Prifysgol Wrecsam
Wrexham University

Module specification

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Module Code	ENG4C4
Module Title	Fundamentals of Aerospace Engineering
Level	4
Credit value	20
Faculty	FACE
HECoS Code	100115
Cost Code	GAME
Pre-requisite module	N/A

Programmes in which module to be offered

Programme title	Core/Optional/Standalone
BEng (Hons) Aerospace Engineering	Core

Breakdown of module hours

Learning and teaching hours	30 hrs
Placement tutor support hours	0 hrs
Supervised learning hours e.g. practical classes, workshops	30 hrs
Project supervision hours	0 hrs
Active learning and teaching hours total	**60 hrs**
Placement hours	0 hrs
Guided independent study hours	140 hrs
Module duration (Total hours)	**200 hrs**

Module aims

This module combines conceptual teaching with guided practical work to strengthen students' understanding of fundamental principles. Learners explore how theoretical knowledge connects with real-world practice through structured experimentation and applied tasks. The approach builds confidence, technical awareness, and the ability to apply knowledge effectively within authentic learning contexts.

This module aims to introduce students to the fundamental principles of aerospace engineering, inspiring them to explore how aerodynamics, structures, propulsion and space

flight combine as an integrated system to enable the design and operation of aircraft and spacecraft.

Module Learning Outcomes

At the end of this module, students will be able to:

1	Explain and apply fundamental aerospace engineering principles, including aerodynamics, structures, propulsion, and basic orbital concepts, in simple engineering contexts.
2	Apply basic analytical methods to solve introductory aerospace engineering problems and interpret simple data or results derived from calculations, simulations, or practical activities.
3	Describe and interpret how key aerospace subsystems interact within an overall engineering system, demonstrating a basic systems-based understanding
4	Communicate technical findings clearly and professionally, demonstrating accurate interpretation of experimental and simulation results.

Assessment

Indicative Assessment Tasks:

This section outlines the type of assessment task the student will be expected to complete as part of the module. More details will be made available in the relevant academic year module handbook.

Assessment 1: Portfolio (75%)

This assessment evaluates the development of fundamental engineering knowledge and practical competence. Students submit a portfolio of evidence derived from practical, laboratory, workshop, or equivalent applied activities undertaken during the module. Evidence may take a range of appropriate forms, including measurements, observations, visual records, and brief technical commentary.

Minimum expectation: The portfolio must demonstrate engagement with a representative range of activities and include sufficient evidence of method, results, and basic interpretation to allow academic judgement of performance and achievement of learning outcomes.

Assessment 2: Oral Presentation (25%)

This assessment evaluates students' ability to communicate engineering understanding using appropriate technical content and supporting evidence.

Students deliver a structured presentation based on a selected system, topic, or set of activities relevant to the module. The presentation should demonstrate understanding of underlying principles, use of relevant data or evidence, and a basic level of analysis.

Minimum expectation:
The presentation must include appropriate supporting material (such as data, examples, or applications) and demonstrate a clear link to the learning activities of the module.

Assessment number	Learning Outcomes to be met	Type of assessment	Duration/Word Count	Weighting (%)	Alternative assessment, if applicable
1	1-3	Portfolio	Equivalent to 2000 words	75%	N/A
2	4	Presentation	10 minutes	25%	N/A

Derogations

Credits shall be awarded by an Assessment Board for those modules in which a pass mark 40% has been achieved, with a minimum mark of 30% in each assessment element.

Learning and Teaching Strategies

Learning and teaching combine classroom-based instruction with structured laboratory practice to reinforce theoretical understanding through application. Students participate in lectures, workshops, and supervised experiments that link principles to professional practice. Online materials and activities complement face-to-face sessions, supporting reflection and self-paced learning. Tutorials and group discussions promote collaboration and the development of analytical and communication skills.

Welsh Elements

This module will be delivered through the medium of English; however, students have the option to submit their assessments in the medium of Welsh. While this module is not currently offered fully through Welsh, Welsh language support and guidance are available, and some learning materials or tutorial discussions may incorporate Welsh elements where appropriate. To further promote bilingual learning, all students have the opportunity to take the 20-credit *Welsh for STEM* short course, designed to develop confidence and subject-specific language skills in both English and Welsh.

Indicative Syllabus Outline

Introduction to aerospace engineering systems:

Overview of the aerospace sector, historical developments and the role of aerodynamics, structures, propulsion and space systems within an integrated engineering framework.

Fundamentals of aerodynamics:

Introduction to airflow, lift and drag, aerofoil behaviour and basic aerodynamic principles relevant to aircraft performance.

Aerostructures and materials:

Basic structural concepts, load paths and material selection for aerospace applications, highlighting interactions between structure and aerodynamic loading.

Propulsion systems:

Fundamental principles of aircraft propulsion, including jet and rocket engines, and their role within the overall aerospace system.

Space flight and orbital mechanics:

Introduction to rockets, space environments and the science of orbiting bodies, linking propulsion, trajectory and mission objectives.

Systems thinking in aerospace engineering:

Exploration of how aerospace subsystems interact to solve complex engineering challenges, reinforcing an integrated and holistic problem-solving approach.

Technical communication skills:

Introduction to technical report structure, academic writing conventions and effective presentation of engineering information.

Applied investigation:

Guided investigation of a fundamental aerospace topic, integrating multiple disciplines and reinforcing systems-based understanding

Indicative Bibliography

Please note the essential reads and other indicative reading are subject to annual review and update.

Essential Reads:

J. D. Anderson, *Introduction to Flight*, 9th ed. New York, NY: McGraw-Hill, 2021.

Other indicative reading:

National Aeronautics and Space Administration, “Beginner’s Guide to Aeronautics,” 2023. [Online]. Available: https://www.grc.nasa.gov/www/k-12/airplane/

Rolls Royce, *The Jet Engine*, 6th ed. Chichester, West Sussex: Wiley Blackwell, 2019.

European Space Agency, “Basics of Spaceflight,” 2023. [Online]. Available: https://www.esa.int/Education

Plus, various others to be signposted on Moodle.

Administrative Information

For office use only	
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Date and details of revision	
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