



## **Module Specification**

### **Aerodynamics C**

Version: 2023-24, v3.0, 25 Jan 2023

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## Part 1: Information

**Module title:** Aerodynamics C

**Module code:** UFMEWA-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:** None

**Excluded combinations:** None

**Co-requisites:** None

**Continuing professional development:** No

**Professional, statutory or regulatory body requirements:** None

## Part 2: Description

**Overview:** Module Entry requirements, the module is intended for science and engineering graduates, or equivalent, with strong mathematical skills.

**Features:** Not applicable

**Educational aims:** See learning outcomes.

**Outline syllabus:** Unsteady Aerodynamics:

Review of the basic laws, Theodorsen equation, panel methods

Oscillating airfoils in incompressible, subsonic, and supersonic flows

Arbitrary airfoil motion, oscillating finite wings

Unsteady motion of finite wings

Unsteady motion of non-lifting bodies

Unsteady boundary layer flow in two-dimensional and asymmetric flows

Periodic boundary layer flows

Unsteady separation

Oscillating flow in a pipe

Unsteady compressible boundary layers

Aero-elastic buffet

Stall flutter

### **Part 3: Teaching and learning methods**

**Teaching and learning methods:** Students will learn through a combination of formal lectures and tutorial sessions.

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

**MO1** The key principles of unsteady aerodynamics

**MO2** The differences between buffet and stall flutter

**MO3** The numerical methods used for unsteady aerodynamics

**MO4** Unsteady motion on wings and no-lifting bodies

**MO5** The physics of unsteady aerodynamics (subsonic/transonic and supersonic flows) and numerical methods, such as panel methods and Theodorsen equation

**MO6** Applications of theoretical predictions to wings

**MO7** The numerical/experimental data from a wing

**MO8** The unsteady phenomena caused by the interaction between the shock on the upper surface and the separation characterized by a main frequency corresponding to the shock movement and the pulsation of the separation

**MO9** Panel methods for analysis of lift generation and oscillating airfoils

**MO10** The boundary-layer viscous – inviscid interaction

**MO11** The Theodorsen function, which is essentially a Fourier Transform of the Wagner Function, and understand its limitations

**MO12** Relevant professional literature

**MO13** Problem formulation and decision making

**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/modules/ufmewa-15-m.html) via the following link <https://uwe.rl.talis.com/modules/ufmewa-15-m.html>

## **Part 4: Assessment**

**Assessment strategy:** The module is examined via an open book exam.

**Assessment tasks:****Examination (Online) (First Sit)**

Description: Online examination

Weighting: 100 %

Final assessment: Yes

Group work: No

Learning outcomes tested: MO1, MO10, MO11, MO12, MO13, MO2, MO3, MO4, MO5, MO6, MO7, MO8, MO9

**Examination (Online) (Resit)**

Description: Online examination

Weighting: 100 %

Final assessment: Yes

Group work: No

Learning outcomes tested:

**Part 5: Contributes towards**

This module contributes towards the following programmes of study:

Aerospace Engineering (Design) [Sep][FT][Frenchay][4yrs] - Not Running MEng 2020-21

Aerospace Engineering with Pilot Studies (Design) [Sep][FT][Frenchay][4yrs] - Not Running MEng 2020-21

Aerospace Engineering (Design) [Sep][SW][Frenchay][5yrs] MEng 2019-20

Aerospace Engineering with Pilot Studies (Design) [Sep][SW][Frenchay][5yrs] MEng 2019-20

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

Aerospace Engineering with Pilot Studies [Sep][FT][Frenchay][4yrs] - Not Running MEng 2020-21

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

Aerospace Engineering with Pilot Studies [Sep][SW][Frenchay][5yrs] MEng 2019-20