Module Specification

Computational Fluid Dynamics

Version: 2021-22, v2.0, 07 Jun 2022

Contents

Part 1: Information

Module title: Computational Fluid Dynamics

Module code: UFMFWL-15-M

Level: Level 7

For implementation from: 2021-22

UWE credit rating: 15

ECTS credit rating: 7.5

Faculty: Faculty of Environment & Technology

Department: FET Dept of Engineering Design & Mathematics

Partner institutions: None

Delivery locations: Frenchay Campus

Field: Engineering, Design and Mathematics

Module type: Standard

Pre-requisites: Computational Methods 2021-22

Excluded combinations: None

Co-requisites: None

Continuing professional development: No

Professional, statutory or regulatory body requirements: None

Part 2: Description

Overview: Not applicable

Features: Not applicable

Educational aims: See Learning Outcomes

Outline syllabus: The syllabus includes:

Introduction to Computational Fluid Dynamics and CFD Package

Engineering flow problems and configurations

Domain, boundary/initial conditions and mesh techniques

Governing equations and numerical methods

Turbulent flow and RANS turbulence modelling

Steady and transient flow solutions

Solution of engineering flow problems using a CFD package

Comparison of results with known experimental and numerical predictions

Introduction to Computational Fluid Dynamics: overview of CFD concepts and solution software, including flow problems, domain, boundary and initial conditions, mesh generation, conversation laws and NS equations, steady and unsteady RANS, turbulence modelling, and large-eddy simulation basics.

Practical RANS modelling techniques: e.g. problem definition, configuration, boundary conditions, 2D/3D mesh generations, solution methods, convergence and results analysis and comparisons.

Part 3: Teaching and learning methods

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

Scheduled learning includes lectures, tutorials and computer practical sessions.

Independent learning includes hours engaged with essential reading, software, assignment preparation and completion etc. These sessions constitute an average time per level as indicated in the table below.

There are a total of 36 scheduled contact hours for lecturing and tutorials.

Lectures/tutorials: 36 hours
Self-directed learning : 60 hours
Coursework: 27 hours
Exam preparation : 27 hours
Total hours : 150

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

MO1 Design and undertake substantial investigations to address significant areas of theory and practice in Computational Fluid Dynamics.

MO2 Select appropriate advanced methodological approaches and critically evaluate their effectiveness.

MO3 Apply appropriate theoretical and practical methods to the analysis and solution of engineering problems.

MO4 Demonstrate and critically evaluate current theoretical and methodological approaches through use of professional literature.

MO5 Act with initiative in decision-making within professional or given guidelines.

MO6 Communicate effectively using professional engineering terms.

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/ufmfwl-15-m.html

Part 4: Assessment

Assessment strategy: The module is assessed using two components of assessment where both theoretical concepts and practical implementation of computational fluid dynamics (CFD) theory are covered.

A two hour written end of module examination is used to assess concepts in CFD theory and methods under controlled conditions.

The coursework component is designed to assess modelling using software packages, and competence in critically evaluating and analysing results of computational fluid dynamics. The coursework assesses underlying CFD concepts in a practical context. The output of this coursework will be a report in the style of a 10 page conference paper. A template will be provided to help students structure the report appropriately.

The referred coursework will involve a reworking of the first sit submission taking into account feedback to improve the quality of the work. In the event of any non-submission of coursework a new but equivalent task will be published.

Assessment components:

Examination (Online) - Component A (First Sit)
Description: Online Examination: 5 hours
Weighting: 25 %
Final assessment: Yes
Group work: No
Learning outcomes tested: MO1, MO2, MO3, MO4, MO5, MO6

Report - Component B (First Sit)

Description: Individual report

Weighting: 75 %

Final assessment: No

Group work: No

Learning outcomes tested: MO1, MO2, MO3, MO4, MO5, MO6

Examination (Online) - Component A (Resit)

Description: Online Examination: 5 hours

Weighting: 25 %

Final assessment: Yes

Group work: No

Learning outcomes tested:

Report - Component B (Resit)

Description: Individual report

Weighting: 75 %

Final assessment: No

Group work: No

Learning outcomes tested:

Part 5: Contributes towards

This module contributes towards the following programmes of study:

Automotive Engineering [Sep][FT][Frenchay][4yrs] MEng 2018-19

Mechanical Engineering [Sep][FT][Frenchay][1yr] - Not Running MSc 2021-22

Mechanical Engineering [Sep][PT][Frenchay][2yrs] - Not Running MSc 2021-22

Mechanical Engineering [Sep][PT][Frenchay][2yrs] MSc 2020-21

Mechanical Engineering [Sep][FT][Frenchay][4yrs] MEng 2018-19