Prifysgol Wrecsam
Wrexham University

Module specification

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Module Code	ENG5C2
Module Title	Aerospace Design and Performance
Level	5
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	24 hrs
Placement tutor support hours	0 hrs
Supervised learning hours e.g. practical classes, workshops	24 hrs
Project supervision hours	0 hrs
Active learning and teaching hours total	**48 hrs**
Placement hours	0 hrs
Guided independent study hours	152 hrs
Module duration (Total hours)	**200 hrs**

Module aims

This module develops applied understanding through a balance of theory and practice. Learners undertake both classroom study and supervised practical activity to explore design, implementation, and evaluation processes. Collaborative work and enquiry-based learning foster communication, teamwork, and the confidence to apply problem-solving techniques in varied contexts.

This module introduces students to aerospace design and performance, developing their understanding of the scientific factors that underpin differing aerospace types, their structures, systems, powerplant and operation.

Module Learning Outcomes

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

1	Analyse broadly defined problems reaching substantiated conclusions relating to aerospace structural components and involving aerodynamic loading and aeroelasticity
2	Identify, evaluate and mitigate risks (the effects of uncertainty) associated with design projects, activities or operations.
3	Evaluate the environmental and societal impact of solutions to broadly defined problems relating to aerospace design.

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

The module is assessed through a portfolio that provides a robust and coherent evaluation of the student's attainment of Learning Outcomes 1–3. The assessment is designed to test analytical capability, application of core engineering principles, and problem-solving competence appropriate to the level of study.

Assessment number	Learning Outcomes to be met	Type of assessment	Duration/Word Count	Weighting (%)	Alternative assessment, if applicable
1	1-3	Portfolio	3000	100%	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 integrates conceptual study with practical investigation to deepen understanding and enhance problem-solving ability. Students participate in lectures, laboratory work, and team-based projects that encourage collaboration and communication. Online materials, recordings, and discussion forums support blended engagement. Tutorials promote reflective learning and increasing autonomy in preparation for advanced study.

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

- **Aerospace Types, Structures, and Operational Roles:**

  Overview of commercial and military aerospace configurations, examining structural arrangements and how these support different operational roles and performance requirements.

- **Airworthiness and Airframe Loads:**

  Introduction to airworthiness requirements and the range of aerodynamic, inertial, and operational loads acting on aerospace structures, forming the basis for structural assessment and compliance.

- **Stressed Skin Construction and Structural Analysis:**

  Study of stressed skin construction principles used in aerospace structures, supported by structural analysis methods and calculations to assess stress distributions, load paths, and aeroelastic behaviour under aerodynamic loading.

- **Aerospace Systems Overview:**

  Examination of major aerospace systems, including their purpose, performance characteristics, and operational principles, with consideration of system integration and interdependency.

- **Failure and Reliability of Aerospace Systems:**

  Application of failure and reliability analysis techniques to aerospace systems and components, enabling identification of potential failure modes, assessment of uncertainty, and evaluation of risk mitigation strategies relevant to aerospace projects, operational activities, and safety-critical decision-making.

- **Aerospace Propulsion and Systems Context:** Consideration of aerospace propulsion systems within the wider aerospace architecture, including their operational role and interaction with structural and systems design.
- **Environmental and Societal Impact Assessment:** Evaluation of environmental and societal impacts associated with aerospace propulsion solutions, including emissions, noise, efficiency, and sustainability considerations, enabling informed judgement on the broader consequences of engineering decisions in the aviation sector.

Indicative Bibliography

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

Essential Reads:

J. Dingle and M. Tooley, *Aircraft Engineering Principles,* 3rd ed. Oxford, UK: Elsevier, 2026.

Other indicative reading:

D. P. Raymer, *Aircraft Design: A Conceptual Approach*, 6th ed. Playa Vista, CA, USA: AIAA, 2018.

N. Cumpsty and A. Heyes, *Jet Propulsion: A Simple Guide to the Aerodynamic and Thermodynamic Design and Performance of Jet Engines*, 3rd ed. Cambridge, UK: Cambridge University Press, 2015.

T. H. G. Megson, *Aircraft Structures for Engineering Students*, 7th ed. Oxford, UK: Butterworth-Heinemann, 2021.

Administrative Information

For office use only	
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