

MODULE DESCRIPTION FORM

DEPARTMENT OF MECHANICAL AND AEROSPACE ENGINEERING

16327 STRUCTURAL MECHANICS

Module Registrar: Prof D H Nash d.nash@strath.ac.uk	Taught To (Course): All third-year undergraduate degree courses delivered by MAE	
Other Lecturers Involved:	Credit Weighting: 10 (ECTS 5)	Semester: 1
Compulsory class	Academic Level: 3	Suitable for Exchange: Y

Required prerequisites

Note: It is the responsibility of ALL students to ensure that they satisfy the prerequisite knowledge for this module BEFORE adding as part of curriculum selection. If unsure, please contact the Module Registrar or discuss with your Programme/Year Adviser of Studies.

Understanding of solid mechanics fundamentals:

- equilibrium of rigid bodies in two dimensions;
- concepts of stress, stress transformation, graphical representation of stress transformation using Mohr's circle;
- concept of unidirectional direct straining and extensional deformation;
- relationship between unidirectional stress and strain;
- shear force and bending moment distributions in transversely loaded beams and their graphical representation.
- instability, buckling and energy methods

Module Format and Delivery (HOURS i.e. 1 credit = 10hrs of study):

Lecture	Tutorial	Laboratory	Groupwork	External	Online	Project	Assignments	Private Study	Total
20	20							60	100

Educational Aim

This class is a direct continuation of the solid mechanics element of class 16232 and aims to extend the students' knowledge and understanding of the mechanical behaviour of materials and structures under a variety of loading conditions.

Learning Outcomes

On completion of the module the student is expected to be able to:

LO1 fully understand the central principle of solid mechanics, namely, the application of equilibrium, compatibility and constitutive relations to determining the deformation of loaded materials and demonstrate this understanding through successful mathematical analysis of various problems of relevance.

LO2 determine the deformation of various common structural elements, namely cylinders, beams and columns under various loading conditions, and be competent in analytically analysing relevant structural analysis problems.

Syllabus

The module will teach the following:

Solid Mechanics: Two-dimensional stress and strain; multiaxial elastic constitutive relations; multiaxial yield criteria; general equations of elasticity leading to solutions for thick and thin cylindrical structures.

Structural Mechanics: Equations and analysis of continuous beams, both determinate and indeterminate; introduction to energy methods of analysis; superposition and dynamic loading effects; introduction to instability and buckling, including end-loaded columns with imperfections; design analysis of columns using British Standards or Euro-Codes.

Assessment of Learning Outcomes

Criteria

For each of the Module Learning Outcomes the following criteria will be used to make judgements on student learning:

LO1

C1 Demonstrate understanding of solid mechanics principles and ability to analyse problems involving the deformation of loaded materials.

LO2

C1 Demonstrate understanding of structural mechanics principles and ability to analyse problems involving the behaviour of loaded structures.

The standards set for each criterion per Module Learning Outcome to achieve a pass grade are indicated on the assessment sheet for all assessment.

Principles of Assessment and Feedback

(within Assessment and Feedback Policy at: <https://www.strath.ac.uk/professionalservices/staff/policies/academic>)

Formative feedback will be provided at tutorial sessions primarily through individual or group discussion of exercises prepared in advance by students. Note:- to receive this feedback students should participate in these tutorials but attendance is not mandatory.

Summative feedback will be provided by the return of examination marks to students after the December exam.

Assessment Method(s) Including Percentage Breakdown and Duration of Exams (*individual weightings*)

Examination				Coursework		Practical		Project	
Number	Month(s)	Duration	Weighting	Number	Weighting	Number	Weighting	Number	Weighting
1	Dec	2 hours	100%						
LO1 & LO2				*		*		*	

* **L/Os:** Indicate which Learning Outcomes (L01, L02, etc) are to be assessed by exam/coursework/practical/project as required.

Coursework / Submission deadlines (*academic weeks*):

Resit Assessment Procedures:

2 hr examination in August diet

PLEASE NOTE:

Students must gain a summative mark of 40% to pass the module. Students who fail the module at the first attempt will be re-assessed during the August diet. This re-assessment will consist entirely of an exam. No marks from any previous attempts will be transferred to a new resit attempt.

Recommended Reading

***Purchase recommended **Highly recommended reading *For reference

** Mechanics of Engineering Materials" 2nd edition, by Benham, Crawford & Armstrong, Addison Wesley Longman

Additional Student Feedback

(Please specify details of when additional feedback will be provided)

Date	Time	Room No
TBA		Check timetable webpages for details

Session: 2023/2024

Approved:

Course Director Signature: S Connolly (on behalf of E Henderson)

Date of Last Modifications: 14/08/2023

