Module Specification

Flight Mechanics

Version: 2027-28, v4.0, Approved

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Part 1: Information

Module title: Flight Mechanics

Module code: UFMFFK-15-2

Level: Level 5

For implementation from: 2027-28

UWE credit rating: 15

ECTS credit rating: 7.5

College: College of Arts, Technology and Environment

School: CATE School of Engineering

Partner institutions: University Centre Weston

Field: Engineering, Design and Mathematics

Module type: Module

Pre-requisites: Aerospace Engineering Maths 2026-27

Excluded combinations: None

Co-requisites: None

Continuing professional development: No

Professional, statutory or regulatory body requirements: None

Part 2: Description

Overview: This module provides a detailed overview of aircraft flight mechanics using illustrated practical examples and computational exercises to help reinforce concepts of aircraft performance and stability. Students will also learn how to process flight test data from experimental flights to derive key aircraft performance parameters.

Features: Not applicable

Educational aims: Introduce students to the fundamentals of flight performance and stability, as well as experimental flight test data processing.

Outline syllabus: The module aims to introduce students to the principles of aircraft flight mechanics, performance, and static stability. The student will also learn how to manipulate and process experimental flight test data.

Elements of aircraft performance will be covered, including trim, take-off and landing, climb, descent, and level flight.

The principles of aircraft longitudinal and lateral-directional static stability will be discussed, including concepts such as weight and balance, the neutral point, and static margin. We will also examine the impact of control surfaces on trimming and stick force gradients, as well as the distinctions between stick-fixed and stick-free static stability. These topics will be addressed through mathematical descriptions, analytical solutions, and numerical simulations.

The principles of flight testing will be covered, including in-flight measurements, post-flight calculations, and comparisons with theoretical results.

The derivation and application of the relevant mathematical tools will be addressed in details.

Part 3: Teaching and learning methods

Teaching and learning methods: Students will learn through a combination of formal lectures and tutorial sessions. The lectures will emphasise key threshold concepts and illustrate their applications with worked examples and real-world scenario cases. In the tutorials, students will engage in exercises related to aircraft performance and dynamics, including their numerical solutions and software applications.

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

MO1 Apply concepts and principles of flight theory to study the performance and stability of an aircraft

MO2 Recognise and process experimental flight test data to derive fundamental aircraft performance properties

Hours to be allocated: 150

Contact hours:

Independent study/self-guided study = 113 hours

Staff-guided learning = 37 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 for this module is as follows:

Group oral examination designed to encourage timely engagement with the material and consolidate understanding of theoretical principles. Using aircraft as case studies, the examination is based on a group presentation and individual examination. Professional body requirements about flight test measurement methods are assessed through the presentation and discussion of experimental data processing (40%).

In-person individual exam, designed to engage students in the understanding of the fundamentals of Flight and the impact of design parameters on aircraft performance (60%). The students will be asked to answer questions on the theory of Flight and to solve practical problems related to the stability, performance, and dynamics of an aircraft.

Resit Assessments

The resit assessment will be the same as the first sit. Any new data will be provided

so that the students can do the work without access to specialist software or equipment. The presentation will be based on a similar aircraft case study (40%)

In-person individual exam as the first sit (60%).

Assessment tasks:

Presentation (First Sit)
Description: This assessment will include a group presentation of the experimental data processing and an individual presentation on the effect of changing design parameters on aircraft performance. The presentation will be followed by a Q&A session, during which students will be asked individual questions.
Weighting: 40 %
Final assessment: No
Group work: Yes
Learning outcomes tested: MO2

Examination (First Sit)
Description: On campus, invigilated and closed book exam. Individual exam on fundamentals of Flight performance and dynamics. The students will be asked to answer questions on the theory of Flight and to solve practical problems related to the stability, performance, and dynamics of an aircraft.
Weighting: 60 %
Final assessment: Yes
Group work: No
Learning outcomes tested: MO1

Presentation (Resit)
Description: This assessment will include a group presentation of the experimental data processing and an individual presentation on the effect of changing design parameters on aircraft performance. The presentation will be followed by a Q&A session, during which students will be asked individual questions.
Weighting: 40 %
Final assessment: No

Group work: Yes
Learning outcomes tested: MO2

Examination (Resit)
Description: On campus, invigilated and closed book exam.
Weighting: 60 %
Final assessment: Yes
Group work: No
Learning outcomes tested: MO1

Part 5: Contributes towards

This module contributes towards the following programmes of study:

Aerospace Engineering with Pilot Studies {Foundation} [Frenchay] BEng (Hons) 2025-26

Aerospace Engineering {Foundation} [Frenchay] BEng (Hons) 2025-26

Aerospace Engineering [Frenchay] BEng (Hons) 2026-27

Aerospace Engineering with Pilot Studies [Frenchay] BEng (Hons) 2026-27

Aerospace Engineering {Apprenticeship-UWE} [UCW] BEng (Hons) 2026-27

Aerospace Engineering [Frenchay] BEng (Hons) 2026-27

Aerospace Engineering with Pilot Studies [Frenchay] BEng (Hons) 2026-27

Aerospace Engineering with Pilot Studies {Foundation} [Frenchay] BEng (Hons) 2025-26

Aerospace Engineering [Frenchay] MEng 2026-27

Aerospace Engineering with Pilot Studies [Frenchay] MEng 2026-27

Aerospace Engineering {Apprenticeship-UWE} [UCW] BEng (Hons) 2026-27

Aerospace Engineering [Frenchay] MEng 2026-27

Aerospace Engineering with Pilot Studies [Frenchay] MEng 2026-27