



MECH2003

Mechanical Design 1

Session 1, Special circumstances 2021

School of Engineering

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Disclaimer

Macquarie University has taken all reasonable measures to ensure the information in this publication is accurate and up-to-date. However, the information may change or become out-dated as a result of change in University policies, procedures or rules. The University reserves the right to make changes to any information in this publication without notice. Users of this publication are advised to check the website version of this publication [or the relevant faculty or department] before acting on any information in this publication.

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

sammy.diasinos@mq.edu.au

Contact via email

44 Waterloo Rd, Room 120

Thursday (9am-10am)

Credit points

10

Prerequisites

(MECH1001 or ENGG150) and (MATH1020 or MATH1025 or MATH133 or MATH136)

Corequisites

Co-badged status

Unit description

In this unit, students will develop skills in computer-aided drawing with a specific focus on part modelling, manufacturing drawings, assembly modelling, CNC programming and surfacing.

The unit also covers basic knowledge in the selection of machine elements and principles in the design of engineering systems. Students are expected to demonstrate the ability to analyse rotating systems required to transmit power and consider the most suitable methods for assembling them.

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: Employ computer-aided-drawing proficiently to produce solid models, assemblies, computer-numerical-control codes and manufacturing drawings that meet industrial and Australian standards.

ULO2: Analyse and identify the usage of different types of permanent and non-permanent joints.

ULO3: Analyse power transmission, losses and angular velocity changes in mechanical

engineering systems.

ULO4: Discuss the mechanical design process and how the use of engineering principles supports this procedure.

ULO5: Apply prerequisite knowledge that will assist with the selection of machine elements and analysis of systems

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 lodgment 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
Diagnostic test	5%	No	Week 2 - Lecture time slot
CAD tests	20%	No	Week 5 and 9 - tutorial time slot
Mid session test	15%	No	Week 8 - Lecture time slot
CAD Assignment	20%	No	Week 13, Friday 6pm
Final examination	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%**

Students will be tested on prerequisite knowledge to allowing them to self assess if they are sufficiently prepared to undertake this unit. The examination will be held during the week 2 lecture.

On successful completion you will be able to:

- Apply prerequisite knowledge that will assist with the selection of machine elements and analysis of systems

CAD tests

Assessment Type [1](#): Examination

Indicative Time on Task [2](#): 18 hours

Due: **Week 5 and 9 - tutorial time slot**

Weighting: **20%**

There will be two tests (10% each) on computer-aided drawing (CAD) using the CREO software. Students are required to demonstrate skills in using the tool to draw solid models, produce manufacturing drawings, create an assembly and generate CNC code.

On successful completion you will be able to:

- Employ computer-aided-drawing proficiently to produce solid models, assemblies, computer-numerical-control codes and manufacturing drawings that meet industrial and Australian standards.

Mid session test

Assessment Type **1**: Examination

Indicative Time on Task **2**: 12 hours

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

Weighting: **15%**

Students will be tested on materials covered in Lectures 1 – 7. The format of this test will be similar to that of the final examination, but shorter.

On successful completion you will be able to:

- Analyse and identify the usage of different types of permanent and non-permanent joints.
- Analyse power transmission, losses and angular velocity changes in mechanical engineering systems.
- Discuss the mechanical design process and how the use of engineering principles supports this procedure.

CAD Assignment

Assessment Type **1**: Creative work

Indicative Time on Task **2**: 20 hours

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

Weighting: **20%**

Students will be required to draw a complex mechanical system that demonstrates all the CAD skills which they have obtained during this unit. One component from the assembly will also have to be manufactured using either 3D printing, laser cutting or CNC machining

On successful completion you will be able to:

- Employ computer-aided-drawing proficiently to produce solid models, assemblies, computer-numerical-control codes and manufacturing drawings that meet industrial and

Australian standards.

- Analyse power transmission, losses and angular velocity changes in mechanical engineering systems.

Final examination

Assessment Type ¹: Examination

Indicative Time on Task ²: 34 hours

Due: **Formal examination period**

Weighting: **40%**

The exam includes multiple choice questions and specific design tasks where accurate solutions of the design analysis are expected. Students will be tested on the entire sessions material. This assessment will be invigilated.

On successful completion you will be able to:

- Analyse and identify the usage of different types of permanent and non-permanent joints.
- Analyse power transmission, losses and angular velocity changes in mechanical engineering systems.
- Discuss the mechanical design process and how the use of engineering principles supports this procedure.
- Apply prerequisite knowledge that will assist with the selection of machine elements and analysis of systems

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." McGraw Hill, 10th Edition.

2. A.W. Boundy, "Engineering drawing and Sketchbook." McGraw Hill, 8th Edition.

Purchased of these textbooks are not compulsory but they are very useful materials that will

benefit one undertaking a career/profession in mechanical engineering design.

3. Students will be trained in using Computer Aided Drawing (CAD) software. The software selected is 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.

4. Other required resources: scientific calculators.

5. Students that may undertake online tutorials or assessments are responsible for having suitable hardware and internet connection.

Unit Schedule

Weeks	Lecture Topics	Assignments during tutorials
1.	Introduction to Mechanical Engineering Design	No tutorial/practical
2.	CAD and Manufacturing Drawings	Sketching in CAD
3.	The Design Process	Part modelling
4.	3D printing and laser cutting	Manufacturing Drawings
5.	Small Volume Manufacturing Techniques	CAD Test 1
6.	Material Removal Methods	Surfacing
7.	Manufacturing Automation	CNC code generating
8.	Permanent and Non-Permanent Joints	Assembly Modelling
9.	Mid session test	CAD Test 2
10.	Design of Basic Rotating Systems	Motors Selection Tutorial
11.	Motors and Motor selection	CAD Assignment
12.	Spring selection	CAD Assignment
13.	Revision	CAD Assignment

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.

Changes since First Published

Date	Description
21/02/2021	There was an error in the late penalties for assessments that made it difficult to understand. This has been corrected.