UNSW Course Outline

ENGG2400 Mechanics of Solids 1 - 2024

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General Course Information

Course Code : ENGG2400
Year : 2024
Term : Term 1
Teaching Period : T1
Is a multi-term course? : No
Faculty : Faculty of Engineering
Academic Unit : School of Civil and Environmental Engineering
Delivery Mode : In Person
Delivery Format : Standard
Delivery Location : Kensington
Campus : Sydney
Study Level : Postgraduate, Undergraduate
Units of Credit : 6

Useful Links

Handbook Class Timetable

Course Details & Outcomes

Course Description

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

Course Learning Outcomes
CLO1 : Represent physical systems in a manner to sufficiently capture the structural elements required to perform an engineering stress/strain analysis.
CLO2 : Discern the relevant principles that must be applied to ascertain stress/strain or load/deflection states of engineering systems and discriminate between relevant and irrelevant information in the context.
CLO3 : Demonstrate an ability to communicate clearly and precisely about technical matters related to the Mechanics of Solids, that includes mathematical, graphical and diagrammatic elements.
CLO4 : Accomplish practical tasks that require the application of knowledge of the Mechanics of Solids
CLO5 : Demonstrate professional communication that includes mathematical, graphical and diagrammatic elements.

Course Learning Outcomes	Assessment Item
CLO1 : Represent physical systems in a manner to sufficiently capture the structural elements required to perform an engineering stress/strain analysis.	• Online learning modules and weekly quizzes • Progress Quizzes • Final Examination
CLO2 : Discern the relevant principles that must be applied to ascertain stress/strain or load/deflection states of engineering systems and discriminate between relevant and irrelevant information in the context.	• Online learning modules and weekly quizzes • Progress Quizzes • Final Examination
CLO3 : Demonstrate an ability to communicate clearly and precisely about technical matters related to the Mechanics of Solids, that includes mathematical, graphical and diagrammatic elements.	• Final Examination
CLO4 : Accomplish practical tasks that require the application of knowledge of the Mechanics of Solids	• Online learning modules and weekly quizzes • Progress Quizzes • Final Examination
CLO5 : Demonstrate professional communication that includes mathematical, graphical and diagrammatic elements.	• Final Examination

Learning and Teaching Technologies

Moodle - Learning Management System | Echo 360

Additional Course Information

ENGG1300 Engineering Mechanics 1 is assumed knowledge, particularly including the development and application of free body diagrams and equilibrium equations. Furthermore, we assume competency in Engineering Mathematics, particularly including the formulation and solution of equations using calculus and algebra. Basic mechanics from physics is also assumed.

Assessments

Assessment Structure

Assessment Item	Weight	Relevant Dates
Online learning modules and weekly quizzes Assessment Format: Individual	15%	Start Date: Not Applicable Due Date: Not Applicable
Progress Quizzes Assessment Format: Individual	35%	Start Date: Not Applicable Due Date: Week 4, 7, 10
Final Examination Assessment Format: Individual	50%	

Assessment Details

Online learning modules and weekly quizzes

Assessment Overview

Weekly online learning modules which are done either at home, library or on campus. The online learning modules step you through solving a problem for each topic, and there is a brief weekly assignment on Moodle to complete applying your learning to engineering problems. Feedback will be returned within a week.

Course Learning Outcomes

- CLO1 : Represent physical systems in a manner to sufficiently capture the structural elements required to perform an engineering stress/strain analysis.
- CLO2 : Discern the relevant principles that must be applied to ascertain stress/strain or load/deflection states of engineering systems and discriminate between relevant and irrelevant information in the context.
- CLO4 : Accomplish practical tasks that require the application of knowledge of the Mechanics of Solids

Assignment submission Turnitin type

This is not a Turnitin assignment

Progress Quizzes

Assessment Overview

High integrity quizzes to assess progress in learning under exam-like conditions. Each of the three quizzes has equal weighting. Feedback will be returned at the end of each quiz.

Course Learning Outcomes

- CLO1 : Represent physical systems in a manner to sufficiently capture the structural elements required to perform an engineering stress/strain analysis.
- CLO2 : Discern the relevant principles that must be applied to ascertain stress/strain or load/ deflection states of engineering systems and discriminate between relevant and irrelevant information in the context.
- CLO4 : Accomplish practical tasks that require the application of knowledge of the Mechanics of Solids

Detailed Assessment Description

Progress Quiz One (WEEK 4) - Wednesday 6th March 2024, Start time: 6pm Sydney Time

- Geometric Properties of Cross-Sections
- Transformation of Stresses
- Transformation of Strains

Progress Quiz Two (WEEK 7) - Wednesday 26th March 2024, Start time: 6pm Sydney Time

- Mechanical Properties of Materials
- Axial Deformations
- Elastic Beam Bending

Progress Quiz Three (WEEK 10) - Wednesday 17th April 2024, Start time: 6pm Sydney Time

- Deflections due to Bending
- Shear Stress and Shear Flow
- Torsion

Assessment Length

90 min

Assessment information

Progress quizzes are open book online quizzes on Moodle.

Final Examination

Assessment Overview

2 hour final exam held during the final examination period. All content may be assessed in the

exam.

Course Learning Outcomes

- CLO1 : Represent physical systems in a manner to sufficiently capture the structural elements required to perform an engineering stress/strain analysis.
- CLO2 : Discern the relevant principles that must be applied to ascertain stress/strain or load/deflection states of engineering systems and discriminate between relevant and irrelevant information in the context.
- CLO3 : Demonstrate an ability to communicate clearly and precisely about technical matters related to the Mechanics of Solids, that includes mathematical, graphical and diagrammatic elements.
- CLO4 : Accomplish practical tasks that require the application of knowledge of the Mechanics of Solids
- CLO5 : Demonstrate professional communication that includes mathematical, graphical and diagrammatic elements.

Assessment Length

2 hours

Assignment submission Turnitin type

This is not a Turnitin assignment

Hurdle rules

A mark of at least 40% in the final examination is required before the class work is included in the final mark.

General Assessment Information

Grading Basis

Standard

Course Schedule

Teaching Week/Module	Activity Type	Content
Week 1 : 12 February - 18 February	Topic	Course Introduction. Geometric Properties of Cross-Sections.
	Lecture	LECTURE A Tuesday 11:00am - 01:00pm Sir John Clancy Auditorium LECTURE B Thursday 11:00am - 01:00pm Sir John Clancy Auditorium
	Workshop	
	Assessment	Online learning module
	Assessment	Online weekly assignment
Week 2 : 19 February - 25 February	Topic	Concept of Stress and Transformation of Stress
	Lecture	LECTURE A Tuesday 11:00am - 01:00pm Sir John Clancy Auditorium LECTURE B Thursday 11:00am - 01:00pm Sir John Clancy Auditorium
	Workshop	
	Assessment	Online learning module
	Assessment	Online weekly assignment
Week 3 : 26 February - 3 March	Topic	Concept of Strain and Transformation of Strain
	Lecture	LECTURE A Tuesday 11:00am - 01:00pm Sir John Clancy Auditorium LECTURE B Thursday 11:00am - 01:00pm Sir John Clancy Auditorium
	Workshop	
	Assessment	Online learning module
	Assessment	Online weekly assignment
Week 4 : 4 March - 10 March	Topic	Mechanical Properties of Materials Axial Deformations
	Lecture	LECTURE A Tuesday 11:00am - 01:00pm Sir John Clancy Auditorium LECTURE B Thursday 11:00am - 01:00pm Sir John Clancy Auditorium
	Workshop	
	Assessment	Online learning module
	Assessment	Online weekly assignment
	Assessment	Progress Quiz 1 (Wednesday 6pm)
Week 5 : 11 March - 17 March	Topic	Elastic Bending and Composite Sections Inelastic Bending
	Lecture	LECTURE A Tuesday 11:00am - 01:00pm Sir John Clancy Auditorium LECTURE B Thursday 11:00am - 01:00pm Sir John Clancy Auditorium
	Workshop	
	Assessment	Online learning module
	Assessment	Online weekly assignment
Week 6 : 18 March - 24 March	Other	Mid-term break - NO CLASSES THIS WEEK
Week 7 : 25 March - 31 March	Topic	Beam Deflections
	Lecture	LECTURE A Tuesday 11:00am - 01:00pm Sir John Clancy Auditorium LECTURE B Thursday 11:00am - 01:00pm Sir John Clancy Auditorium
	Workshop	
	Assessment	Online learning module
	Assessment	Online weekly assignment
	Assessment	Progress Quiz 2 (Wednesday 6pm)
Week 8 : 1 April - 7 April	Topic	Shear Stresses in Built-Up Members Shear Flow in Thin-Walled Beams
	Lecture	LECTURE A Tuesday 11:00am - 01:00pm Sir John Clancy Auditorium LECTURE B Thursday 11:00am - 01:00pm Sir John Clancy Auditorium
	Workshop	
	Assessment	Online learning module
	Assessment	Online weekly assignment
Week 9 : 8 April - 14 April	Topic	Torsion Indeterminate Torsion Problems
	Lecture	LECTURE A Tuesday 11:00am - 01:00pm Sir John Clancy Auditorium LECTURE B Thursday 11:00am - 01:00pm Sir John Clancy Auditorium

	Workshop	
	Assessment	Online learning module
	Assessment	Online weekly assignment
Week 10 : 15 April - 21 April	Topic	Failure Theories Buckling of Columns
	Lecture	LECTURE A Tuesday 11:00am - 01:00pm Sir John Clancy Auditorium LECTURE B Thursday 11:00am - 01:00pm Sir John Clancy Auditorium
	Workshop	
	Assessment	Online learning module
	Assessment	Online weekly assignment
	Assessment	Progress Quiz 3 (Wednesday 6pm)

Attendance Requirements

For courses with Workshops or Laboratories, attendance for those classes is a necessary part of the course and workshop/laboratory content that is examinable. Minimal attendance of at least 80% of the workshop/laboratory in which you are enrolled for the duration of the term, is required to Satisfactory complete the course assessment.

Course Resources

Prescribed Resources

Textbook: "Mechanics of Materials: Tenth Edition in SI Units" - RC Hibbeler, Pearson Education. Free access for students via Kortext.

UNSW Library website: https://www.library.unsw.edu.au/

Recommended Resources

Other resources are provided digitally. You may choose to get additional textbooks.

Course Evaluation and Development

The Faculty of 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.

Staff Details

Position	Name	Email	Location	Phone	Availability	Equitable Learning Services Contact	Primary Contact
Convenor	Elena Atroshchenko		Room 607, H20 (Civil Engineering) building		appointment by e-mail	No	Yes

Other Useful Information

Academic Information

I. Special consideration and supplementary assessment

If you have experienced an illness or misadventure beyond your control that will interfere with your assessment performance, you are eligible to apply for Special Consideration prior to, or within 3 working days of, submitting an assessment or sitting an exam.

Please note that UNSW has a Fit to Sit rule, which means that if you sit an exam, you are declaring yourself fit enough to do so and cannot later apply for Special Consideration.

For details of applying for Special Consideration and conditions for the award of supplementary assessment, please see the information on UNSW's Special Consideration page.

II. Administrative matters and links

All students are expected to read and be familiar with UNSW guidelines and polices. In particular, students should be familiar with the following:

- Attendance
- UNSW Email Address
- Special Consideration
- Exams
- Approved Calculators
- Academic Honesty and Plagiarism
- Equitable Learning Services

III. Equity and diversity

Those students who have a disability that requires some adjustment in their teaching or learning environment are encouraged to discuss their study needs with the course convener prior to, or at the commencement of, their course, or with the Equity Officer (Disability) in the Equitable

Learning Services. Issues to be discussed may include access to materials, signers or note-takers, the provision of services and additional exam and assessment arrangements. Early notification is essential to enable any necessary adjustments to be made.

IV. Professional Outcomes and Program Design

Students are able to review the relevant professional outcomes and program designs for their streams by going to the following link: https://www.unsw.edu.au/engineering/student-life/student-resources/program-design.

Note: This course outline sets out the description of classes at the date the Course Outline is published. The nature of classes may change during the Term after the Course Outline is published. Moodle or your primary learning management system (LMS) should be consulted for the up-to-date class descriptions. If there is any inconsistency in the description of activities between the University timetable and the Course Outline/Moodle/LMS, the description in the Course Outline/Moodle/LMS applies.

Academic Honesty and Plagarism

UNSW has an ongoing commitment to fostering a culture of learning informed by academic integrity. All UNSW students have a responsibility to adhere to this principle of academic integrity. Plagiarism undermines academic integrity and is not tolerated at UNSW. *Plagiarism at UNSW is defined as using the words or ideas of others and passing them off as your own.*

Plagiarism is a type of intellectual theft. It can take many forms, from deliberate cheating to accidentally copying from a source without acknowledgement. UNSW has produced a website with a wealth of resources to support students to understand and avoid plagiarism, visit: student.unsw.edu.au/plagiarism. The Learning Centre assists students with understanding academic integrity and how not to plagiarise. They also hold workshops and can help students one-on-one.

You are also reminded that careful time management is an important part of study and one of the identified causes of plagiarism is poor time management. Students should allow sufficient time for research, drafting and the proper referencing of sources in preparing all assessment tasks.

Repeated plagiarism (even in first year), plagiarism after first year, or serious instances, may also be investigated under the Student Misconduct Procedures. The penalties under the procedures

can include a reduction in marks, failing a course or for the most serious matters (like plagiarism in an honours thesis or contract cheating) even suspension from the university. The Student Misconduct Procedures are available here:

www.gs.unsw.edu.au/policy/documents/studentmisconductprocedures.pdf

Submission of Assessment Tasks

Work submitted late without an approved extension by the course coordinator or delegated authority is subject to a late penalty of five percent (5%) of the maximum mark possible for that assessment item, per calendar day.

The late penalty is applied per calendar day (including weekends and public holidays) that the assessment is overdue. There is no pro-rata of the late penalty for submissions made part way through a day. This is for all assessments where a penalty applies.

Work submitted after five days (120 hours) will not be accepted and a mark of zero will be awarded for that assessment item.

For some assessment items, a late penalty may not be appropriate. These will be clearly indicated in the course outline, and such assessments will receive a mark of zero if not completed by the specified date. Examples include:

- Weekly online tests or laboratory work worth a small proportion of the subject mark;
- Exams, peer feedback and team evaluation surveys;
- Online quizzes where answers are released to students on completion;
- Professional assessment tasks, where the intention is to create an authentic assessment that has an absolute submission date; and,
- Pass/Fail assessment tasks.

Faculty-specific Information

Engineering Student Support Services – The Nucleus - enrolment, progression checks, clash requests, course issues or program-related queries

Engineering Industrial Training – Industrial training questions

UNSW Study Abroad – study abroad student enquiries (for inbound students)

UNSW Exchange – student exchange enquiries (for inbound students)

UNSW Future Students – potential student enquiries e.g. admissions, fees, programs, credit transfer

Phone

(+61 2) 9385 8500 – Nucleus Student Hub

(+61 2) 9385 7661 – Engineering Industrial Training

(+61 2) 9385 3179 – UNSW Study Abroad and UNSW Exchange (for inbound students)

School-specific Information

Final Examinations

Final Exams in T1 2024 will be held on campus between the 26th April and 9th May, and Supplementary Exams between the 20th - 24th May 2024. You are required to be available on these dates. Please do not to make any personal or travel arrangements during this period.

School Contact Information

For assistance with enrolment, class registration, progression checks and other administrative matters, please see the Nucleus: Student Hub. They are located inside the Library – first right as you enter the main library entrance. You can also contact them via http://unsw.to/webforms or reserve a place in the face-to-face queue using the UniVerse app.

For course administration matters, please contact the Course Coordinator.

Questions about this course should normally be asked during the scheduled class so that everyone can benefit from the answer and discussion.