Module Specification

Integrated Structural Engineering

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Contents

Part 1: Information

Module title: Integrated Structural Engineering

Module code: UBGJFQ-30-2

Level: Level 5

For implementation from: 2025-26

UWE credit rating: 30

ECTS credit rating: 15

College: College of Arts, Technology and Environment

School: CATE School of Architecture and Environment

Partner institutions: None

Field: Geography and Environmental Management

Module type: Module

Pre-requisites: Engineering Principles (Building Engineering) 2024-25

Excluded combinations: None

Co-requisites: None

Continuing professional development: No

Professional, statutory or regulatory body requirements: None

Part 2: Description

Overview: Through this module students will learn the process for analysis of structures under various types of load and boundary conditions, and then use of analysis results to design structural elements using various materials such as reinforced concrete, steel or timber.

Students will be required to select appropriate materials for a building structure to minimise embodied carbon emissions. The design processes will use standard

codes of practice and appropriate industry guidance.

Students will create a structural scheme design for a small multi-storey building open-ended design brief.

Features: Not applicable

Educational aims: In this module, initially the students will acquire the necessary knowledge, understanding and skills to analyse and solve problems relating to multi-variables design structural systems.

Then, students will use analysis to design various structural components according to the code of practice by selecting the approrpriate construction materials.

Outline syllabus: The following topics will be covered through this module:

1)The objective of structural analysis and the principal for design of structures.

2)Actions (permanent, variable and lateral loads) on structures.

3)Ultimate and Servicablity Limit States design.

4)Qualitative analysis of structural system.

5)Virtual load method and moment distribution method for analysis of structural systems.

6)Plastic analysis to calculate collapse loads of structures.

7)Design of structural elements in different materials.

8)Design of structural stability systems.

9)Introduction to use of computer software for analysis and design of structures.

10) Assessment of embodied carbon in a structure.

Part 3: Teaching and learning methods

Teaching and learning methods: The module will be delivered through experiential project based learning, and implemented practically to solve a few problems during lecturial session.

Then students will practice the obtained knowledge and procedure for analysis and design of structures to an open ended real world structure as a project during tutorial sessions and discuss about challenges which they will face and learn about proper solution.

Formative feedback will be provided on the students work in tutorial sessions.

Module Learning outcomes: On successful completion of this module students will achieve the following learning outcomes.

MO1 Determine actions (permanent, variable and lateral loads) on structures in Ultimate and Serviceability Limit States.

MO2 Use qualitative and quantitative methods to analyse structural systems.

MO3 Calculate collapse loads of structures through plastic analysis of beams and frames.

MO4 Prepare detailed design of structures and their elements according to appropriate codes of practice including design of overall structural stability.

Hours to be allocated: 300

Contact hours:

Independent study/self-guided study = 228 hours

Lectures = 24 hours

Total = 300

Reading list: The reading list for this module can be accessed at readinglists.uwe.ac.uk via the following link https://rl.talis.com/3/uwe/lists/B05980AB-ECC7-12D0-C018-B9868A474FEC.html

Part 4: Assessment

Assessment strategy: There will be two assessments for this module as:

Task (1): A group design portfolio (50%)
The assessment strategy in this task aims to create an experiential based learning environment where students work in design teams of 4-6 students to create a solution to an open-ended real world structural engineering design challenge. Students will produce a solution in three structural materials – reinforced concrete, structural steel and timber. Their solution will follow real-world industry practice and will require the students to produce a safe solution.
The group work overall mark will be adjusted by peer-review formal Contribution Factors - these factors allow students to assess other members of the group's contribution to the work.

Task (2): A group presentation (20%)
Students need to present their working progress for design of structure in PowerPoint (or similar). The presentation will articulate: The Scheme Design Solution, The stability provision within the structure, A Statement on the principle challenges faced a) undertaking the design, b) working in a team c) how working together could have been improved.

Task (3): Individual Exam (30%)
The individual exam will be conducted to assess students knowledge and skill for analysis of structures under applied design loads through:
- Qualitative analysis of determinate and indeterminate structures
- Elastic analysis of beam, frames (or truss) using virtual load and moment distribution methods
- Plastic analysis of beams and frames

The resit strategy for this module is the same as for the first sit. It will require

students to complete a similar project challenge working in groups.
For the resit exam, the team work portfolio and related tasks will be adjusted based on the number of students in each team. If only one student proceed for resit, the team work will be scaled to task fitted for one person.

Assessment tasks:

Portfolio (First Sit)
Description: This portfolio will include:

Selecting appropriate engineering properties for structural design in a range of materials
Selecting appropriate materials to minimise the embodies carbon within the structure
Developing an outline structural layout for the building showing all principle structural members (incl. identifying material) and where stability bracing is provided (Drawing)
Design of basic reinforced concrete elements
Design of basic structural steel elements
Design of basic timber elements

The Portfolio is needed to submit by the group on middle of second semester.
Weighting: 50 %
Final assessment: No
Group work: Yes
Learning outcomes tested: MO1, MO4

Presentation (First Sit)
Description: Presentation (10 minutes). Students need to present their working progress for design of structure in PowerPoint (or similar). The presentation will articulate: The Scheme Design Solution, The stability provision within the structure, A Statement on the principle challenges faced a) undertaking the design, b) working in a team c) how working together could have been improved.

The group needs to present their progress at end of the first semester.
Weighting: 20 %

Final assessment: No
Group work: Yes
Learning outcomes tested: MO4

Examination (First Sit)
Description: Exam (2 hours)

The exam is needed to be conducted individually at end of second semester.
Weighting: 30 %
Final assessment: Yes
Group work: No
Learning outcomes tested: MO2, MO3

Portfolio (Resit)
Description: Portfolio (max 9,000 words). For the resit exam, the team work portfolio and related tasks will be adjusted based on the number of students in each team. If only one student proceed for resit, the team work will be scaled to task fitted for one person.
Weighting: 50 %
Final assessment: No
Group work: Yes
Learning outcomes tested: MO1, MO4

Presentation (Resit)
Description: Presentation (10 minutes). Students need to present their working progress for design of structure in PowerPoint (or similar). The presentation will articulate: The Scheme Design Solution, The stability provision within the structure, A Statement on the principle challenges faced a) undertaking the design, b) working in a team c) how working together could have been improved.

For the resit exam, tasks will be adjusted based on the number of students in each team. If only one student proceed for resit, the team work will be scaled to task fitted for one person.
Weighting: 20 %

Final assessment: No

Group work: Yes

Learning outcomes tested: MO4

Examination (Resit)

Description: Exam (2 hours)

Weighting: 30 %

Final assessment: Yes

Group work: No

Learning outcomes tested: MO2, MO3

Part 5: Contributes towards

This module contributes towards the following programmes of study:

Civil Engineering {Apprenticeship-UWE} [Frenchay] BEng (Hons) 2024-25

Civil Engineering [Frenchay] BEng (Hons) 2024-25

Civil Engineering [Frenchay] BEng (Hons) 2024-25

Civil Engineering [Frenchay] MEng 2024-25

Civil Engineering [Frenchay] MEng 2024-25