ES3G3-30 Structural Engineering Project

23/24

Department
School of Engineering
Level
Undergraduate Level 3
Module leader
Stephen Hicks
Credit value
30
Module duration
24 weeks
Assessment
100% coursework
Study location
University of Warwick main campus, Coventry

Description

Introductory description

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Module web page

Module aims

The aim of the module is to provide an experience of performing a work-related project on an individual basis (projects will be supervised on a group basis and involve group interaction without influencing an individual character). Students will have the opportunity to apply and demonstrate their capabilities (engineering knowledge, initiative, self-motivation, enthusiasm) to plan, carry out, and control an open-ended design project in civil engineering. Students will enhance their writing, oral, and communication skills through preliminary writing of a proposal, writing interim and final reports that conform to predefined specifications, and giving an oral presentation under specific time constraints. The module will provide students with a simulated experience of working as professional engineers in an industrial organisation.

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.

Definition of a realistic structural work-related project (e.g. building, skyscraper bridge) through a design brief that is characterized by diverse and contradictory aspirations as well as numerous (and
often obscure) constraints that offer the opportunity of various solutions to emerge based on subjective and challenging judgements. Assessment of the design brief with emphasis on the location, architectural and service requirements of the project. Methods to expand on the design brief by gathering all the required information and data relevant to environmental and planning issues, site conditions, material suppliers, collaborators, specialists and other contractors. Synthesis
of all available information to define a set of clear objectives against which a design solution should
be tested. ‘Think outside the box’ and renegotiate those constraints of the design brief that prevent an optimum design solution to emerge. Conceptual design and use of sketches prepared to scale to describe a solution for the structural system and how loads are transferred to foundations. Choice of structural materials, preliminary design of structural members, an approximate method of analysis. 3D linear elastic analysis using structural analysis software. Structural Eurocodes, resistance of members, loads, load combinations, serviceability, and ultimate limit states. Engineering drawings, drawing conventions, tolerances, limits and fits, assemblies, and CAD applications. Sustainability in design and construction, green economy, and assessment of design solution using a set of criteria of the low-carbon agenda.

Learning outcomes

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

- Choose a concept for a structural system (“conceptual design”) that satisfies the location, architectural, and service requirements of a construction project (e.g. bridge, stadium, building, etc)
- Appreciate the concept of a structural system using sketches prepared to scale
- Critically assess structural materials (e.g. concrete, steel) and their mechanical properties (e.g. strength) for the structural members of a structure
- Make reasonable initial estimations for the geometry, dimensions, and cross-section size of structural elements (e.g. beams, columns, foundations, etc.)
- Synthesize design calculations and engineering drawings.
- Demonstrate critical awareness of health and safety and sustainability in design and construction
- Deliver a design that conforms to a detailed specification and in accordance with standards and regulations
- Demonstrate coherently constructed ideas and information, communicated for a range of work/practice and/or academic audiences
- The ability to lead and take responsibility for the management of individual learning demonstrated in individual work/practice contexts.

Indicative reading list

C. Arya. Design of structural elements. Taylor and Francis, 2005. QC 137.A7
M.Y.H. Bangash. Structural details in concrete, Blackwell, 1992. QC 137.4.B2
K.S. Elliott. Multi-storey precast concrete framed structures, 1996. QC 137.4.E5
E.H. Gaylord et al. International Structural Engineering Handbook, 4th ed., McGraw-Hill, 1997, QC137.S8
I.A. MacLeod. Modern Structural Analysis. T. Telford, 2005. QC 137.M2
M. Millais. Building structures: from concepts to design. 2nd Ed. Taylor and Francis, 2005. TH 854.M4
M.J. Ryall et al. (Eds). Manual of Bridge Engineering. 2000. TG 300.M2
Standard Method of Detailing Structural Concrete, 3rd ed. (3-day loan), Institution of Structural Engineers,
2006. QC 137.4 S8
BS EN 1990: 2002. Basis of Design
BS EN 1991-1-1: 2002. Actions on Structures (General Actions; Imposed Loads for Buildings) BS EN 1992-1-1: 2004. Design of Concrete Structures BS EN 1993-1-1: 2005. Design of Steel Structures BS EN 1994-1-1: 2006. Design of Composite Structures of Steel and Concrete BS 5400: Steel, Concrete and Composite Bridges: -- Part 2: 1978. Specification for Loads. -- Part 3: 1982. Code of Practice for Design of Steel Bridges. -- Part 4: 1990. Code of Practice for Design of Concrete Bridges. BS 8110: Part 1, Structural use of concrete, 1985. (In SRC; ask at the Help Desk) BS 1192: Construction Drawing Practice: - Part 1: 1984. Recommendations for General Principles

Subject specific skills

No subject specific skills defined for this module.

Transferable skills

No transferable skills defined for this module.

Study

Study time

Type	Required
Lectures	18 sessions of 1 hour (6%)
Other activity	28 hours (9%)
Private study	254 hours (85%)
Total	300 hours

Private study description

254 hours of private study

Other activity description

28 hours of group tutorials.

Costs

No further costs have been identified for this module.

Assessment

You do not need to pass all assessment components to pass the module.

Assessment group A1

	Weighting	Study time
Interim individual report Interim individual report (15 pages)	20%	
Final individual report Final individual report (30 pages)	50%	
Individual oral presentation	20%	
Logbook	10%	

Feedback on assessment

Detailed marking and feedback on assignments (interim report, final report, logbook, oral presentation). Verbal feedback during tutorials.

Availability

Courses

This module is Core for:

- Year 3 of DESA-H221 Undergraduate Civil and Infrastructure Engineering (Non-integrated Degree Apprenticeship)