Module Specification

Fundamental Aerodynamics

Version: 2025-26, v7.0, Approved

Contents

Part 1: Information

Module title: Fundamental Aerodynamics

Module code: UFMFRK-15-2

Level: Level 5

For implementation from: 2025-26

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 2024-25

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 fundamental principles of aerodynamics is essential for the design of aerodynamic structures, components and systems and to optimise vehicle performance. In this module, students will continue building on their knowledge gained at year 1 and apply it to realistic situations that would be encountered by an aerospace engineer.

The core aerodynamic knowledge and principles are supported through computer practical sessions based on Ansys engineering software.

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 we 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

High Mach number flows (compressibility effects, transonic effects)

Supersonic flows over aerofoils: shock waves and expansion fans

High lift devices and associated technologies

Boundary Layers

Computer Practicals: Introduction to numerical simulation using Computational Fluid Dynamics (CFD) : geometry and mesh generation for 2D aerifoils and 3D wings; boundary conditions; accuracy and convergence; post-processing; validation and assessment against published data.

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 fundamental aerodynamic theory to calculate and describe subsonic, transonic and supersonic flows and their effects on bodies.

MO2 Demonstrate key transferable skills in problem formulation, self-management, literature research and analysis, and communication.

MO3 Implement numerical models, including CFD, to produce validated simulations of aerodynamic flows for basic geometries in different flow regimes.

Hours to be allocated: 150

Contact hours:

Independent study/self-guided study = 114 hours

Face-to-face learning = 36 hours

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 via end of term exam.

On-campus exam in invigilated controlled conditions (100%).

The resit assessment will replicate the first sit setup.

Assessment tasks:

Examination (First Sit)

Description: Examination is in controlled conditions on campus (invigilated) on UWE PCs. Students access the exam paper online.
Weighting: 100 %
Final assessment: Yes
Group work: No
Learning outcomes tested: MO1, MO2, MO3

Examination (Resit)
Description: Examination is in controlled conditions on campus (invigilated) on UWE PCs. Students access the exam paper online.
Weighting: 100 %
Final assessment: Yes
Group work: No
Learning outcomes tested: MO1, MO2, MO3

Part 5: Contributes towards

This module contributes towards the following programmes of study:

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

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

Aerospace Engineering [Frenchay] BEng (Hons) 2024-25

Aerospace Engineering [Frenchay] MEng 2024-25

Aerospace Engineering with Pilot Studies [Frenchay] BEng (Hons) 2024-25

Aerospace Engineering with Pilot Studies [Frenchay] MEng 2024-25

Aerospace Engineering {Apprenticeship-UWE} [UCW] BEng (Hons) 2024-25

Aerospace Engineering {Apprenticeship-UCW} [UCW] BEng (Hons) 2024-25

Aerospace Engineering {Apprenticeship-UCW} [UCW] BEng (Hons) 2024-25

Aerospace Engineering [Frenchay] MEng 2024-25

Aerospace Engineering [Frenchay] BEng (Hons) 2024-25

Aerospace Engineering {Apprenticeship-UWE} [UCW] BEng (Hons) 2024-25

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

Aerospace Engineering with Pilot Studies [Frenchay] BEng (Hons) 2024-25

Aerospace Engineering with Pilot Studies [Frenchay] MEng 2024-25

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

Aerospace Engineering {Apprenticeship-UWE} [UCW] BEng (Hons) 2024-25

Aerospace Engineering {Apprenticeship-UCW} [UCW] - WITHDRAWN BEng (Hons) 2024-25

Aerospace Engineering {Apprenticeship-UCW} [UCW] - WITHDRAWN BEng (Hons) 2024-25

Aerospace Engineering {Apprenticeship-UWE} [UCW] BEng (Hons) 2024-25

Aerospace Engineering with Pilot Studies [Frenchay] MEng 2024-25

Aerospace Engineering [Frenchay] MEng 2024-25