ES3D1-15 Concrete Structures

22/23

Department
School of Engineering
Level
Undergraduate Level 3
Module leader
Georgia Kremmyda
Credit value
15
Module duration
10 weeks
Assessment
100% exam
Study location
University of Warwick main campus, Coventry

Description

Introductory description

ES3D1-15 Concrete Structures

Module web page

Module aims

The design of concrete structures is a main stream activity of professional civil engineers. The module aims at developing ability to conduct structural design of reinforced concrete elements (slabs including two way slabs and flat plates, beams and columns).

Outline syllabus

This is an indicative module outline only to give an indication of the sort of topics that may be covered. Actual sessions held may differ.

Design process; structural form and action; choice of material; uncertainties in design: partial safety factors. Limit States.
Design of reinforced concrete beams to ULS: design assumptions; resistance to bending; stress and strain blocks; design formulae for singly and doubly reinforced rectangular sections; examples.

Design of T- and L-beam sections in bending; examples
Design for shear; truss analogy; examples
Serviceability limit state (SLS): elastic theory; deflections, cracking; bond and anchorage; calculation and control of crack widths; examples
Design of reinforced concrete columns; axially loaded short columns; eccentric load; principles of column interaction diagrams; slender columns; biaxial bending; examples.
Reinforced concrete slabs; one-way and two-way spanning elements, flat slabs. Shear in slabs: punching shear; examples.

Learning outcomes

By the end of the module, students should be able to:

- Communicate the relationship between design, durability and cost, ease of construction.
- Distinguish the physical behaviour of under and over reinforced concrete members.
- Consolidate the fundamental principles of structural design for concrete structures, including principles of Limit State Design, margins of uncertainty associated with loading, material
- Design and check for serviceability (crack and deflection) conditions and for ultimate limit state conditions in accordance with relevant reinforced concrete design standards (Eurocodes).
- Critically examine the results of structural design of concrete sections.

Indicative reading list

Millais, M., ‘Building Structures: from Concepts to Design,’ 2nd Ed., Taylor & Francis, 2005.
Arya, C., Design of Structural elements, Spon Press, 2009.
Mosley, W.H., Hulse, R., Bungey, J.H. Reinforced Concrete Design: to Eurocode 2, 7th ed. Palgrave Macmillan, 2012.

Subject specific skills

1. Ability to conceive, make and realise a component
2. Ability to develop economically viable and ethically sound sustainable solutions
3. Ability to be pragmatic, taking a systematic approach and the logical and practical steps necessary for, often complex, concepts to become reality
4. Ability to seek to achieve sustainable solutions to problems and have strategies for being creative and innovative
5. Ability to be risk, cost and value-conscious, and aware of their ethical, social, cultural, environmental, health and safety, and wider professional engineering responsibilities
6. Ability to apply relevant practical and laboratory skills

Transferable skills

1. Apply problem solving skills, information retrieval, and the effective use of general IT facilities
2. Awareness of the nature of business and enterprise in the creation of economic and social value
3. Overcome difficulties by employing skills, knowledge and understanding in a flexible manner

4. Ability to formulate and operate within appropriate codes of conduct, when faced with an ethical issue
5. Appreciation of the global dimensions of engineering, commerce and communication

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Study

Study time

Type	Required
Lectures	34 sessions of 1 hour (23%)
Practical classes	3 sessions of 1 hour (2%)
Private study	113 hours (75%)
Total	150 hours

Private study description

113 hours guided independent learning

Costs

No further costs have been identified for this module.

Assessment

You must pass all assessment components to pass the module.

Students can register for this module without taking any assessment.

Assessment group B2

	Weighting	Study time
Online Examination QMP ~Platforms - AEP,QMP	100%	

- Online examination: No Answerbook required
- Students may use a calculator
- Engineering Data Book 8th Edition

	Weighting	Study time

- Graph paper

Feedback on assessment

Feedback in examples class.
Model solutions to recent past papers.
Cohort level feedback on examinations.

Past exam papers for ES3D1

Availability

Pre-requisites

To take this module, you must have passed:

- All of
  - ES2C2-15 Civil Engineering Design 1
  - ES2C3-15 Civil Engineering Materials and Structural Analysis

Post-requisite modules

If you pass this module, you can take:

- ES4F4-15 Advanced Structural Engineering
- ES4E3-15 Structural Dynamics and Vibration
- ES97P-15 Earthquake Resilient Structures

Courses

This module is Core for:

- Year 3 of UESA-H216 BEng Civil Engineering
- Year 4 of UESA-H215 BEng Civil Engineering with Intercalated Year
- Year 3 of UESA-H217 MEng Civil Engineering
- Year 4 of UESA-H218 MEng Civil Engineering with Intercalated Year

This module is Core optional for:

- Year 3 of UESA-H218 MEng Civil Engineering with Intercalated Year
- Year 3 of UESA-H115 MEng Engineering with Intercalated Year

This module is Optional for:

- Year 3 of UESA-H113 BEng Engineering
- Year 3 of UESA-H114 MEng Engineering
- Year 4 of UESA-H115 MEng Engineering with Intercalated Year
- UESA-H11L Undergradaute Engineering (with Intercalated Year)
    - Year 3 of H11L Engineering (with Intercalated Year)
    - Year 4 of H11L Engineering (with Intercalated Year)

This module is Option list A for:

- Year 4 of UESA-H111 BEng Engineering with Intercalated Year
- UESA-H112 BSc Engineering
    - Year 3 of H112 Engineering
    - Year 3 of H112 Engineering