

MECH3110

Mechanical Design 1

Term 1, 2022



Course Overview

Staff Contact Details

Convenors

Name	Email	Availability	Location	Phone
Daniel Egger	d.egger@unsw.edu.au	Please email to book a consultation	402H, Ainsworth Building	

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

Important Links

- [Student Wellbeing](#)
- [Urgent Mental Health & Support](#)
- [Equitable Learning Services](#)
- [Faculty Transitional Arrangements for COVID-19](#)
- [Moodle](#)
- [Lab Access](#)
- [Computing Facilities](#)
- [Student Resources](#)
- [Course Outlines](#)
- [Makerspace](#)
- [UNSW Timetable](#)
- [UNSW Handbook](#)

Course Details

Units of Credit 6

Summary of the Course

This course will continue the development of a systematic approach to problem solving and design that commenced in earlier courses. It will focus on mathematical modelling for design applications; force flow through components and assemblies; belt, chain and gear drive design; rolling element bearing selection; dynamically-loaded bolted connections; shaft design and explore these ideas in terms of practical applications.

Course Aims

This course will continue the development of a systematic approach to problem solving and design that commenced in earlier courses. The course follows on from the introduction provided by ENGG1000, establishes the machine element design approach and provides an opportunity to apply the mechanical knowledge and techniques gained from MMAN2400 and MMAN3400. Students will interact as part of a design team, while developing design solutions for a realistic problem of reasonable size and complexity. The lecture topics relate closely to assignment requirements with a balance between theory and practice. Assessment will have a strong emphasis on practical design knowledge and skills as well as a high standard of professional written and graphical communication. This will include researching information for design assignments and searching for solutions as task specifications become less complete and more realistic. A proof of concept prototype will be manufactured, assembled and tested to ensure the design is feasible and functions as claimed.

Course Learning Outcomes

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

Learning Outcome	EA Stage 1 Competencies
1. Design and implement solutions to open-ended design problems	PE1.1, PE1.2, PE1.5, PE2.1, PE2.3, PE2.4
2. Manage a design project and be able to plan, schedule and document work activities in accordance with standard practice.	PE1.3, PE1.6, PE2.1, PE2.3, PE2.4, PE3.2, PE3.3, PE3.6
3. Assess the safety of engineering structures and components in a machine system encountered in industry.	PE1.3, PE1.4, PE2.2, PE2.3, PE2.4, PE3.3, PE3.4, PE3.5
4. Communicate design decisions in a engineering design report to industry standards	PE1.6, PE3.1, PE3.2, PE3.4

Teaching Strategies

This course attempts to approximate a typical design workplace environment in which accurate and professional quality results are required against cost and time constraints, information is incomplete or conflicting and team interaction is essential.

Lectures in this course are designed to cover the terminology, core concepts and techniques in the design of machines. They show how the various techniques are applied in practice and the details of when, where, and how they should be applied.

Workshops are designed to provide feedback and discussion on the assignments, and to investigate problem areas in depth. Workshop guidance will assist the student to develop the capacity to make judgements based on sound engineering practice and solid theory. Students will be expected to seek out necessary information, or ask for help.

Effective learning is supported when students are actively engaged in the learning process and by a climate of enquiry, and these are best achieved through learning activities like lectures and workshops using real-world examples combined with hands-on prototyping. Students become more engaged in the learning process if they can see the relevance of their studies to professional, disciplinary and/or personal contexts. This relevance is shown in all parts of the course through lectures and assignments and by way of examples drawn from industry.

Assessment

Assessment task	Weight	Due Date	Course Learning Outcomes Assessed
1. Transmission Assignment	40%	Friday Week 10, 23:55	1, 2, 3, 4
2. Fastener Assignment	20%	Friday Week 8, 23:55	1, 3, 4
3. Gearbox Prototyping Project	40%	Group contract due Friday Week 2 by 23:55, Engineering drawings due Monday Week 5 by 09:00, Feasibility study documenting engineering analysis of design due Friday Week 5 by 23:55, Compliance testing will be held during exam period.	1, 2, 3, 4

Assessment 1: Transmission Assignment

Submission notes: Report to be submitted to Turnitin on the course Moodle page.

Due date: Friday Week 10, 23:55

Deadline for absolute fail: 5 days after the due date.

Marks returned: Marks to be returned upon release of final marks (after exam period).

Design of a transmission system to provide mechanical power for a given process.

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

Additional details

Students will work in groups to design a transmission system. Please refer to assessment guidelines within Teams for further information.

Assessment 2: Fastener Assignment

Submission notes: Report to be submitted to Turnitin on the course Moodle page.

Due date: Friday Week 8, 23:55

Deadline for absolute fail: 5 days after the due date.

Marks returned: Two weeks after submission

Design of a system that utilises bolt fasteners to support various structures.

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

Additional details

Individual assignment. Students will design and analyse a structure that utilises bolted joints. Please refer to assessment guidelines within Teams for further information.

Assessment 3: Gearbox Prototyping Project

Due date: Group contract due Friday Week 2 by 23:55, Engineering drawings due Monday Week 5 by 09:00, Feasibility study documenting engineering analysis of design due Friday Week 5 by 23:55, Compliance testing will be held during exam period.

Marks returned: All assessment marks returned within two weeks of submission of the respective deliverable.

Design and analysis of a geared transmission system. Final design will be prototyped and tested for compliance.

Additional details

Group assessment. 4 main deliverables:

1. Group contract (0%). Due Friday Week 2, 23:55.
2. Engineering drawings (10%). Due Monday Week 5, 09:00.
3. Feasibility study documenting engineering analysis of design (10%). Due Friday Week 5, 23:55.
4. Compliance testing of manufactured geared transmission prototype (20%). Compliance testing will be held during Week 11.

Please refer to assessment guidelines within Teams for further information.

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: 14 February - 18 February	Lecture	Monday 15:00 - 17:00: Introduction + Design Process Tuesday 12:00 - 14:00: Shaft Design 1 Thursday 11:00 - 13:00: Shaft Design 2
	Workshop	1st session topic: How to approach open ended design 2nd session topic: Major project open consultation
Week 2: 21 February - 25 February	Lecture	Monday 15:00 - 17:00: Shaft Design Case Study Tuesday 12:00 - 14:00: Gear Design 1 Thursday 11:00 - 13:00: Gear Design 2
	Workshop	1st session topic: Shaft design problem solving session 2nd session topic: Major project open consultation
Week 3: 28 February - 4 March	Lecture	Monday 15:00 - 17:00: Gear Design Case Study Tuesday 12:00 - 14:00: Introduction to Motors + Case Study
	Laboratory	Thursday 11:00 - 13:00: Technician Consultation at Undergraduate Teaching Labs
	Workshop	1st session topic: Gear design problem solving session 2nd session topic: Major project open consultation

Week 4: 7 March - 11 March	Lecture	Monday 15:00 - 17:00: Fasteners 1 Tuesday 12:00 - 14:00: Fasteners 2 + Case Study
	Laboratory	Thursday 11:00 - 13:00: Technician Consultation at Undergraduate Teaching Labs
	Workshop	1st session topic: Major project open consultation 2nd session topic: Major project open consultation
Week 5: 14 March - 18 March	Lecture	Monday 15:00 - 17:00: Belt and Chain Transmissions 1 Tuesday 12:00 - 14:00: Belt and Chain Transmissions 2
	Workshop	1st session topic: Fastener joint design problem solving session 2nd session topic: Open consultation
Week 6: 21 March - 25 March	Lecture	Monday 15:00 - 17:00: No Lecture Tuesday 12:00 - 14:00: No Lecture
	Workshop	1st session topic: Open consultation 2nd session topic: Major project open consultation
Week 7: 28 March - 1 April	Lecture	Monday 15:00 - 17:00: Belt and Chain Transmissions Case Study Tuesday 12:00 - 14:00: Bearings + Case Study
	Workshop	1st session topic: Belt and chain transmission design problem solving session 2nd session topic: Open consultation
Week 8: 4 April - 8 April	Lecture	Monday 15:00 - 17:00: Flywheel Design + Case Study Tuesday 12:00 - 14:00: Open Consultation
	Workshop	1st session topic: Open consultation 2nd session topic: Open consultation
Week 9: 11 April - 15 April	Lecture	Monday 15:00 - 17:00: No Lecture Tuesday 12:00 - 14:00: Guest Lectures from

		Industry
	Workshop	1st session topic: Open consultation 2nd session topic: Open consultation
Week 10: 18 April - 22 April	Lecture	Monday 15:00 - 17:00: Public Holiday Tuesday 12:00 - 14:00: Open Consultation
	Workshop	1st session topic: Open consultation 2nd session topic: Open consultation

Resources

Prescribed Resources

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

Recommended Resources

UNSW Library website: <https://www.library.unsw.edu.au/>

Moodle: <https://moodle.telt.unsw.edu.au/login/index.php>

Microsoft

Teams: https://teams.microsoft.com//team/19%3aLeusaQMTz-c8zf3So_wzfgYwjcyzqzuauR-cKGD6MBo1%40thread.tacv2/conversations?groupId=3a3bde46-58e7-459a-9d28-6f75bda750cd&tenantId=3ff6cfa4-e715-48db-b8e1-0867b9f9fba3

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.

Recent improvements include:

- assessment weightings were adjusted to more accurately capture the effort required.
- workload reduced for specific deliverables of the prototyping assessment
- changed the format of the workshops from 1 x 2hr to 2 x 1hr to improve engagement and timely support

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, for a minimum of zero marks.

The late penalty is applied per calendar day (or part thereof), including weekends and public holidays, that the assessment is overdue.

Work submitted after the 'deadline for absolute fail' is not accepted and a mark of zero will be awarded for that assessment item. For example:

- Your course has an assessment task worth a total of **30 marks (Max Possible Mark)**
- You submit the assessment **2 days after the due date**
- The assessment is marked as usual and achieves a score of **20 marks (Awarded Mark)**
- The late policy is applied using **Late Mark = Awarded Mark - (Days*Penalty per Day)*Max Possible Mark**. Your adjusted final score is **8 marks** ($20 - ((2*0.2)*30)$).

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.

Special Consideration Outcomes

Assessments have default Special Consideration outcomes. The default outcome for the assessment will be advised when you apply for Special Consideration. Below is the list of possible outcomes:

Outcome	Explanation	Example
Time extension	Student provided more time to submit the assessment	e.g. 1 more week of time granted to submit a report
Supplementary assessment	Student provided an alternate assessment at a later date/time	e.g. a supplementary exam is scheduled during the supplementary exam period of the term
Substitute item	The mark for the missed assessment is substituted with the mark of another assessment	e.g. mark for Quiz 1 applied also applied as mark for Quiz 2, meaning if a student achieved a mark of 20/30 for Quiz 1 and was granted Special Consideration for Quiz 2, a mark of 20/30 would be applied for Quiz 2, etc
Exemption	All course marks are recalculated excluding this assessment and its weighting	e.g. The course has an assessment structure of: - Assignments 30%, - Lab report 30%, - Final Exam 40%. If the Lab report is missed and student is granted Special Consideration, then the assessment structure may be reweighted as follows: - Assignments 50% - Final Exam 50% as though the Lab report did not exist
Non-standard	Course Coordinator is contacted for the outcome when special consideration is granted as the outcome differs on a case-by-case basis	e.g. typical for group assessments where time extension supplementary assessment could be granted to the group member, time extension could be granted to the whole group, etc. Clarify with your Course Convenor for

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

****T1-2022 UPDATE****

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 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 policies. In particular, students should be familiar with the following:

- [Attendance](#)
- [UNSW Email Address](#)
- [Special Consideration](#)
- [Exams](#)
- [Approved Calculators](#)

- [Academic Honesty and Plagiarism](#)

Image Credit

https://www.alibaba.com/product-detail/ENLOONG-Luxury-Watches-Mechanical-Movement-with_62180278155.html

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	✓