ES2C3-15 Civil Engineering Materials and Structural Analysis

20/21

Department
School of Engineering
Level
Undergraduate Level 2
Module leader
Reyes Garcia
Credit value
15
Module duration
10 weeks
Assessment
40% coursework, 60% exam
Study location
University of Warwick main campus, Coventry

Description

Introductory description

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Module web page

Module aims

The aims of the module are to introduce the rationale behind appraisal and design of structures; the main activity of many professional civil engineers. The module will lay the foundations for more advanced and specific structure design modules, since it will review and more deeply explain fundamental structural analysis concepts such as stress and strain, statical determinacy and bending moment/shear forces. A range of materials (concrete, timber, masonry and fibre reinforced polymers) will be investigated in terms of structural behaviour, analysis and design. Especially for concrete the module will provide knowledge and understanding on its constituent materials, their properties and those of fresh and hardened concrete. Variables that affect these properties in the short and long term will be identified.

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.

Structures:
o Stress and Strain: combination and failure criteria
o Elastic theory of bending and torsion
o Linear elastic analysis of statically determinate and indeterminate structures
o Qualitative structural analysis
Materials:
o Introduction
o Portland Cement: Manufacture, Composition and Hydration
o Other Cements: Classification, Modified PC, CRMs, non-Portland cements
o Aggregates and admixtures
o Fresh Concrete and Curing
o Hardened concrete: Strength, testing and variation
o Durability of Concrete
o Sustainability and Concrete
o Introduction to Timber, Masonry and Fibre Reinforced Polymers

Learning outcomes

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

- Show knowledge and understanding of how concrete samples can be cast, moulded and cured to assess the property and quality of concrete.
- Demonstrate detailed understanding of stress and strain states in structural elements
- Perform qualitative and quantitative structural analysis.
- Analyse the effects of material and process variables on the mechanical properties of concrete.
- Appreciate the sustainability issues and latest UK regulatory framework surrounding the manufacture and use of cement and concrete.
- Evaluate the structural behaviour of a range of civil engineering materials such as concrete, timber, masonry and fibre reinforced polymers.

Indicative reading list

Megson, T. H. G., Structural and Stress Analysis, Elsevier, 3rd Ed., Oxford, 2014.
Millais, M., Building Structures: from Concepts to Design, 2nd Ed., Routledge, 2005.
Domone, P. and Illston, J (Eds.), Construction Materials: Their Nature and Behaviour, 4th Ed., T & F Books, London, New York, 2010.
Neville, A. M., Concrete Technology, 2nd Ed., Prentice Hall, 2010.
Internet based sites (such as MPA and UK government) for up-to-date sources on sustainable cements and concretes.

Subject specific skills

Ability to apply basic principles and different methods to carry out the qualitative and quantitative analysis of structures.
Understand the need of reading technical literature (textbooks, articles) to solve structural problems.
Ability to apply practical skills in the design of concrete mixes, as well as the H&S risks associated with it.
Knowledge and understanding of risk issues, including health & safety, and environmental aspects of materials in civil engineering.

Transferable skills

Apply mathematical and problem-solving skills to analyse civil engineering structures.
Plan self-learning and work-load prioritisation.
Overcome difficulties by employing skills developed in Year 1.
Develop team-working skills in concrete mixing/testing laboratories.

Study

Study time

Type	Required
Lectures	10 sessions of 3 hours (20%)
Practical classes	3 sessions of 3 hours (6%)
Other activity	7 hours (5%)
Private study	104 hours (69%)
Total	150 hours

Private study description

104 hours of guided independent learning

Other activity description

- 5 x 1 hours Examples Classes
- 2 hours Revision Lectures

Costs

No further costs have been identified for this module.

Assessment

You must pass all assessment components to pass the module.

Assessment group D1

	Weighting	Study time	Eligible for self-certification
Assessment component			
Open-ended written assignment	40%		No
Reassessment component is the same			
Assessment component			
Online Examination QMP ~Platforms - AEP,QMP	60%		No

- Online examination: No Answerbook required

Reassessment component is the same

Feedback on assessment

Written examination: cohort level feedback.
Solutions to problems and questions for exam preparation.

Past exam papers for ES2C3

Availability

Post-requisite modules

If you pass this module, you can take:

- ES3E2-15 Civil Engineering Design II

Courses

This module is Core for:

- Year 2 of UESA-H216 BEng Civil Engineering
- Year 2 of UESA-H217 MEng Civil Engineering

This module is Option list A for:

- Year 2 of UESA-H113 BEng Engineering
- Year 2 of UESA-H112 BSc Engineering
- Year 2 of UESA-HN11 BSc Engineering and Business Studies
- Year 2 of UESA-H114 MEng Engineering