

### Summary Information

Module Code	5500ICBTCE
Formal Module Title	Structural Analysis and Modelling
Owning School	Civil Engineering and Built Environment
Career	Undergraduate
Credits	15
Academic level	FHEQ Level 5
Grading Schema	40

### Teaching Responsibility

LJMU Schools involved in Delivery
LJMU Partner Taught

### Partner Teaching Institution

Institution Name
International College of Business and Technology

### Learning Methods

Learning Method Type	Hours
Lecture	45
Practical	15
Tutorial	15

### Module Offering(s)

Display Name	Location	Start Month	Duration Number Duration Unit
APR-PAR	PAR	April	12 Weeks

JAN-PAR	PAR	January	12 Weeks
SEP-PAR	PAR	September	12 Weeks

## Aims and Outcomes

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.
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**After completing the module the student should be able to:**

### Learning Outcomes

Code	Number	Description
MLO1	1	Analyse equilibrium and compatibility in relation to structures.
MLO2	2	Analyse stresses and strains, loads, deformations and determine deflection of structural systems in civil engineering structures.
MLO3	3	Determine compound and complex forces in civil engineering structures.
MLO4	4	Use computer/software applications in structural analysis and design.

## Module Content

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.
Module Overview	
Additional Information	

## Assessments

Assignment Category	Assessment Name	Weight	Exam/Test Length (hours)	Module Learning Outcome Mapping

Report	Coursework	30	0	MLO3, MLO4
Exam	Written Exam	70	2	MLO1, MLO2

## Module Contacts

### Module Leader

Contact Name	Applies to all offerings	Offerings
Karl Jones	Yes	N/A

### Partner Module Team

Contact Name	Applies to all offerings	Offerings
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