MECH3003

Mechanical Design 2

Session 1, In person-scheduled-weekday, North Ryde 2025

School of Engineering

Contents

General Information

Unit convenor and teaching staff
Unit Convener
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Monday 11am to 1pm (by appointment)

Credit points
10

Prerequisites
((MECH2001 or MECH201) and (MECH2003 or MECH203) and (MECH2004 or MECH204)) or admission to MEngMechEng

Corequisites

Co-badged status

Unit description
In this unit, students will develop the skills to produce design solutions for complex engineering design problems. The unit covers knowledge in the design of machine components such as gears, belt drives, chain drives, bearings and shaft systems. At the end of the unit, students are expected to demonstrate the ability to design a complete mechanical system as well as the critical details for components of a larger system. The unit will culminate with an opportunity for the students to present a constructed system and demonstrate its ability to achieve the defined task in a competition.

Important Academic Dates

Information about important academic dates including deadlines for withdrawing from units are available at https://www.mq.edu.au/study/calendar-of-dates

Learning Outcomes

On successful completion of this unit, you will be able to:

ULO1: Define a complex mechanical engineering problem into a series of specifications and consider multiple alternative solutions that may achieve these specifications.
ULO2: Apply concepts and knowledge in Mechanics of Materials and Materials engineering to create mathematical representations of the performance of common

mechanical components to generate effective design choices..

ULO3: Conceptualise and analyse an entire mechanical system, numerically, to determine and optimise the requirements of the individual components to ensure a viable and cost-effective solution to performing a specified task.

ULO4: Conceptualise and implement the plan to manufacture a prototype of a mechanical design which demonstrates the effectiveness or deficiencies of the numerical analysis undertaken to enhance the design of a multi-faceted mechanical engineering problem.

ULO5: Apply prerequisite unit knowledge to aid the design of solutions for complex engineering problems including producing AS1100 standard manufacturing drawings.

General Assessment Information

Grading and passing requirements for this unit

To pass this unit, a student must obtain a mark of 50 or more for the unit (i.e. obtain a passing grade P/ CR/ D/ HD). Please refer below to the policies and procedures section for further details about grading.

Late assessment submission penalties

The late submission policies adopted in this unit are in line with the general faculty's policy on assessment submission deadlines, including late submissions. Unless a Special Consideration request has been submitted and approved, a 5% penalty (of the total possible mark of the task) will be applied for each day, for a written report or presentation assessment that is not submitted, up until the 7th day (including weekends). After the 7th day, a grade of '0' will be awarded even if the assessment is submitted. The submission time for all uploaded assessments is 11:59 pm. A 1-hour grace period will be provided to students who experience a technical concern. For any late submission of time-sensitive tasks, such as scheduled tests/exams, performance assessments/presentations, and/or scheduled practical assessments/labs, please apply for Special Consideration. Assessments where Late Submissions will be accepted ·

Design Report (this does not include the competition) – YES, Standard Late Penalty applies

All other assessments - NO, unless Special Consideration is Granted

Special consideration for the final exam

If you receive special consideration for the final exam, a supplementary exam will be scheduled by the faculty during a supplementary exam period, typically about 3 to 4 weeks after the normal exam period. By making a special consideration application for the final exam, you declare yourself available for a resit during the supplementary examination period, and you will not be eligible for a second special consideration approval based on pre-existing commitments. Please ensure you are familiar with the policy prior to submitting an application. Approved applicants will

receive an individual notification one week prior to the exam with their supplementary examination's exact date and time. For all assessments that late penalties do not apply too, the convenor will move the weighting of the missed assessmnet to an alternative assessment at the convener's discretion.

Assessment tasks

Students are expected to receive the grades for their assessment submission between 2 to 4 weeks after the submission deadline.

Assessment Tasks

Name	Weighting	Hurdle	Due
Diagnostic Test	5%	No	Lecture of week 2
In class exercises	10%	No	SGTA weeks 4 to 8 inclusive
Design Report and Competition	30%	No	Competition: Lecture of week 12, Report week: 13
Mid Session Test	10%	No	Lecture of Week 7
Project Trial and Presentation	10%	No	SGTA of week 10
Final Examination	35%	No	TBD

Diagnostic Test

Assessment Type [1]: Examination
Indicative Time on Task [2]: 4 hours
Due: **Lecture of week 2**
Weighting: **5%**

A test assessing the assumed knowledge that students are expected to have obtained by completing the pre-requisites for this unit. Students who fail the diagnostic quiz should consider disenrolling from the unit before the census date.

On successful completion you will be able to:

- Apply prerequisite unit knowledge to aid the design of solutions for complex engineering problems including producing AS1100 standard manufacturing drawings.

In class exercises

Assessment Type [1]: Design Task
Indicative Time on Task [2]: 4 hours
Due: **SGTA weeks 4 to 8 inclusive**
Weighting: **10%**

A series of exercises that will allow students to apply the design process to optimise individual machine components.

On successful completion you will be able to:

- Apply concepts and knowledge in Mechanics of Materials and Materials engineering to create mathematical representations of the performance of common mechanical components to generate effective design choices..
- Conceptualise and analyse an entire mechanical system, numerically, to determine and optimise the requirements of the individual components to ensure a viable and cost-effective solution to performing a specified task.

Design Report and Competition

Assessment Type [1]: Project
Indicative Time on Task [2]: 30 hours
Due: **Competition: Lecture of week 12, Report week: 13**
Weighting: **30%**

Report summarising the design process undertaken for each individual sub-system. This should include; decisions made to achieve the required task, the detailed analysis undertaken that assists with making those decisions, the iterations undertaken to achieve an enhanced final design. Each of the individual sub-systems will be required to be manufactured and assembled into a single working prototype which will be assessed based on the ability of the device to achieve a specified task.

On successful completion you will be able to:

- Define a complex mechanical engineering problem into a series of specifications and consider multiple alternative solutions that may achieve these specifications.
- Apply concepts and knowledge in Mechanics of Materials and Materials engineering to create mathematical representations of the performance of common mechanical

components to generate effective design choices..

- Conceptualise and analyse an entire mechanical system, numerically, to determine and optimise the requirements of the individual components to ensure a viable and cost-effective solution to performing a specified task.
- Conceptualise and implement the plan to manufacture a prototype of a mechanical design which demonstrates the effectiveness or deficiencies of the numerical analysis undertaken to enhance the design of a multi-faceted mechanical engineering problem.
- Apply prerequisite unit knowledge to aid the design of solutions for complex engineering problems including producing AS1100 standard manufacturing drawings.

Mid Session Test

Assessment Type [1]: Examination
Indicative Time on Task [2]: 12 hours
Due: **Lecture of Week 7**
Weighting: **10%**

A test assessing the students knowledge of material delivered up to and including Week 7

On successful completion you will be able to:

- Define a complex mechanical engineering problem into a series of specifications and consider multiple alternative solutions that may achieve these specifications.
- Apply concepts and knowledge in Mechanics of Materials and Materials engineering to create mathematical representations of the performance of common mechanical components to generate effective design choices..
- Apply prerequisite unit knowledge to aid the design of solutions for complex engineering problems including producing AS1100 standard manufacturing drawings.

Project Trial and Presentation

Assessment Type [1]: Presentation
Indicative Time on Task [2]: 8 hours
Due: **SGTA of week 10**
Weighting: **10%**

Presentation describing the concept that the group has selected. The group will also have an opportunity to initially test their concept prior to the final competition. Bonus marks will be awarded to students who are able to demonstrate a working prototype.

On successful completion you will be able to:

- Define a complex mechanical engineering problem into a series of specifications and consider multiple alternative solutions that may achieve these specifications.
- Apply concepts and knowledge in Mechanics of Materials and Materials engineering to create mathematical representations of the performance of common mechanical components to generate effective design choices..
- Conceptualise and analyse an entire mechanical system, numerically, to determine and optimise the requirements of the individual components to ensure a viable and cost-effective solution to performing a specified task.
- Conceptualise and implement the plan to manufacture a prototype of a mechanical design which demonstrates the effectiveness or deficiencies of the numerical analysis undertaken to enhance the design of a multi-faceted mechanical engineering problem.
- Apply prerequisite unit knowledge to aid the design of solutions for complex engineering problems including producing AS1100 standard manufacturing drawings.

Final Examination

Assessment Type [1]: Examination
Indicative Time on Task [2]: 30 hours
Due: **TBD**
Weighting: **35%**

Final examination assessing all the content delivered throughout the course. This assessment will be invigilated.

On successful completion you will be able to:

- Define a complex mechanical engineering problem into a series of specifications and consider multiple alternative solutions that may achieve these specifications.
- Apply concepts and knowledge in Mechanics of Materials and Materials engineering to create mathematical representations of the performance of common mechanical components to generate effective design choices..
- Apply prerequisite unit knowledge to aid the design of solutions for complex engineering problems including producing AS1100 standard manufacturing drawings.

[1] If you need help with your assignment, please contact:

- the academic teaching staff in your unit for guidance in understanding or completing this type of assessment
- the Writing Centre for academic skills support.

[2] Indicative time-on-task is an estimate of the time required for completion of the assessment task and is subject to individual variation

Delivery and Resources

SGTA's

There will be no SGTA's conducted in week 1. All SGTA's begin as of week 2 in the semester. Students are required to attend the SGTA that they have enrolled in through eStudent to ensure that there are sufficient computing resources for all who attend and to facilitate group work. Attendance at the SGTA will be recorded and some activities undertaken there will be graded.

Availability for Assessments

Students must be available to undertake all assessments conducted the mid-session test and participate in the design competition during the relevant weekly lecture time slots. They must also be available during the enrolled SGTA's to facilitate working within their respective groups, complete the in class exercises and participate in the presentation. Not being available at these times will require an approved special consideration for these assessments.

Methods of Communication

We will communicate with you via your university email or through announcements on iLearn. Queries to convenors can either be placed on the iLearn discussion board or sent to MECH3003@mq.edu.au from your university email address.

Technology used.

This unit requires students to use the CAD software CREO 9.0. No other software will be accepted for any assessments that require the use of CAD. This software is only available on windows operating system. A reduced capability version of this software is available for students to download for free from the PTC web site. More information is available in the first week lecture slides.

Recommended and/or Required texts

The following text are recommended for this unit:

- Richard G Budynas, "Shigley's Mechanical Engineering Design." McGrawll Hill, 11th SI

edition.

Unit Schedule

Refer to iLearn and lecture notes for the unit schedule.

Policies and Procedures

Macquarie University policies and procedures are accessible from Policy Central (https://policies.mq.edu.au). Students should be aware of the following policies in particular with regard to Learning and Teaching:

- Academic Appeals Policy
- Academic Integrity Policy
- Academic Progression Policy
- Assessment Policy
- Fitness to Practice Procedure
- Assessment Procedure
- Complaints Resolution Procedure for Students and Members of the Public
- Special Consideration Policy

Students seeking more policy resources can visit Student Policies (https://students.mq.edu.au/support/study/policies). It is your one-stop-shop for the key policies you need to know about throughout your undergraduate student journey.

To find other policies relating to Teaching and Learning, visit Policy Central (https://policies.mq.edu.au) and use the search tool.

Student Code of Conduct

Macquarie University students have a responsibility to be familiar with the Student Code of Conduct: https://students.mq.edu.au/admin/other-resources/student-conduct

Results

Results published on platform other than eStudent, (eg. iLearn, Coursera etc.) or released directly by your Unit Convenor, are not confirmed as they are subject to final approval by the University. Once approved, final results will be sent to your student email address and will be made available in eStudent. For more information visit connect.mq.edu.au or if you are a Global MBA student contact globalmba.support@mq.edu.au

Academic Integrity

At Macquarie, we believe academic integrity – honesty, respect, trust, responsibility, fairness and courage – is at the core of learning, teaching and research. We recognise that meeting the expectations required to complete your assessments can be challenging. So, we offer you a range of resources and services to help you reach your potential, including free online writing and maths support, academic skills development and wellbeing consultations.

Student Support

Macquarie University provides a range of support services for students. For details, visit http://students.mq.edu.au/support/

Academic Success

Academic Success provides resources to develop your English language proficiency, academic writing, and communication skills.

- Workshops
- Chat with a WriteWISE peer writing leader
- Access StudyWISE
- Upload an assignment to Studiosity
- Complete the Academic Integrity Module

The Library provides online and face to face support to help you find and use relevant information resources.

- Subject and Research Guides
- Ask a Librarian

Student Services and Support

Macquarie University offers a range of Student Support Services including:

- IT Support
- Accessibility and disability support with study
- Mental health support
- Safety support to respond to bullying, harassment, sexual harassment and sexual assault
- Social support including information about finances, tenancy and legal issues
- Student Advocacy provides independent advice on MQ policies, procedures, and processes

Student Enquiries

Got a question? Ask us via the Service Connect Portal, or contact Service Connect.

IT Help

For help with University computer systems and technology, visit http://www.mq.edu.au/about_us/offices_and_units/information_technology/help/.

When using the University's IT, you must adhere to the Acceptable Use of IT Resources Policy. The policy applies to all who connect to the MQ network including students.

Changes from Previous Offering

We value student feedback to be able to continually improve the way we offer our units. As such we encourage students to provide constructive feedback via student surveys, to the teaching staff directly, or via the FSE Student Experience & Feedback link in the iLearn page.

Student feedback from the previous offering of this unit was very positive overall, with students pleased with the clarity around assessment requirements and the level of support from teaching staff. As such, no change to the delivery of the unit is planned, however we will continue to strive to improve the level of support and the level of student engagement.

Engineers Australia Competency Mapping

EA Competency Standard		Unit Learning Outcomes
Knowledge and Skill Base	1.1 Comprehensive, theory-based understanding of the underpinning fundamentals applicable to the engineering discipline.	ULO1, ULO2, ULO3, ULO4
	1.2 Conceptual understanding of underpinning maths, analysis, statistics, computing.	
	1.3 In-depth understanding of specialist bodies of knowledge	ULO1, ULO2, ULO3, ULO4
	1.4 Discernment of knowledge development and research directions	
	1.5 Knowledge of engineering design practice	ULO1, ULO2, ULO3, ULO4
	1.6 Understanding of scope, principles, norms, accountabilities of sustainable engineering practice.	
Engineering Application Ability	2.1 Application of established engineering methods to complex problem solving	ULO1, ULO2, ULO3, ULO4
	2.2 Fluent application of engineering techniques, tools and resources.	ULO1, ULO2, ULO3, ULO4
	2.3 Application of systematic engineering synthesis and design processes.	ULO3, ULO4
	2.4 Application of systematic approaches to the conduct and management of engineering projects.	ULO3, ULO4
Professional and Personal Attributes	3.1 Ethical conduct and professional accountability.	ULO3, ULO4
	3.2 Effective oral and written communication in professional and lay domains.	ULO3, ULO4
	3.3 Creative, innovative and pro-active demeanour.	ULO3, ULO4

	3.4 Professional use and management of information.	ULO3, ULO4
	3.5 Orderly management of self, and professional conduct.	ULO3
	3.6 Effective team membership and team leadership	ULO3

Unit information based on version 2025.01R of the Handbook