Module Specification

Seismic Analysis and Structural Retrofitting

Version: 2027-28, v2.0, 02 Aug 2023

Contents

Part 1: Information

Module title: Seismic Analysis and Structural Retrofitting

Module code: UBGL5Q-15-M

Level: Level 7

For implementation from: 2027-28

UWE credit rating: 15

ECTS credit rating: 7.5

College: College of Arts, Technology and Environment

School: CATE School of Architecture and Environment

Partner institutions: None

Field:

Module type: Module

Pre-requisites: None

Excluded combinations: None

Co-requisites: None

Continuing professional development: No

Professional, statutory or regulatory body requirements: None

Part 2: Description

Overview: This module covers determine and analysis of seismic loads on structures and design of various types of frame structures, including steel structures, reinforced concrete structures, and masonry buildings, to withstand earthquake loading. The course emphasizes knowledge of retrofitting structures against seismic and dynamic excitation

Features: Not applicable

Educational aims: 1. Calculate earthquake loads for structures in different seismic zones and conditions.
2. Design lateral load-resistant systems for various types of structures, including steel, reinforced concrete, and masonry.
3. Apply the Performance Based Design Method for designing structures subjected to ground motions.
4. Gain practical experience with various strengthening and retrofitting methods for seismic vulnerable structures.

Outline syllabus: 1. Seismic design codes and methods
- Eurocode 8, Design of structures for earthquake resistance
-Codal based procedures for determination of design lateral loads.

2. Earthquake Effect on structure
- Calculate earthquake loads based on structure location, soil type and performance level of structure
-Earthquake Load distribution in Structure

3. Main Components for Design of Earthquake Resistant Structure
- Stiffness
- Strength
- Ductility
- Configuration

4. Lateral Load Resistant Systems for Structures
- Moment resistant frames
- Brace systems for steel structures
- Shear wall system for RC structures

5. Performance Based Design Method for Structure Subjected to Ground Motion
- Calculate capacity curve of structure using Pushover Analysis
- Define target displacement according to performance level of building

6. Seismic Retrofitting of structures

- Retrofitting techniques for steel structures
- Strengthening methods for RC structures
- Lateral resistant systems for masonry buildings

Part 3: Teaching and learning methods

Teaching and learning methods: The module will be delivered through experiential, project-based learning. Students will solve problems during lecture sessions to apply the acquired knowledge and analysis and design procedures for structures. They will engage in practical examples and projects during tutorial sessions, using appropriate software for seismic analysis. Formative feedback will be provided on students' work during tutorial sessions.

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

MO1 Determine earthquake actions on structures based on EC8 (Eurocode 8).

MO2 Design of steel, reinforced concrete and masonry structures to resist earthquake loads according to relevant code provisions.

MO3 Evaluate the capacity and performance of structures under lateral loads.

MO4 Propose the most suitable seismic retrofitting schemes for different types of structures.

Hours to be allocated: 150

Contact hours:

Independent study/self-guided study = 114 hours

Face-to-face learning = 24 hours

Total = 150

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/5D2FE901-44C9-2534-A6AD-4C5C084F4110.html

Part 4: Assessment

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

Assessment Task 1: Report (70%)
The assessment strategy in this task aims to create an experiential based learning environment where students work in teams of 4-5 students to create a solution for analysis of a real world structure under earthquake load. Their solution will follow real-world industry practice and will require the students to produce a proper 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.

For the resit, the team work portfolio and related tasks will be adjusted based on the number of students in each team. If only one student proceeds for resit, the team work will be scaled to task fitted for one person.

Assessment Task 2: Individual Report (30%)
This task will include of individual practice regarding novel developed methods and technologies to diminish harmful effect of seismic loads on structures.

The referral follows the same scheme of the formative assessment.

Assessment tasks:

Report (First Sit)
Description: Report 1 - Students work in teams to create a solution for analysis of a real world structure under dynamic load (5,000 words).
Weighting: 70 %
Final assessment: Yes
Group work: Yes
Learning outcomes tested: MO1, MO2, MO3

Report (First Sit)

Description: Report 2 - Individual report (3,000 words).

Weighting: 30 %

Final assessment: No

Group work: No

Learning outcomes tested: MO4

Report (Resit)

Description: Report 1 - Students work in teams to create a solution for analysis of a real world structure under dynamic load (5,000 words).

Weighting: 70 %

Final assessment: Yes

Group work: Yes

Learning outcomes tested: MO1, MO2, MO3

Report (Resit)

Description: Report 2 - Individual report (3,000 words).

Weighting: 30 %

Final assessment: No

Group work: No

Learning outcomes tested: MO4

Part 5: Contributes towards

This module contributes towards the following programmes of study:

Civil Engineering [Frenchay] MEng 2024-25