Module Specification

Thermofluid Systems and Computational Flow Dynamics

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Contents

Part 1: Information

Module title: Thermofluid Systems and Computational Flow Dynamics

Module code: UFMFAQ-30-3

Level: Level 6

For implementation from: 2023-24

UWE credit rating: 30

ECTS credit rating: 15

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: None

Excluded combinations: None

Co-requisites: None

Continuing professional development: No

Professional, statutory or regulatory body requirements: None

Part 2: Description

Overview: The Thermofluid Systems and Computational Flow Dynamics module focusses on thermofluid systems, the types and designs of typical plant found in nuclear industries, such as fans, compressors and HVAC systems. Key areas for study are understanding fluid flow theory and applying CFD modelling.

Features: Not applicable

Educational aims: Learners will develop the theoretical understanding of fluid flow principles, by investigating hot and cold fluids in fluid flow machines. Learners will study Computational Flow Dynamics (CFD) theory and carry out CFD modelling, which would be used in industry.

Outline syllabus: The topics covered in this unit are:

Thermofluids:
Compressible flow machines design (fans, compressors)
Compressible flow machines (pumps)
Refrigeration and heat pumps
Air conditioning, mixing of air-streams and psychrometry
HVAC systems, combined heat and power (CHP), energy recovery.

CFD:
CFD theory and applications
CFD modelling software
Laminar and turbulent flow conditions
Modelling with Hex geometries
Mesh and mesh characteristics
Boundary flow conditions
Navier-Stokes flow transport equations

Part 3: Teaching and learning methods

Teaching and learning methods: See Outline Syllabus and Assessment.

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

MO1 Conduct thermofluid and flow analysis calculations

MO2 Explain and analyse the operating principles of HVAC and fluid machinery

MO3 Explain and evaluate energy use, design and cost drivers of fluid machinery

MO4 Design and create computational fluid dynamics (CFD) models

Hours to be allocated: 300

Contact hours:

Independent study/self-guided study = 228 hours

Face-to-face learning = 72 hours

Total = 300

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/index.html

Part 4: Assessment

Assessment strategy: Data Interpretation: Examination - Analysing a Case Study – The learner will be given a set of fluids data as a case study and will be asked to perform flow analysis calculations, for example viscosity and flow velocity vectors in a constricted pipe.

CFD Model – The learners will create a CFD model of fluid flow in a section of nuclear plant and present their results, along with explanations of operating principles, energy use and design of fluid machinery in presentation slides.

The resit assessment strategy is the same as the first sit.

Assessment tasks:

Examination (First Sit)
Description: Examination - Data interpretation, analysing a case study
Weighting: 25 %
Final assessment: Yes
Group work: No
Learning outcomes tested: MO1

Practical Skills Assessment (First Sit)

Description: CFD model
Weighting: 30 %
Final assessment: No
Group work: No
Learning outcomes tested: MO2, MO3

Set Exercise (First Sit)
Description: Presentation slides
Weighting: 45 %
Final assessment: No
Group work: No
Learning outcomes tested: MO4

Examination (Resit)
Description: Examination - Data interpretation, analysing a case study
Weighting: 25 %
Final assessment: Yes
Group work: No
Learning outcomes tested:

Practical Skills Assessment (Resit)
Description: CFD model
Weighting: 30 %
Final assessment: No
Group work: No
Learning outcomes tested:

Set Exercise (Resit)
Description: Presentation slides
Weighting: 45 %
Final assessment: No
Group work: No
Learning outcomes tested:

Part 5: Contributes towards

This module contributes towards the following programmes of study:

Mechanical Engineering with Nuclear {Apprenticeship-UCS} [Sep][FT][UCS][4yrs] BEng (Hons) 2021-22

Mechanical Engineering with Nuclear [Sep][PT][UCS][4yrs] BEng (Hons) 2021-22

Mechanical Engineering with Nuclear {Apprenticeship-UCS} [Sep][FT][UCS][5yrs] BEng (Hons) 2020-21