

Liverpool John Moores University

Title: STRUCTURAL ANALYSIS AND MODELLING
Status: Definitive
Code: **5500ICBTCE** (126967)
Version Start Date: 01-08-2021

Owning School/Faculty: Civil Engineering and Built Environment
Teaching School/Faculty: ICBT, Colombo

Team	Leader
Alison Cotgrave	Y

Academic Level: FHEQ5
Credit Value: 15
Total Delivered Hours: 77
Total Learning Hours: 150
Private Study: 73

Delivery Options

Course typically offered: Semester 1 and Summer

Component	Contact Hours
Lecture	45
Practical	15
Tutorial	15

Grading Basis: 40 %

Assessment Details

Category	Short Description	Description	Weighting (%)	Exam Duration
Report	AS1	Coursework (1500 words)	30	
Exam	AS2	Written Examination – 2 hours	70	2

Aims

This unit provides learners with an understanding of statically determinate and indeterminate structures. Learners will also gain skills to determine compound and complex forces in civil engineering structures.

Learning Outcomes

After completing the module the student should be able to:

- 1 Analyse equilibrium and compatibility in relation to structures.
- 2 Analyse stresses and strains, loads, deformations and determine deflection of structural systems in civil engineering structures.
- 3 Determine compound and complex forces in civil engineering structures.
- 4 Use computer/software applications in structural analysis and design.

Learning Outcomes of Assessments

The assessment item list is assessed via the learning outcomes listed:

Coursework	3	4
Written Exam	1	2

Outline Syllabus

Equilibrium and compatibility: requirements for trusses, beams and frames, principle of superposition for determinate structures, review of statics, internal loadings, stress and strain, mechanical properties of materials, axial loading, multi-axial loading.

Structural stability and determinacy: statically determinate structures, shear force diagrams (SFD), bending moment diagrams (BMD) for beams, continuous beams, floor-beam systems, 3D frames, arches, trusses and roof frames.

Stress and strain: constitutive relations, 2D plane stress/strain problems, struts, buckling loads of ideal struts, empirical strut formulae, strain energy, resilience, suddenly applied loads, shear flow, shear centre and combined loading, pure bending, unsymmetrical bending, bending of composite beams, elastoplastic bending, elastic torsion, elastoplastic torsion, torsion of circular shafts, elastic and plastic behaviour.

Steel beams and frames behaving plastically, columns subjected to axial load, transverse load and moments.

Compound and complex forces: analysis of determinate simple, compound and complex trusses, multiple system of trusses, three hinged arched trusses and 3D framework using joint method, section method and assumed force method. Analysis of continuous beams, frames, trusses.

Deflection of statically determinate beams, frames, curved bars, trusses and arches, error in fabrication.

Statically indeterminate beams, frames and trusses (externally and internally), using method of consistent deformation, slope-deflection method, moment distribution method, Maxwell law of reciprocal relations, settlement of supports.

Influence line for simply supported beams, continuous beams, floor-beam

systems, frames, series of concentrated live loads and trusses, moment charts and absolute maximum moment.

Types of software: e.g. SAP 2000, PROKON, Autodesk Use of software: configuring PROKON, file management, working A structural analysis tool, features offered by Prokon in the latest version include frame analysis as well as design links of columns, beams and base.

Learning Activities

Students will be supported in their learning, to achieve the above learning outcomes, in the following ways:

By a series of lectures and tutorials and through participation within tutorial sessions, and IT lab based practical sessions for problem solving.

Self-managed investigative study to analyse cases related to the industry.

In-class participation and case studies are key features of this module.

A recommended resource list - indicating key reading, internet support and physical learning assistance, is provided to help enable students to undertake self-directed study.

Notes

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