



## **Module Specification**

### **Avionics and Control 3**

Version: 2021-22, v4.0, 20 Jul 2022

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## Part 1: Information

**Module title:** Avionics and Control 3

**Module code:** UFMFL7-30-3

**Level:** Level 6

**For implementation from:** 2021-22

**UWE credit rating:** 30

**ECTS credit rating:** 15

**Faculty:** Faculty of Environment & Technology

**Department:** FET Dept of Engineering Design & Mathematics

**Partner institutions:** None

**Delivery locations:** Frenchay Campus

**Field:** Engineering, Design and Mathematics

**Module type:** Standard

**Pre-requisites:** None

**Excluded combinations:** None

**Co-requisites:** None

**Continuing professional development:** No

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

## Part 2: Description

**Overview:** This module provides students with the opportunity to explore avionics and control concepts through real world examples. Students will also have the opportunity to develop their understanding through practice based learning using avionics platforms.

**Features:** Not applicable

**Educational aims:** The course aims to provide an advanced study of aircraft avionics and flight control design with illustrated practical, computational exercises and group project work so that students can experience how complex aircraft avionics and flight control systems are designed.

In addition, the educational experience may explore, develop, and practise but not formally discretely assess the following:

IT skills in context

Communication skills and working effectively in teams

Application of project management and systems engineering skills

Problem formulation and decision making

Progression to independent learning

**Outline syllabus:** The syllabus includes:

Signal Processing:

Conditioning and converting inputs and outputs of different types.

Analogue signal conditioning, A/D and D/A conversion

System Architectural Options:

Analogue, digital, microprocessor circuit design, databus configurations

Real Time Programming

The use of a compiled high level language (for example C) to effect processing and decision-making in a real-time system.

Use of a real-time executive in a safety critical environment.

Device interfacing and control.

Safety Critical Design:

Examination of robust design, failure tolerance and failure recovery

Avionics - The commercial and military environment:

Examination of the current avionic system design and future directions

Control theory for open and closed loop control of flight manoeuvres and flight

simulation

An overview of the construction of a flight simulator and the integration of its sub-systems

Knowledge of the sub-systems especially for control and flight

The basics of the typical software systems and architecture in flight simulators, real-time systems and I/O computers

Flight computer and flight models, aerodynamic considerations and approximations

Simulation of aircraft control systems to achieve specified objectives

The human-in-the-loop – stabilisation and full control authority: safety aspects

The use of flight simulators in aircraft design, stability and control studies, flight handling, pilot-training, and research

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

**Teaching and learning methods:** Large group lecture supported by small group tutorial sessions. Study time outside of contact hours will be spent on going through exercises and example problems.

Practical sessions will provide experience of empirical methods, modelling and simulation and will require time outside for assignment preparation.

Scheduled learning includes lectures, practical classes and workshops;

Independent learning includes hours engaged with essential reading, case study preparation, assignment preparation and completion etc.

Contact Hours:

Activity:

Contact: 72 hours

Assimilation and skill development: 88 hours

Coursework: 120 hours

Exam preparation: 20 hours

Total: 300 hours

Contact hours include workshop time under technician supervision.

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

**MO1** Design avionics systems to achieve performance, operational and logistic requirements (Avionics)

**MO2** Examine and differentiate the configuration of avionics architectures in civil and military aircraft (Avionics)

**MO3** Interpret the interactions between real time data and a complex system and the interfacing analogue data sources to analogue and digital systems (Avionics)

**MO4** Schedule and manage multiple streams of digital data in a high integrity, time critical and safety critical environment via the utilisation of a real-time kernel (Avionics)

**MO5** Design a micro-controller circuit and real-time programming in a high level language (Avionics)

**MO6** Design, develop and implement real-time control interactions in a complex non-linear environment (Flight Control)

**MO7** Break down the composition of a flight simulator in terms of its sub-systems, and determine the interaction between the system elements (Flight Control)

**MO8** Formulate and implement control algorithms to modify the flight characteristics of an aircraft to meet predefined desired flying qualities (Flight Control)

**MO9** Validate and verify robust real-time control interventions within the flight simulation environment (Flight Control)

**MO10** Define and develop a suitable testing procedure for evaluating a system (Flight Control)

**Hours to be allocated:** 300

**Contact hours:**

Independent study/self-guided study = 228 hours

Face-to-face learning = 72 hours

Total = 300

**Reading list:** The reading list for this module can be accessed at [readinglists.uwe.ac.uk](https://uwe.rl.talis.com/modules/ufmfl7-30-3.html) via the following link <https://uwe.rl.talis.com/modules/ufmfl7-30-3.html>

## Part 4: Assessment

**Assessment strategy:** Component A consists of an exam on Avionic systems and control applications.

Component B consists of a Avionics and Flight control group project demonstrating key skills and thus includes: flight control, flight stability and automation.

The resit assessment for component A is the same as the first sit. The resit assessment for component B consists of a Avionics and Flight control individual project.

### Assessment components:

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

Description: Online Examination: 4 hours

Weighting: 38 %

Final assessment: Yes

Group work: No

Learning outcomes tested: MO1, MO2, MO3, MO4, MO5

#### In-class test - Component A (First Sit)

Description: Assessed tutorial preparation and tasks

Weighting: 37 %

Final assessment: No

Group work: No

Learning outcomes tested: MO1, MO2, MO3, MO4, MO5

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

Description: Report and background files showing individual contributions, plus personal log books

Weighting: 25 %

Final assessment: No

Group work: Yes

Learning outcomes tested: MO10, MO6, MO7, MO8, MO9

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

Description: Online Examination: 4 hours

Weighting: 38 %

Final assessment: Yes

Group work: No

Learning outcomes tested: MO1, MO2, MO3, MO4, MO5

**Written Assignment - Component B (Resit)**

Description: Individual assignment - report and personal logbook

Weighting: 62 %

Final assessment: No

Group work: No

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

**Part 5: Contributes towards**

This module contributes towards the following programmes of study:

Aerospace Engineering (Systems) [Sep][FT][Frenchay][4yrs] MEng 2019-20

Aerospace Engineering with Pilot Studies (Systems) [Sep][FT][Frenchay][4yrs] MEng  
2019-20

Aerospace Engineering with Pilot Studies (Systems) [Sep][FT][Frenchay][3yrs] BEng  
(Hons) 2019-20

Aerospace Engineering (Systems) [Sep][FT][Frenchay][3yrs] BEng (Hons) 2019-20

Aerospace Engineering (Systems) {Foundation} [Sep][FT][Frenchay][4yrs] BEng  
(Hons) 2018-19

Aerospace Engineering (Systems) [Sep][SW][Frenchay][5yrs] MEng 2018-19

Aerospace Engineering with Pilot Studies (Systems) [Sep][SW][Frenchay][4yrs]  
BEng (Hons) 2018-19

Aerospace Engineering with Pilot Studies (Systems) [Sep][SW][Frenchay][5yrs]  
MEng 2018-19

Aerospace Engineering (Systems) [Sep][SW][Frenchay][4yrs] BEng (Hons) 2018-19

Aerospace Engineering [Sep][FT][Frenchay][3yrs] BEng (Hons) 2019-20

Aerospace Engineering with Pilot Studies [Sep][FT][Frenchay][3yrs] BEng (Hons)  
2019-20

Aerospace Engineering with Pilot Studies [Sep][FT][Frenchay][4yrs] MEng 2019-20

Aerospace Engineering [Sep][FT][Frenchay][4yrs] MEng 2019-20

Aerospace Engineering with Pilot Studies [Sep][SW][Frenchay][5yrs] MEng 2018-19

Aerospace Engineering [Sep][SW][Frenchay][5yrs] MEng 2018-19

Aerospace Engineering with Pilot Studies [Sep][SW][Frenchay][4yrs] BEng (Hons)  
2018-19

Aerospace Engineering with Pilot Studies {Foundation} [Sep][FT][Frenchay][4yrs]  
BEng (Hons) 2018-19

Aerospace Engineering with Pilot Studies (Systems) {Foundation}  
[Sep][FT][Frenchay][4yrs] BEng (Hons) 2018-19

Aerospace Engineering [Sep][SW][Frenchay][4yrs] BEng (Hons) 2018-19



Aerospace Engineering {Foundation} [Sep][FT][Frenchay][4yrs] BEng (Hons) 2018-19