MECH2004

Mechanics of Solids

Session 1, In person-scheduled-weekday, North Ryde 2022

School of Engineering

Contents

General Information

Unit convenor and teaching staff
Lecturer
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Monday 12 to 2pm

Credit points
10

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

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.

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 submission policies and guidelines

The late submission policies adopted in this unit are in line with the general faculty's policy on assessment submission deadlines, including late submissions.

All online quizzes, in-class activities, or scheduled tests and exams must be undertaken at the time indicated in the unit guide. Students may apply for Special Consideration if these activities are missed due to illness or misadventure.

All other assessments must be submitted by 5:00 pm on their due date.

Assessments not submitted by the due date will receive a mark in accordance with the late submission policy as follows:

A 12-hour grace period will be given, after which the following deductions will be applied to the awarded assessment mark: 12 to 24 hours late = 10% deduction; for each day thereafter, an additional 10% per day or part thereof will be applied until five days beyond the due date. After this time, a mark of zero (0) will be given. For example, an assessment worth 20% is due 5 pm on 1 January. Student A submits the assessment at 1 pm, 3 January. The assessment received a mark of 15/20. A 20% deduction is then applied to the mark of 15, resulting in the loss of three (3) marks. Student A is then awarded a final mark of 12/20.

Special consideration for 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.

Additional information

1. Participation: SGTA is a weekly event starting from week 2 and participation in SGTAs is compulsory and students attendance will be marked. Participation marks will also include students active engagement on Ilearn, and ECHO360, and whether students have paid sufficient attention to the information presented on Ilearn regarding the quiz, exam and all other assignments. The weightings for participation is 5%, and the estimated time on task (3 hours) is the time for students to get familiar with ILEARN and ECHO360, understanding where the critical

information (e.g. instructions for Lab, teaching videos) are located on Ilearn, reading the FAQ (Frequently asked questions), etc. The above also includes checking and ensuring that sufficient study time has been allocated to this unit.

2. Laboratory participation and report: There are only two laboratory sessions in this unit and they are in weeks 7 and 8 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.

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.

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.

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 and to a simple real-world problem by clarifying the assumptions and limitations of the engineering solution.

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

Assessment Tasks

Name	Weighting	Hurdle	Due
Common quiz administered online	10%	No	Week 7
Participation	5%	No	Week 14
Examination	45%	No	TBA
Project	10%	No	Week 13
Assignments	20%	No	Week 3,6,9 and 12
Laboratory report	10%	No	Week 10

Common quiz administered online

Assessment Type [1]: Quiz/Test
Indicative Time on Task [2]: 2 hours
Due: **Week 7**
Weighting: **10%**

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.

Participation

Assessment Type [1]: Participatory task
Indicative Time on Task [2]: 3 hours
Due: **Week 14**
Weighting: **5%**

This assessment includes students participation in SGTAs and other activities embedded in other learning activities described in the unit.

On successful completion you will be able to:

- 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: **45%**

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.

Project

Assessment Type [1]: Presentation
Indicative Time on Task [2]: 14 hours
Due: **Week 13**
Weighting: **10%**

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.

Assignments

Assessment Type [1]: Problem set
Indicative Time on Task [2]: 40 hours
Due: **Week 3,6,9 and 12**
Weighting: **20%**

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.

Laboratory report

Assessment Type [1]: Lab report
Indicative Time on Task [2]: 15 hours
Due: **Week 10**
Weighting: **10%**

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.

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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

Mechanics of Materials in SI Units, 10th Edition (Russell C. Hibbeler)

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 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.

Engineers Australia Competency Mapping

All key learning outcomes of this unit (see learning outcomes section; ULO1 – ULO4) are designed to meet the requirements of the Engineers Australia competency standard. The table below shows how the learning outcomes are mapped to the requirements.

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
	1.2 Conceptual understanding of underpinning maths, analysis, statistics, computing.	ULO1, ULO2

	1.3 In-depth understanding of specialist bodies of knowledge	ULO1, ULO2, ULO3
	1.4 Discernment of knowledge development and research directions	ULO1
	1.5 Knowledge of engineering design practice	ULO3
	1.6 Understanding of scope, principles, norms, accountabilities of sustainable engineering practice.	ULO1, ULO2
Engineering Application Ability	2.1 Application of established engineering methods to complex problem solving	ULO2, ULO3
	2.2 Fluent application of engineering techniques, tools and resources.	ULO2, ULO3
	2.3 Application of systematic engineering synthesis and design processes.	ULO2, ULO3
	2.4 Application of systematic approaches to the conduct and management of engineering projects.	ULO4
Professional and Personal Attributes	3.1 Ethical conduct and professional accountability.	ULO4
	3.2 Effective oral and written communication in professional and lay domains.	ULO4
	3.3 Creative, innovative and pro-active demeanour.	NA
	3.4 Professional use and management of information.	ULO4
	3.5 Orderly management of self, and professional conduct.	ULO4
	3.6 Effective team membership and team leadership	NA