



MECH3003

Mechanical Design 2

Session 1, Weekday attendance, North Ryde 2021

School of Engineering

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Notice

As part of [Phase 3 of our return to campus plan](#), most units will now run tutorials, seminars and other small group activities on campus, and most will keep an online version available to those students unable to return or those who choose to continue their studies online.

To check the availability of face-to-face activities for your unit, please go to [timetable viewer](#). To check detailed information on unit assessments visit your unit's iLearn space or consult your unit convenor.

General Information

Unit convenor and teaching staff

Unit Convener and Lecturer

Sammy Diasinos

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Contact via email

44 Waterloo Rd, Room 120

Thursday (9am-10am)

Lecturer

Shaokoon Cheng

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Contact via email

44 Waterloo Rd, Room 122

Tuesday (12pm to 2pm)

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:** Analyse and provide design solutions through the selection of appropriate machine components.
- ULO2:** Apply concepts and knowledge in Mechanics of Materials and Materials engineering to generate effective design solutions.
- ULO3:** Conceptualise and develop a mechanical system, through a prototype, that will be a viable and cost-effective solution to performing a specified task.
- ULO4:** Apply suitable engineering practices, specifically design optimisation skills to enhance the design of a complex mechanical engineering system.
- ULO5:** Apply prerequisite unit knowledge to aid the design of solutions for complex engineering problems.

General Assessment Information

For assignments submitted past the due date, the following penalties apply 0-24hrs: -25%, 24-48hrs: -50%, 48-72hrs: -75%, >72hrs: -100%. Extenuating circumstances will be considered upon lodgement of a formal notice of disruption of studies.

Students are required to refer to Ilearn for detailed marking rubrics for the assessment tasks.

In order 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). For further details about grading, please refer below in the policies and procedures section. The unit will be graded according to the Macquarie University Grading policy. The following grades will be used according to the listed numerical range:

GRADE	RANGE	STATUS ('Standard Grade' in AMIS)	DESCRIPTION
HD	85-100	Pass	Provides consistent evidence of deep and critical understanding in relation to the learning outcomes. There is substantial originality, insight or creativity in identifying, generating and communicating competing arguments, perspectives or problem solving approaches; critical evaluation of problems, their solutions and their implications; creativity in application as appropriate to the program.
D	75-84	Pass	Provides evidence of integration and evaluation of critical ideas, principles and theories, distinctive insight and ability in applying relevant skills and concepts in relation to learning outcomes. There is demonstration of frequent originality or creativity in defining and analysing issues or problems and providing solutions; and the use of means of communication appropriate to the program and the audience.
CR	65-74	Pass	Provides evidence of learning that goes beyond replication of content knowledge or skills relevant to the learning outcomes. There is demonstration of substantial understanding of fundamental concepts in the field of study and the ability to apply these concepts in a variety of contexts; convincing argumentation with appropriate coherent justification; communication of ideas fluently and clearly in terms of the conventions of the program.

P	50-64	Pass	Provides sufficient evidence of the achievement of learning outcomes. There is demonstration of understanding and application of fundamental concepts of the program; routine argumentation with acceptable justification; communication of information and ideas adequately in terms of the conventions of the program. The learning attainment is considered satisfactory or adequate or competent or capable in relation to the specified outcomes.
F	0-49	Fail	Does not provide evidence of attainment of learning outcomes. There is missing or partial or superficial or faulty understanding and application of the fundamental concepts in the field of study; missing, undeveloped, inappropriate or confusing argumentation; incomplete, confusing or lacking communication of ideas in ways that give little attention to the conventions of the program.

Assessment Tasks

Name	Weighting	Hurdle	Due
<u>Diagnostic Test</u>	5%	No	Week 2 - Lecture time slot
<u>Mid Session Test</u>	15%	No	Week 8 - Lecture time slot
<u>Project Trial and Presentation</u>	10%	No	Week 10 - Tutorial time slot
<u>Design Report and Competition</u>	30%	No	Week 13, Friday 6pm
<u>Final Examination</u>	40%	No	Formal examination period

Diagnostic Test

Assessment Type ¹: Examination

Indicative Time on Task ²: 4 hours

Due: **Week 2 - Lecture time slot**

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.

Mid Session Test

Assessment Type ¹: Examination

Indicative Time on Task ²: 14 hours

Due: **Week 8 - Lecture time slot**

Weighting: **15%**

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

On successful completion you will be able to:

- Analyse and provide design solutions through the selection of appropriate machine components.
- Apply concepts and knowledge in Mechanics of Materials and Materials engineering to generate effective design solutions.
- Apply prerequisite unit knowledge to aid the design of solutions for complex engineering problems.

Project Trial and Presentation

Assessment Type ¹: Presentation

Indicative Time on Task ²: 9 hours

Due: **Week 10 - Tutorial time slot**

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:

- Analyse and provide design solutions through the selection of appropriate machine components.
- Apply concepts and knowledge in Mechanics of Materials and Materials engineering to generate effective design solutions.
- Conceptualise and develop a mechanical system, through a prototype, that will be a viable and cost-effective solution to performing a specified task.
- Apply suitable engineering practices, specifically design optimisation skills to enhance the design of a complex mechanical engineering system.
- Apply prerequisite unit knowledge to aid the design of solutions for complex engineering problems.

Design Report and Competition

Assessment Type ¹: Creative work

Indicative Time on Task ²: 30 hours

Due: **Week 13, Friday 6pm**

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:

- Analyse and provide design solutions through the selection of appropriate machine components.
- Apply concepts and knowledge in Mechanics of Materials and Materials engineering to generate effective design solutions.
- Conceptualise and develop a mechanical system, through a prototype, that will be a viable and cost-effective solution to performing a specified task.
- Apply suitable engineering practices, specifically design optimisation skills to enhance the design of a complex mechanical engineering system.
- Apply prerequisite unit knowledge to aid the design of solutions for complex engineering problems.

Final Examination

Assessment Type ¹: Examination

Indicative Time on Task ²: 31 hours

Due: **Formal examination period**

Weighting: **40%**

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

On successful completion you will be able to:

- Analyse and provide design solutions through the selection of appropriate machine components.
- Apply concepts and knowledge in Mechanics of Materials and Materials engineering to generate effective design solutions.
- Apply prerequisite unit knowledge to aid the design of solutions for complex engineering problems.

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

1. Richard G Budynas, "Shigley's Mechanical Engineering Design." McGrawHill, 10th Edition.

Purchased of this textbook is not compulsory but does contain useful material that will benefit one undertaking a career/profession in mechanical engineering design.

2. Students will be expected to utilise CAD software during their assessments. This must be CREO 6.0. During the first lecture, instructions will be provided on how to download the software to install on a student's PC's. Please note that this requires a windows operating system and is not available for installation on MacOS.

3. Other required resources: scientific calculators.

Unit Schedule

Weeks	Lecture Topics	Assignments during tutorials
1.	Introduction to Mechanical Engineering Design 2 and revision of Mechanical Engineering Design	No tutorial/practical
2.	Diagnostic Test and Introduction to Project Competition	CAD exercises
3.	Gear Analysis	Design Process application to project
4.	Belt Drive Analysis	Gear in class assignment
5.	Chain Drive Analysis	Belt drive in class assignment

6.	Shaft Analysis	Chain drive in class assignment
7.	Bearing Analysis	Shaft in class assignment
8.	Weld Analysis	Bearing in class assignment
9.	Mid session test	Project development
10.	Fastener Analysis	Project Trial and Presentation
11.	FEA and Topology Optimisation	Project development
12.	Project Competition	Project development
13.	Revision	Report completion

Policies and Procedures

Macquarie University policies and procedures are accessible from [Policy Central \(https://policies.mq.edu.au\)](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](#)
- [Grade Appeal Policy](#)
- [Complaint Management Procedure for Students and Members of the Public](#)
- [Special Consideration Policy](#)

Students seeking more policy resources can visit [Student Policies \(https://students.mq.edu.au/support/study/policies\)](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 \(https://policies.mq.edu.au\)](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

Student Support

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

Learning Skills

Learning Skills (mq.edu.au/learningskills) provides academic writing resources and study strategies to help you improve your marks and take control of your study.

- [Getting help with your assignment](#)
- [Workshops](#)
- [StudyWise](#)
- [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

Students with a disability are encouraged to contact the [Disability Service](#) who can provide appropriate help with any issues that arise during their studies.

Student Enquiries

For all student enquiries, visit Student Connect at [ask.mq.edu.au](#)

If you are a Global MBA student contact globalmba.support@mq.edu.au

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.