Material relevant to the course including news, announcements, and grades will be regularly posted to the ENGG\*4400 Courselink site. You are responsible for checking the site regularly.

### 3.2 Additional Resources(s)

**Lecture Information (Notes)**

Lecture notes will be posted on the course website. However, assignments and examinations will also cover additional content that is discussed and presented during lectures.

**Lab Information (Lab Manual)**

The Teaching Assistant will be available in lab periods to direct activities and answer questions. The Teaching Assistant will provide resources regarding tutorials and links to related web pages.

### 3.3 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.

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## 4 Learning Outcomes

## 4.1 Course Learning Outcomes

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

1. Identify common biomechanical device problems
2. Understand the regulatory framework for biomedical devices
3. Specify suitable device materials, and manufacturing strategies
4. Apply engineering principles to the development of novel biomechanical designs
5. Design and manage the development of biomedical devices.

## 4.2 Engineers Canada - Graduate Attributes

Successfully completing this course will contribute to the following:

#	Outcome Set Name	Course Learning Outcome
1	Knowledge base	3, 5
1.4	Comprehend and apply program-specific engineering concepts	3, 5
2	Problem analysis	1
2.1	Formulate a problem statement in engineering and nonengineering terminology	1
2.3	Identify, organize and justify appropriate information	1
4	Design	5
4.2	Construct design-specific problem statements	5
4.3	Create engineering design solutions	5
5	Use of engineering tools	3, 4
5.1	Select appropriate engineering tools from various alternatives	3
5.2	Apply selected engineering tools	3, 4
5.3	Recognize limitations of selected engineering tools	3
8	Professionalism	2, 5
8.1	Identify what it means to be a professional and distinguish between legislated and non-legislated based professions	2
8.2	Perform in a professional manner	5
9	Impact of engineering on society and environment	1, 2
9.1	Analyze the social, environmental and legal aspects of engineering activity	2
9.3	Identify the impact of introducing innovative technologies to solve engineering problems	1
12	Life-long learning	1

#	Outcome Set Name	Course Learning Outcome
12.1	Identify personal career goals and opportunities for professional development	1
12.2	Analyze a self-assessment of skills relative to SOE defined learning outcomes	1

## 5 Teaching and Learning Activities

### 5.1 Lecture Schedule (Subject to change at the discretion of the instructor)

Lectures	Lecture Topics	Learning Objectives
1	Introduction to biomechanical design & course administration	1
2	Project introduction	1, 5
3	Medical device regulation, intellectual property, biomechanical industry overview	2
4	Engineering drawing, dimensioning, tolerancing	4, 5
5	Design process & quality controls	2, 4, & 5
6-9	Biomechanical data sources, types, & characteristics	4 & 5
10-12	Functional requirements & testing	1, 2, 4 & 5
13-15	Materials	1, 2, 3 & 4
16	Guest lecture - resumé and cover letter	1, 5
17-18	Manufacturing	1, 3, 4, & 5

19-21	Case Studies & Guest Lectures TBD	1 - 5
22-23	Final design presentations	1 - 5
24	Review	1 - 5

## 5.2 Lab Schedule

Week	Lab Activity	Lea
1-2	No Lab	
3	Biomechanics lab review & intro to Visual3D	
4	Lab assignment, group formation, planning, equipment exploration	
5	Lab data collection (40min/group)	
6-9	Coaching: Design project progress & optional data collection, report preparation	
10	Resumé workshop	
11-12	Coaching: Design report progress & report preparation	

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## 6 Assessments

### 6.1 Marking Schemes & Distributions

Name	Scheme A (%)
Concept Sketches	5.00
3-D Modelling	5.00

Name	Scheme A (%)
Client Management	5.00
Resume	5.00
Lab Submission	10.00
Design Project Deliverables	45.00
Final Exam	25.00
Total	100.00

## 6.2 Assessment Details

### Concept Sketches

**Due:** Week 4

### 3-D Modelling

**Date:** Week 5

### Lab Submission

**Date:** Week 7

### Client Management

**Date:** Week 9

### Resume

**Date:** Week 10

### Design Project Deliverables

**Date:**

TBD (Report, Presentation, etc)

### Final Exam

**Date:** , TBA on Webadvisor

December 8, 2:30 - 4:30 PM

## 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:

**Passing grade:** In order to pass the course, your overall average must be 50% or above and your Final Exam mark must be 50% or above. A mark of below 50% in the Final Exam will result in that mark being assigned for the entire course.

**Late Submission Penalties:**

- 10% penalty if the report is less than 1 hour late (as denoted by Courselink).
- 40% penalty if the report is between 1 hour and 24 hours late.
- 80% penalty if the report is between 24 and 48 hours late
- 100% penalty (i.e., zero) if the report is more than 48 hours late.

**The Design Project:** This project forms a major activity in the course. Teams will be asked to evaluate individual team member participation. Evidence of lack of participation by individuals will result in a modified grade assessment for those students.

**Final Exam:** The Final Exam will be used to assess your understanding of the lecture material. The Final Exam will be closed book with no electronic aids permitted.

## 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 regulations and procedures for [Academic Consideration](#) are detailed in the Undergraduate Calendar.

## 9.3 Drop Date

Courses that are one semester long must be dropped by the end of the fortieth class day; two-semester courses must be dropped by the last day of the add period in the second semester. The regulations and procedures for [Dropping Courses](#) are available in the Undergraduate Calendar.

## 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.

More information: [www.uoguelph.ca/sas](http://www.uoguelph.ca/sas)

## 9.6 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 or faculty advisor.

The [Academic Misconduct Policy](#) is detailed in the Undergraduate Calendar.

## 9.7 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, a classmate 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 which apply to undergraduate, graduate and diploma programs.

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