Module Specification

Space Engineering

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Part 1: Information

Module title: Space Engineering

Module code: UFMF8V-15-3

Level: Level 6

For implementation from: 2025-26

UWE credit rating: 15

ECTS credit rating: 7.5

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: The module provides a first introduction to space mission engineering from a preliminary design viewpoint. The content will encompass the broad outcomes and performance aspects of modern space missions.

A space mission is characterised by an orderly collection of mission objectives, requirements, spacecraft, orbit, space environment, launch vehicle, and ground operations. The spacecraft is expected to fulfill mission needs for several years while

exposed to the harsh operating conditions. The space operation incurs high cost and significant safety risk. Understanding the interaction of contravening mission elements is central to mission planning and success.

In this module, we present how a typical space mission is engineered and analysed.

Features: Not applicable

Educational aims: Extend the context of the aerospace discipline to the requirements of the space sector. Acquire the knowledge and understanding of scientific principles and methods essential to underpin the skills necessary to analyse and design space missions. The module is encouraged by the Royal Aeronautical Society.

Outline syllabus: Topics covered likely to include, but not limited to:

Introduction to astronautics and astrodynamics.

Space commercialisation, space travel, modern missions and satellite applications.

Iteration based space mission lifecycle engineering.

Orbital mechanics.

Orbit correction, perturbations and elementary manoeuvring.

Coverage analysis, constraints and trade studies.

Space environment interactions.

Introduction to Space Systems Engineering.

Part 3: Teaching and learning methods

Teaching and learning methods: The module delivery is designed to support students engineer innovative space missions.

The elements of space mission engineering and design methods will be presented in lectures. To motivate and make clear the connection between theory and practice, the students will apply design and simulation techniques on real mission scenarios. The material will then be explored in-depth and discussed in small groups in tutorials to develop a full-scale mission which will be analysed for technical feasibility at the preliminary design level.

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

MO1 Implement an effective analysis of broad mission and system requirements to conceive, define, and develop a space mission. This includes consideration of technical complexity, performance trade-offs, reliability, and cost within the engineering design cycle.

MO2 Determine the desired mission orbit and dynamics through the application of Newton's theories, laws of conservation and computation of Kepler's elements.

MO3 Analyse space environmental factors and their impact on spacecraft (payload and platform), mission performance, and lifespan, supported by appropriate simulation and verification techniques.

Hours to be allocated: 150

Contact hours:

Independent study/self-guided study = 114 hours

Face-to-face learning = 36 hours

Reading list: The reading list for this module can be accessed at readinglists.uwe.ac.uk via the following link https://rl.talis.com/3/uwe/lists/93C9E55D-4D0E-A3DE-77FB-A11C2B304ED0.html

Part 4: Assessment

Assessment strategy: The assessment strategy is designed to allow students to follow the standard mission design process as part of a space team.

The computer-based mission will be developed during the module with a methodological approach supported by the weekly delivery of material. The students will work in groups in the tutorial and simulation-based workshops to progressively develop the mission.

The assessment for this module is as follows:

A will be a controlled condition examination to assess specific and independent learning.

A group presentation that documents the mission design will be required along with the project archive of mission design.

The group marks will be moderated using a peer review process as set out in the Departmental Group Work Policy.

Resit is the same as the first sit

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

Assessment tasks:

Examination (First Sit)
Description: Written exam (2 hours)
Weighting: 50 %
Final assessment: Yes
Group work: No
Learning outcomes tested: MO2, MO3

Presentation (First Sit)
Description: Group viva to assess group and individual understanding, contribution, and teamwork.
Weighting: 50 %
Final assessment: No
Group work: Yes
Learning outcomes tested: MO1

Examination (Resit)
Description: Written exam (2 hours)
Weighting: 50 %
Final assessment: Yes
Group work: No
Learning outcomes tested: MO2, MO3

Presentation (Resit)
Description: Group viva to assess group and individual understanding, contribution, and teamwork.
Weighting: 50 %
Final assessment: No
Group work: Yes
Learning outcomes tested: MO1

Part 5: Contributes towards

This module contributes towards the following programmes of study:

Aerospace Engineering with Pilot Studies [Frenchay] BEng (Hons) 2023-24

Aerospace Engineering with Pilot Studies [Frenchay] MEng 2023-24

Aerospace Engineering {Foundation} [Sep][SW][Frenchay][5yrs] BEng (Hons) 2021-22

Aerospace Engineering [Frenchay] BEng (Hons) 2023-24

Aerospace Engineering [Frenchay] MEng 2023-24

Aerospace Engineering [Frenchay] MEng 2023-24

Aerospace Engineering [Frenchay] BEng (Hons) 2023-24

Aerospace Engineering with Pilot Studies [Frenchay] BEng (Hons) 2023-24

Aerospace Engineering with Pilot Studies [Frenchay] MEng 2023-24

Aerospace Engineering with Pilot Studies [Frenchay] MEng 2022-23

Aerospace Engineering with Pilot Studies [Frenchay] MEng 2023-24

Aerospace Engineering [Frenchay] MEng 2022-23

Aerospace Engineering [Frenchay] MEng 2023-24

Aerospace Engineering with Pilot Studies [Frenchay] MEng 2022-23

Aerospace Engineering [Frenchay] MEng 2022-23

Aerospace Engineering with Pilot Studies {Foundation} [Sep][SW][Frenchay][5yrs] BEng (Hons) 2021-22

Aerospace Engineering {Foundation} [Frenchay] BEng (Hons) 2022-23

Aerospace Engineering [Frenchay] BEng (Hons) 2022-23

Aerospace Engineering [Frenchay] MEng 2022-23

Aerospace Engineering with Pilot Studies {Foundation} [Frenchay] BEng (Hons) 2022-23

Aerospace Engineering with Pilot Studies [Frenchay] MEng 2022-23

Aerospace Engineering with Pilot Studies [Frenchay] BEng (Hons) 2022-23