Module Specification

Computational Methods

Version: 2023-24, v3.0, 27 Mar 2023

Contents

Part 1: Information

Module title: Computational Methods

Module code: UFMFU7-15-3

Level: Level 6

For implementation from: 2023-24

UWE credit rating: 15

ECTS credit rating: 7.5

Faculty: Faculty of Environment & Technology

Department: FET Dept of Engineering Design & Mathematics

Partner institutions: None

Field: Engineering, Design and Mathematics

Module type: Module

Pre-requisites: Stress Analysis 2023-24

Excluded combinations: None

Co-requisites: None

Continuing professional development: No

Professional, statutory or regulatory body requirements: None

Part 2: Description

Overview: Two of the main modern mechanical engineering tools are introduced in this module which is supported by lectures and practical computer practice.

Features: Not applicable

Educational aims: See Learning Outcomes.

Outline syllabus: FEA:

Introduction to Finite Element Analysis: overview of FEA applications, nodes, elements, meshes, stiffness matrix, and boundary conditions - loads and restraints.

Practical modelling techniques: e.g: techniques, planning, pre-processing, model solution, post processing, symmetry, convergence tests, boundary conditions, element types/selection, co-ordinate systems, mesh creation.

Elementary elastic plastic analysis.

CFD:

Introduction to CFD and meshing theories including discretisation from the fluid theory, turbulence models, mesh generation and error analysis.

Practical modelling using an industry standard CFD package exploring mesh independency, the use of different turbulence models and the importance of convergence and validation of results.

Part 3: Teaching and learning methods

Teaching and learning methods: This module is supported by small computer practical sessions. Study time outside of contact hours will be spent on going through FEA and CFD exercises and example problems.

Scheduled learning includes lectures and computer practical sessions. Around half of the practical sessions are spent working through CFD/FEA exercises. The other half are spent working on the coursework assignments.

Independent learning includes hours engaged with the software, assignment preparation and completion.

Contact: 36 hours
Assimilation and skill development: 60 hours

Coursework: 36 hours

Exam preparation: 18 hours

Total: 150 hours

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

MO1 Show a detailed knowledge and understanding of the theoretical background on which Finite Element Analysis (FEA) and Computational Fluid Dynamics (CFD) are based and the iterative nature of the design/analysis process

MO2 Show a detailed knowledge of how FEA and CFD modelling techniques can be used to analyse engineering components

MO3 Demonstrate subject specific skills with respect to undertake analysis in an integrated CAD environment with an understanding of the underlying principles and their computing implementations

MO4 Demonstrate usage of the pre-processing, solve and post-processing stages of industrial standard CFD and FEA codes, including mesh generation and results validation

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://uwe.rl.talis.com/modules/ufmfu7-15-3.html

Part 4: Assessment

Assessment strategy: Assessed through two pieces of coursework:

The first in CFD and the second in FEA.

Each coursework assignment is based on simulating a simple fluid dynamics/solid mechanics problem and writing a brief report detailing the modelling process and analysing the results. Both are max 8 pages.

Assessment tasks:

Report (First Sit)
Description: Coursework 1 CFD (max 8 pages)
Weighting: 50 %
Final assessment: No
Group work: No
Learning outcomes tested: MO1, MO2, MO3, MO4

Report (First Sit)
Description: Coursework 2 FEA (max 8 pages)
Weighting: 50 %
Final assessment: No
Group work: No
Learning outcomes tested: MO1, MO2, MO3, MO4

Report (Resit)
Description: Coursework 1 CFD (max 8 pages)
Weighting: 50 %
Final assessment: No
Group work: No
Learning outcomes tested: MO1, MO2, MO3, MO4

Report (Resit)
Description: Coursework 2 FEA report (max 8 pages)
Weighting: 50 %

Final assessment: No

Group work: No

Learning outcomes tested: MO1, MO2, MO3, MO4

Part 5: Contributes towards

This module contributes towards the following programmes of study:

Automotive Engineering {Foundation} [Sep][FT][Frenchay][5yrs] - Not Running MEng 2020-21

Automotive Engineering [Sep][SW][Frenchay][4yrs] - Not Running BEng (Hons) 2020-21

Automotive Engineering {Foundation} [Sep][FT][Frenchay][4yrs] - Not Running BEng (Hons) 2020-21

Mechanical Engineering and Vehicle Technology {Foundation} [Feb][FT][GCET][4yrs] BEng (Hons) 2020-21

Mechanical Engineering and Vehicle Technology {Foundation} [Oct][FT][GCET][4yrs] BEng (Hons) 2020-21

Automotive Engineering [Sep][SW][Frenchay][5yrs] MEng 2020-21

Automotive Engineering {Foundation} [Sep][SW][Frenchay][6yrs] MEng 2019-20

Automotive Engineering {Foundation} [Sep][SW][Frenchay][5yrs] BEng (Hons) 2019-20