



## **Module Specification**

### Fundamental Aerodynamics

Version: 2022-23, v4.0, 31 May 2022

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## Part 1: Information

**Module title:** Fundamental Aerodynamics

**Module code:** UFMFRK-15-2

**Level:** Level 5

**For implementation from:** 2022-23

**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, University Centre Weston

**Field:** Engineering, Design and Mathematics

**Module type:** Standard

**Pre-requisites:** Aerospace Thermofluids 2021-22

**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 key 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 = 150

**Reading list:** The reading list for this module can be accessed at [readinglists.uwe.ac.uk](https://uwe.rl.talis.com/index.html) 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 apply mathematical methods to the analysis of aerodynamic problems and are able to apply aerodynamic theory to real engineering problems in an aerospace context.

The module is therefore assessed in two components

Component A:

Two hour end of module examination in invigilated controlled conditions (50%)

Component B:

An assignment on aerodynamics assessed by an individual technical poster output (50%).

The assignment tests the students on the use of numerical simulation software in which students are required to demonstrate detailed understanding and analysis. Through this exercise, students will also be expected to demonstrate awareness of professional literature on aerodynamics theory as well as demonstrating decision making and communication skills as a member of a group.

Peer review is incorporated within the assessment process to ensure that the group work aspect is a positive experience for students and staff.

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

**Assessment components:**

**Examination (Online) - Component A (First Sit)**

Description: Online Examination in controlled conditions (invigilated)

Weighting: 50 %

Final assessment: Yes

Group work: No

Learning outcomes tested: MO1, MO2, MO3, MO4

**Poster - Component B (First Sit)**

Description: Individual Technical Poster

Weighting: 50 %

Final assessment: No

Group work: No

Learning outcomes tested: MO1, MO2, MO3, MO4

**Examination (Online) - Component A (Resit)**

Description: Online Examination in controlled conditions (invigilated)

Weighting: 50 %

Final assessment: Yes

Group work: No

Learning outcomes tested:

**Poster - Component B (Resit)**

Description: Individual Technical Poster

Weighting: 50 %

Final assessment: No

Group work: No

Learning outcomes tested:

**Part 5: Contributes towards**

This module contributes towards the following programmes of study:

Aerospace Engineering {Apprenticeship-UWE} [Sep][FT][UCW][4yrs] BEng (Hons)  
2021-22

Aerospace Engineering {Apprenticeship-UCW} [Sep][FT][UCW][4yrs] BEng (Hons)  
2021-22

Aerospace Engineering {Apprenticeship-UCW} [Sep][FT][UCW][5yrs] BEng (Hons)  
2021-22

Aerospace Engineering [Sep][FT][Frenchay][3yrs] BEng (Hons) 2021-22

Aerospace Engineering [Sep][SW][Frenchay][4yrs] BEng (Hons) 2021-22

Aerospace Engineering [Sep][FT][Frenchay][4yrs] MEng 2021-22

Aerospace Engineering [Sep][SW][Frenchay][5yrs] MEng 2021-22

Aerospace Engineering with Pilot Studies [Sep][SW][Frenchay][5yrs] MEng 2021-22

Aerospace Engineering with Pilot Studies [Sep][FT][Frenchay][4yrs] MEng 2021-22

Aerospace Engineering with Pilot Studies [Sep][FT][Frenchay][3yrs] BEng (Hons)  
2021-22

Aerospace Engineering with Pilot Studies [Sep][SW][Frenchay][4yrs] BEng (Hons)  
2021-22

Aerospace Engineering {Foundation} [Sep][FT][Frenchay][4yrs] BEng (Hons) 2020-21

Aerospace Engineering {Foundation} [Sep][SW][Frenchay][5yrs] BEng (Hons) 2020-21

Aerospace Engineering with Pilot Studies {Foundation} [Sep][FT][Frenchay][4yrs] BEng (Hons) 2020-21

Aerospace Engineering with Pilot Studies {Foundation} [Sep][SW][Frenchay][5yrs] BEng (Hons) 2020-21

Aerospace Engineering Manufacturing [Sep][PT][UCW][3yrs] FdSc 2020-21

Aerospace Engineering {Foundation} [Sep][FT][Frenchay][4yrs] - Not Running BEng (Hons) 2020-21

Aerospace Engineering (Manufacturing) {Foundation} [Sep][SW][Frenchay][5yrs] - Not Running BEng (Hons) 2020-21

Aerospace Engineering (Manufacturing) {Foundation} [Sep][FT][Frenchay][4yrs] - Not Running BEng (Hons) 2020-21

Aerospace Engineering (Design) {Foundation} [Sep][SW][Frenchay][5yrs] - Not Running BEng (Hons) 2020-21

Aerospace Engineering (Systems) {Foundation} [Sep][FT][Frenchay][4yrs] - Not Running BEng (Hons) 2020-21

Aerospace Engineering (Design) {Foundation} [Sep][FT][Frenchay][4yrs] - Not Running BEng (Hons) 2020-21

Aerospace Engineering (Systems) {Foundation} [Sep][SW][Frenchay][5yrs] - Not Running BEng (Hons) 2020-21

Aerospace Engineering {Foundation} [Sep][SW][Frenchay][5yrs] - Not Running BEng (Hons) 2020-21

Aerospace Engineering (Manufacturing) {Apprenticeship-UCW} [Sep][FT][UCW][5yrs] - Not Running BEng (Hons) 2020-21

Aerospace Engineering with Pilot Studies {Foundation} [Sep][FT][Frenchay][4yrs] - Not Running BEng (Hons) 2020-21

Aerospace Engineering with Pilot Studies (Systems) {Foundation}

[Sep][SW][Frenchay][5yrs] - Not Running BEng (Hons) 2020-21

Aerospace Engineering with Pilot Studies (Systems) {Foundation}

[Sep][FT][Frenchay][4yrs] - Not Running BEng (Hons) 2020-21

Aerospace Engineering with Pilot Studies (Manufacturing) {Foundation}

[Sep][SW][Frenchay][5yrs] - Not Running BEng (Hons) 2020-21

Aerospace Engineering with Pilot Studies (Design) {Foundation}

[Sep][SW][Frenchay][5yrs] - Not Running BEng (Hons) 2020-21

Aerospace Engineering with Pilot Studies (Manufacturing) {Foundation}

[Sep][FT][Frenchay][4yrs] - Not Running BEng (Hons) 2020-21

Aerospace Engineering with Pilot Studies {Foundation} [Sep][SW][Frenchay][5yrs] -  
Not Running BEng (Hons) 2020-21

Aerospace Engineering with Pilot Studies (Design) {Foundation}

[Sep][FT][Frenchay][4yrs] - Not Running BEng (Hons) 2020-21

Aerospace Engineering [Sep][PT][UCW][8yrs] MEng 2019-20

Aerospace Engineering [Sep][PT][Frenchay][8yrs] MEng 2019-20

Aerospace Engineering with Pilot Studies (Design) [Sep][PT][Frenchay][6yrs] BEng  
(Hons) 2019-20

Aerospace Engineering with Pilot Studies [Sep][PT][Frenchay][6yrs] BEng (Hons)  
2019-20

Aerospace Engineering with Pilot Studies (Manufacturing) [Sep][PT][Frenchay][6yrs]  
BEng (Hons) 2019-20

Aerospace Engineering with Pilot Studies (Systems) [Sep][PT][Frenchay][6yrs] BEng  
(Hons) 2019-20

Aerospace Engineering (Design) [Sep][PT][Frenchay][8yrs] MEng 2019-20

Aerospace Engineering (Manufacturing) [Sep][PT][Frenchay][8yrs] MEng 2019-20

Aerospace Engineering (Systems) [Sep][PT][Frenchay][8yrs] MEng 2019-20