MECH2004

Mechanics of Solids

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

School of Engineering

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General Information

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Credit points
10

Prerequisites
MECH1001 and (MATH1020 or MATH1025)

Corequisites

Co-badged status

Unit description
This unit examines the basic concepts of Mechanics of Solids. It covers knowledge in stress-strain relations and various types of engineering stresses. At the end of the unit, students are expected to demonstrate proficiencies in resolving problems that are related to statically indeterminate systems, shear stress, bending stress and torsional stress. Students are also expected to describe mechanical stresses and the deformation of complex loaded structures through bending moment diagrams, shear force diagrams and Mohr's circle theories.

Learning in this unit enhances student understanding of global challenges identified by the United Nations Sustainable Development Goals (UNSDGs) Industry, Innovation and Infrastructure; Sustainable Cities and Communities

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: Recall and outline the application and limitations of Solid Mechanics theories through the derivation of governing equations in the discipline.
ULO2: Apply fundamental theories in Mechanics of Materials to produce accurate numerical solutions.
ULO3: Analyse and dissect complex mechanical engineering system problems.
ULO4: Exercise the professional skills of self-learning, time-management, and project management.

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 ·

Assessments - The 4 assignments, the lab report, and the final project (Powerpoint presentation), – YES, Standard Late Penalty applies

Assessments - Quiz, Exam - NO, unless Special Consideration is Granted

Special consideration for the quiz and 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 the quiz, the convenor will discuss with the students and arrange for a suitable time to take the quiz.

Assessment tasks

1. Participation: SGTA is a weekly event starting from week 2, and participation in SGTAs is compulsory, and students' attendance will be marked. A more than 80% attendance is required.

2. Laboratory participation and report: Students must print and bring along the lab worksheet published on Ilearn when attending the laboratory session. There are only two laboratory sessions in this unit, and they are in weeks 6 and 7 only. Only one laboratory report is required for this unit. The template for the laboratory report can be found on Ilearn. The laboratory report should be type-written. The report must be submitted on Ilearn.

Marking rubrics for the Project and Laboratory report can be found on Ilearn in the sections with headings "Project" and " Laboratory assessment".

3. Assignments: There are 4 SHORT assignments in this unit. The assignments should be hand-written and submitted as PDF documents on Ilearn. The deadlines for the assignments are the Friday of Week 3, 6,9, and 12. These assignments are necessary to ensure that students are up-to-date with the content delivered in this unit, which is also important to help prepare students for the quiz and final exam. The 4 assignments must be submitted on Ilearn.

Marking rubrics for the four assignments are explicitly stated in the assignment documents, with a clear description of what constitutes an F, P, CR, D and HD. Some feedback will be provided for the assignments.

4. Project: Students must watch the project introduction video (see document under the Final project section in Ilearn) and study the marking rubrics to understand the expectations and requirements of this assessment task. Essentially, students are expected to demonstrate their ability to apply concepts learned in this unit to a simple real-world problem by clarifying the assumptions and limitations of the engineering solution. The PowerPoint presentation for the project must be submitted to Ilearn.

5. Quiz: Mid-term quiz is in week 7, and it will be given during lecture hours. The quiz must be submitted on Ilearn.

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

Assessment Tasks

Name	Weighting	Hurdle	Due	Groupwork/Individual	Short Extension	AI Approach
Assignments	20%	No	2359 of Friday Week 3, Week 6, Week 9, Week 12		No	
Project	20%	No	2359 of Friday Week 13		No	
Examination	35%	No	TBA		No	

Name	Weighting	Hurdle	Due	Groupwork/Individual	Short Extension	AI Approach
Laboratory report	15%	No	2359 of Friday Week 10		No	
Common quiz administered online	10%	No	Week 7		No	

Assignments

Assessment Type [1]: Problem set
Indicative Time on Task [2]: 40 hours
Due: **2359 of Friday Week 3, Week 6, Week 9, Week 12**
Weighting: **20%**
Groupwork/Individual:
Short extension [3]: No
AI Approach:

There will be four assignments in total. These assignments are designed to help students achieve the learning outcomes of this unit progressively. The assignment will cover all the essential foundational knowledge necessary for students to pass the unit, and they include problems on statically indeterminate problems, centroid and moment of inertia, mechanical properties of materials, torsion and other stresses in beams. All assignments should be hand-written, and must be submitted in Ilearn before the due date.

On successful completion you will be able to:

- Recall and outline the application and limitations of Solid Mechanics theories through the derivation of governing equations in the discipline.
- Apply fundamental theories in Mechanics of Materials to produce accurate numerical solutions.
- Analyse and dissect complex mechanical engineering system problems.

Project

Assessment Type [1]: Presentation
Indicative Time on Task [2]: 17 hours
Due: **2359 of Friday Week 13**
Weighting: **20%**
Groupwork/Individual:
Short extension [3]: No
AI Approach:

This presentation will be held in week 13. All students are required to present an example of how theory of mechanics of materials can be effectively applied.

On successful completion you will be able to:

- Recall and outline the application and limitations of Solid Mechanics theories through the derivation of governing equations in the discipline.
- Analyse and dissect complex mechanical engineering system problems.
- Exercise the professional skills of self-learning, time-management, and project management.

Examination

Assessment Type [1]: Examination
Indicative Time on Task [2]: 2 hours
Due: **TBA**
Weighting: **35%**
Groupwork/Individual:
Short extension [3]: No
AI Approach:

This is a close book exam.

On successful completion you will be able to:

- Recall and outline the application and limitations of Solid Mechanics theories through the derivation of governing equations in the discipline.
- Apply fundamental theories in Mechanics of Materials to produce accurate numerical solutions.
- Analyse and dissect complex mechanical engineering system problems.

Laboratory report

Assessment Type [1]: Lab report
Indicative Time on Task [2]: 15 hours
Due: **2359 of Friday Week 10**
Weighting: **15%**
Groupwork/Individual:
Short extension [3]: No

AI Approach:

This is an individual assignment and students are required to write up their observations and experimental data obtained from the laboratory experiments.

On successful completion you will be able to:

- Apply fundamental theories in Mechanics of Materials to produce accurate numerical solutions.
- Exercise the professional skills of self-learning, time-management, and project management.

Common quiz administered online

Assessment Type [1]: Quiz/Test
Indicative Time on Task [2]: 2 hours
Due: **Week 7**
Weighting: **10%**
Groupwork/Individual:
Short extension [3]: No
AI Approach:

The quiz will cover topics taught in the first 7 weeks of lecture.

On successful completion you will be able to:

- Recall and outline the application and limitations of Solid Mechanics theories through the derivation of governing equations in the discipline.
- Apply fundamental theories in Mechanics of Materials to produce accurate numerical solutions.
- Analyse and dissect complex mechanical engineering system problems.

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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
- Academic Success 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.

[3] An automatic short extension is available for some assessments. Apply through the Service Connect Portal.

Delivery and Resources

Textbook

The unit covers the majority of the content in Mechanics of Materials in SI Units, 10th/ 11th Edition (Russell C. Hibbeler). It is not mandatory to purchase the textbook, but students are encouraged to own a copy of the textbook.

Running of practicals and tutorials in week 1

There are no practicals or tutorials in week 1. Note also that the practicals are in Week 6 and Week 7 ONLY. There will be lectures in Week 1. All lectures are online. Please see Ilearn page for Zoom link.

On-campus activities

Students must contact the convenor as soon as possible if they are unable to attend the On-campus activities. The On-campus activities are the weekly SGTAs, and the two practicals (Week 6 and Week 7).

Technology used

Students will be exposed to two engineering apparatuses that demonstrate Torque and bending moment. Calculus and Trigonometry are fundamental to the unit. Students are expected to use a scientific calculator to determine the answers and use a Microsoft Excel spreadsheet to optimise parameters for their solution presented in the project to be submitted in Week 13. Compasses and protractors are also required for some of the topics taught in this unit.

Methods of Communication

We will communicate with students via your university email or through announcements on iLearn. Queries to convenors can either be placed on the iLearn discussion board or sent to any of the teaching staff from your university email address.

Unit Schedule

Refer to iLearn and lecture notes for the unit schedule.

Engineers Australia Competency Standard		Unit Learning Outcomes
Knowledge and Skill Base	1.1 Comprehensive, theory-based understanding of the underpinning fundamentals applicable to the engineering discipline.	1,2,3
	1.2 Conceptual understanding of underpinning maths, analysis, statistics, computing.	1,2,3,
	1.3 In-depth understanding of specialist bodies of knowledge	3

	1.4 Discernment of knowledge development and research directions	3
	1.5 Knowledge of engineering design practice	3
	1.6 Understanding of scope, principles, norms, accountabilities of sustainable engineering practice.	1,2,3
Engineering Application Ability	2.1 Application of established engineering methods to complex problem solving	2,3,
	2.2 Fluent application of engineering techniques, tools and resources.	4
	2.3 Application of systematic engineering synthesis and design processes.	3,4
	2.4 Application of systematic approaches to the conduct and management of engineering projects.	2,3
Professional and Personal Attributes	3.1 Ethical conduct and professional accountability.	4
	3.2 Effective oral and written communication in professional and lay domains.	4
	3.3 Creative, innovative and pro-active demeanour.	4
	3.4 Professional use and management of information.	4
	3.5 Orderly management of self, and professional conduct.	4
	3.6 Effective team membership and team leadership	4

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 since First Published

Date	Description
16/02/2025	Amended the study weeks allocated for laboratory work to ensure consistency with their actual allocation in the 2025 timetable.

Unit information based on version 2025.02 of the Handbook