



MECH203

Mechanical Design 1

S2 Day 2018

Dept of Engineering

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General Information

Unit convenor and teaching staff

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Credit points

3

Prerequisites

(ENGG150 or ENGG170 or ELEC170(P)) and (MATH132 or MATH135(P)) and ((PHYS106 and PHYS107) or (PHYS140(P) and PHYS143(P)))

Corequisites

Co-badged status

Unit description

In this unit students will develop their skills in machine drawing and engineering design. The unit will demonstrate to students the processes involved in the selection of machine elements and machine assembly design in an engineering context. The unit will introduce students to the principles of computer-aided design and manufacture.

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:

Ability to identify the usage of different types of permanent and non-permanent joints.

Ability to produce manufacturing drawings that meet industrial standards.

Ability to analyse power transmission, losses and speed reduction ratio in a mechanical engineering system.

Ability to analyse forces and perform stress analysis accurately to design the members of machines and structures.

Ability to analyse, design and select machine elements (e.g. belts and pulleys, chain and sprockets, bearings) off-the-shelf using commercial available catalogs and specify appropriate manufacturing techniques for the elements.

Ability to present design concepts effectively and professionally.

General Assessment Information

1. There will be no tutorial or practicals in week 1.
2. Extension of assessment tasks will only be given for formal academic request that has been applied online.
3. Students are required to refer to llearn for detailed marking rubrics for the assessment tasks.
4. 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:

ASSESSMENT GRADES AND STATUS

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 quiz</u>	5%	No	Week 2
<u>Computer Aided Drawing quiz</u>	10%	No	Week 4 and Week 7
<u>Mid-term Quiz</u>	5%	No	Week 10
<u>Design report</u>	15%	No	Week 11
<u>In class assignments</u>	10%	No	Week 8,9,12,13
<u>Final exam</u>	55%	No	TBA

Diagnostic quiz

Due: **Week 2**

Weighting: **5%**

Quiz will be held during lecture. Students will be tested on fundamental mechanics. Students are required to pass the assessment before the census date.

On successful completion you will be able to:

- Ability to analyse forces and perform stress analysis accurately to design the members of machines and structures.

Computer Aided Drawing quiz

Due: **Week 4 and Week 7**

Weighting: **10%**

There will be two tests (5% each) on computer-aided drawing (CAD) using the CREO software. Students are required to demonstrate skills in using the tool to draw 3D objects and manufacturing drawings.

On successful completion you will be able to:

- Ability to produce manufacturing drawings that meet industrial standards.

Mid-term Quiz

Due: **Week 10**

Weighting: **5%**

Students will be tested on materials covered in Lectures 1 – 9.

On successful completion you will be able to:

- Ability to identify the usage of different types of permanent and non-permanent joints.
- Ability to analyse power transmission, losses and speed reduction ratio in a mechanical engineering system.
- Ability to analyse forces and perform stress analysis accurately to design the members of machines and structures.

Design report

Due: **Week 11**

Weighting: **15%**

This design report must be well-written and submitted online only. The maximum number of pages in the report is ten. In the event that this assessment task is submitted late, the following penalties will apply; 0 to 24 hours -25%, 24 hours to 48 hours -50%, greater than 48 hours will result in no mark being awarded. Any acts of plagiarisms such as similarities in design report layout, content (e.g. design solutions) and manufacturing drawings will incur academic penalty.

On successful completion you will be able to:

- Ability to produce manufacturing drawings that meet industrial standards.
- Ability to analyse forces and perform stress analysis accurately to design the members of machines and structures.
- Ability to analyse, design and select machine elements (e.g. belts and pulleys, chain and sprockets, bearings) off-the-shelf using commercial available catalogs and specify appropriate manufacturing techniques for the elements.
- Ability to present design concepts effectively and professionally.

In class assignments

Due: **Week 8,9,12,13**

Weighting: **10%**

There are four in-class assignments (2.5% each). Students are required to produce accurate

solutions of their design and manufacturing drawings that meet industrial standards. Students are expected to be punctual for these tutorials and marks will only be awarded for assignments that are submitted during the tutorial. Students who are late for these tutorials may not have their assignments marked.

No marks will be awarded for attendance only.

Any acts of plagiarisms such as similarities in design solution and manufacturing drawings between students in the tutorial class will incur academic penalty.

On successful completion you will be able to:

- Ability to produce manufacturing drawings that meet industrial standards.
- Ability to analyse power transmission, losses and speed reduction ratio in a mechanical engineering system.
- Ability to analyse, design and select machine elements (e.g. belts and pulleys, chain and sprockets, bearings) off-the-shelf using commercial available catalogs and specify appropriate manufacturing techniques for the elements.
- Ability to present design concepts effectively and professionally.

Final exam

Due: **TBA**

Weighting: **55%**

This is a closed book 3 hours exam. Attendance is compulsory for all students. The exam includes multiple choice questions and specific design tasks where accurate solutions of the design analysis are expected.

On successful completion you will be able to:

- Ability to identify the usage of different types of permanent and non-permanent joints.
- Ability to analyse power transmission, losses and speed reduction ratio in a mechanical engineering system.
- Ability to analyse forces and perform stress analysis accurately to design the members of machines and structures.
- Ability to analyse, design and select machine elements (e.g. belts and pulleys, chain and sprockets, bearings) off-the-shelf using commercial available catalogs and specify appropriate manufacturing techniques for the elements.
- Ability to present design concepts effectively and professionally.

Delivery and Resources

1. Richard G Budynas, "Shigley's Mechanical Engineering Design." McGrawHill, 9th Edition.

2. A.W. Boundy, "Engineering drawing." McGrawll Hill, 5th 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. CREO. Students will be trained in this computer-aided drawing software in this unit.

4. Other required resources: scientific calculators.

Unit Schedule

Weeks	Lecture Topics	Assignments during tutorials
1.	Introduction to Mechanical Engineering Design	No tutorial and practical
2.	Manufacturing Drawings	Computer Aided Drawing
3.	Design of Basic Mechanical Systems	Computer Aided Drawing
4.	Design of Basic Rotating Systems and Tolerances	Computer Aided Drawing - Quiz
5.	Small Volume Manufacturing Techniques	Computer Aided Drawing
6.	Permanent and Non-permanent Joints	Computer Aided Drawing
7.	Motors and Selection of Motors	Computer Aided Drawing – Quiz
8.	Gears System Design	Motors Selection Tutorial – In class assignment
9.	Belt Drive System Design	Gear System Design Tutorial – In class assignment
10.	Quiz	Belt Drive System design
11.	Shaft and Bearings Design	Belt Drive System design
12.	Chain Drive System Design	Shaft and Bearings Tutorial – In class assignment
13.	Mechanical Engineering Systems Design and Summary	Chain Drive System Design Tutorial – In class assignment

Refer to iLearn and lecture notes for more details.

Policies and Procedures

Macquarie University policies and procedures are accessible from **Policy Central** (<https://staff.mq.edu.au/work/strategy-planning-and-governance/university-policies-and-procedures/policy-central>). 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](#) (**Note:** *The Special Consideration Policy is effective from 4 December 2017 and replaces the Disruption to Studies Policy.*)

Undergraduate students seeking more policy resources can visit the [Student Policy Gateway](https://students.mq.edu.au/support/study/student-policy-gateway) (<https://students.mq.edu.au/support/study/student-policy-gateway>). It is your one-stop-shop for the key policies you need to know about throughout your undergraduate student journey.

If you would like to see all the policies relevant to Learning and Teaching visit [Policy Central](http://staff.mq.edu.au/work/strategy-planning-and-governance/university-policies-and-procedures/policy-central) (<http://staff.mq.edu.au/work/strategy-planning-and-governance/university-policies-and-procedures/policy-central>).

Student Code of Conduct

Macquarie University students have a responsibility to be familiar with the Student Code of Conduct: <https://students.mq.edu.au/study/getting-started/student-conduct>

Results

Results shown in *iLearn*, 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.

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 improve your marks and take control of your study.

- [Workshops](#)
- [StudyWise](#)
- [Academic Integrity Module for Students](#)
- [Ask a Learning Adviser](#)

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

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.

Graduate Capabilities

Creative and Innovative

Our graduates will also be capable of creative thinking and of creating knowledge. They will be imaginative and open to experience and capable of innovation at work and in the community. We want them to be engaged in applying their critical, creative thinking.

This graduate capability is supported by:

Learning outcome

- Ability to analyse, design and select machine elements (e.g. belts and pulleys, chain and sprockets, bearings) off-the-shelf using commercial available catalogs and specify appropriate manufacturing techniques for the elements.

Assessment task

- In class assignments

Capable of Professional and Personal Judgement and Initiative

We want our graduates to have emotional intelligence and sound interpersonal skills and to demonstrate discernment and common sense in their professional and personal judgement. They will exercise initiative as needed. They will be capable of risk assessment, and be able to handle ambiguity and complexity, enabling them to be adaptable in diverse and changing environments.

This graduate capability is supported by:

Learning outcome

- Ability to present design concepts effectively and professionally.

Assessment task

- Design report

Commitment to Continuous Learning

Our graduates will have enquiring minds and a literate curiosity which will lead them to pursue knowledge for its own sake. They will continue to pursue learning in their careers and as they participate in the world. They will be capable of reflecting on their experiences and relationships with others and the environment, learning from them, and growing - personally, professionally and socially.

This graduate capability is supported by:

Learning outcome

- Ability to present design concepts effectively and professionally.

Assessment task

- Design report

Discipline Specific Knowledge and Skills

Our graduates will take with them the intellectual development, depth and breadth of knowledge, scholarly understanding, and specific subject content in their chosen fields to make them competent and confident in their subject or profession. They will be able to demonstrate, where relevant, professional technical competence and meet professional standards. They will be able to articulate the structure of knowledge of their discipline, be able to adapt discipline-specific knowledge to novel situations, and be able to contribute from their discipline to inter-disciplinary solutions to problems.

This graduate capability is supported by:

Learning outcomes

- Ability to identify the usage of different types of permanent and non-permanent joints.
- Ability to produce manufacturing drawings that meet industrial standards.
- Ability to analyse power transmission, losses and speed reduction ratio in a mechanical engineering system.
- Ability to analyse forces and perform stress analysis accurately to design the members of machines and structures.
- Ability to analyse, design and select machine elements (e.g. belts and pulleys, chain and sprockets, bearings) off-the-shelf using commercial available catalogs and specify appropriate manufacturing techniques for the elements.

Assessment tasks

- Diagnostic quiz
- Computer Aided Drawing quiz
- Mid-term Quiz

- Final exam

Critical, Analytical and Integrative Thinking

We want our graduates to be capable of reasoning, questioning and analysing, and to integrate and synthesise learning and knowledge from a range of sources and environments; to be able to critique constraints, assumptions and limitations; to be able to think independently and systemically in relation to scholarly activity, in the workplace, and in the world. We want them to have a level of scientific and information technology literacy.

This graduate capability is supported by:

Learning outcomes

- Ability to identify the usage of different types of permanent and non-permanent joints.
- Ability to analyse power transmission, losses and speed reduction ratio in a mechanical engineering system.
- Ability to analyse forces and perform stress analysis accurately to design the members of machines and structures.
- Ability to analyse, design and select machine elements (e.g. belts and pulleys, chain and sprockets, bearings) off-the-shelf using commercial available catalogs and specify appropriate manufacturing techniques for the elements.

Assessment tasks

- Mid-term Quiz
- Design report
- Final exam

Problem Solving and Research Capability

Our graduates should be capable of researching; of analysing, and interpreting and assessing data and information in various forms; of drawing connections across fields of knowledge; and they should be able to relate their knowledge to complex situations at work or in the world, in order to diagnose and solve problems. We want them to have the confidence to take the initiative in doing so, within an awareness of their own limitations.

This graduate capability is supported by:

Learning outcome

- Ability to analyse, design and select machine elements (e.g. belts and pulleys, chain and sprockets, bearings) off-the-shelf using commercial available catalogs and specify appropriate manufacturing techniques for the elements.

Assessment tasks

- In class assignments

- Final exam

Effective Communication

We want to develop in our students the ability to communicate and convey their views in forms effective with different audiences. We want our graduates to take with them the capability to read, listen, question, gather and evaluate information resources in a variety of formats, assess, write clearly, speak effectively, and to use visual communication and communication technologies as appropriate.

This graduate capability is supported by:

Learning outcomes

- Ability to produce manufacturing drawings that meet industrial standards.
- Ability to present design concepts effectively and professionally.

Assessment tasks

- Design report
- In class assignments
- Final exam

Engaged and Ethical Local and Global citizens

As local citizens our graduates will be aware of indigenous perspectives and of the nation's historical context. They will be engaged with the challenges of contemporary society and with knowledge and ideas. We want our graduates to have respect for diversity, to be open-minded, sensitive to others and inclusive, and to be open to other cultures and perspectives: they should have a level of cultural literacy. Our graduates should be aware of disadvantage and social justice, and be willing to participate to help create a wiser and better society.

This graduate capability is supported by:

Learning outcome

- Ability to present design concepts effectively and professionally.

Assessment task

- Design report

Socially and Environmentally Active and Responsible

We want our graduates to be aware of and have respect for self and others; to be able to work with others as a leader and a team player; to have a sense of connectedness with others and country; and to have a sense of mutual obligation. Our graduates should be informed and active participants in moving society towards sustainability.

This graduate capability is supported by:

Learning outcome

- Ability to present design concepts effectively and professionally.

Assessment task

- Design report

Changes from Previous Offering

Changes in Response to Student Feedback

The concept of good design principles and techniques will be emphasized in lectures 3, 7,8, 9, 11,12 and 13. Students will be trained to think critically and to extract information to perform their design task.