UNSW Course Outline

MECH3110 Mechanical Design 1 - 2024

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General Course Information

Course Code : MECH3110
Year : 2024
Term : Term 1
Teaching Period : T1
Is a multi-term course? : No
Faculty : Faculty of Engineering
Academic Unit : School of Mechanical and Manufacturing Engineering
Delivery Mode : In Person
Delivery Format : Standard
Delivery Location : Kensington
Campus : Sydney
Study Level : Postgraduate, Undergraduate
Units of Credit : 6

Useful Links

Handbook Class Timetable

Course Details & Outcomes

Course Description

This course has been designed to build upon the systematic approach to problem-solving and design that was previously introduced in other related coursework. The primary focus of this course will be mathematical modelling for design applications, including the analysis of force

flow through components and assemblies, the design of dynamically-loaded bolted connections and welded joints, as well as the design of power transmission systems such as shafts, gears, belt and chain drives, and the selection of rolling element bearings for specific applications. Through the exploration of these concepts, students will gain practical knowledge and skills relevant to real-world engineering applications.

Course Aims

The current course serves as a continuation of the systematic approach to problem-solving and design that was previously introduced in earlier coursework. Specifically, this course builds upon the introduction provided by ENGG1000/DESN1000 and extends the machine element design approach that was previously introduced in MMAN2100/DESN2000. Moreover, this course provides students with an opportunity to apply the mechanical knowledge and techniques that were acquired in MMAN2400 and MMAN3400. Through collaboration in design teams, students will develop solutions for realistic problems of reasonable size and complexity. The lecture topics will closely relate to the requirements of design assignments, with an appropriate balance between theoretical concepts and practical applications. The assessment methodology will place a strong emphasis on practical design knowledge and skills, as well as the ability to communicate effectively in both written and graphical formats. To this end, students will be expected to conduct research to complete design assignments and to seek solutions to problems when task specifications are incomplete or complex.

Course Learning Outcomes

Course Learning Outcomes
CLO1 : Design and implement solutions to open-ended design problems
CLO2 : Manage a design project and be able to plan, schedule and document work activities in accordance with standard practice.
CLO3 : Assess the safety of engineering structures and components in a machine system encountered in industry.
CLO4 : Communicate design decisions in a engineering design report to industry standards

Course Learning Outcomes	Assessment Item
CLO1 : Design and implement solutions to open-ended design problems	• Gearbox Prototyping Project • Fastener Assignment • Power Transmission Assignment
CLO2 : Manage a design project and be able to plan, schedule and document work activities in accordance with standard practice.	• Gearbox Prototyping Project • Power Transmission Assignment
CLO3 : Assess the safety of engineering structures and components in a machine system encountered in industry.	• Fastener Assignment • Gearbox Prototyping Project • Power Transmission Assignment
CLO4 : Communicate design decisions in a engineering design report to industry standards	• Fastener Assignment • Gearbox Prototyping Project • Power Transmission Assignment

Learning and Teaching Technologies

Moodle - Learning Management System | Microsoft Teams

Additional Course Information

This is a 6 unit-of-credit (UoC) course and involves 6 hours per week (h/w) of scheduled contact. Please check your timetable on myUNSW for the time and location of your classes.

The normal workload expectations of a student are approximately 25 hours per term for each UOC, including class contact hours, other learning activities, preparation and time spent on all assessable work.

You should aim to spend about 15 h/w on this course. The additional time should be spent in making sure that you understand the lecture material, completing the workshop exercise

questions and set assignments, further reading.

Assessments

Assessment Structure

Assessment Item	Weight	Relevant Dates
Gearbox Prototyping Project Assessment Format: Group	40%	Start Date: Not Applicable Due Date: See "Detailed assessment description" section.
Fastener Assignment Assessment Format: Individual	20%	Start Date: Not Applicable Due Date: 11:55 pm, Friday, Week 8.
Power Transmission Assignment Assessment Format: Group	40%	Start Date: Not Applicable Due Date: 11:55 pm, Friday, Week 11

Assessment Details

Gearbox Prototyping Project

Assessment Overview

Assessment length: Maximum 20 pages (from introduction to conclusion) for the project report.

This is a group assignment. In this assignment, you are required to design and analyse a geared transmission system in groups of six students. The final design will be prototyped and tested for performance.

There are four main deliverables in this major assignment:

1. Group contract (0%)
2. Manufacturing files (10%)
3. Project report (15%)
4. Final competition (15%)

Mandatory teamwork evaluation tasks are due one week after the submission deadline of each deliverable.

Marking will be against specific criteria in a marking guide, and formal feedback on your assessment task will be provided within two weeks of the relevant deliverable deadline.

Course Learning Outcomes

- CLO1 : Design and implement solutions to open-ended design problems

- CLO2 : Manage a design project and be able to plan, schedule and document work activities in accordance with standard practice.
- CLO3 : Assess the safety of engineering structures and components in a machine system encountered in industry.
- CLO4 : Communicate design decisions in a engineering design report to industry standards

Detailed Assessment Description

Due date for each deliverable

1. Group contract (0%): due 11:55 pm, Friday, Week 2.
2. Manufacturing documents (10%): due 11:55 pm, Sunday, Week 4.
3. Project report (15%): due 11:55pm, Friday, Week 5.
4. Final competition (15%): during Week 10 workshop.

Deadline for absolute fail: Five (5) calendar days after the due date of this assessment.

Assessment Length

Maximum 20 pages (from introduction to conclusion) for the project report.

Submission notes

Submit the deliverables in the required format to the relevant submission box on the course Moodle page.

Assignment submission Turnitin type

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

Fastener Assignment

Assessment Overview

Assessment length: Maximum 15 pages (from introduction to conclusion).

This is an individual assignment. In this assignment, you are asked to design a system that utilises bolt fasteners to support various structures.

Marking will be against specific criteria in a marking guide, and formal feedback on your assessment task will be provided within two weeks after the submission deadline.

Course Learning Outcomes

- CLO1 : Design and implement solutions to open-ended design problems
- CLO3 : Assess the safety of engineering structures and components in a machine system encountered in industry.

- CLO4 : Communicate design decisions in a engineering design report to industry standards

Detailed Assessment Description

Deadline for absolute fail: Five (5) calendar days after the due date of this assessment.

Assessment Length

Maximum 15 pages (from introduction to conclusion).

Submission notes

Submit a report in .pdf format to the Turnitin submission box on the course Moodle page.

Assignment submission Turnitin type

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

Power Transmission Assignment

Assessment Overview

Assessment length: Maximum 20 pages (from introduction to conclusion).

This is a group assignment. In this assignment, students will work in groups of six students to design a power transmission system to provide mechanical power for a given process.

A mandatory teamwork evaluation task is due after the submission deadline of the assignment.

Marking will be against specific criteria in a marking guide, and formal feedback on your assessment task will be provided upon the release of the final course grade.

Course Learning Outcomes

- CLO1 : Design and implement solutions to open-ended design problems
- CLO2 : Manage a design project and be able to plan, schedule and document work activities in accordance with standard practice.
- CLO3 : Assess the safety of engineering structures and components in a machine system encountered in industry.
- CLO4 : Communicate design decisions in a engineering design report to industry standards

Detailed Assessment Description

Deadline for absolute fail: Five (5) calendar days after the due date of this assessment.

Assessment Length

Maximum 20 pages (from introduction to conclusion).

Submission notes

Submit a report in .pdf format to the Turnitin submission box on the course Moodle page.

Assignment submission Turnitin type

This assignment is submitted through Turnitin and students do not see Turnitin similarity reports.

General Assessment Information

Grading Basis

Standard

Course Schedule

Teaching Week/Module	Activity Type	Content
Week 1 : 12 February - 18 February	Lecture	Monday 2 pm - 4 pm: Introduction to mechanical design. Wednesday 11 am - 1 pm: Shaft design 1.
	Workshop	Session 1 topic: How to approach open-ended design. Session 2 topic: Assessment help and open consultation.
Week 2 : 19 February - 25 February	Lecture	Monday 2 pm - 4 pm: Shaft design 2 and case study. Wednesday 11 am - 1 pm: Gear design 1.
	Workshop	Session 1 topic: Shaft design problem-solving session Session 2 topic: Assessment help and open consultation.
	Assessment	Gearbox Prototyping Project: Group contract due at 11:55 pm on Friday.
Week 3 : 26 February - 3 March	Lecture	Monday 2 pm - 4 pm: Gear design 2 and case study. Wednesday 11 am - 1 pm: Motor selection and case study.
	Workshop	Session 1 topic: Gear design problem-solving session. Session 2 topic: Technical consultation in the Undergraduate Teaching Lab.
Week 4 : 4 March - 10 March	Lecture	Monday 2 pm - 4 pm: Fasteners 1. Wednesday 11 am - 1 pm: Fasteners 2 and case study.
	Workshop	Session 1 topic: Assessment help and open consultation. Session 2 topic: Technical consultation in the Undergraduate Teaching Lab.
	Assessment	Gearbox Prototyping Project: Manufacturing documentations due at 11:55 pm on Sunday.
Week 5 : 11 March - 17 March	Lecture	Monday 2 pm - 4 pm: Power transmission using belt drive systems. Wednesday 11 am - 1 pm: Power transmission using chain drive systems.
	Workshop	Session 1 topic: Fastener joint design problem-solving session. Session 2 topic: Assessment help and open consultation.
	Assessment	Gearbox Prototyping Project: Project report due at 11:55 pm on Friday.
Week 6 : 18 March - 24 March	Online Activity	Optional online consultations.
Week 7 : 25 March - 31 March	Lecture	Monday 2 pm - 4 pm: Bearings and case study. Wednesday 11 am - 1 pm: Industry guest lecture on bearings.
	Workshop	Session 1 topic: Belt and chain transmission design problem-solving session. Session 2 topic: Assessment help and open consultation.
Week 8 : 1 April - 7 April	Lecture	Monday 2 pm - 4 pm: No class. Public Holiday. Wednesday 11 am - 1 pm: Flywheel design and case study.
	Workshop	Session 1 topic: Assessment help and open consultation. Session 2 topic: Gearbox Prototyping Project assembly session in the Undergraduate Teaching Lab.
	Assessment	Fastener Assignment due at 11:55 pm on Friday.
Week 9 : 8 April - 14 April	Lecture	Monday 2 pm - 4 pm: Transmission assignment help session. Wednesday 11 am - 1 pm: No lecture.
	Workshop	Session 1 topic: Assessment help and open consultation. Session 2 topic: Assessment help and open consultation.
Week 10 : 15 April - 21 April	Lecture	Monday 2 pm - 4 pm: No lecture. Wednesday 11 am - 1 pm: Assessment help and open consultation.
	Workshop	Session 1 topic: Assessment help and open consultation. Session 2 topic: Gearbox Prototyping Project Final Competition in the Undergraduate Teaching Lab.
Week 11 : 22 April - 28 April	Assessment	Transmission Assignment due at 11:55 pm on Friday.

Attendance Requirements

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

General Schedule Information

Lectures will be delivered online via Microsoft Teams with an in-person attendance option (pre-

registration required). Lectures are recorded.

Workshops are delivered face-to-face and are NOT recorded. Please refer to your timetable on myUNSW for the time and location of your workshop sessions.

Course Resources

Prescribed Resources

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

Prescribed software: SOLIDWORKS 2023 and Microsoft Teams.

Recommended Resources

Recommended textbook: Engineering Drawing, A. W. Boundy, 8th Ed, McGraw Hill.

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

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

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:

- The due dates and weightings of the assessments 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.

Staff Details

Position	Name	Email	Location	Phone	Availability	Equitable Learning Services Contact	Primary Contact
Convenor	Darson Li		Room 408J, Ainsworth Building J17			No	Yes
Lab staff	Bruce Oliver		Undergraduate Teaching Lab, Willis Annexe J18			No	No

Other Useful Information

Academic Information

I. Special consideration and supplementary assessment

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, or within 3 working days of, submitting an assessment or sitting an exam.

Please note that UNSW has a Fit to Sit rule, which means that if you sit an exam, 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.

II. Administrative matters and links

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
- Equitable Learning Services

III. 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.

IV. Professional Outcomes and Program Design

Students are able to review the relevant professional outcomes and program designs for their streams by going to the following link: https://www.unsw.edu.au/engineering/student-life/student-resources/program-design.

Note: This course outline sets out the description of classes at the date the Course Outline is published. The nature of classes may change during the Term after the Course Outline is published. Moodle or your primary learning management system (LMS) should be consulted for the up-to-date class descriptions. If there is any inconsistency in the description of activities between the University timetable and the Course Outline/Moodle/LMS, the description in the Course Outline/Moodle/LMS applies.

Academic Honesty and Plagarism

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.

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 or contract cheating) even suspension from the university. The Student Misconduct Procedures are available here:

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

Submission of Assessment Tasks

Work submitted late without an approved extension by the course coordinator or delegated authority is subject to a late penalty of five percent (5%) 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. This is for all assessments where a penalty applies.

Work submitted after five days (120 hours) will not be 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 will be clearly indicated in the course outline, and such assessments will receive a mark of zero if not completed by the specified date. Examples include:

- Weekly online tests or laboratory work worth a small proportion of the subject mark;
- Exams, peer feedback and team evaluation surveys;
- Online quizzes where answers are released to students on completion;
- Professional assessment tasks, where the intention is to create an authentic assessment that has an absolute submission date; and,
- Pass/Fail assessment tasks.

Faculty-specific Information

Engineering Student Support Services – The Nucleus - enrolment, progression checks, 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

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)

School-specific Information

Short Extensions

Short extensions are not currently applicable to Mechanical and Manufacturing Engineering Courses.

Review of Results

The purpose of a review of results is if there was a marking error. Review of results is for when you have cause to believe that there is a marking error. Review of Results cannot be used to get feedback. If you would like feedback for assessments prior to the final exam, you are welcome to contact the course convenor directly. No feedback will be provided on final exams.

Use of AI

The use of AI is prohibited unless explicitly permitted by the course convenor. Please respect this and be aware that penalties will apply when unauthorised use is detected, such as through Turnitin. If the use of generative AI, such as ChatGPT, is allowed in a specific assessment, they must be properly credited, and your submissions must be substantially your own work.

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