MECH4100

Mechanical Design 2

Term Two // 2021

School of Mechanical and Manufacturing Engineering // UNSW Engineering

Course Overview

Staff Contact Details

Convenors

Name	Email	Availability	Location	Phone
Irene Renaud-Assemat	i.renaudassemat@unsw.edu.au	9am-5pm, Mon-Fri	Ainsworth Building J17, Room 208C	

Lecturers

Name	Email	Availability	Location	Phone
Daniel Eggler	d.eggler@unsw.edu.au		Ainsworth Building J17, Room 402H	

School Contact Information

Location

UNSW Mechanical and Manufacturing Engineering

Ainsworth building J17, Level 1

Above Coffee on Campus

Hours

9:00–5:00pm, Monday–Friday*

*Closed on public holidays, School scheduled events and University Shutdown

Web

School of Mechanical and Manufacturing Engineering

Engineering Student Support Services

Engineering Industrial Training

UNSW Study Abroad and Exchange (for inbound students)

UNSW Future Students

Phone

(+61 2) 9385 8500 – Nucleus Student Hub

(+61 2) 9385 7661 – Engineering Industrial Training

(+61 2) 9385 3179 – UNSW Study Abroad and UNSW Exchange (for inbound students)

(+61 2) 9385 4097 – School Office**

**Please note that the School Office will not know when/if your course convenor is on campus or available

Email

Engineering Student Support Services – current student enquiries

- e.g. enrolment, progression, clash requests, course issues or program-related queries

Engineering Industrial Training – Industrial training questions

UNSW Study Abroad – study abroad student enquiries (for inbound students)

UNSW Exchange – student exchange enquiries (for inbound students)

UNSW Future Students – potential student enquiries

- e.g. admissions, fees, programs, credit transfer

School Office – School general office administration enquiries

- NB: the relevant teams listed above must be contacted for all student enquiries. The School will only be able to refer students on to the relevant team if contacted

Course Details

Credit Points 6

Summary of the Course

In this course, students will undertake a major design project as a team, enabling them to develop conceptual and detailed solutions for an engineering project, utilizing and extending their knowledge and skills acquired throughout the degree programme. This includes project-based design process, project management, design for manufacturing, reliability, affordability, and sustainability.

Students will organize their own work and integrate it with the overall activities of the team, as well as coordinate the overall direction of the team, and report their performance through prototype manufacturing and testing, written deliverables and oral presentation.

Course Aims

This is the final undergraduate course (or Masters course) in Mechanical Engineering Design. Here students will be expected to apply the knowledge and skills acquired in the preceding courses to a real design problem. To facilitate this students will be working on a team project.

Students will engage in written work, verbal communication activities. This will involve researching information, planning and meeting specified requirements.

The demonstration of team work and collaborative skills are essential for satisfactory completion. The quality of your reporting will be evaluated to the standards expected of professional consulting engineers.

Students are expected to formulate the technical specifications for their projects and to complete the designs with a high level of engineering expertise. Students are responsible for organizing, managing the project and coordinating the workload within their team.

This course will conclude on testing and performance evaluation of the built prototype.

Course Learning Outcomes

After successfully completing this course, you should be able to:

Learning Outcome	EA Stage 1 Competencies
1. Implement the basic elements of managing a design project, plan and schedule work activities in accordance with standard practice	PE1.6, PE2.1, PE2.3, PE2.4, PE3.1, PE3.4, PE3.5, PE3.6
2. Apply an effective problem solving approach that is deliverable in practice and justify and defend the selection	PE1.1, PE1.4, PE1.6, PE2.1, PE2.2, PE2.3, PE3.3
3. Appreciate the need to critically review and reflect on your own capability and to invite peer review; to benchmark your performance against appropriate standards and to determine areas for your further development	PE1.6, PE2.1, PE2.3, PE2.4, PE3.5, PE3.6

Learning Outcome	EA Stage 1 Competencies
4. Execute effective oral and written presentations to technical audiences	PE3.2, PE3.4

Teaching Strategies

This course attempts to approximate the learning processes that you will encounter upon entering industry. As-such, the course will be highly activity based. The material presented in lectures will be limited to the material necessary to engage in the assessable learning activities.

The final year of your degree/Master's program is an ideal opportunity to experience real world engineering problems and to gauge your strengths and weaknesses against their expectations and standards.

For the work in this course, everyone will be assigned to a group for the duration of the course. Most of the activities and assessments will be conducted through the group although individual performance will be monitored and assessed.

Dialogue is encouraged between you, others in the class, technical and academic staff. Diversity of experiences is acknowledged, as some students in each class have different background. You may draw on your experience to illustrate various aspects of the work you undertake and this should help to motivate and facilitate engagement with the other members of your group.

Technical, professional and personal knowledge and skills are best acquired through a combination of conceptual support, experience, reflection and planning. This course provides a range of learning strategies and activities to support this approach. The electronic Learning Management System (LMS) Moodle and Microsoft Teams are used to foster an environment where you can collaborate in discussion groups and acquire the necessary information to complete your work through interaction with lecturers, mentors and your peers.

A large part of engineering design involves the effective communication (oral and written) of your ideas and the confident justification of your approach. You will work on a major design project where you can practice your design skills and demonstrate your understanding of the fundamental concepts of design, teamwork and project management.

Assessment

Assessment Tasks

Assessment task	Weight	Due Date	Student Learning Outcomes Assessed
Preliminary and Critical design reviews	30%	Week 3 (15/06/21 by 12pm) and Week 5 (30/06/21 by 12pm)	1, 2
Report	25%	06/08/2021 05:00 PM	2, 4
Presentation	25%	06/08/2021 05:00 PM	2, 4
Prototype testing	20%	Exam Period	2, 3

Assessment Details

Assessment 1: Preliminary and Critical design reviews

Start date: Not Applicable

Length: PowerPoint presentation + Engineering Drawings

Details:

Preliminary Design Review (week 3) - 10%

- Team organization, RASCI
- Planning
- Quality governance

Critical Design Review (week 5) - 20%

- Concept definition
- Compliance with the requirements
- Drawings for manufacturing
- Feedback from technical staff

Assessment criteria: Both design reviews will be assessed based on the quality of the presentation. Technical reviews must provide assurance that the prototype being developed will meet specified requirements. Engineering drawings must be compliant with Australian standards AS1100.

Deadline for absolute fail: number of days after the due date which is the weighting of the assessment divided by 20% per day

Marks will be returned within 2 weeks of the due date.

Each group assessment will have a peer review component (Team evaluation)

Additional details:

Please refer to assessment guidelines for further information.

Submission notes: via Moodle

Turnitin setting: This assignment is submitted through Turnitin and students can see Turnitin similarity reports.

Assessment 2: Report

Length: 15 pages + appendices

Details:

Report (15 pages + appendices + risk assessment form)

Assessment criteria: The quality, detail, structure and content of the report will be assessed.

Deadline for absolute fail: number of days after the due date which is the weighting of the assessment divided by 20% per day

Marks will be returned within 2 weeks of the due date.

Each group assessment will have a peer review component (Team evaluation)

Additional details:

Please refer to assessment guidelines for further information.

Submission notes: via Moodle

Turnitin setting: This assignment is submitted through Turnitin and students can see Turnitin similarity reports.

Assessment 3: Presentation

Length: video or narrated PowerPoint – 10 min

Details:

Presentation (video or narrated PowerPoint – 10 min)

Assessment criteria: The quality, clarity, structure and content of the presentation will be assessed.

Deadline for absolute fail: number of days after the due date which is the weighting of the assessment divided by 20% per day

Marks will be returned within 2 weeks of the due date.

Each group assessment will have a peer review component (Team evaluation)

Additional details:

Please refer to assessment guidelines for further information.

Submission notes: via Moodle

Turnitin setting: This assignment is submitted through Turnitin and students can see Turnitin similarity reports.

Assessment 4: Prototype testing

Length: 1 hour

Details:

Prototype Testing (performance evaluation)

Assessment criteria: Prototype will be tested against Project Design & Operations requirements. A scorecard will record technical performances.

Deadline for absolute fail: number of days after the due date which is the weighting of the assessment divided by 20% per day

Marks will be returned within 2 weeks of the due date.

Each group assessment will have a peer review component (Team evaluation)

Additional details:

Please refer to assessment guidelines for further information.

Submission notes: Physical prototype testing

Turnitin setting: This is not a Turnitin assignment

Attendance Requirements

Students are strongly encouraged to attend all classes and review lecture recordings.

Course Schedule

View class timetable

Timetable

Date	Type	Content
Week 1: 31 May - 4 June	Lecture	
	Project	Weekly group meeting with mentor.
Week 2: 7 June - 11 June	Lecture	
	Project	Weekly group meeting with mentor.
Week 3: 14 June - 18 June	Workshop	Workshop Tour
	Project	Weekly group meeting with mentor.
Week 4: 21 June - 25 June	Workshop	Technical staff consultation session for design / manufacturing advice
	Project	Weekly group meeting with mentor.
Week 5: 28 June - 2 July	Workshop	Technical staff consultation session for design / manufacturing advice
	Project	Weekly group meeting with mentor.
Week 7: 12 July - 16 July	Lecture	Guest industrial partners (TBC)
	Project	Weekly group meeting with mentor.
Week 8: 19 July - 23 July	Workshop	Assembly session
	Project	Weekly group meeting with mentor.
Week 9: 26 July - 30 July	Workshop	Assembly session
	Project	Weekly group meeting with mentor.
Week 10: 2 August - 6 August	Workshop	Assembly session
	Project	Weekly group meeting with mentor.

Resources

Recommended Resources

Suggested reading (a starting point only)

Excellent advice, descriptions and guidelines, based on practical experience are given in *Making Stirling Engines* by Andy Ross, which can be obtained as a free download from the following page: http://www.stirlingbuilder.com/.

Walker, G. (1973) Stirling Cycle Machines, Clarendon Press Oxford

R.G. Budynas & K.J. Nisbett, Shigley's Mechanical Engineering Design (SI Units), 11th Ed, McGraw Hill

UNSW Library Website: https://www.library.unsw.edu.au/

Course Evaluation and Development

Feedback on the course is gathered periodically using various means, including the UNSW myExperience process, informal discussion in the final class for the course, and the School's Student/Staff meetings. Your feedback is taken seriously, and continual improvements are made to the course based, in part, on such feedback.

This year, the course has been redesigned to include hands-on experience. Students will have the opportunity to go through all the phases of a mechanical design project from design to manufacturing and testing. They will implement specific tools of project management and complete a set of project deliverables such as Preliminary Design Review, Critical Design Review, Prototype Testing, formal report and presentation.

Laboratory Workshop Information

Laboratory / Workshop Safety

All staff and students must observe all safety requirements in the laboratory / workshop. You must come to the laboratory dressed for work, NO LOOSE OR BAGGY CLOTHING, NO SANDALS OR BARE FEET. Before beginning any experiment, inspect all equipment you will use for potential hazards. While using laboratory equipment, keep alert for any developing hazard.

It is essential that you take all care to avoid unsafe practices during this project. The combination of heat, naked flames and moving parts (amongst other risks) mean that a thorough safety assessment should be carried out before any work commences. This document must be adhered to at all times when working on this project.

Submission of Assessment Tasks

Assessment submission and marking criteria

Should the course have any non-electronic assessment submission, these should have a standard School cover sheet.

All submissions are expected to be neat and clearly set out. Your results are the pinnacle of all your hard work and should be treated with due respect. Presenting results clearly gives the marker the best chance of understanding your method; even if the numerical results are incorrect.

Marking guidelines for assignment submissions will be provided at the same time as assignment details to assist with meeting assessable requirements. Submissions will be marked according to the marking guidelines provided.

Late policy

Work submitted late without an approved extension by the course coordinator or delegated authority is subject to a late penalty of 20 percent (20%) of the maximum mark possible for that assessment item, per calendar day.

The late penalty is applied per calendar day (including weekends and public holidays) that the assessment is overdue. There is no pro-rata of the late penalty for submissions made part way through a day.

Work submitted after the ‘deadline for absolute fail’ is not accepted and a mark of zero will be awarded for that assessment item.

For some assessment items, a late penalty may not be appropriate. These are clearly indicated in the course outline, and such assessments receive a mark of zero if not completed by the specified date. Examples include:

1. Weekly online tests or laboratory work worth a small proportion of the subject mark, or
2. Online quizzes where answers are released to students on completion, or
3. Professional assessment tasks, where the intention is to create an authentic assessment that has an absolute submission date, or
4. Pass/Fail assessment tasks.

Examinations

You must be available for all quizzes, tests and examinations. For courses that have final examinations, these are held during the University examination periods: February for Summer Term, May for T1, August for T2, and November/December for T3.

Please visit myUNSW for Provisional Examination timetable publish dates. For further information on exams, please see the Exams webpage.

Special Consideration

If you have experienced an illness or misadventure beyond your control that will interfere with your

assessment performance, you are eligible to apply for Special Consideration prior to submitting an assessment or sitting an exam.

UNSW now has a Fit to Sit / Submit rule, which means that if you attempt an exam or submit a piece of assessment, you are declaring yourself fit enough to do so and cannot later apply for Special Consideration.

For details of applying for Special Consideration and conditions for the award of supplementary assessment, please see the information on UNSW's Special Consideration page.

Please note that students will **not** be required to provide **any** documentary evidence to support absences from any classes missed **because of COVID-19 public health measures such as isolation**. UNSW will **not** be insisting on medical certificates from anyone deemed to be a positive case, or when they have recovered. Such certificates are difficult to obtain and put an unnecessary strain on students and medical staff.

Applications for special consideration **will** be required for assessment and participation absences – but no documentary evidence **for COVID 19 illness or isolation** will be required.

Academic Honesty 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, visit: student.unsw.edu.au/plagiarism. The Learning Centre 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 Centre, 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. The Student Misconduct Procedures are available here:

www.gs.unsw.edu.au/policy/documents/studentmisconductprocedures.pdf

Academic Information

Credit points

Course credit is calculated in Units-Of-Credit (UOC). The normal workload expectation for one UOC is approximately 25 hours per term. This includes class contact hours, private study, other learning activities, preparation and time spent on all assessable work.

Most coursework courses at UNSW are 6 UOC and involve an estimated 150 hours to complete, for both regular and intensive terms. Each course includes a prescribed number of hours per week (h/w) of scheduled face-to-face and/or online contact. Any additional time beyond the prescribed contact hours should be spent in making sure that you understand the lecture material, completing the set assignments, further reading, and revising for any examinations.

On-campus class attendance

Public distancing conditions must be followed for all face-to-face classes. To ensure this, only students enrolled in those classes will be allowed in the room. No over-enrolment is allowed in face-to-face classes. Students enrolled in online classes can swap their enrolment from online to a **limited** number of on-campus classes by Sunday, Week 1. Please refer to your course's Microsoft Teams and Moodle sites for more information about class attendance for in-person and online class sections/activities.

Your health and the health of those in your class is critically important. You must stay at home if you are sick or have been advised to self-isolate by NSW health or government authorities. Current alerts and a list of hotspots can be found here. **You will not be penalised for missing a face-to-face activity due to illness or a requirement to self-isolate.** We will work with you to ensure continuity of learning during your isolation and have plans in place for you to catch up on any content or learning activities you may miss. Where this might not be possible, an application for fee remission may be discussed. Further information is available on any course Moodle or Teams site.

In certain classroom and laboratory situations where physical distancing cannot be maintained or there is a high risk that it cannot be maintained, face masks will be considered **mandatory PPE** for students and staff.

For more information, please refer to the
FAQs: https://www.covid-19.unsw.edu.au/safe-return-campus-faqs

Guidelines

All students are expected to read and be familiar with UNSW guidelines and polices. In particular, students should be familiar with the following:

- Attendance
- UNSW Email Address
- Special Consideration
- Exams
- Approved Calculators
- Academic Honesty and Plagiarism

Important Links

- Moodle
- Lab Access
- Computing Facilities
- Student Resources
- Course Outlines
- Faculty Transitional Arrangements for COVID-19
- Makerspace
- UNSW Timetable
- UNSW Handbook
- Equitable Learning Services

Image Credit

Synergies in Sound 2016

CRICOS

CRICOS Provider Code: 00098G

Acknowledgement of Country

We acknowledge the Bedegal people who are the traditional custodians of the lands on which UNSW Kensington campus is located.

Appendix: Engineers Australia (EA) Professional Engineer Competency Standard

Program Intended Learning Outcomes	
Knowledge and skill base	
PE1.1 Comprehensive, theory based understanding of the underpinning natural and physical sciences and the engineering fundamentals applicable to the engineering discipline	✓
PE1.2 Conceptual understanding of the mathematics, numerical analysis, statistics, and computer and information sciences which underpin the engineering discipline	
PE1.3 In-depth understanding of specialist bodies of knowledge within the engineering discipline	
PE1.4 Discernment of knowledge development and research directions within the engineering discipline	✓
PE1.5 Knowledge of engineering design practice and contextual factors impacting the engineering discipline	
PE1.6 Understanding of the scope, principles, norms, accountabilities and bounds of sustainable engineering practice in the specific discipline	✓
Engineering application ability	
PE2.1 Application of established engineering methods to complex engineering problem solving	✓
PE2.2 Fluent application of engineering techniques, tools and resources	✓
PE2.3 Application of systematic engineering synthesis and design processes	✓
PE2.4 Application of systematic approaches to the conduct and management of engineering projects	✓
Professional and personal attributes	
PE3.1 Ethical conduct and professional accountability	✓
PE3.2 Effective oral and written communication in professional and lay domains	✓
PE3.3 Creative, innovative and pro-active demeanour	✓
PE3.4 Professional use and management of information	✓
PE3.5 Orderly management of self, and professional conduct	✓
PE3.6 Effective team membership and team leadership	✓