ENGG*3100 Engineering and Design III

01

Winter 2020
Section(s): C01

School of Engineering
Credit Weight: 0.75
Version 1.00 - January 06, 2020

---

1 Course Details

1.1 Calendar Description

This course combines the knowledge gained in the advanced engineering and basic science courses with the design skills taught in ENGG*1100 and ENGG*2100 in solving open-ended problems. These problems are related to the student's major. Additional design tools are presented, including model simulation, sensitivity analysis, linear programming, knowledge-based systems and computer programming. Complementing these tools are discussions on writing and public speaking techniques, codes, safety issues, environmental assessment and professional management. These topics are taught with the consideration of available resources and cost.

Pre-Requisites:	Registration in the BENG program and completion of 6.00 credits of ENGG courses including ENGG*2100
Restrictions:	Students must have a minimum cumulative average of 60% or higher in ALL ENGG courses. Restriction waiver requests are handled by the Director, School of Engineering, or designate.

1.2 Course Description

This course builds on the design skills taught previously and focuses on a project-based model of learning. The lab time is designed to use a studio-style pedagogical approach to design. Each student is to apply the knowledge that they learned in their discipline-specific courses in the design environment.

1.3 Timetable

Lectures:

Tuesday	14:30-15:50	WMEM 103
Thursday	14:30-15:50	WMEM 103

Design Labs:

0101	Monday	8:30 - 10:20	THRN 1002, 1006, 1435
0104	Tuesday	8:30 - 10:20	THRN 1002, 1006, 1435
0105	Wednesday	8:30 - 10:20	THRN 1002, 1006, 1435
0102	Thursday	8:30 - 10:20	THRN 1002, 1006, 1435
0103	Friday	8:30 - 10:20	THRN 1002, 1006, 1435

1.4 Final Exam

No Final Exam.

---

2 Instructional Support

2.1 Instructional Support Team

Instructor: Andrea Bradford
Email: abradfor@uoguelph.ca
Telephone: +1-519-824-4120 x52485
Office: THRN 1342

Instructor: Eran Ukwatta
Email: eukwatta@uoguelph.ca
Telephone: +1-519-824-4120 x53404
Office: RICH 1507

Instructor: Ping Wu
Email: pingwu@uoguelph.ca
Telephone: +1-519-824-4120 x58451
Office: THRN 2361

Instructor: Ryan Clemmer
Email: rclemmer@uoguelph.ca
Telephone: +1-519-824-4120 x52132

Office: THRN 1337

Instructor: Manickavasagan Annamalai
Email: mannamal@uoguelph.ca
Telephone: +1-519-824-4120 x53499
Office: THRN 2401

2.2 Teaching Assistants

Teaching Assistant: Samantha Mehltretter
Email: mehltres@uoguelph.ca

Teaching Assistant: Stephen Stajkowski
Email: stajkows@uoguelph.ca

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

Teaching Assistant: Kjeld Meereboer
Email: kmeerebo@uoguelph.ca

Teaching Assistant: Stephanie Roth
Email: sroth06@uoguelph.ca

Teaching Assistant: Tanzim Mashrur
Email: tmashrur@uoguelph.ca

Teaching Assistant: Anush Agarwal
Email: agarwala@uoguelph.ca

Teaching Assistant: Erika Ziraldo
Email: eziraldo@uoguelph.ca

Teaching Assistant: Mohamed Aly
Email: maly@uoguelph.ca

---

3 Learning Resources

3.1 Required Resources

Course Website (Website)
https://courselink.uoguelph.ca/
Course material, announcements, and grades will be regularly posted to the **ENGG*3100** Courselink site. You are responsible for checking the site regularly.

I < Clickers for quizzes (Equipment)
Please refer to the Courselink site for information on registering an i>Clicker.

3.2 Recommended Resources

Recommended Resource to Improve Your Technical Writing Skills (Textbook)

Thorsten Ewald. 2014. ***Writing in the Technical Fields, A Practical Guide***. Oxford Univ. Press.

---

4 Learning Outcomes

This course builds on the design skills taught previously and focuses on a project-based model of learning. The lab time is designed to use a studio-style pedagogical approach to design. Each student is to apply the knowledge that they learned in their discipline-specific courses in the design environment.

4.1 Course Learning Outcomes

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

1. Apply skills and knowledge from core and program specific engineering courses to a relevant engineering problem.
2. Define a problem with modest complexity and develop appropriate design criteria and constraints.
3. Build on experience with the design cycle to create, develop and assess a design solution.
4. Select, apply, and recognize the limitations of various engineering design tools, including model simulation and sensitivity analysis.
5. Critically evaluate information from many sources including engineering publications, data processing, and engineering analysis, and disseminate design information in technical communications.
6. Recognize professional and ethical behaviour and perform accordingly.
7. Analyze the social, environmental, economic and legal impacts of engineered designs.
8. Apply project management techniques to allocate time and resources and meet project objectives.
9. Work effectively and demonstrate leadership as a member of a team.

4.2 Engineers Canada - Graduate Attributes (2018)

Successfully completing this course will contribute to the following:

#	Outcome	Learning Outcome
1	Knowledge Base	1
1.3	Recall, describe and apply fundamental engineering principles and concepts	1
1.4	Recall, describe and apply program-specific engineering principles and concepts	1
2	Problem Analysis	5
2.2	Identify, organize and justify appropriate information, including assumptions	5
4	Design	2, 3, 7
4.1	Describe design process used to develop design solution	3
4.2	Construct design-specific problem statements including the definition of criteria and constraints	2, 7
4.3	Create a variety of engineering design solutions	3
4.4	Evaluate alternative design solutions based on problem definition	3, 7
4.5	Develop and refine an engineering design solution, through techniques such as iteration, simulation and/or prototyping	3
5	Use of Engineering Tools	4
5.1	Select appropriate engineering tools from various alternatives	4
5.3	Recognize limitations of selected engineering tools	4
6	Individual & Teamwork	9
6.3	Execute and adapt individual role to promote team success through, for example, timeliness, respect, positive attitude	9
6.4	Apply strategies to mitigate and/or resolve conflicts	9
6.5	Demonstrate leadership through, for example, influencing team vision and process, promoting a positive team culture, and inspiring team members to excel	9
7	Communication Skills	5
7.1	Identify key message(s) and intended audience in verbal or written communication as both sender and receiver	5

#	Outcome	Learning Outcome
7.3	Construct the finished elements using accepted norms in English, graphical standards, and engineering conventions, as appropriate for the message and audience	5
7.4	Substantiate claims by building evidence-based arguments and integrating effective figures, tables, equations, and/or references	5
7.5	Demonstrate ability to process oral and written communication by following instructions, actively listening, incorporating feedback, and formulating meaningful questions	5
8	Professionalism	6
8.3	Demonstrate professional behaviour	6
9	Impact of Engineering on Society and the Environment	3, 7
9.1	Analyze the safety, social, environmental, and legal aspects of engineering activity	3, 7
9.2	Evaluate the uncertainties and risks associated with engineering activities	3, 7
9.3	Anticipate the positive and negative impacts of introducing innovative technologies to solve engineering problems	7
10	Ethics & Equity	6
10.3	Demonstrate values consistent with good ethical practice, including equity, diversity, and inclusivity	6
11	Economics and Project Management	3, 7, 8
11.1	Apply project management techniques and manage resources within identified constraints	8
11.2	Identify risk and change management techniques, in the context of effective project management	8
11.3	Estimate economic impact and feasibility of an engineering project or design using techniques such as cost benefit analysis over the life of the project or design	3, 7
12	Life Long Learning	6
12.1	Identify personal career goals and opportunities for professional	6

#	Outcome	Learning Outcome
	development	
12.2	Self-assess skills relative to career goals and SOE defined learning outcomes	6
12.3	Demonstrate capability for continuous knowledge and skill development in a changing world	6

5 Teaching and Learning Activities

The following schedules of lecture and lab activities will be adjusted at the discretion of the instructors.

5.1 Lecture

Week 1

Topics: Course outline and learning outcomes. Problem-based learning approach. Review of design process and design competencies. Selecting an appropriate design project.

Week 2

Topics: Problem definition. Design constraints and criteria. Considering impacts on society and the environment. Lang School of Business perspective on problem definition.

Week 3

Topics: Project management (Part 1 - planning schedule, budget, responsibilities). Finding and accessing resources for design projects.

Week 4

Topics: Creativity in design. Generating design alternatives. Evaluating alternative designs including sensitivity analysis.

Week 5

Topics: Material selection. Technical writing workshop.

Week 6

Topics: Collaboration / leadership. Conflict resolution.

Week 7

Topics: Refining/optimizing designs. Life cycle assessment.

Week 8

Topics: Cost analysis. Sales and marketing.

Week 9

Topics: Project management - Part 2. Technical communications workshop.

Week 10

Topics: Due diligence. Ethics and equity.

Week 11

Topics: Design Project Presentations (Semi-finals)

Week 12

Topics: Career planning, 41x0, graduate studies. Design Day.

5.2 Lab

Week 1

Topics: Professionalism workshop.

Week 2

Topics: Lifelong learning skills. Team building. Support for project selection.

Week 3

Topics: Support for proposal preparation. Team skills.

Week 4

Topics: Support for proposal preparation.

Week 5

Topics: Proposal feedback. Support for preliminary design / interim report.

Week 6

Topics: Support for preliminary design / interim report.

Week 7

Topics: Feedback on design process and interim report.

Week 8

Topics: Support for preparation of technical memo.

Week 9

Topics: Support for preparation of design presentations.

Week 10

Topics: Design presentations.

Week 11

Topics: Presentation feedback. Support for final design reports.

Week 12

Topics: Lifelong learning activity.

5.3 Other Important Dates

Monday, January 6, 2020: First day of classes
Monday, February 17 – Friday, February 21, 2020: **Winter Break**
Thursday, April 2, 2020: **Design Day**
Friday, April 3, 2020: Last day of classes. Last day to drop one semester courses.

6 Assessments

6.1 Marking Schemes & Distributions

Individual grades may be reduced from team grades if peer comments and/or instructor observations indicate that an individual has not made an equitable contribution (quality or quantity) to the design and/or design deliverables.

Scheme B offers the opportunity for a team to shift some of the weight of the proposal to the interim report, if this is beneficial.

Name	Scheme A (%)	Scheme B (%)
Clicker Quizzes	10	10
Design Process Reviews	15	15
Design Proposal	10	5
Interim Design Report*	20	25
Technical Memo	10	10
Design Presentation	10	10
Final Design Report*	25	25
Total	100	100

6.2 Assessment Details

Clicker Quizzes (10%)
Date: Thursdays (Best 8 out of 10)
Learning Outcome: 1, 2, 3, 6, 7, 8, 9

Design Process (15%)
Date: Mon, Jan 13 - Fri, Apr 3
Learning Outcome: 5, 6, 8, 9
Individual design process grades will be based on teaching team observations, interim and final reflections and log books. Design competencies such as team skills, professionalism, and project management will be assessed.

Students are required to maintain a logbook to keep a record of all group and individual activities, notes, ideas, calculations, planning, decisions etc. Logbooks will be checked weekly.

The Interim Design Reflection and Final Design Reflection must be completed individually and submitted to Courselink within 24 h after the design report submission deadline. **Failure to earn a pass on either the interim or final design reflection will result in a penalty of 50% of the process grade. Failure to earn a pass on both the interim and final design reflection will result in a penalty of 100% of the process grade. The quality of the reflections may also affect adjustments to individual grades on design deliverables.**

Team and Project Selection (0%)
Date: Week 2, Submitted to CourseLink Dropbox.

Design Proposal (10%)
Date: Week 4, Submitted to CourseLink DropBox.
Learning Outcome: 1, 2, 3, 4, 5, 8
To ensure that design teams are on the right track for the design project, proposals are graded critically with constructive feedback that can be used to improve the subsequent deliverables. Teams have the opportunity to address the feedback and improve their grade on the interim report. If it is to the team's advantage, the weight of the proposal can be reduced to 5%, with a 5% increase in weight on the interim report (Scheme B).

Interim Report (20%)
Date: Week 6, Submitted to CourseLink Dropbox.
Learning Outcome: 1, 2, 3, 5, 7, 8
Note that an individual reflection is due within 24 h of the interim report submission deadline. Reflections are described further under design process.

Technical Memo (10%)
Date: Week 9, Submitted to CourseLink DropBox.
Learning Outcome: 1, 5, 7

Design Presentation (10%)
Date: Week 10, In Design Lab.
Learning Outcome: 1, 2, 3, 5, 6

Final Design Report (25%)
Date: Week 12, Submitted to CourseLink Dropbox.
Learning Outcome: 1, 2, 3, 4, 5, 7, 8
Note that an individual reflection is due within 24 h of the final report submission deadline. Reflections are described further under design process.

---

7 Course Statements

7.1 Engagement

Students are expected to spend about 15 h on academic tasks associated with a 0.75 credit course each week, including the lectures and labs. Active learning approaches will be incorporated into the lectures and student participation is highly encouraged. The course employs a project-based learning approach such that full engagement in the design project

activities is required to achieve the intended learning outcomes of the course.

7.2 Groupwork - Expectations

The dynamics of each learning activity should be based on professionalism and mutual respect. Everyone in the classroom has the right to participate and contribute. The learning environment must be free from harassment. Every student is expected to:

1. Maintain **courteous relations** with all members of their design team;
2. Maintain the **highest standards of integrity**, personal and professional conduct;
3. **Familiarize themself with and abide** by the letter and spirit of all applicable documents, policies, rules and regulations;
4. Comply with **both the letter and spirit of the law** to design a functional, safe, durable, cost effective, environmentally friendly, and socially beneficial design.
5. **Attend all Lab sessions**. If you are unable to make one of your lab sessions due to illness or extra-curricular responsibilities, it is essential that you let the professor know about your absence.
6. **Attend all group meetings.** If you are unable to attend a group meeting or expect to be late, it is essential that you clearly communicate with all members of your design team.
7. **Make an equal contribution to the work of the team**. Expectations for work quality and timing of deliverables must be communicated to and agreed upon by all group members.
8. Ensure that all **submitted work is original** or properly referenced.
9. Carefully **review any work** that is submitted by their group (and includes their name), even if it was completed by other group members.

7.3 Course Grading Policies

Lecture Activities and Quizzes: There will be a number of activities and i>clicker quizzes during the lectures throughout the semester. Students are required to be present and use their own i>clicker during the quizzes. Impersonating a classmate by using their clicker is an academic offense. **The activities and quizzes are intended to help you better understand the course content and enable you to apply it to the design project.** Information on registering an i>Clicker is posted on Courselink.

Submission Deadlines: Design deliverables are due on the day of the team's lab section by 10:59 pm. Individual reflections are due within 24h of the team deliverable submission.

Late Submissions: Late penalties for submissions will be applied as follows: 10% deduction for <1h late; 25% deduction for <12h late; and 50% deduction for <24 late. **Submissions that are more than 24 h late will receive a grade of zero**. Individual **reflections received more than 24 h late will not be graded** and cannot earn a Pass.

Certification: Students must write their PEO SMP (Student Membership Program) number on all submitted work. This signifies adherence to the SOE Code of Ethics and Professional

Conduct, including an equitable contribution to the group work.

Individual and Team Assessments: Individual grades may differ from team grades in positive and negative ways.

- Individuals demonstrating exceptional leadership based on peer comments and/or instructor observations may be awarded bonus marks at the discretion of the instructors.
- Individuals not carrying their weight (quality or quantity) based on peer comments and/or instructor observations may receive a reduced grade at the discretion of the instructors. A severe quantity issue may lead to a penalty for academic misconduct.

Contesting Grades Posted in CourseLink: If a team feels that a particular deliverable was graded unfairly, or if there is an error in the grading, it should be brought to the attention of the instructors within one week after the grade is posted on Courselink. Grades posted on Courselink will not be reconsidered beyond this period.

Adjustment of individual grades will be made at the end of the term. If a student feels that an adjustment has been applied unfairly, they should advise the instructors within one week. The onus will be on the student to produce their logbooks and other evidence of their contributions to the group design and deliverables.

Passing Grade: In order to pass the course, a student must obtain a final grade of 50% or higher.

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
