ENGG2400

Mechanics of Solids 1

Summer // 2021

School of Civil and Environmental Engineering // UNSW Engineering

Course Overview

Staff Contact Details

Convenors

Name	Email	Availability	Location	Phone
Daniel O'Shea	d.oshea@unsw.edu.au	Email for appointment. Available Friday	Room 213, H20	

School Contact Information

Student Services can be contacted via unsw.to/webforms.

Course Details

Credit Points 6

Summary of the Course

This course provides an introduction to the fundamentals to the mechanics of solids. The topics include properties of plane cross-sectional shapes including centroid & principal second moment of area; concepts of stress and strain; 2D transformation of stresses and strains under axis rotation; principal stresses and strains; Mohr's circle of stress and strain; stress-strain relationships; elasticity, thermal strain, Poisson's ratio and Hooke's Law; bars under axial force; Indeterminate axial force systems; elastic bending stress formula; composite beams; deflections due to bending; step functions; simple indeterminate beams; shear flow; shear centre; torsion of circular shafts and box sections.

Course Aims

The objectives of this course are:

To reinforce knowledge of statics and to expand this knowledge in the areas of strain and stress analysis, thus enabling student to deal with more complex and integrated engineering problems involving Mechanics of Solids;
To introduce students to the basic principles and laws underlying Mechanics of Solids;
To familiarize students with the modelling and analysis techniques when formulating and solving problems for predicting the states of stress and strain for bodies in static equilibrium;
To give students an opportunity to develop and reflect on graduate attributes such as critical thinking and problem solving, lifelong learning skills and collaborative skills.

Course Learning Outcomes

1. Demonstrate a comprehension of the basic concepts and the role of Mechanics of Solids in the analysis and design of structures
2. Demonstrate a comprehension of the theoretical background to the concept of stresses and strains;
3. Be able to understand and apply the concepts of stresses and strains to formulate and evaluate the stresses and deformations within axial force and bending moment problems;
4. Be able to evaluate stresses due to axial force, bending moment, shear and torsion in symmetrical and unsymmetrical cross-sections;be able to calculate and evaluate beam deflections for statically determinate and indeterminate beams by using integration methods and step functions;
5. Be able to calculate shear and torsion stresses due to shear and torsion forces respectively;
6. Be able to calculate principal stresses, strains and combined stresses and draw Mohrâ??s circle;

Teaching Strategies

The teaching strategies that will be used include:

- **Online Lectures** that will focus on the development and application of generalised problem-solving processes for the stress, strain and deformation analysis of structures. Lectures will also emphasise the relationship of the content to engineering practice and will provide an opportunity for reflection on learning. The lectures are recorded and should be available on the Moodle

course page.

- **Problem** classes will concentrate on strategies for solving such problems. Students will be encouraged, from time to time, to work in small groups to solve problems.
- **Moodle Course Page** provides a step by step guide on the course. Links to video recordings and learning modules to help students learn the solution techniques for many of the subject areas.
- **Microsoft Teams -** delivery of online lectures and demonstrations, and discussion forum to ask questions of lecturers and peers

Suggested approaches to learning in this course include:

- Regular participation in lectures and class problem sessions. *Review lecture and class problem material. Follow worked examples. Reflect on class problems and quizzes.*
- Complete all the required tasks in the Moodle course page for this course.
- Weekly reading and recording of your learning.
- Appropriate preparation for class problem activities.
- Planning time to achieve all assessment requirements (see assessment).
- Students who perform poorly in the quizzes are strongly encouraged to discuss their progress with the lecturers during the semester.

Assessment

Assessment Tasks

Assessment task	Weight	Due Date	Student Learning Outcomes Assessed
Weekly Online Assignments	10%	Friday Week 5, 9pm	1, 2, 3, 4, 5, 6
Quiz	30%	Friday Week 3, 10am	1, 2, 3, 4, 5, 6
Final Examination	60%	See Exam Timetable	1, 2, 3, 4, 5, 6

Assessment Details

Assessment 1: Weekly Online Assignments

Start date: Start of Week 1

Details:

Weekly open book online quizzes which are done either at home, library or on campus.

Assessment 2: Quiz

Start date: Friday Week 3 (10am AEST)

Details:

High integrity mid-session quiz to assess progress in learning under exam-like conditions.

Assessment 3: Final Examination

Start date: See Exam Timetable

Details:

The final exam is given because the course learning outcomes include a significant level of technical learning that can be effectively assessed in an exam environment and because exams have high reliability.

Students must receive 40% in the final exam to pass the course

Attendance Requirements

Students are strongly encouraged to attend all classes and review lecture recordings.

Course Schedule

View class timetable

Timetable

Date	Type	Content
4 January - 8 January	Topic	Tuesday - Introduction, Geometric Properties of Cross-Sections
	Topic	Thursday - Concept of Stress, Concept of Strain
11 January - 15 January	Topic	Tuesday - Mechanical Properties of Materials, Transformation of Stresses
	Topic	Thursday - Transformation of Strains, Axial Deformations
18 January - 22 January	Topic	Tuesday - Elastic Bending, Bending of Composite Sections
	Topic	Thursday - Inelastic Bending, Deflections due to Bending
	Assessment	Midterm Quiz (See Moodle for Details)
25 January - 29 January	Topic	Tuesday - Public Holiday (no class)
	Topic	Thursday - Shear Stresses in Beams, Shear Flow and Shear Centre
1 February - 5 February	Topic	Tuesday - Torsion
	Topic	Thursday - Revision of Course
	Assessment	Final Exam (see Exam Timetable)

Resources

Prescribed Resources

Textbook: "Mechanics of Materials: Tenth Edition in SI Units" - RC Hibbeler, Pearson Education

Recommended Resources

Course Evaluation and Development

The School of Civil and Environmental Engineering evaluates each course each time it is run through (i) the MyExperience Surveys, and (ii) Focus Group Meetings. As part of the MyExperience process, your student evaluations on various aspects of the course are graded; the Course Coordinator prepares a summary report for the Head of School. Any problem areas are identified for remedial action, and ideas for making improvements to the course are noted for action the next time that the course is run. Focus Group Meetings are conducted by the four-Year Managers (academic staff) for any students who wish to attend, in each year of the civil and/or environmental engineering programs. Student comments on each course are collected and disseminated to the Lecturers concerned, noting any points which can help improve the course.

Academic Honesty and Plagiarism

Beware! An assignment that includes plagiarised material will receive a 0% Fail, and students who plagiarise may fail the course. Students who plagiarise are also liable to disciplinary action, including exclusion from enrolment.

Plagiarism is the use of another person's work or ideas as if they were your own. When it is necessary or desirable to use other people's material you should adequately acknowledge whose words or ideas they are and where you found them (giving the complete reference details, including page number(s)). The Learning Centre provides further information on what constitutes Plagiarism at:

https://student.unsw.edu.au/plagiarism

Academic Information

Supplementary Examinations:

Supplementary Examinations for Summer 2021 will be held on Saturday 13th February should you be required to sit one. You are required to be available on this dates. Please do not to make any personal or travel arrangements during this period.

ACADEMIC ADVICE

For information about:

- Notes on assessments and plagiarism;
- Special Considerations: student.unsw.edu.au/special-consideration;
- General and Program-specific questions: The Nucleus: Student Hub
- Year Managers and Grievance Officer of Teaching and Learning Committee, and
- CEVSOC/SURVSOC/CEPCA

Refer to Academic Advice on the School website available at:

https://www.engineering.unsw.edu.au/civil-engineering/student-resources/policies-procedures-and-forms/academic-advice

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Acknowledgement of Country

We acknowledge the Bedegal people who are the traditional custodians of the lands on which UNSW Kensington campus is located.