Module Specification

Computational Fluid Dynamics

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

Contents

Part 1: Information

Module title: Computational Fluid Dynamics

Module code: UFMFWL-15-M

Level: Level 7

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: Advanced Heat Transfer 2022-23

Excluded combinations: None

Co-requisites: None

Continuing professional development: No

Professional, statutory or regulatory body requirements: None

Part 2: Description

Overview: Complex flow problems that arise in a variety of industrial settings generally can only be solved using computational methods. These flows can involve complex geometries and flow properties and uncertain flow conditions. In this module students learn how to set-up and implement a CFD method using industry standard software applied to a variety of engineering flow problems. The module builds upon the fluid dynamics material that has been developed throughout the module from level 4 through to level 6 and represents and advanced application of the fundamental scientific and mathematical principles that have been covered in the programme.

Features: Not applicable

Educational aims: This module will equip students with the specialist knowledge to develop, implement and interpret computational (CFD) methods of solution to industrial flow problems.

Outline syllabus: The syllabus includes:

Introduction to Computational Fluid Dynamics and an industry standard CFD package

Engineering flow problems and underlying physics

Governing equations and numerical techniques

CAD and grid generation

Domains, boundary and initial conditions

Turbulent flow and modelling turbulence

Steady, non- steady and transient flow analysis

Data analysis and handling: Data formats, interchange formats, parallel computing, graphical representation and limitations.

Analysis and comparison of results: Uncertainty, measurements and theoretical solutions

CFD Modelling practice: problem formulation, domain analysis, grid generation, establishing initial conditions and inputs, numerical solution, post processing of results

Part 3: Teaching and learning methods

Teaching and learning methods: This module is delivered through a series of lectorials where lecture content and small group tutorial work is combined and managed to ensure that students are able to consolidate understanding of the theoretical material through examples and application. Computational aspects of the module are supported by sessions in the computer simulation lab.

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

MO1 Apply Computational Fluid Dynamics (CFD) to the solution of complex fluid flow problems, critically interpret results and after performing substantial investigation

MO2 Establish and explain an advanced framework to design and develop a method to solve a practice -based engineering problem in complex thermofluid problems

MO3 Design and implement an investigation to analyse an industrial flow problem resulting in a technically detailed report based on a critical evaluation of current theoretical and methodological approaches using professional literature and knowledge-base.

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 assessment is two connected parts

A coursework that applies CFD concepts and methods to a real industrial problem. The output of this coursework will be an industry standard report in the style of an eight page conference style paper.

An oral examination on the paper submission.

The resit assessment strategy has the same profile as the first sit assessment.

Assessment tasks:

Presentation (First Sit)
Description: Individual oral examination (15 minutes)
Weighting: 25 %
Final assessment: Yes
Group work: No
Learning outcomes tested: MO1, MO2, MO3

Report (First Sit)
Description: Group report (small groups) 8 pages
Weighting: 75 %
Final assessment: No
Group work: Yes
Learning outcomes tested: MO1, MO2, MO3

Presentation (Resit)
Description: Individual oral examination (15 minutes)
Weighting: 25 %
Final assessment: Yes
Group work: No
Learning outcomes tested: MO1, MO2, MO3

Report (Resit)

Description: Group report (small groups) -or individual report

Resit deliverable(s) will be scaled appropriately to group size and task complexity

Weighting: 75 %

Final assessment: No

Group work: Yes

Learning outcomes tested: MO1, MO2, MO3

Part 5: Contributes towards

This module contributes towards the following programmes of study:

Automotive Engineering [Sep][FT][Frenchay][4yrs] - Not Running MEng 2020-21

Automotive Engineering [Sep][SW][Frenchay][5yrs] MEng 2019-20

Automotive Engineering {Foundation} [Sep][FT][Frenchay][5yrs] MEng 2019-20

Automotive Engineering {Foundation} [Sep][SW][Frenchay][6yrs] MEng 2018-19

Mechanical Engineering [Sep][PT][Frenchay][2yrs] - Not Running MSc 2022-23

Mechanical Engineering [Sep][FT][Frenchay][4yrs] MEng 2020-21

Automotive Engineering [Sep][FT][Frenchay][4yrs] MEng 2020-21

Mechanical Engineering [Sep][PT][Frenchay][7yrs] MEng 2018-19

Mechanical Engineering {Foundation} [Sep][SW][Frenchay][6yrs] MEng 2018-19