MECH204

Mechanics of Solids

S2 Day 2014

Dept of Engineering

Contents

General Information

Unit convenor and teaching staff Shaokoon Cheng shaokoon.cheng@mq.edu.au
Credit points 3
Prerequisites (ENGG170(P) or ELEC170(P) or ENGG150(P)) and (MATH132(P) or MATH135(P)) and ((PHYS140(P) and PHYS143(P)) or (PHYS106(P) and PHYS107(P))
Corequisites
Co-badged status
Unit description This unit will examine free body diagrams. Stress-strain relations and elastic constants will be analysed in an engineering context. The unit will examine statically determinate stress systems,considering the impacts of direct stress, shear stress, bending stress, torsional stress in an engineering context. Bending moment diagrams, shear force diagrams and deflection of beams will be examined.

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:

The student will be able to determine critical forces and design components of machines and structures.

The student will be able to demonstrate understanding on the concepts of mechanical stress and strain.

The student will be able to produce shear force and bending moment diagrams of simply supported beams.

The student will be able to perform stress and strain transformation of a two-dimensional element and explain the concept of principal stresses.

The student will be able to identify failure mechanisms of a beam under different loading

conditions and other mechanical structures.

General Assessment Information

In order to pass this unit, students need to fulfill the following criterias:

1. Achieve at least 50% marks overall.

2. Students must submit at least 1 major assignment and 1 laboratory report.

3. Students must attend the mandatory final examination.

The unit will be graded according to the Macquarie University grading policy.

Assessment Tasks

Name	Weighting	Due
Assignment	20%	Week 6 and Week 11
Laboratory reports	20%	Week 8 and Week 10
Quiz	15%	Week 9
Tutorial	5%	Every week
Final Examination	40%	TBA

Assignment

Due: **Week 6 and Week 11**
Weighting: **20%**

There will be two assignments and each assignment weighs 10%

On successful completion you will be able to:

- The student will be able to determine critical forces and design components of machines and structures.
- The student will be able to demonstrate understanding on the concepts of mechanical stress and strain.
- The student will be able to produce shear force and bending moment diagrams of simply supported beams.
- The student will be able to perform stress and strain transformation of a two-dimensional element and explain the concept of principal stresses.
- The student will be able to identify failure mechanisms of a beam under different loading conditions and other mechanical structures.

Laboratory reports

Due: **Week 8 and Week 10**
Weighting: **20%**

There will be two laboratory reports and each report weighs 10%

On successful completion you will be able to:

- The student will be able to determine critical forces and design components of machines and structures.
- The student will be able to demonstrate understanding on the concepts of mechanical stress and strain.
- The student will be able to produce shear force and bending moment diagrams of simply supported beams.
- The student will be able to identify failure mechanisms of a beam under different loading conditions and other mechanical structures.

Quiz

Due: **Week 9**
Weighting: **15%**

The quiz will be on topics taught from week 1 to week 8.

On successful completion you will be able to:

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- The student will be able to identify failure mechanisms of a beam under different loading conditions and other mechanical structures.

Tutorial

Due: **Every week**
Weighting: **5%**

Student understanding of a topic will be assessed by the tutors.

On successful completion you will be able to:

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- The student will be able to produce shear force and bending moment diagrams of simply supported beams.
- The student will be able to perform stress and strain transformation of a two-dimensional element and explain the concept of principal stresses.
- The student will be able to identify failure mechanisms of a beam under different loading conditions and other mechanical structures.

Final Examination

Due: **TBA**
Weighting: **40%**

This will be a closed book exam. Attendance is compulsory for all students.

On successful completion you will be able to:

- The student will be able to determine critical forces and design components of machines and structures.
- The student will be able to demonstrate understanding on the concepts of mechanical stress and strain.
- The student will be able to perform stress and strain transformation of a two-dimensional element and explain the concept of principal stresses.

Delivery and Resources

Text book:

R.C. Hibbeler, “Mechanics of Materials.” *Pearson*, 9th edition.

Reference book:

J.L. Meriam and L.G. Kraige, “Statics.” *Wiley*, 7th edition.

E.P. Popov, “Engineering Mechanics of Solids.” *Prentice Hall*, 2nd edition.

Unit Schedule

Week	Lecture Topic	Lecturer	Practical/ Tutorial	Due Assignments/ Tasks
Week 1	Introduction to Mechanics of Solids	Shaokoon Cheng		
Week 2	Centroid and Moment of inertia	Shaokoon Cheng	Solving forces in members of machine and truss	
Week 3	Stress and strain	Shaokoon Cheng	Centroid and Moment of inertia	
Week 4	Mechanical properties of materials	Shaokoon Cheng	Stress and strain	
Week 5	Axially loaded member	Shaokoon Cheng	Mechanical properties of materials	
Week 6	Torsion	Shaokoon Cheng	Axially loaded member	Assignment 1
Week 7	Shear force and bending moment diagrams	Shaokoon Cheng	Laboratory: Torsion	
Semester break				
Week 8	Shear force and bending moment diagrams	Shaokoon Cheng	Laboratory: Bending of beams	Laboratory report 1
Week 9	Mechanical stresses in thin wall cyclinder	Shaokoon Cheng	Shear force and bending moment diagrams	Quiz

Week 10	Stress transformation and Mohr's circle	Shaokoon Cheng	Mechanical stresses in thin wall cyclinder	Laboratory report 2
Week 11	Strain transformation and Mohr's circle	Shaokoon Cheng	Stress transformation and Mohr's circle	Assignment 2
Week 12	Buckling	Shaokoon Cheng	Strain transformation and Mohr's circle	
Week 13	Revision	Shaokoon Cheng	Revision	

Policies and Procedures

Macquarie University policies and procedures are accessible from Policy Central. Students should be aware of the following policies in particular with regard to Learning and Teaching:

Academic Honesty Policy http://mq.edu.au/policy/docs/academic_honesty/policy.html

Assessment Policy http://mq.edu.au/policy/docs/assessment/policy.html

Grading Policy http://mq.edu.au/policy/docs/grading/policy.html

Grade Appeal Policy http://mq.edu.au/policy/docs/gradeappeal/policy.html

Grievance Management Policy http://mq.edu.au/policy/docs/grievance_management/policy.html

Disruption to Studies Policy http://www.mq.edu.au/policy/docs/disruption_studies/policy.html *The Disruption to Studies Policy is effective from March 3 2014 and replaces the Special Consideration Policy.*

In addition, a number of other policies can be found in the Learning and Teaching Category of 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/support/student_conduct/

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://informatics.mq.edu.au/help/.

When using the University's IT, you must adhere to the Acceptable Use Policy. The policy applies to all who connect to the MQ network including students.

Graduate Capabilities

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

- The student will be able to determine critical forces and design components of machines and structures.
- The student will be able to demonstrate understanding on the concepts of mechanical stress and strain.
- The student will be able to produce shear force and bending moment diagrams of simply

supported beams.
- The student will be able to perform stress and strain transformation of a two-dimensional element and explain the concept of principal stresses.
- The student will be able to identify failure mechanisms of a beam under different loading conditions and other mechanical structures.

Assessment tasks

- Assignment
- Laboratory reports
- Quiz
- Tutorial
- Final Examination

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

- The student will be able to determine critical forces and design components of machines and structures.
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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 outcomes

- The student will be able to determine critical forces and design components of machines and structures.
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- The student will be able to perform stress and strain transformation of a two-dimensional element and explain the concept of principal stresses.
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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

- The student will be able to identify failure mechanisms of a beam under different loading conditions and other mechanical structures.

Assessment task

- Tutorial

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:

Assessment task

- Laboratory reports

Changes since First Published

Date	Description
24/12/2013	The Prerequisites was updated.