MECH3003

Mechanical Design 2

Session 1, In person-scheduled-weekday, North Ryde 2023

School of Engineering

Contents

General Information

Unit convenor and teaching staff
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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

Requirements to Pass this Unit

To pass this unit you must:

- Attend 9 of the 12 weekly SGTA's, and
- Attempt all assessments, and
- Achieve a total mark equal to or greater than 50%

Hurdle Assessments

Late Assessment Submission Penalty

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 a written report or presentation assessment 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 11:55 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

- In class tutorial exercises – YES, Standard Late Penalty applies
- Project Trial and Presentation – YES, Standard Late Penalty applies
- Design Report and Competition – YES, Standard Late Penalty applies
- Diagnostic test – NO, unless Special Consideration is Granted
- Mid session test – NO, unless Special Consideration is Granted
- Final examination – NO, unless Special Consideration is Granted

Special Consideration

The Special Consideration Policy aims to support students who have been impacted by short-term circumstances or events that are serious, unavoidable and significantly disruptive, and which may affect their performance in assessment. If you experience circumstances or events that affect your ability to complete the assessments in this unit on time, please inform the convenor and submit a Special Consideration request through ask.mq.edu.au.

Note that a Special Consideration should only be applied for if you miss more than three of the weekly SGTA's.

Assessment Tasks

Name	Weighting	Hurdle	Due
Diagnostic Test	5%	No	Must be completed by 11:55pm on Monday of Week 4
In class tutorial exercises	10%	No	By the completion of enrolled SGTA's for weeks 3 to 7
Mid Session Test	10%	No	Week 8 lecture time slot
Project Trial and Presentation	10%	No	Enrolled SGTA for week 10
Design Report and Competition	30%	No	Competition: Week 12 lecture time, Report: Friday of week 13
Final Examination	35%	No	Examination period

Diagnostic Test

Assessment Type [1]: Examination
Indicative Time on Task [2]: 4 hours
Due: **Must be completed by 11:55pm on Monday of Week 4**
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 tutorial exercises

Assessment Type [1]: Design Task
Indicative Time on Task [2]: 4 hours
Due: **By the completion of enrolled SGTA's for weeks 3 to 7**
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.

Mid Session Test

Assessment Type [1]: Examination
Indicative Time on Task [2]: 12 hours
Due: **Week 8 lecture time slot**

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: **Enrolled SGTA for 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.

Design Report and Competition

Assessment Type [1]: Creative work
Indicative Time on Task [2]: 30 hours
Due: **Competition: Week 12 lecture time, Report: Friday of 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.

Final Examination

Assessment Type [1]: Examination
Indicative Time on Task [2]: 30 hours
Due: **Examination period**
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.

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[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 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. Not being available at these times will require an approved special consideration for these assessments to be rescheduled.

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.

Covid Information

For the latest information on the University's response to COVID-19, please refer to the Coronavirus infection page on the Macquarie website: https://www.mq.edu.au/about/coronavirus-faqs

Remember to check this page regularly in case the information and requirements change during semester. If there are any changes to this unit in relation to COVID, these will be communicated via iLearn.

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 ask.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/

The Writing Centre

The Writing Centre 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 AskMQ, 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

In the 2023 offering of the unit, the participation during SGTA's will not contribute to the final grade of students but attendance will still be monitored.

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