



# ENGG\*3100 Engineering and Design III

01

Winter 2023

Section(s): C01

School of Engineering

Credit Weight: 0.75

Version 1.00 - December 22, 2022

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## 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 is a project-based, experiential learning course. Students apply knowledge and build on design and professional skills developed in previous courses.



## 2.2 Teaching Assistants

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## 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.

### 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.

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## 4 Learning Outcomes

## 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

#	Outcome	Learning Outcome
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
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

#	Outcome	Learning Outcome
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 development	6
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 learning outcomes. Problem-based learning approach. Assessments. 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. Stakeholders.

**Week 3**

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

**Week 4**

**Topics:** Creativity in design. Generating design alternatives. Evaluating alternative designs including sensitivity analysis. Use of tools and prototypes.

**Week 5**

**Topics:** Universal design. Interdisciplinary collaboration. Leadership. Technical writing workshop (argumentation and revision).

**Week 6**

**Topics:** Framework for life cycle assessment (LCA). Social LCA. Environmental LCA.

**Week 7**

**Topics:** Project Management (Part 2: Staying/getting back on track). Conflict resolution.

**Week 8**

**Topics:** Cost analysis and business considerations for diverse designs.

**Week 9**

**Topics:** Technical communications (organizing content and evidence to support claims).

**Week 10**

**Topics:** Engineering for social justice.

**Week 11**

**Topics:** Top 10 design team presentations.

**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 9, 2023: **First day of classes**

Monday, February 20 – Friday, February 24, 2023: **Winter Break**

Thursday, April 6, 2023: **Design Day**

Friday, April 7, 2023: **Holiday**

Monday, April 10, 2022: **Last day of classes.** (Friday schedule) 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 (%)
Design Process	20	20
Team and Project Selection	0	0
Design Proposal	10	5
Interim Report	20	25
Technical Memo	10	10
Design Presentation	10	10
Final Design Report	30	30
Total	100	100

## 6.2 Assessment Details

### Design Process (20%)

**Date:** Mon, Jan 16 - Mon, Apr 10

**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.

The Interim Design Reflection and Final Design Reflection must be completed individually and submitted to Courselink as noted below. **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.**

Completion of pre- and post-term surveys is also expected. A pass on the final reflection may not be earned if surveys are not completed.

### Team and Project Selection (0%)

**Date:** Week 2, one day following your lab period no later than 11:00 pm, Submitted to CourseLink Dropbox

### Design Proposal (10%)

**Date:** Week 4, one day following your lab period no later than 11:00 pm, 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, the day of your lab period no later than 5:30 pm, Submitted to CourseLink Dropbox.

**Learning Outcome:** 1, 2, 3, 5, 7, 8

Note that an individual reflection is due on Monday February 27 by 11:00 pm. Reflections are described further under design process.

### **Technical Memo (10%)**

**Date:** Week 8, one day following your lab period no later than 11:00 pm, Submitted to CourseLink Dropbox.

**Learning Outcome:** 1, 5, 7

### **Design Presentation (10%)**

**Date:** Week 10, during design lab period, Design Lab

**Learning Outcome:** 1, 2, 3, 5, 6

Alternative instructions will be provided in the event that presentations cannot be delivered in person in Winter 2023. The date of the assessment will remain the same.

### **Final Design Report (30%)**

**Date:** Week 12, the day of your lab period no later than 5:30 pm, Submitted to CourseLink Dropbox.

**Learning Outcome:** 1, 2, 3, 4, 5, 7, 8

Note that an individual reflection is due with the final report submission. Reflections are described further under design process.

## **7 Course Statements**

### **7.1 Engagement**

Students are expected to spend about 15 h each week on academic tasks associated with a 0.75 credit course, including the lectures and labs. Active learning approaches will be incorporated into the lectures and labs 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 themselves with **all applicable documents** and course materials;
5. **Attend all Lab sessions**. If a student is unable to attend a lab session due to illness or extra-curricular responsibilities, it is essential that they let the instructor know about their absence.
6. **Attend all group meetings**. If a student is unable to attend a group meeting or expects to be late, it is essential that they clearly communicate with all members of their 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

**Course Learning Activities:** There will be activities planned for many lectures and design labs. These activities are intended to help you better understand the course content and enable you to apply it to the design project. There will be no make-up activities.

**Submission Deadlines:** Design deliverables are due as specified in the course outline.

**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 <24h 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 for the reflection.

**Illness in Winter 2023:** Student design teams should anticipate that team members will experience illness in Winter 2023 and make appropriate plans so that deadlines can be met. Extensions will not be considered unless more than half of the design team is ill, for more than a few days, at the same time.

**Certification:** Students must include their signature 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 make a booking at least 14 days in advance, and no later than November 1 (fall), March 1 (winter) or July 1 (summer). Similarly, new or changed accommodations for online quizzes, tests and exams must be approved at least a week ahead of time.

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>

## 9.9 Disclaimer

Please note that the ongoing COVID-19 pandemic may necessitate a revision of the format of course offerings, changes in classroom protocols, and academic schedules. Any such changes will be announced via CourseLink and/or class email.

This includes on-campus scheduling during the semester, mid-terms and final examination schedules. All University-wide decisions will be posted on the COVID-19 website (<https://news.uoguelph.ca/2019-novel-coronavirus-information/>) and circulated by email.

## 9.10 Illness

Medical notes will not normally be required for singular instances of academic consideration, although students may be required to provide supporting documentation for multiple missed assessments or when involving a large part of a course (e.g.. final exam or major assignment).

## 9.11 Covid-19 Safety Protocols

For information on current safety protocols, follow these links:

- <https://news.uoguelph.ca/return-to-campus/how-u-of-g-is-preparing-for-your-safe-return/>
- <https://news.uoguelph.ca/return-to-campus/spaces/#ClassroomSpaces>

Please note, these guidelines may be updated as required in response to evolving University, Public Health or government directives.

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