ENGG*4110 Biological Engineering Design IV

Winter 2019
Section(s): C01

School of Engineering
Credit Weight: 1.00
Version 1.00 - January 06, 2019

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1 Course Details

1.1 Calendar Description

This is the capstone design course for the Biological Engineering program. Teams normally of 3-4 students apply engineering analysis and design principles to a problem in a biological system or process. A completely specified solution at the level of preliminary or final design is required, including assessment of socio-economic and environmental impact. This is a small group design that requires reports and a poster presentation to a professional standard. Ethics and legal case studies relevant to professional engineering practice are presented during the lectures. Students who have achieved a PASS in ENGG*4000 are eligible for this course and will be added to the course prior to the first day of classes.

Pre-Requisite(s):	ENGG*4000
Restriction(s):	Registration in semester 8 (last semester) of the B.Eng. program and in a max. of 3.25 credits registration. Students must have a minimum cumulative average of 60% or higher in ALL ENGG courses. Instructor consent required. Restriction waiver requests are handled by the Director, School of Engineering, or designate.

1.2 Timetable

Lectures: Tuesday from 07:00 pm to 08:50 pm

THRN, Room 1200

Poster Presentation: Design Day - Thursday, April 04, 2019 from 10:00 am to 2:00 pm

Engineering Complex

1.3 Final Exam

Apr 15, 2019 (Monday)

0830 am to 1030 am

Exam time and location is subject to change. Please see WebAdvisor for the latest information.

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2 Instructional Support

2.1 Instructional Support Team

Instructor: Ping Wu P.Eng.
Email: pingwu@uoguelph.ca
Telephone: +1-519-824-4120 x53385
Office: THRN 2361

Course Co-ordinator: Kimberley Thompson P.Eng.
Email: kithomps@uoguelph.ca
Telephone: +1-519-824-4120 x56986
Office: THRN 1410

2.2 Teaching Assistant(s)

Teaching Assistant: Alison Gowman EIT
Email: agowman@uoguelph.ca

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3 Learning Resources

3.1 Required Resource(s)

Course Website (Website)
https://courselink.uoguelph.ca
Course material, news, announcements, and grades will be posted to the **ENGG*41X** Courselink site. You are responsible for checking the site 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 students.

Law for Professional Engineers (Textbook)
Marston, D.L. (2008) ***Law for Professional Engineers (Fourth Edition)***. McGraw-Hill Ryerson. Toronto. ISBN 978-0-07-098521-6

Canadian Professional Engineering and Geoscience (Textbook)
Andrews, G.C. (2009) ***Canadian Professional Engineering and Geoscience***, Practice and Ethics 5th Edition, Nelson, ISBN 13: 978-0-17-650990-3

3.2 Recommended Resource(s)

Practical Law of Architecture, Engineering and Geoscience (Textbook)

Samuels, B. M and Sanders, D. R. (2011) ***Practical Law of Architecture, Engineering and Geoscience***, Pearson, ISBN 978-0-13-700408-9

3.3 Additional Resource(s)

Other Resources (Other)

Lecture: Notes are not available for this course. However, supporting information is posted on Courselink site.

Memos: Download the memo requirements according to the schedule given in this handout and posted on Courselink.

Projects: Download the assignments according to the schedule given in this handout and posted on Courselink.

School: Students are encouraged to design and build components or prototypes of devices if possible. Facilities of the School machine shop, access to all undergraduate laboratories and associated instruments and equipment are available subject to approval. The need for, and costs of, materials, special services or use of other facilities should be foreseen. Small grants may be available to purchase materials or components which are essential to the project but cannot be sourced within the School. ***Requests must be made to the instructor using the posted Supplies_Tech Request Form and/or Equipment Request Form, specifying the exact nature of the service required.*** The sooner these requests have been submitted the better. The funds available depend upon the School's budget, and are not guaranteed.

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4 Learning Outcomes

The goal is to prepare students to deal with open-ended, multi-faceted design problems similar to those that they will encounter as working professionals.

4.1 Course Learning Outcomes

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

1. Apply their academic knowledge to work on a complex engineering problem identified in ENGG*4000.
2. Collect and analyze information and synthesize solutions taking into account significant echnological, commercial, social and environmental factors.
3. Prepare an interim report that summarizes the status of the project at week five.
4. Summarize and communicate the design solution in written and graphical form as a final report.
5. Concisely explain the various stages of the design (proposal, interim and final) in a

memo.

6. Concisely articulate the design results in a poster that is orally presented to a group of P.Engs. at the end of the semester.
7. Explain the responsibilities of engineers to society and demonstrate the expectations in professional practice through class discussions, report submission and the final exam.
8. Participate in and further develop group interaction skills, which are monitored through the PEAR (Peer Evaluation Assessment and Review) software.
9. Prepare a reflection on project management and work experience relative to PEO's work experience requirement for licensure.

4.2 Life-Long Learning

A component of Life-Long Learning is the School's Exit Survey. This Exit Survey provides valuable insight into student development and expectations as they enter the workforce. **Information provided to the School through the Exit Survey is confidential but completion is mandatory. Failure to complete the Exit Survey will result in an Incomplete Grade for the course.** Additional information on the Exit Survey will be provided in Courselink and in class.

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5 Teaching and Learning Activities

Course Format

Classes are scheduled for each week on Tuesday. In addition to classroom time, where active learning is being promoted, it is expected that each team member will spend an average of 15 to 20 h per week on the design project over the semester, as this course is equivalent to two regular senior engineering science courses. The active learning component will require group discussions and presentations on material related to the lecture material.

Students work in teams of three or four persons. Smaller (or larger) groups are only considered by the course coordinator under extraordinary circumstances, and approval is conditional on availability of sufficient resources. Inter-disciplinary groups are encouraged if a particular problem has sufficient scope to provide appropriate experience to all team members. ***It is expected that the selection of the team, the project and the faculty advisor was arranged before the start of the semester.***

Teams are encouraged to use the design studios scattered throughout the Engineering Complex. Access to these rooms can be facilitated through the faculty advisor.

Each team is advised by a School faculty member responsible for helping to delineate the terms of reference for the project, providing guidance where necessary, and evaluating all written reports. The projects are self-administered: each team must carry out planning and execution of the project on its own. Accordingly, team members are required to keep a log book on the activities each individual completes. ***Team members and their faculty***

advisor should discuss and record concerns about the group's progress at the interim report stage and take appropriate action. The respective log books will be reviewed in deciding the appropriate action.

5.1 Lecture

Topic(s): History
History and evolution of the engineering profession in Canada. [GA 8]

The Engineering Proposal. [GA 6]

Topic(s): Regulation
Regulation of engineering in Ontario; the Professional Engineers Act; Regulation 941, Professional
Registration. [GA 8]

Creativity and idea generation for design. [GA 4]

Topic(s): Professionalism, Moral Reasoning and Ethics
Professionalism, Moral Reasoning and Ethics. [GA 8 & 12]

Interim (Progress) Report. [GA 6]

Topic(s): Engineering Code of Ethics
The Engineering Code of Ethics. [GA 10]

The Iron Ring Ceremony.

Topic(s): Ethical dilemmas
Ethical dilemmas and difficult decisions, PEO Video Resource Case Study, Case studies: lessons
from the blue pages, disciplinary measures. [GA 10]

Design stages - tools and techniques. [GA 5]

Topic(s): Tort Law and Professional Liability
Tort Law and Professional Liability. [GA 10]

The Final Design Report and Poster. [GA 6]

Topic(s): Contract Law
Contract Law. [GA 10]

Topic(s): Professional Practice Examination
Professional Practice Examination. [GA 8, 10 & 12]

5.2 Other Important Dates

Monday, January 7: Classes commence

Monday, February 18 – Friday, February 22: Winter Break

Tuesday, March 5: Iron Ring Ceremony

Friday, March 8: 40th Class Day. Last day to drop winter semester courses.

Thursday, April 4: Design Day

Friday, April 5: Last day of classes

5.3 Student Design Activity and Milestones

Week No.	Task
0	Selection of project, formation of team, and selection of faculty advisor.
1	Confirm terms of reference and schedule faculty advisor meeting times. Prepare project proposal summary memo. Submit an electronic copy of the summary memo to Dropbox before Tuesday Jan 15, 2019 at 17:00 h.
2 - 6	Analyze and research problem, develop design alternatives, evaluate and specify prime contender. Before Friday Feb. 15, 2019, 17:00 h., submit hard copy of interim report to faculty advisor (if requested) and post electronic copy to Dropbox. Electronic DOE completed on PEAR.
7 - 11	Develop final design/prototype, evaluate and refine.
12	Prepare design report, present findings with the poster and complete Exit Survey. (i) Poster presentation - Design Day, Thursday April 4, 2019, 10:00-14:00 h. Location Engineering Complex. **Note! Attendance of all group members at the final poster presentation and evaluation is a course requirement.** (ii) Monday April 8, 2019, 09:00 h, submit hard copy of final report to faculty advisor (if required) and post electronic copy to Dropbox. Electronic DOE completed on PEAR. (iii) Before Monday April 08, 2019, 17:00 h, complete the confidential on-line Exit Survey. Further details in Courselink.

6 Assessments

6.1 Marking Schemes & Distributions

The final grades will be determined from the team work submitted to the faculty advisor and the course instructor. The submitted work will be evaluated according to the Rubrics posted on Courselink, with the assessment weighted as follows:

Proposal Memo (formative only)

Interim report (see Note #1): 20%

Final report (see Note #1): 40%

Poster presentation: 10%

Reflection: 5%

Final memo: 3%

Logbook: 2%

Online Quizzes: P/F

Exit Survey (see Note #2): 0%

Final Exam (see Note #2): 20%

The final exam is an important assessment in this course. In the event that a student fails the final exam, the course grade calculation will change to the following scheme:

Proposal Memo (formative only)

Interim report (see Note #1): 15%

Final report (see Note #1): 30%

Poster presentation: 7%

Reflection: 3%

Final memo: 3%

Logbook: 2%

Online Quizzes: P/F

Exit Survey (see Note #2): 0%

Final Exam (see Note #2): 40%

6.2 Assessment Details

Proposal Memo (formative only) (0%)
Learning Outcome(s): 4,8,9
Proposal Memo: 15 Jan. 2019 @ 17:00 hr (formative only)

On-line Quizzes (pass or fail) (0%)
22 Jan., 05 March and 01 Apr (on course readings; taken until passed; if not INC will be given for course)

Interim Report (See Note #1) (20%)
Learning Outcome(s): 1,3
15 Feb, 2019 @ 17:00 hr

Memos/Reflection (5%)
Learning Outcome(s): 4,8,9
01 Mar, 2019 @ 17:00 hr (worth 5 %)

Poster Presentation (10%)
Learning Outcome(s): 5
04 Apr. 2019 @ 10:00 hr to 14:00 hr

Final Report (See Note#1) (40%)
Learning Outcome(s): 1,2,4,5,6,7,8,9
08 Apr. 2019 @ 09:00 hr

Final Memo (3%)
Learning Outcome(s): 4,8,9
08 Apr. 2019 @ 09:00 hr (worth 3 %)

Exit Survey (See Note #2) (0%)
Learning Outcome(s): 7,7
08 Apr. 2019 @ 17:00 hr

Logbook (2%)
Learning Outcome(s): 4,8,9
08 Apr, 2019 @ 17:00 hr

Final Examination (20%)
Learning Outcome(s): 7,7
15 Apr, 2019 08:30 hr to 10:30 hr

6.3 Supporting Information for Assessments

1. Failure to submit a distribution of effort (DOE - completed via PEAR - details available on Courselink) will result in an incomplete grade for this component of the course. Individual

grades in a group will only be adjusted by the course coordinator if substantial differences in effort are documented in the individual log books (failure to provide an up to date log book will stop the grade adjustment process), information submitted via the electronic DOE and evidence of the steps taken to address the uneven effort. These steps include a group discussion with the presence of the project advisor or 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.

2. A special component of 41x0 is the Exit Survey, which provides important information to the Graduate Attribute component of the accreditation requirements in the School. More information on the Exit Survey is given in Section 4.4. **Failure to complete the Exit Survey will result in an Incomplete Grade for the entire course.**

3. In the event that a student fails the final exam, the course grade calculation will change to the alternative grading scheme.

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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 at 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, students must obtain an overall grade of 50% or higher on the aggregate of all the course work outlined in Section 6 Assessment. Please note the alternate grading scheme outlined in Section 6 in the event that a student fails the final exam.

Late Reports: There will be no extension of the deadlines for submissions, except for serious health or compassionate reasons, with the appropriate documentation. Just like the consulting world where projects are not awarded if the proposals are late, a grade of zero will be given for late submissions.

Certification: Students must write their PEO SMP (Student Membership Program) number on all submitted work. This signifies that the SOE Code of Ethics was adhered to. For group projects, students must also state that they contributed to the group effort in an equitable manner.

Logbook: Each student should keep a logbook detailing the activities performed that are related to the course. It should include record of all group and individual activites, lecture notes, meeting minutes, work distribution, design notes, calculations, planning, decisions, sketches and all relevant information. The logbook should be signed off by other members of the group on a regular basis. The logbook will be reviewed by the instructor, course coordinator, faculty advisor and TA from time to time.

7.2 Course Specific Lab and Machine Shop Safety

Safety is critically important to the School and is the responsibility of all members of the School: faculty, staff and students. ENGG*41X0 does not have a laboratory component for the lecture portion for the course. However, for the project component, some student teams may be in the shop and or in the lab to build and test their prototype or final design. When in the shop and the lab, students must adhere to the applicable safety requirements and regulations. In addition, you are responsible for reporting all safety issues to the laboratory supervisor, GTA or faculty responsible.

7.3 Photo, Video, Media Consent

Photos and videos will be taken throughout the semester for the purpose of communicating to the public about the engineering program at UofG. These pictures and videos may include poster presentations and showcasing of prototypes on Design Day. The final memo will also be included in a compendium and on the university's website, which will be made accessible to the public.

Please follow the link to the university's website to download the consent form:

https://news.uoguelph.ca/guides/brand-guide/imagery/copyright-and-consent/

The completed consent form should be submitted individually to the Courselink dropbox.

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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.

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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

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 course registration are available in the Undergraduate and Graduate 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

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 can be found on the SAS website
https://www.uoguelph.ca/sas

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
