

Liverpool John Moores University

Title: CIVIL ENGINEERING STRUCTURAL DESIGN
Status: Definitive
Code: **5507ICBTCE** (126972)
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:** 78
Total Learning Hours: 150 **Private Study:** 72

Delivery Options

Course typically offered: S2 and Non Std S2 (S2 for Jan)

Component	Contact Hours
Lecture	45
Tutorial	15
Workshop	15

Grading Basis: 40 %

Assessment Details

Category	Short Description	Description	Weighting (%)	Exam Duration
Report	AS1	Coursework (1500 words)	30	
Exam	AS2	Written Examination (Open Book)	70	3

Aims

This unit provides learners with an understanding of civil engineering structural design, beginning with simple structural elements found in buildings and moving on to stable earthwork retaining walls.

Learning Outcomes

After completing the module the student should be able to:

- 1 Design and develop simple building elements for reinforced concrete and steel structures.
- 2 Produce valid designs for building elements.
- 3 Recognise theories for earth retaining structure design & design earth retaining structures.
- 4 Demonstrate various traffic studies and apply the knowledge in planning and design of pavement.

Learning Outcomes of Assessments

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

Coursework	2	4
Exam	1	3

Outline Syllabus

Design concepts: permissible stress, load factor, limit state concept, probabilistic approach, characteristic loads, characteristic strength (partial factors of safety), limit states, durability, fire resistance, other prime considerations

Produce valid designs for simply supported beams in steel: concept of limit state design (applied to steel), classification of sections, and suitability of UB/UC sections regarding moment capacity, shear resistance and deflection

Produce valid designs for simply supported beams in reinforced concrete: concept of limit state design as applied to reinforced concrete, reinforcing requirements and the deflection performance of singly reinforced rectangular beams,

Produce valid designs for simply supported beams in timber: natural characteristics of timber (how these affect the design methods), suitability of rectangular beams (regarding moment capacity), shear capacity, bearing capacity and deflection

Produce valid designs for columns in steel: buckling characteristics of UC, UB and SHS sections, axial load capacity of slender axially loaded sections (with bending moments about the major axis)

Produce valid designs for short columns in reinforced concrete: design status of column, reinforcing requirements of a short reinforced column under axial load (with bending moments about one axis)

Produce valid designs for columns in timber: axial load capacity of slender rectangular timber sections

Produce valid designs for columns in masonry: vertical load capacity of square and

rectangular masonry columns

Further theories to analyse structures: energy theorems, force method, matrix force method of analysis, matrix displacement method of analysis, finite element formulation, energy method, yield criteria

In-situ reinforced concrete structural elements: one-way spanning slab, two-way spanning slab

Doubly reinforced concrete beams: column foundations, continuous beams, continuous one-way spanning floor slabs, cut-off points for reinforcement, distribution reinforcement, cover distances, main bars, distribution bars and links, shear reinforcement, column shutters (starter bars and kickers)

Site investigation: geophysical exploration, sampling in soils, in-situ tests, site investigation report

General engineering geology: site selection for dams and reservoir projects, highway and tunnel projects, ground improvement, temporary support

Detail structural elements: manual and computer-aided design (CAD) techniques

Retaining wall design: factors of safety, force calculation (different types of retaining walls), effects of groundwater in retaining wall design, stability against sliding and overturning

Stability of slopes: failure surfaces, total and effective stress analysis

Lateral pressure and retaining walls: active and passive earth pressure, Rankine theory, Coulomb theory, retaining structures and stability

Shallow foundations: foundation types, bearing capacity (allowable bearing capacity), settlement calculation, foundations in difficult soils

Deep foundations: pile types, single pile, pile groups, settlement calculation

Transportation: Trends in the demand for travel: growth in the demand for personal and freight travel and the composition of travel, factors relating to travel demand, growth forecasts for travel

Methods of transport modelling, data collection and processing, types of transportation models

Design of pavement sections for standard code of practice

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.

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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