Module Specification

Computational Civil Engineering

Version: 2025-26, v2.0, 28 Jul 2023

Contents

Part 1: Information

Module title: Computational Civil Engineering

Module code: UBGJFN-15-2

Level: Level 5

For implementation from: 2025-26

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: With the increasing complexity of civil engineering projects and the need for more efficient and accurate solutions, computational tools have become essential in all engineering fields, including civil engineering.

This module is aimed at equipping students with those tools by learning programming fundamentals, including structure and best practice, and applying these skills to solve problems in various civil engineering fields. MATLAB, a widely

used software for scientific and engineering computing, is the software package adopted in this module. Students will also learn to write programs to analyse data for or to solve civil engineering problems and critically compare methods and programs, considering computational efficiency and the accuracy of the results.

Features: Not applicable

Educational aims: This module aims at providing students with the knowledge and skills to apply programming and numerical and statistical methods to solve civil engineering problems.

Outline syllabus: 1. Principles of Computer Programming
2. Pseudocode and Flowcharts
3. Scripts, Variables, Vectors and Matrices in Matlab
4. Plotting and Graphing
5. Operators and Conditional Statements
6. For and While Loops
7. Statistics and Data Analysis Methods
8. Symbolic Tool and Optimisation Algorithms

Part 3: Teaching and learning methods

Teaching and learning methods: This module is taught using lectures to introduce the fundamental principles, followed by practical sessions in computer rooms where students will apply the concepts covered in the lectures to develop MATLAB routines to solve civil engineering problems.

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

MO1 Demonstrate competence in programming fundamentals, including structure and best practice

MO2 Write programs to analyse data for or to solve civil engineering problems

MO3 Apply numerical and statistical methods in a programming context to solve civil engineering problems

MO4 Critically compare numerical methods and programmes, considering computational efficiency and accuracy of the results

Hours to be allocated: 150

Contact hours:

Independent study/self-guided study = 114 hours

Face-to-face learning = 36 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/297A36B4-FFEF-A50D-B28E-724178E2149F.html?lang=en&login=1

Part 4: Assessment

Assessment strategy: Assessment through one portfolio composed of two elements: (i) a script file with the code to solve a civil engineering problem; and (ii) a report explaining the problem-solving process, analysing the results, and discussing possible strategies to improve the quality and efficiency of the developed code.

The assessment strategy for this module consists of a portfolio that allows students to demonstrate their programming skills, problem-solving abilities, and critical thinking in the context of civil engineering applications. The portfolio is composed of two elements:

1. Script File
Students are required to develop a script file containing the code to solve a given civil engineering problem. The script should demonstrate their understanding and application of programming concepts, numerical methods, and statistical analysis covered in the module. The script file assesses their technical proficiency, accuracy in implementation and efficiency in solving the problem.

2. Report

In addition to the script file, students must submit a report that explains the problem-solving process, analyses the results obtained from the code, and discusses possible strategies to improve the quality and efficiency of the developed code. The report assesses their ability to critically evaluate their code, identify areas for improvement, and propose solutions to enhance the code's performance and accuracy. It also evaluates their understanding of the civil engineering problem, proficiency in interpreting and analysing the results, and communication skills in presenting their findings.

This assessment strategy aligns with the educational aims of the module by evaluating students' ability to apply programming and computational methods to solve civil engineering problems. The portfolio approach provides a comprehensive assessment of students' skills and knowledge, allowing them to showcase their technical abilities in developing the script file and their analytical and communication skills in the report.

The script file evaluates students' technical competence in implementing programming concepts and applying numerical and statistical methods to solve real-world civil engineering problems. It focuses on their ability to write accurate and efficient code, demonstrating their proficiency in using appropriate algorithms, data structures, and problem-solving strategies.

The report component assesses students' critical thinking and problem-solving skills. It requires them to analyse the results obtained from their code, identify potential improvements, and propose strategies to enhance the code's quality and efficiency. This encourages students to think critically about their programming choices, consider alternative approaches, and communicate their findings effectively.

The referral follows the same scheme of the summative assessment, using a new problem.

Assessment tasks:

Portfolio (First Sit)

Description: Portfolio composed of two elements: (i) a script file with the code to solve a civil engineering problem; and (ii) a report explaining the problem-solving process, analysing the results, and discussing possible strategies to improve the quality and efficiency of the developed code.
Weighting: 100 %
Final assessment: Yes
Group work: No
Learning outcomes tested: MO1, MO2, MO3, MO4

Portfolio (Resit)
Description: Portfolio composed of two elements: (i) a script file with the code to solve a civil engineering problem; and (ii) a report explaining the problem-solving process, analysing the results, and discussing possible strategies to improve the quality and efficiency of the developed code.
Weighting: 100 %
Final assessment: Yes
Group work: No
Learning outcomes tested: MO1, MO2, MO3, MO4

Part 5: Contributes towards

This module contributes towards the following programmes of study:

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

Civil Engineering [Frenchay] MEng 2024-25