

Module Details	
Module Title:	Structural Mechanics and Analysis
Module Code:	CSE5011-B
Academic Year:	2019-20
Credit Rating:	20
School:	Department of Civil and Structural Engineering
Subject Area:	Civil and Structural Engineering
FHEQ Level:	FHEQ Level 5
Pre-requisites:	
Co-requisites:	

Contact Hours	
Type	Hours
Lectures	48
Tutorials	21
Laboratory	3
Directed Study	128

Availability	
Occurrence	Location / Period
BDA	University of Bradford / Semester 1 (Sep - Jan)

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.
Appreciating the effects of different loads on pin-jointed trusses and framed structures.

Learning Outcomes

1	Explain the basic concepts and fundamental assumptions of solid and structural mechanics.
2	Solve engineering problems relating to stress and strain analysis.
3	Formulate and solve solid mechanics problem related to engineering activities.
4	Apply appropriate hand calculations to the analysis of simple linear elastic structures.
5	Identify particular classes of structural analysis problem and adapt standard solution methods.

Learning, Teaching and Assessment Strategy

Concepts are introduced and explained in depth using interactive lectures. Students are provided with tutorial sheets to work on during their directed study time in order to further develop their understanding. Issues with the lecture material and tutorial sheets are discussed with the tutor during tutorial sessions. Understanding of the structural concepts is further enhanced using the laboratory class. Oral feedback is given during the laboratory sessions and tutorials.

Students will be formatively assessed by a 'mock exam' during the middle of the semester. Students will receive timely feedback on their performance in order to evaluate their attainment of the learning outcomes and to prepare for the summative assessments.

The summative assessment (examinations) will concern the application of practical skills to the knowledge base of the module and will assess the learning outcomes listed above. The first examination will assess Learning Outcomes 1, 2 and 3 listed above. Learning outcomes 4 and 5 will be assessed during the second examination

Mode of Assessment				
Type	Method	Description	Length	Weighting
Formative	Examination - closed book	Mock Exam	2 hours	%
Referral	Examination - closed book	Supplementary assessment 1	2 hours	50%
Referral	Examination - closed book	Supplementary assessment 2	2 hours	50%
Summative	Examination - closed book	Semester 1 Examination 1 - closed book	2 hours	50%
Summative	Examination - closed book	Semester 1 Examination 2 - closed book	2 hours	50%

Reading List
To access the reading list for this module, please visit https://bradford.rl.talis.com/index.html .

Please note:

This module descriptor has been published in advance of the academic year to which it applies. Every effort has been made to ensure that the information is accurate at the time of publication, but minor changes may occur given the interval between publishing and commencement of teaching. Upon commencement of the module, students will receive a handbook with further detail about the module and any changes will be discussed and/or communicated at this point.