Faculty of Engineering

ENGG1000
ENGINEERING DESIGN AND INNOVATION

Course Outline
2021, Term 1

Course Coordinator
Ilpo Koskinen

This outline informs you how this course will be run.

If you need more help…

Before the course starts, ask at the Nucleus.

Once you are enrolled, the Moodle Learning Management site has more specific information for this course

Quick-start To-Do List

Before week 1
• Read this course outline • Check you can access the course site on Moodle • Prepare to attend the first lecture, on Monday 15/02 from 2:00 – 4:00 pm. • Research availability of reference text: Dym et al. *Engineering Design.* • Install Office 365 using your free UNSW license • Familiarise yourself with Microsoft Teams

Week 1		
Monday, 15/02		
2:00 - 4:00pm	Attend lecture introducing this course and the available projects. After the lecture, select your project for the term via Moodle.	Teams Live Event
Thursday, 18/02		
3:00 - 5:00pm	Participate in the *Impromptu Design Day*. After the session, complete the *Reflective Writing Assessment Task*, worth 5 % of your final grade.	Moodle

Week 2		
Monday, 22/02		
2:00 – 3:00 pm	Attend lecture on teamwork and project management.	Teams Live Event
3:00 - 4:00 pm	Attend lecture launching your selected project.	Moodle
4:00 – 5:00 pm	Attend your first mentor session	Moodle
Thursday, 25/02		
2:00 – 3:00 pm	Attend a lecture on problem definition and design journals.	Teams Live Event
3:00 – 4:00 pm	Attend a second project-specific lecture.	Moodle
4:00 - 5:00 pm	Attend a second mentor session	Moodle

1. Course Staff

This course is coordinated jointly by the Faculty of Engineering and Design Next. Academic staff from various Engineering Schools coordinate specific Projects and Technical streams within the course.

Faculty	Convenor contacts
Design Next	Prof Ilpo Koskinen - designnext@unsw.edu.au Doménique Van Gennip - d.vangennip@unsw.edu.au Nicholas Gilmore - nicholas.gilmore@unsw.edu.au

Project	Coordinator contacts
Bionic Hand	Michael Stevens - michael.stevens@unsw.edu.au
Project eEVee	Peter Neal - peter.neal@unsw.edu.au
Robots to the Rescue	Michael Schofield - michael.schofield@unsw.edu.au
Impact-proof Buildings	Prof Wei Gao - w.gao@unsw.edu.au
Battling the Big Dry	Prof Lucy Marshall - lucy.marshall@unsw.edu.au
Airborne Terrain Mapping	Prof Linlin Ge – l.ge@unsw.edu.au
Renewable Energy from Waves	Prof Ian Turner - ian.turner@unsw.edu.au Dr Mitch Harley - m.harley@unsw.edu.au
Autonomous Container Delivery	Matthew Priestley - m.priestley@unsw.edu.au
National Emergency Supply Equipment	Darson Li - darson.li@unsw.edu.au
Mars Regolith Collection	Binghao Li - binghao.li@unsw.edu.au
Sunray Speedway	A/Prof Ziv Hameiri - z.hameiri@unsw.edu.au

2. Course Information

Units of credit: 6 UOC
Prerequisite(s): None

2.1 Course summary

In this course, you will experience first-hand one of the major things that engineers do: designing and building creative solutions to problems. You will learn to think the way that engineers think, coming up with good solutions to problems despite being limited by budget, time and resources, the requirement to also meet environmental and social objectives and of course the limitations of the laws of physics. This will help you to appreciate the central ideas of engineering design as an on-time, on-budget and fit for purpose solution to a poorly specified, open-ended problem.

You will start to build critical skills for engineers that will be called upon repeatedly in your academic and professional lives, including concept development, critical thinking and evaluation skills, clear communication, research and information literacy skills and the skills involved in successfully functioning within a team environment to complete a given task.

A key part of the course is a design project. You will select one project from the ones offered in the Faculty of Engineering. Once you've joined a project, you will be assigned to a team of around 5-6 students. It is with this team that you will work to practically solve your design problem.

Your team must also make sure that it has enough technical skills to complete the project. These skills are taught in a Technical Stream linked to your project.

Common Faculty-wide activities and assessments will complement this project-specific work. Further, the Faculty ensures that all project-specific work achieves the same learning outcomes. Any differences in assessments and learning activities between projects are reviewed to ensure equivalence.

2.2 Course aims

This course aims to make you familiar with the process of engineering design and the use of design methods for: (1) defining an open-ended design problem; (2) generating alternative conceptual solutions; (3) evaluating these solutions and implementing them. We also want to give you opportunities to develop your professional skills, such as technical writing, public speaking, teamwork and project management.

2.3 Course learning outcomes (CLO)

At the successful completion of this course, you should be able to:

1. Demonstrate an understanding of the process of engineering design and the use of design methods.
2. Become familiar with the tangible elements of engineering design.
3. Understand the dynamics of collaborative teams and how to work effectively within a team to accomplish tasks within given deadlines.
4. Understand the basic elements of project management and be able to plan and schedule work activities in accordance with standard practice, including being able to organise, conduct and record engineering meetings.
5. Be able to convey your thoughts and ideas effectively in an engineering design report.
6. Understand some of the roles and responsibilities of a professional engineer, as well as the ways that quality, safety, diversity and equal opportunity apply to university and professional life.

2.4 Relationship with the rest of your program and the discipline

This course looks at what it means to be a design engineer. You will see the big picture and how all your studies, such as mathematics and science, fit together. It will also look at some of the non-technical issues which are just as vital to a successful engineering career.

You will study and experience Engineering Design as a multi-faceted activity, which requires considerable creativity, as well as judgement, decision making and problem-solving skills. You will see the need to take context into account and be able to complete design projects on time and within budget. The problem solving and project management skills that you learn in this course will be invaluable for later courses in your degree, in your career and for life in general.

The following table explains how ENGG1000 is designed to align with Engineers Australia's Stage 1 Competencies. These are the Program Learning Outcomes for the Bachelor of Engineering (Honours).

Course Learning Outcome (CLO)	CLO Statement	Program Learning Outcome (PLO)
CLO 1	Demonstrate an understanding of the process of engineering design and the use of design methods.	1.5, 2.1, 2.3
CLO 2	Become familiar with the tangible elements of engineering design	1.3
CLO3	Understand the dynamics of collaborative teams and how to work effectively within a team to accomplish tasks within given deadlines	3.6
CLO4	Understand the basic elements of project management and be able to plan and schedule work activities in accordance with standard practice, including being able to organise, conduct and record engineering meetings.	2.4
CLO5	Be able to convey your thoughts and ideas effectively in an engineering design report	3.2
CLO6	Understand some of the roles and responsibilities of a professional engineer, as well as the ways that quality, safety, diversity and equal opportunity apply university and professional life.	1.5, 1.6

2.5 Course evaluation and development

Engineering Design is a team effort, and we are particularly interested in your feedback. We want your suggestions of what is good and should be retained, and what is not so good and should be improved (with ideas on how to do it).

In addition to the standard UNSW Course and Teaching Evaluation and Improvement (myExperience) surveys, we will be asking for your feedback in other ways during the course. Do make attempts to communicate constructive feedback to your lecturers. Feedback on individual tasks is often requested during the course.

3.Strategies and Approaches to Learning

3.1 Learning philosophy

This course is, first and foremost, an exercise in experiential learning, with emphasis on reflection on the design process. You will work together in teams to design a solution to a specified but open-ended problem. This project will be supported with a variety of additional student experiences to help you acquire individual and group skills in areas needed for communicating the design, including graphical representation, collaboration, report writing and any necessary discipline-specific knowledge.

3.2 Learning and teaching activities

Teaching in this course is centred on the project. For example, you will develop communication skills by communicating about the project; you will develop teamwork and project management skills in the context of your project team; and you will experience the kinds of technical problems resolved by engineers in your selected project area. How this will work out in detail will depend upon the particular project. You will receive a separate handout describing this once you have finalised your choice. If you want to see details earlier, refer to the Moodle site for this course.

3.2 Expectations of students

Integrity and Respect

The UNSW Student Code of Conduct among other things, expects all students to demonstrate integrity in all the academic work and to treat all staff, students and visitors to the University with courtesy, tolerance and respect.

Time commitment

UNSW expects students to spend approximately 150 hours to successfully complete a 6 UOC course like ENGG1000. Since there is no final exam, this translates to approximately 12-15 hours per week of work for this course. We expect 60 hours to be spent participating in face-to-face classes, with the remaining 90 hours spent collaborating with your teammates outside of class time, and in private study.

Participation

When you attend classes (whether those are delivered face-to-face or online), we expect you to actively participate in the activities organised. This may mean listening, taking notes, asking questions or engaging in peer discussions. It may also mean working by yourself or in groups on tutorial exercises.

To complete the design project, you are required to work in a team. We expect all team members to agree on how they will manage the team (e.g. making and documenting decisions), to assign the project work equitably and contribute to the delivery of project outputs to the best of their ability. If this is not feasible, discuss this with your mentor as soon as possible. Low or no participation in your team may lead to some or all of your team marks to be removed.

Students are expected to contribute to online discussions through the course forum on Moodle and your project's Microsoft Teams instance. You may wish to discuss challenges faced through this course, ask questions about course content, and discuss solutions to project challenges.

Attendance and punctuality

We expect students to be punctual and attend at all lectures, mentor meetings and classes. While exceptions may be made for special circumstances, we do expect University commitments to take precedence over regular work activities, holidays etc. If you miss a class, you should catch up in your time. Lectures will be recorded and made available through Moodle.

4. Course Schedule and Structure

4.1 Teaching times and locations

In general, you will have ENGG1000 classes on Mondays and Thursdays from 2 to 5 pm.

At 3 pm on Monday of Week 2, you will attend your first project-specific class. The details of this class will be available via your project-specific section in Moodle, and a project-specific Microsoft Team. Make sure to check these details before the end of Week 1. Most of your classes will be online, although some projects may allow for some workshop time in UNSWs Makerspaces.

4.2 Course Schedule

Blue items are faculty-wide activities completed by every ENGG1000 student, except for those undertaking Civil Engineering projects (which have an alternative but equivalent schedule from week 2 onwards). The black items are determined by your selected Project and associated Technical Stream. The coordinators for your Project and Technical Stream will provide specific schedules for these activities, which supersede this generic overview.

Week	Monday 2 – 5pm	Thursday 2- 5pm
1	Common lecture – 2 hr *An overview of the course and introduction to projects offered, followed by a briefing for the impromptu design day.*	Impromptu Design Day – 2 hr *A team-based rapid prototyping design challenge, followed by a reflective writing assessment task. (3-5 pm)*
2	Common lecture – 1 hr *Teamwork and project management.* Project activities – 2 hr	Common lecture – 1 hr *Problem statement and design journals* Project activities – 2hrs
3	Common lecture – 2hr *Requirements, Concept generation and concept evaluation. Oral presentation skills.* Project activities – 1 hr	Project / technical stream activities – 3 hrs
4	Common lecture – 1 hr *Report writing*	Project / technical stream activities – 3 hrs
5	Common lecture – 1 hr *Testing and verification* Project activities – 2 hr	Project / technical stream activities – 3 hrs
6	Revision week	Revision week
7	Project activities – 3 hrs	Project / technical stream activities – 3 hrs
8	Public holiday	Project / technical stream activities – 3 hrs
9	Project activities – 3 hrs	Project activities – 3 hrs
10	Project activities – 3 hrs	Project activities – 3 hrs
11	ENGG1000 Showcase – 2hrs	

5. Design Projects

5.1 Introduction

We want you to experience the engineering design process as well as hear about it and reflect upon it. So, in this course, you will learn by doing; by working on tasks connected with a project.

Performance of your design will be a critical part of the assessment; the other marks will be awarded for the process (what you do) and your reflection (thinking about and showing that you have understood what you do).

5.2 Range of Projects and Project Selection

After the Week 1 Monday lecture, the next step is to review the 1-page project descriptions, available on Moodle. This information complements the project pitches provided in the common lecture on the Monday of Week 1.

Projects fall within the topic areas listed below. Some areas have more than one project. You may select any of the projects, independently of your preferred field of study.

Project title(s)	**Engineering topic areas**
Bionic Hand	Biomedical, Mechanical, Electrical and Computing
Project eEVee	Chemical, Mechanical, Electrical, Petroleum and Environmental
Robots to the Rescue	Computing, Electrical and Mechanical
Impact-proof Buildings Battling the Big Dry Renewable Energy from Waves Airborne Terrain Mapping	Civil, Environmental, Humanitarian and Surveying
Autonomous Container Delivery	Electrical, Mechanical, and Computing
National Emergency Supply Equipment	Mechanical, Electrical and Computing
Mars Regolith Collection	Mining, Mechanical, Electrical and Computing
Sunray Speedway	Photovoltaic, Renewable Energy, Mechanical and Electrical

Once you've decided on which project you'd like to complete, submit your preferences to the project selection questionnaire on Moodle. You'll need to rank your preferences for all projects. Projects are subject to quotas so you may not receive your first preference. However, we'll use a sorting algorithm to try to give students their more prefered projects. Note, we may run an additional remote project if necessary.

The project selection tool opens Monday Week 1, 15/02 at 2pm and closes Wednesday Week 1, 17/02 at 5pm.

For exceptional circumstances, you may contact the course convenor.

6. Assessments

6.1 Assessment tasks

ENGG1000 has been designed to ensure equivalence and alignment between the various projects offered in this course. Each project operates within an agreed framework of assessments, as indicated in the following table. Full details of each project's specific assessment activities and their weightings are provided in the project outlines available on the Moodle site after the project has been selected. You are encouraged to preview these and download them for future reference.

Task	Weight	CLO1	CLO2	CLO3	CLO4	CLO5	CLO6
Impromptu Design - Reflective Writing Due Week 2, Thursday at 5:00 pm	5 %	++	+			+	+
Engineering Design Process (EDP) Due Week 4, Sunday at 11:59 pm	15 %	++	++	+	+	+	+
Project Consult your project outline and coordinator for a detailed breakdown.	60 %	++	++	++	++	++	++
Technical Consult technical stream guide and coordinator for a detailed breakdown.	20 %	+	++			+	+

6.2 Assessment criteria and standards

The marking rubrics used in ENGG1000 will be provided separately on Moodle. Students should familiarise themselves with these rubrics well before the assessment due date. Because of differences between each Project's specific learning and assessment activities it may be necessary to moderate/adjust marks (up or down) to ensure fairness. This will be undertaken after all the results are available at the end of the semester and done by a representative panel of the Faculty.

6.3 Submission of assessment tasks

Most assessments will be submitted through Moodle. Presentations are generally given in front of other groups in class or a live virtual meeting, or are submitted as a video. Submission of testing assessments is dependent on your project, and not all projects will facilitate online delivery modes. Specific submission details for each assessment will be provided separately on Moodle.

6.3 Requests for special consideration

There are no formal examinations in this course. However, if you find that your performance in an assessable component has been significantly affected by illness or other unexpected circumstance, then you should make an application for special consideration as soon as possible by visiting the Nucleus Student Hub. Talk to the project/course coordinator too. Note that consideration is not granted automatically and often requires an application to be lodged ahead of an assessment due date.

6.4. Feedback on assessment

You will receive feedback on you and your team's performance in many ways throughout this course. Sometimes it may be written, other times verbal comments. The use of rubrics also provides students with guidance on how they well they are performing in the course. In addition to feedback from the teaching staff, from time to time, you will also receive feedback from your peers – particularly your teammates.

7. Additional Information

7.1 Academic integrity, referencing and plagiarism

UNSW has an ongoing commitment to fostering a culture of learning informed by academic integrity. All UNSW students have a responsibility to adhere to this principle of academic integrity. Plagiarism undermines academic integrity and is not tolerated at UNSW. Plagiarism at UNSW is defined as using the words or ideas of others and passing them off as your own.

Plagiarism is a type of intellectual theft. It can take many forms, from deliberate cheating to accidentally copying from a source without acknowledgement. UNSW has produced a website with a wealth of resources to support students to understand and avoid plagiarism. The Learning and Career Hub assists students with understanding academic integrity and how not to plagiarise. They also hold workshops and can help students one-on-one.

You are also reminded that careful time management is an important part of study and one of the identified causes of plagiarism is poor time management. Students should allow sufficient time for research, drafting and the proper referencing of sources in preparing all assessment tasks.

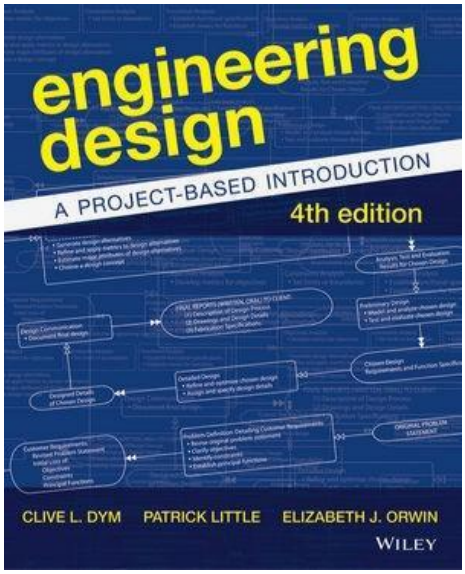
If plagiarism is found in your work when you are in first year, your lecturer will offer you assistance to improve your academic skills. They may ask you to look at some online resources, attend the Learning and Career Hub, or sometimes resubmit your work with the problem fixed. However, more serious instances in first year, such as stealing another student's work or paying someone to do your work, may be investigated under the Student Misconduct Procedures.

Repeated plagiarism (even in first year), plagiarism after first year, or serious instances, may also be investigated under the Student Misconduct Procedures. The penalties under the procedures can include a reduction in marks, failing a course or for the most serious matters (like plagiarism in an honours thesis) even suspension from the university.

7.2 Readings and resources

The Moodle site for this course is a vital and integrated part of the learning environment. You can access Moodle and login using your zID and password.

The recommended text for this course is:



Dym, Clive L., Little, P., Orwin, Elizabeth J.
Engineering Design: A Project Based Introduction.

You should have access to a copy as it provides a useful reading on several relevant topics throughout your degree. It is available as a text and as an accompanying eBook from the UNSW Bookshop. There are copies available for purchase from the University Book Store and available in the University Library Reserved Collection. The coordinator of your selected project will tell you if alternative or additional textbooks are recommended. References specific to a particular project are given in the School outlines that will be supplied after you have finalised your decision and may be previewed on the Moodle site for this course.

7.3 Administrative matters

For most of you this will be your first session at UNSW. We are a large, complex organisation and you will have much to become familiar with. Take time to review the documentation on processes and procedures that you will have received at enrolment and from your School. Additional Administrative Matters documentation for this course will be posted on the Moodle site.

Questions about enrolment and other administrative matters should be directed to the Nucleus. They are located inside the Library – first right as you enter the main library entrance. You can also contact them via a webform or reserve a place in the in-person queue using the UniVerse app.

For administration matters, please contact your Project Coordinator or the Course Coordinator if you do not yet have a Project Coordinator.

7.4 Occupational Health and Safety

Like the wider community, UNSW has strict policies and expectations on Occupational Health and Safety, and you should read these. They may be accessed on the University Governance website.

The requirements for risk management and workshop/lab access will differ between projects. University makerspaces also have specific induction processes. You should aim to complete safety training/inductions as early as possible in the term.

If you have any questions about risk management policies and procedures, please speak to your project coordinator or the course coordinator. They will be able to direct you to the relevant Health and Safety Advisor.

7.5 Equity and Diversity

Those students who have a disability that requires some adjustment in their teaching or learning environment are encouraged to discuss their study needs with the course convener prior to, or at the commencement of, their course, or with the Equity Officer (Disability) in the Equitable Learning Services. Issues to be discussed may include access to materials, signers or note-takers, the provision of services and additional exam and assessment arrangements. Early notification is essential to enable any necessary adjustments to be made.

Ilpo Koskinen
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Thanks to Chris Menictas