Module Specification

Avionics and Control 3

Version: 2023-24, v6.0, 15 Sep 2023

Contents

Part 1: Information

Module title: Avionics and Control 3

Module code: UFMFL7-30-3

Level: Level 6

For implementation from: 2023-24

UWE credit rating: 30

ECTS credit rating: 15

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: 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 predefine 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 via the following link https://uwe.rl.talis.com/modules/ufmfl7-30-3.html

Part 4: Assessment

Assessment strategy: The assessment strategy is as follows:

An exam on Avionic systems and control applications.

An Avionics and Flight control group project demonstrating key skills and thus includes: flight control, flight stability and automation.

The resit assessment is the same as the first sit.

Resit deliverable(s) will be scaled appropriately to group size and task complexity

Assessment tasks:

Examination (Online) (First Sit)
Description: Online Examination (2 hours + 2 hours for submission)
Weighting: 38 %
Final assessment: Yes
Group work: No
Learning outcomes tested: MO1, MO2, MO3, MO4, MO5

Written Assignment (First Sit)
Description: Report and background files showing individual contributions, plus personal log books

Weighting: 62 %
Final assessment: No
Group work: Yes
Learning outcomes tested: MO1, MO10, MO2, MO3, MO4, MO5, MO6, MO7, MO8, MO9

Examination (Online) (Resit)
Description: Online Examination (2 hours + 2 hours for submission)
Weighting: 38 %
Final assessment: Yes
Group work: No
Learning outcomes tested: MO1, MO2, MO3, MO4, MO5

Written Assignment (Resit)
Description: Individual assignment - report and personal logbook

Resit deliverable(s) will be scaled appropriately to group size and task complexity
Weighting: 62 %
Final assessment: No
Group work: Yes
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][SW][Frenchay][4yrs] - Not Running BEng (Hons) 2020-21

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

Aerospace Engineering with Pilot Studies (Systems) [Sep][SW][Frenchay][5yrs] - Not Running MEng 2020-21

Aerospace Engineering with Pilot Studies (Systems) [Sep][SW][Frenchay][4yrs] - Not Running BEng (Hons) 2020-21

Aerospace Engineering (Systems) [Sep][SW][Frenchay][5yrs] - Withdrawn MEng 2020-21

Aerospace Engineering with Pilot Studies (Systems) {Foundation} [Sep][SW][Frenchay][5yrs] BEng (Hons) 2019-20

Aerospace Engineering (Systems) {Foundation} [Sep][SW][Frenchay][5yrs] BEng (Hons) 2019-20

Aerospace Engineering (Systems) [Sep][PT][Frenchay][8yrs] MEng 2018-19

Aerospace Engineering with Pilot Studies (Systems) [Sep][PT][Frenchay][6yrs] BEng (Hons) 2018-19

Aerospace Engineering [Sep][SW][Frenchay][5yrs] - Withdrawn MEng 2020-21

Aerospace Engineering [Sep][SW][Frenchay][4yrs] - Not Running BEng (Hons) 2020-21

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

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

Aerospace Engineering with Pilot Studies [Sep][SW][Frenchay][5yrs] - Withdrawn MEng 2020-21

Aerospace Engineering with Pilot Studies {Foundation} [Sep][SW][Frenchay][5yrs] BEng (Hons) 2019-20

Aerospace Engineering {Foundation} [Sep][SW][Frenchay][5yrs] BEng (Hons) 2019-20

Aerospace Engineering with Pilot Studies [Sep][PT][Frenchay][6yrs] BEng (Hons) 2018-19

Aerospace Engineering [Sep][PT][Frenchay][8yrs] MEng 2018-19