

Structural Mechanics and Analysis

Module Code:	CSE5011-B
Academic Year:	2018-19
Credit Rating:	20
School:	Department of Civil and Structural Engineering
Subject Area:	Civil and Structural Engineering
FHEQ Level:	FHEQ Level 5
Module Leader:	Dr Therese Sheehan

Additional Tutors:
Dr Michael Honnor

Pre-requisites:

Co-requisites:

Contact Hours

Type	Hours
Lectures	48
Tutorials	24
Laboratory	3
Directed Study	128

Availability Periods

Occurrence	Location/Period
BDA	University of Bradford / Academic Year (Sept - May)

Module Aims

To evaluate the concepts of a general three-dimensional stress and strain state and to relate these concepts to the behaviour of actual materials and structural elements.

To extend the ability to deal with normal force, shear force and bending moment in statically determinate beam assemblies with internal hinges and cranked members.

To introduce methods for determining the displacements in statically determinate beams,

frames and trusses.

To introduce and develop understanding of the flexibility method, with applications to indeterminate beams, frames and trusses with a single redundancy.

Outline Syllabus

Fundamental assumptions of solid mechanics.

Stress state; principal stresses, maximum shear stress, two-dimensional stress states, plane stress and plane strain.

Mohr's circle of stress.

Torsion - the torsion equation.

Work of external loads.

Total potential energy.

Strain energy methods.

Unit load method for calculating deflections.

Thick cylinder.

Elasticity and plasticity. Yield criteria and their application.

Buckling instabilities - the Euler criterion.

Brittle and ductile behaviour. Fundamentals of fracture mechanics - stress intensity, strain energy release rate, plastic zone size.

Methods for determining internal forces in beam assemblies.

Methods for counting and identifying redundancies.

Unit load method for evaluating displacements in a variety of statically determinate structures.

Flexibility method for solving indeterminate beams, frames and trusses with a single redundancy.

Moment distribution method for beam and frame.

Module Learning Outcomes

On successful completion of this module, students will be able to...

- 1 Explain the basic concepts of solid mechanics
Solve engineering problems relating to stress and strain analysis.
Compute displacements in statically determinate structures.
Solve simple indeterminate structures via the flexibility method.
Solve indeterminate structures via the moment distribution method.
- 2 Formulate and solve solid mechanics problem related to engineering activities.
Apply appropriate hand calculations to the analysis of simple linear elastic structures.
Appreciate the effects of different loads on pin-jointed trusses and framed structures
- 3 Recognise particular classes of problem and adapt standard solution methods.

Learning, Teaching and Assessment Strategy

Concepts are introduced using formal lectures. Deeper understanding is developed during tutorials, and further enhanced using the laboratory class. Oral feedback is given during the laboratory sessions and tutorials.

Written assessment will concern the application of practical skills to the knowledge base of

the module and the formal examination will assess the wider learning outcomes expressed in the descriptor.

Mode of Assessment

Type	Method	Description	Length	Weighting	Final Assess'
Summative	Examination - closed book	Semester 2 Examination - closed book	2 hours	50%	Yes
Summative	Examination - closed book	Semester 1 Examination - closed book	2 hours	50%	No
Referral	Examination - closed book	Supplementary assessment	2 hours	50%	No
Referral	Examination - closed book	Supplementary assessment	2 hours	50%	No

Legacy Code (if applicable)

ENG2302L; MAE5007-B

Reading List

To view Reading List, please go to [rebus:list](#).