

Module Code	MEU44B01
Module Name	4B1 MECHANICS OF SOLIDS 2
ECTS Weighting	5 ECTS
Semester taught	Semester 2
Module Coordinator/s	Associate Professor Mark Ahearne
Module Learning Outcomes with reference to the Graduate Attributes and how they are developed in discipline	<p>On successful completion of this module, students should be able to:</p> <p>LO1. Demonstrate a fundamental knowledge of the theory of elasticity, including equilibrium equations, compatibility equations, boundary conditions and stress functions.</p> <p>LO2. Calculate the stress and strain distribution using stress functions in engineering structures under load.</p> <p>LO3. Assess the suitability of specific viscoelastic models for different materials and different mechanical characterization techniques.</p> <p>LO4. Calculate the mechanical behaviour of laminates in different orientations</p> <p>Graduate Attributes: levels of attainment</p> <p>To act responsibly – Enhanced</p> <p>To think independently – Enhanced</p> <p>To develop continuously – Enhanced</p> <p>To communicate effectively – Enhanced</p>
Module Content	<p>This module expands upon fundamental topics developed in MEU33B03. Theory of elasticity is used to develop equations describing the stress-strain behaviour in different components under load. The use of stress functions is developed and applied to problems such as thick-walled pressure vessels and holes in plates. Rheological models are developed and used to describe the behaviour of viscoelastic materials. The mechanical characteristic of laminate structures and the influence orientation has on mechanical strength are examined. Finally, the theory of the finite element method and its use in solving problems in mechanics is introduced.</p> <p>Module Syllabus</p> <p>Theory of Elasticity</p> <ul style="list-style-type: none"> • Deformation, displacements and strains • Stress and equilibrium • Constitutive relations – linear elastic solids • Stress functions • Beams • Thick-walled pressure vessels • Concentrated load at a point • Hole in a plate <p>Viscoelastic behaviour</p> <ul style="list-style-type: none"> • Viscoelastic modelling • Intermittent loading <p>Laminate theory</p>

- Influence of orientation
- Strength of unidirectional laminates
- Analysis of composite laminates

Teaching and Learning Methods

Lectures: The teaching strategy follows several different textbooks that examine different aspects of mechanics of solids.

Tutorials: Tutorials follow a series of question sheets, with problems similar to exam questions. The solutions for these are available online and are released gradually as the module progresses. The tutorials are given to class groupings and are informal. Tutorials are attended by teaching assistants or by the lecturer, to provide formative feedback (e.g., on the micro-project work). No assessment of tutorial performance is noted.

Assessment Details Please include the following: <ul style="list-style-type: none"> • Assessment Component • Assessment description • Learning Outcome(s) addressed • % of total • Assessment due date 	Assessment Component	Assessment Description	LO Addressed	% of total	Week due	
		Written exam	End of semester examination	1-5	850	Exam period
		Assignment	Written report	5	15	Week 31

Reassessment Requirements Written examination (100%)

Contact Hours and Indicative Student Workload	Contact hours: 40 (32 lectures, 8 tutorials)
	Independent Study (preparation for course and review of materials): 30
	Independent Study (preparation for assessment, incl. completion of assessment): 45

Recommended Reading List Elasticity Theory, Applications and Numerics, Sadd, Elsevier
Theory of Elasticity, Timoshenko, McGraw-Hill
Mechanics of Materials, Gere, 5th edition, Nelson Thornes

Module Pre-requisite 3B3 Mechanics of Solids (or equivalent)

Module Co-requisite Not applicable

Module Website

Are other Schools/Departments involved in the delivery of this module? No

Module Approval Date

Approved by

Academic Start Year

Academic Year of Date