Liverpool John Moores University

Title:	ENGINEERING MECHANICS AND STRENGTH OF MATERIALS
Status:	Definitive
Code:	**4503ICBTCE** (126962)
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:	FHEQ4	**Credit Value:**	15	**Total Delivered Hours:**	79
Total Learning Hours:	150	**Private Study:**	71		

Delivery Options
Course typically offered: Semester 1

Component	Contact Hours
Lecture	45
Off Site	8
Practical	9
Tutorial	15

Grading Basis: 40 %

Assessment Details

Category	Short Description	Description	Weighting (%)	Exam Duration
Portfolio	AS2	Coursework and Lab Report (2000 words)	50	
Exam	AS3	Written Examination (Closed Book)	50	2

Aims

The aim of this unit is to give learners an understanding of the properties, structural behaviour and use of construction materials. Learners will examine forces in engineering applications at rest or in motion and develop mathematical skills to solve

complex engineering problems. Learners will also develop skills to solve statically determinate structures subjected to different loading systems. Also it aims to concepts of statics and dynamics in civil engineering structures.

Learning Outcomes

After completing the module the student should be able to:

1	Identify behaviour of various structural elements applying concepts of resolution of forces for statics problems for civil engineering applications.
2	Demonstrate the properties and use of construction materials justifying the reasons for their selection, considering factors such as effect on the design of buildings and installations, effects on the environment and Perform laboratory experiments safely and deal with recording, analysing and interpretation of results.
3	Solve dynamics problems for civil engineering application.
4	Analyse various shapes of cross section to determine: cross sectional area, centre of gravity, second moment of area and section modulus and simple structures subject to point loads and UDLs, to calculate support reactions, shearing force, bending moment values and deflections.

Learning Outcomes of Assessments

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

Portfolio	1	2	3
Written Examination	4		

Outline Syllabus

Draw a static force system for a given civil engineering structure, the forces in a given pulley system.
Centroid of composite bodies used in civil engineering structures, first moment of area of composite bodies, Second moment of area of composite bodies and its use in civil engineering applications.
Structural behavior: internal and external forces, equilibrium and free body diagrams, stresses and strains, deformations due to force and displacement induced loads, relationship between behavior and use, forms of loading, inherent properties of structural materials (timber, steel, reinforced concrete), behavior of structural materials when formed into structural members(e.g. beams, columns, frames, pads, bases, studs, steel brackets).
Cantilevers and simply supported beams: variety of point loads and uniformly distributed loads, uniformly varying loads, load bending moment diagrams, shear force diagrams, Mohr's moment-area method (variety of point loads and uniformly distributed loads), Macaulay's method (variety of point loads and uniformly distributed loads), bending deflection in beams (variety of materials for beam section).
Axial load carrying capacity: elastic buckling, Euler's method for determining the critical load, concept of effective length.

Properties of construction materials: metals and alloys, e.g. iron, steel, zinc, copper, brass, aluminum, lead, timber and timber products, clay products (e.g. bricks, tiles), cements and concretes, plastics and other artificial materials, coatings and finishes, e.g. paints, clear finishes, wood treatments.
Properties of materials: as appropriate to field of study, e.g. strength, elasticity, porosity and water absorption, thermal and moisture movement, thermal and electrical conductivity/resistivity, durability, workability, density, specific heat capacity, viscosity.
Uses of materials: construction, refurbishment, maintenance, replacement, energy efficiency, environmental issues, use of renewable resources.
Particle motion problems for civil engineering applications, angular velocity, angular acceleration centrifugal force linear and rotational rigid body motion problems, impulse momentum theory to solve civil engineering structural problem.
Solving scientific problems for civil engineering applications: experimentation relevant to the above as appropriate to field of study, use of scientific method (nature of experiment, intended aims and objectives, apparatus, method, results, calculations, analysis, conclusion).
Construction materials related laboratory practical work such as slump test, compressive strength test of concrete, basic structural mechanics lab tests.

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 practical sessions for problem solving including video and Power-Point presentations together with a number of practical sessions.
Students should develop a competence in using scientific equipment adopting an active learning approach.
Laboratory work will have an emphasis on the manipulation, interpretation and analysis of the data, which should allow reasoned conclusions and recommendations to be made.
Self-managed investigative study to analyse cases related to the selection of materials to suitable applications within the construction industry.
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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