Module Specification

Fundamental Aerodynamics

Version: 2024-25, v6.0, 24 Jun 2024

Contents

Part 1: Information

Module title: Fundamental Aerodynamics

Module code: UFMFRK-15-2

Level: Level 5

For implementation from: 2024-25

UWE credit rating: 15

ECTS credit rating: 7.5

College: College of Arts, Technology and Environment

School: CATE School of Engineering

Partner institutions: None

Field: Engineering, Design and Mathematics

Module type: Module

Pre-requisites: Aerospace Thermofluids 2023-24

Excluded combinations: None

Co-requisites: None

Continuing professional development: No

Professional, statutory or regulatory body requirements: None

Part 2: Description

Overview: A thorough knowledge of the principles of aerodynamics is essential for the design of aerodynamic structures, components and systems and to optimise performance. In this module students will continue building on their knowledge gained at level 4 and apply their knowledge to realistic situations that would be encountered by an aerospace engineer.

The core aerodynamic knowledge and principles are consolidated through an assessed group activity based on numerical simulations.

Features: Not applicable

Educational aims: The aim of this module is to introduce fundamental concepts in aerodynamics and to show their practical significance for aircraft.

Outline syllabus: In this module you will cover fundamental concepts in aerodynamics relevant to aerospace engineering, including:

Basic concepts on potential flow theory ; 2D aerofoils and 3D wing theory.

Subsonic flow over aerofoils and wings

Transonic and supersonic flows over aerofoils

High lift devices and associated technologies

Introduction to numerical simulation using Computational Fluid Dynamics (CFD): relevant equations; principles of discretisation; turbulence models; mesh generation; boundary conditions; accuracy and convergence; post-processing; validation and assessment of results.

Part 3: Teaching and learning methods

Teaching and learning methods: This module combines lectures and tutorials to introduce and convey keys concepts of aerodynamic theory and aerodynamic flows consolidated by worked examples, supervised computer simulations, and self-paced tutorial questions.

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

MO1 Apply aerodynamic theory to calculate and describe subsonic, transonic and supersonic flows (SM2b, SM6m, EA2).

MO2 Implement numerical models, including CFD, to produce validated simulations of aerodynamic flows for basic geometries in different flow regimes (SM5m, EA3b, D3b, P4).

MO3 Demonstrate key transferable skills in problem formulation, self-management and communication (SM3b, EA3b, EA6m, D4, EL3).

MO4 Research and analyse a range of literature to make sound judgements (P4, SM6m, EA5m).

Hours to be allocated: 150

Contact hours:

Independent study/self-guided study = 114 hours

Face-to-face learning = 36 hours

Total = 0

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: The assessment strategy is designed to ensure that students have secure knowledge in applying mathematical methods to the analysis of aerodynamic problems and are able to apply aerodynamic theory to real engineering problems in an aerospace context.

All assessment is individual.

DEWIS type / online exam in invigilated controlled conditions (50%).

An on-campus closed book invigilated practical test in computational fluid dynamics (CFD) comprises the other50% of the module.

The practical test require students to prepare, run and post-process CFD cases to

demonstrate proficiency, as well as understanding and analysis of CFD methods and results.

The resit assessment will replicate the first sit setup for both components.

Assessment tasks:

Practical Skills Assessment (First Sit)
Description: Individual on-campus closed book computer room test. Students are tested on their ability to handle a specific software including pre-processing, operation and post-processing. Questions on the interpretation of the flow field and accompanying theory are also included.
Weighting: 50 %
Final assessment: No
Group work: No
Learning outcomes tested: MO2, MO3

Examination (Online) (First Sit)
Description: Online Examination in controlled conditions (invigilated) e.g. using a DEWIS type exam (on Blackboard).
Weighting: 50 %
Final assessment: Yes
Group work: No
Learning outcomes tested: MO1, MO2, MO3, MO4

Practical Skills Assessment (Resit)
Description: The same type of test as for the first sitting. Competency test of industrial standard fluid dynamics software
Weighting: 50 %
Final assessment: No
Group work: No
Learning outcomes tested: MO2, MO3

Examination (Online) (Resit)

Description: Online Examination in controlled conditions (invigilated) e.g. using a DEWIS type exam (on Blackboard).
Weighting: 50 %
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:

Aerospace Engineering {Apprenticeship-UWE} [UCW] BEng (Hons) 2023-24

Aerospace Engineering with Pilot Studies [Frenchay] BEng (Hons) 2023-24

Aerospace Engineering with Pilot Studies [Frenchay] MEng 2023-24

Aerospace Engineering {Apprenticeship-UCW} [UCW] BEng (Hons) 2023-24

Aerospace Engineering {Apprenticeship-UCW} [UCW] BEng (Hons) 2023-24

Aerospace Engineering [Frenchay] BEng (Hons) 2023-24

Aerospace Engineering [Frenchay] MEng 2023-24

Aerospace Engineering [Frenchay] MEng 2023-24

Aerospace Engineering [Frenchay] BEng (Hons) 2023-24

Aerospace Engineering {Apprenticeship-UCW} [UCW] BEng (Hons) 2023-24

Aerospace Engineering {Apprenticeship-UCW} [UCW] BEng (Hons) 2023-24

Aerospace Engineering {Apprenticeship-UWE} [UCW] BEng (Hons) 2023-24

Aerospace Engineering with Pilot Studies [Frenchay] BEng (Hons) 2023-24

Aerospace Engineering with Pilot Studies [Frenchay] MEng 2023-24

Aerospace Engineering {Foundation} [Frenchay] BEng (Hons) 2022-23

Aerospace Engineering with Pilot Studies {Foundation} [Frenchay] BEng (Hons) 2022-23