



# ENGG\*2100 Engineering and Design II

01

Fall 2023

Section(s): C01

School of Engineering

Credit Weight: 0.75

Version 1.00 - September 06, 2023

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## 1 Course Details

### 1.1 Calendar Description

This course is a progression in engineering design skills with particular emphasis on computer usage in design, oral communication of solutions and team skills. Computer usage in design will include advanced CAD/CAM/CAE tools; and database management software. An introduction to safety in engineering practice and design, and the concept of sustainable development are covered.

**Pre-Requisites:** Completion of 4.00 credits including ENGG\*1100

**Restrictions:** Registration in the BENG or BENG:C Programs.

### 1.2 Course Description

This is the second course in the undergraduate engineering design sequence. The main goals of the courses are to provide experience and guidance for working in and leading teams, developing communication and presentation skills, and teaching design using 3D modeling techniques. Students in this course will work in teams to reverse engineer a small model, and then use skills learned in this project to then conceive, design, model, simulate, and present a unique solution to a complex design problem.

### 1.3 Timetable

ENGG 2100 is comprised of lectures (MACN 105), a design lab, a computer lab, and a seminar. During the design lab time (in THRN 1006), students will work on a design project and a reverse engineering project (in THRN 1025) in alternate weeks based on their section number. Similarly, students will attend a seminar (in MCLN 101) and a computer lab (in THRN 2313). A more detailed lab schedule will be posted on Courselink with labs and seminars starting in Week 1.

**Lectures - In person - face to face delivery, MACN 105**

Monday and Wednesday, 2:30 pm - 3:20pm

### **Labs**

Lab attendance is expected in-person for all scheduled laboratory activities. Students **MUST** attend their assigned section only. Notify your GTA if you will be absent **PRIOR** to your scheduled lab time to arrange potential accommodations for missed assessments. Failure to do so may result in a grade of zero for that assessment.

Students will be divided between the design lab (THRN 1006) and the reverse engineering project lab (THRN 1025) during the scheduled lab period based on their section number. A lab schedule will be posted on CourseLink.

**Project Labs** - The majority of the project labs (reverse engineering and design project) will be held in Thornbrough (THRN) Room 1025 and 1006.

**Computer Labs** - These labs will be held in the Thornbrough (THRN) Room 2313 computer lab.

### **Seminars**

Each student will attend and give one 5-minute presentation (PowerPoint Presentation) during the semester. The seminars will be delivered in-person in MCLN 101 during the scheduled seminar time throughout the semester (starting in Week 1). You will be assigned a week to present and this information will be posted on CourseLink. Students are expected to attend the seminars to offer feedback in the weeks they are not presenting.

### **General Note**

The expectation is that an average student requires about 15 hours per week to get a 'B' grade in this course. These 15 hours include the 6 hours of scheduled class time (2 hrs of lecture and 4 hrs of lab time).

## **1.4 Final Exam**

The final exam is currently scheduled for December 11th, 2023, 11:30 am - 1:30 pm. Please see WebAdvisor for the latest information.

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## **2 Instructional Support**

### **2.1 Instructional Support Team**

**Instructor:** Ryan Clemmer  
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**Telephone:** +1-519-824-4120 x52132  
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**Lab Technician:** David Wright  
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**Lab Technician:** Ken Graham  
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**Library Support:** Jacqueline Kreller-Vanderkooy  
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**Telephone:** +1-519-824-4120 x54539  
**Office:** LIB 277

## 2.2 Teaching Assistants

**Teaching Assistant (GTA):** Dhruvin Dankhara  
**Email:** ddankhar@uoguelph.ca  
  
**Teaching Assistant (GTA):** Grace Ly  
**Email:** gly01@uoguelph.ca  
  
**Teaching Assistant (GTA):** Smitkumar Patel  
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**Teaching Assistant (GTA):** Jainil Kiran Modi  
**Email:** modij@uoguelph.ca

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## 3 Learning Resources

### 3.1 Required Resources

#### CourseLink (Website)

<https://courselink.uoguelph.ca/>

Course material, news, announcements, and grades will be regularly posted to the

ENGG\*2100 Courselink site. You are responsible for checking the site regularly.

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.

## 3.2 Other Resources

**Lecture Information:** Lectures will be delivered face-to-face.

**Lab Information:** Teaching Assistants will be available in lab periods to direct activities and answer questions. The Teaching Assistants will provide resources regarding tutorials and links to related web pages. See Courselink for detailed information regarding which face-to-face labs and seminars you are expected to attend throughout the semester.

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## 4 Learning Outcomes

This is the second course in the undergraduate engineering design sequence. The main goals of the courses are to provide experience and guidance for working in and leading teams, developing communication and presentation skills, and teaching design using 3-D modelling techniques. Students in this course will work in teams to reverse engineer a common object such as a lawn mower, and then use skills learned in this project to then conceive, design, build, test and present a unique solution to a complex design problem.

### 4.1 Course Learning Outcomes

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

1. Develop and deliver an oral presentation on an engineering topic of interest
2. Work within a team to reverse engineer a complex structure
3. Work within a team to solve a complex problem
4. Conceptualize physical solutions to a complex problem
5. Develop, design, build, test and demonstrate a novel design solution for a complex problem
6. Generate an engineering design report
7. Identify various manufacturing strategies and their characteristics.
8. Evaluate safety issues related to design.
9. Discuss issues related to professionalism, sustainability, and ethics as they relate to design.
10. Demonstrate competency with standard computer aided design modelling techniques

## 4.2 Engineers Canada - Graduate Attributes (2018)

Successfully completing this course will contribute to the following:

#	Outcome	Learning Outcome
4	Design	4, 5, 7
4.1	Describe design process used to develop design solution	5
4.2	Construct design-specific problem statements including the definition of criteria and constraints	4, 5
4.3	Create a variety of engineering design solutions	4, 5, 7
4.4	Evaluate alternative design solutions based on problem definition	4, 5
4.5	Develop and refine an engineering design solution, through techniques such as iteration, simulation and/or prototyping	5
5	Use of Engineering Tools	2, 10
5.2	Demonstrate proficiency in the application of selected engineering tools	2, 10
6	Individual & Teamwork	3
6.1	Describe principles of team dynamics and leadership	3
6.2	Understand all members' roles and responsibilities within a team	3
6.3	Execute and adapt individual role to promote team success through, for example, timeliness, respect, positive attitude	3
6.4	Apply strategies to mitigate and/or resolve conflicts	3
6.5	Demonstrate leadership through, for example, influencing team vision and process, promoting a positive team culture, and inspiring team members to excel	3
7	Communication Skills	1, 6
7.1	Identify key message(s) and intended audience in verbal or written communication as both sender and receiver	1, 6
7.2	Interpret technical documentation such as device specification sheets, drawings, diagrams, flowcharts, and pseudocode	6
7.3	Construct the finished elements using accepted norms in English, graphical standards, and engineering conventions, as appropriate for the message and audience	6

#	Outcome	Learning Outcome
7.4	Substantiate claims by building evidence-based arguments and integrating effective figures, tables, equations, and/or references	6
7.5	Demonstrate ability to process oral and written communication by following instructions, actively listening, incorporating feedback, and formulating meaningful questions	1
8	Professionalism	8, 9
8.1	Demonstrate an understanding of what it means to be a professional engineer and distinguish between legislated and non-legislated professions	8, 9
9	Impact of Engineering on Society and the Environment	8, 9
9.1	Analyze the safety, social, environmental, and legal aspects of engineering activity	8, 9
11	Economics and Project Management	6
11.1	Apply project management techniques and manage resources within identified constraints	6

## 5 Teaching and Learning Activities

### 5.1 Lecture

#### Lecture 01

**Topics:** Introduction to Course and Course Logistics

**Learning Outcome:** 1

#### Lecture 02

**Topics:** Design and Engineering

**Learning Outcome:** 4

#### Lecture 03

**Topics:** "Total Design"

#### Lecture 04

**Topics:** Presentations & Slide Design

**Learning Outcome:** 1

#### Lecture 05

<b>Topics:</b>	Teamwork - basics
<b>Learning Outcome:</b>	2, 3
<b>Lecture 06</b>	
<b>Topics:</b>	Teamwork - group dynamics
<b>Learning Outcome:</b>	2, 3
<b>Lecture 07</b>	
<b>Topics:</b>	Meetings
<b>Learning Outcome:</b>	2, 3
<b>Lecture 08</b>	
<b>Topics:</b>	Meeting - Chairing
<b>Learning Outcome:</b>	2, 3
<b>Lecture 09</b>	
<b>Topics:</b>	Tools of Engineering Design
<b>Learning Outcome:</b>	2, 4
<b>Lecture 10</b>	
<b>Topics:</b>	Drawing and Tolerancing
<b>Learning Outcome:</b>	7
<b>Lecture 11</b>	
<b>Topics:</b>	Brainstorming
<b>Learning Outcome:</b>	3, 4
<b>Lecture 12</b>	
<b>Topics:</b>	Brainstorming - by design
<b>Learning Outcome:</b>	3, 4
<b>Lecture 13</b>	
<b>Topics:</b>	Creative Design, Concept Development
<b>Learning Outcome:</b>	4
<b>Lecture 14</b>	
<b>Topics:</b>	Creative Design, Case Studies
<b>Learning Outcome:</b>	4
<b>Lecture 15</b>	
<b>Topics:</b>	Evaluating Design Solutions
<b>Learning Outcome:</b>	4, 8
<b>Lecture 16</b>	
<b>Topics:</b>	Evaluating Design Solutions Examples
<b>Learning Outcome:</b>	4, 8
<b>Lecture 17</b>	

<b>Topics:</b>	Intellectual Property
<b>Lecture 18</b>	
<b>Topics:</b>	Manufacturing
<b>Learning Outcome:</b>	7
<b>Lecture 19</b>	
<b>Topics:</b>	Polymer Manufacturing
<b>Learning Outcome:</b>	7
<b>Lecture 20</b>	
<b>Topics:</b>	Quality Assurance
<b>Learning Outcome:</b>	7
<b>Lecture 21</b>	
<b>Topics:</b>	International, National and Local Standards and Guidelines
<b>Learning Outcome:</b>	8, 9
<b>Lecture 22</b>	
<b>Topics:</b>	Sustainable Design and Ethics
<b>Learning Outcome:</b>	8, 9
<b>Lecture 23</b>	
<b>Topics:</b>	Safety - Case Studies
<b>Learning Outcome:</b>	8, 9
<b>Lecture 24</b>	
<b>Topics:</b>	Course Review

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## 6 Assessments

### 6.1 Marking Schemes & Distributions

Name	Scheme A (%)
Individual Presentation, with the use of aids	10
Reverse Engineering Project	20
CAD Midterm	10
Design and Build project	40
Final Exam	20



Name	Scheme A (%)
Total	100

## 6.2 Assessment Details

### Individual Presentation, with the use of aids (10%)

**Date:** Scheduled in the seminar sections Sept 25 - Nov 10, MCLN 101

**Learning Outcome:** 1

### Reverse Engineering Project (20%)

**Date:** Scheduled in the design and computer lab, THRN 2313 (1025 & 1006)

**Learning Outcome:** 2, 3, 10

<b>CAD Mastery Check 1</b>	<b>Sept 25 - Oct 6</b>	(individual assignment)	1%
<b>CAD Mastery Check 2</b>	<b>Oct 16 - 27</b>	(individual assignment)	1%
<b>2-D Drawings</b>	<b>Oct 16 - 27</b>	(individual assignment)	10%
<b>Animation</b>	<b>Oct 30 - Nov 10</b>	(group assessment)	8%

### CAD Midterm (10%)

**Date:** Weeks of Oct 30 - Nov 10, Virtual

**Learning Outcome:** 10

Scheduled during computer lab time, however, may be completed anytime during that week.

### Design and Build project (40%)

**Date:** scheduled during the design lab, Presentations in THRN 1006, submissions in-person and on-line

**Learning Outcome:** 3, 4, 5, 6

<b>Team Contract and Work Plan</b>	<b>Sep 22</b>	(group assignment)	0%
<b>Concept Sketches</b>	<b>Sep 25 - Oct 6</b>	(group assessment)	3%
<b>Proof of Concept</b>	<b>Oct 16 - 27</b>	(group assessment)	2%
<b>Design Proposal</b>	<b>Oct 13</b>	(group assessment)	5%
<b>Midterm Peer Evaluation</b>	<b>Oct 20</b>	(individual assessment)	2%
<b>Design Presentation, Demo &amp; Evaluation</b>	<b>Nov 13 - 24</b>	(group assessment)	15%
<b>Final Report</b>	<b>Nov 29</b>	(group assessment)	10%
<b>Peer Assessment</b>	<b>Dec 1</b>	(individual assessment)	3%

### Final Exam (20%)

**Date:** Mon, Dec 11, 11:30 AM - , 1:30 PM, TBD

**Learning Outcome:** 6, 8, 9

## 7 Course Statements

### 7.1 Grading Policies

**Missed Assessments:** If you are unable to meet any in-course requirement due to medical, psychological, or compassionate reasons, please email the course instructor or GTA BEFORE the assessment is due. 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>

**Midterm Grading:** If you miss the Midterm you will be assessed a mark of 0 for the exam.

**Passing Grade:** In order to pass the course, you must achieve a combined mark (all aspects of the course) of 50% or above. You must also pass both the Final Exam and the Design and Build Project portions of the course. 50% is considered a passing grade. A failing grade (below 50%) for the entire course, or the Final Exam or the Design and Build Project will mean that you have failed the course. The assigned grade will be your lowest of these grades.

**Outstanding Fees:** Excess use of lab materials by a student team will result in monetary charges being assessed to all the students in that team. Failure to pay these charges will result in individual student final grades being withheld until their own balance is cleared.

**Late Submissions:** Deliverables are generally due at 10:59 PM on the date specified (typically on the day of the lab), unless they are to be completed during the scheduled lab or seminar time. An additional one-hour grace period will be provided beyond the due date. Deliverables handed in after the expiration of the grace period (as indicated on Courselink) but before 10:59 AM the following day will receive a penalty of 15%. Reports submitted between 12 and 24 hours late will receive a late penalty of 30%. Reports will not be accepted more than 24 hours beyond the due date.

**Grading Philosophy:** The grading philosophy used for this course will recognize that design has a significant artistic component and is not a right or wrong situation. Thus, we will start with a perspective that your work is assumed to be a "B" until there is evidence within that work that is impressive or aspects that are disappointing. Impressive and disappointing components are integrated to leave a final assessment.

**Group Assessment:** Team-based activities form a major proportion of 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.

## 7.2 Laboratory / Machine Shop Safety

Many laboratory sessions will be held in the School's machine shop. The following safety principles apply to all sessions and to all students:

1. Ken Graham and Dave Wright have full authority for all aspects of our time in THRN 1025
2. You will NOT be able to attend any lab session other than the one assigned to your lab section of the course
3. You will be required to show respect for Ken, Dave, your GTA and the shop equipment
4. You will be required to dress appropriately
5. No open toed shoes
6. No loose clothing
7. Safety glasses are to be worn
8. Shop coats are recommended and are available in the shop for your use
9. If you do not know how to use shop equipment - ASK
10. THINK first.
11. Additional rules will be posted in the shop or expressed by Ken or Dave.
12. Failure to safely work in the shop may lead to lost shop privileges. This is likely to have academic consequences.

# 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 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).

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