

# ES2C2-15 Civil Engineering Design 1

**21/22**

**Department**

School of Engineering

**Level**

Undergraduate Level 2

**Module leader**

Stephen Hicks

**Credit value**

15

**Module duration**

12 weeks

**Assessment**

100% coursework

**Study location**

University of Warwick main campus, Coventry

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## Description

### Introductory description

ES2C2-15 Civil Engineering Design1

[Module web page](#)

### Module aims

Design describes a process of imagination and creativity that applies to all engineering activities, whether the requirement is to produce an artefact, a process, or a conceptual framework. Creativity requires imagination, intuition, intellectual rigour, and the sound application of underlying engineering principles. The module aims to develop your creativity and conceptual thinking, exploring where design ideas come from, how those ideas evolve into practical and workable engineering solutions, and what factors lead to good design at the concept stage of a civil engineering project.

### 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.

Surveying:

Planning and control: Whole to part, Geodetic vs plane, Types of survey  
Common techniques and equipment: tape, level, theodolite, EDM, GPS  
Techniques of measurement and error evaluation and control: Error types and mitigation, Bowditch, Least Squares, GPS  
Setting out: profiles, curves  
Instrumentation and Monitoring

Introduction to structural design:

Conceptual design

Actions on structures, design standards and basic load analysis hand-calculations

Load paths and structural stability

Handling ill-defined briefs

Identifying key requirements

Rapid communication – sketching

Critiquing designs

Introduction to geotechnical design

Soil Mechanics and Engineering Geology

Geotechnical problems and slope stability

Desk and walkover studies

Groundwater and seepage

Introduction to foundation selection and design

Preliminary analysis methods

## **Learning outcomes**

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

- Specify appropriate surveying techniques and apply them with due regard to survey control, analysis and purpose.
- Evaluate and interpret topographical survey data.
- Develop conceptual structural and geotechnical solutions to Civil Engineering design problems; interpreting briefs; bounding problems and identifying key issues; and critiquing, iterating and selecting solutions.
- Use sketching, models and other techniques to develop and communicate design thinking.
- Appreciate how civil engineers design and construct infrastructure with safety, sustainability and professional ethics at the core of the process.

## **Indicative reading list**

Surveying:

Uren J. & Price B, (2010). Surveying for Engineers. Palgrave Macmillan, 5th ed. ISBN-10: 0230221572, ISBN-13: 978-0230221574

Bannister, A., Raymond S. and Baker R., (1998). Surveying. Prentice Hall, 7th ed. ISBN-10: 0582302498, ISBN-13: 978-0582302495

Geotechnical engineering:

Barnes, (2016) G.E. Soil Mechanics: Principles and Practice, 4th Ed. ISBN-10: 1137512202, ISBN-13 978-1137512208

Waltham (2009), Foundation of Engineering Geology, 3rd Ed, Spon

Structural engineering:

Structural Engineer's Pocket Book, Fiona Cobb, 2nd Ed, CRC Press, 2015

The Structural Basis of Architecture, Bjorn Sandaker, Arne Eggen, Mark Cruvellier, Routledge, 2nd Ed, 2011

Sketching for Engineers and Architects, Ron Slade Routledge, 2016

M. Millais. Building structures: from concepts to design. 2nd Ed. Taylor and Francis, 2005. TH 854.M4

## **Subject specific skills**

1. Ability to conceive, make and realise a component, product, system or process
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

## **Transferable skills**

1. Communicate (written and oral; to technical and non-technical audiences) and work with others
2. Plan self-learning and improve performance, as the foundation for lifelong learning/CPD
3. Exercise initiative and personal responsibility, including time management, which may be as a team member or leader
4. Awareness of the nature of business and enterprise in the creation of economic and social value
5. Overcome difficulties by employing skills, knowledge and understanding in a flexible manner
6. Ability to formulate and operate within appropriate codes of conduct, when faced with an ethical issue
7. Appreciation of the global dimensions of engineering, commerce and communication
8. Be professional in their outlook, be capable of team working, be effective communicators, and be able to exercise responsibility and sound management approaches.

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## **Study**

### **Study time**

<b>Type</b>	<b>Required</b>
Lectures	16 sessions of 1 hour (11%)
Total	150 hours

<b>Type</b>	<b>Required</b>
Tutorials	2 sessions of 1 hour (1%)
Practical classes	2 sessions of 1 hour (1%)
Supervised practical classes	12 sessions of 1 hour (8%)
Fieldwork	32 sessions of 1 hour (21%)
Online learning (independent)	8 sessions of 1 hour (5%)
Private study	78 hours (52%)
Total	150 hours

### **Private study description**

78 hours of guided independent learning.

### **Costs**

No further costs have been identified for this module.

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### **Assessment**

You must pass all assessment components to pass the module.

#### **Assessment group A3**

	<b>Weighting</b>	<b>Study time</b>
Surveying Group Report	30%	
Surveying group report, including peer assessment		
Individual Portfolio of Design Work	35%	
Portfolio assignment - Individual structural design portfolio (maximum 16 pages)		
Individual geotechnical design portfolio (maximum 16 pages)	35%	
Portfolio assignment		

### **Feedback on assessment**

Structural design portfolio due in Week 24.

Geotechnical design portfolio due in Week 30.

Surveying group report due in week 37 (after fieldwork in week 31).

Individual and cohort level feedback and coaching will be ubiquitous. The focus on fieldwork and design work will allow detailed and regular discussion between academics and students. Students will also be required to both give and receive feedback on peers' work, a key aspect of the design process and learning outcome of the module.

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## Availability

### Post-requisite modules

If you pass this module, you can take:

- ES97P-15 Earthquake Resilient Structures
- ES3E2-15 Civil Engineering Design II
- ES3B6-30 Geotechnical Engineering
- ES3E1-30 Design Project with Construction Management (Civil Engineering, BEng)
- ES3D2-15 Steel Structures
- ES3D1-15 Concrete Structures
- ES4E3-15 Structural Dynamics and Vibration
- ES4F4-15 Advanced Structural Engineering

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