

Module specification

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Module Code	ENG6D1
Module Title	Lightweight Structures and Composites
Level	6
Credit value	20
Faculty	FACE
HECoS Code	100203
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	21 hrs
Placement tutor support hours	0 hrs
Supervised learning hours e.g. practical classes, workshops	21 hrs
Project supervision hours	0 hrs
Active learning and teaching hours total	42 hrs
Placement hours	0 hrs
Guided independent study hours	158 hrs
Module duration (Total hours)	200 hrs

Module aims

This module integrates advanced theoretical study with applied laboratory investigation. Students critically evaluate techniques, interpret data, and justify design or methodological decisions within a professional context. The combination of theory and practice cultivates independent learning, innovation, and readiness for individual project or dissertation work.

This module aims to develop students' understanding of composite materials and lightweight structural systems through the study of their structure, properties, processing methods, and engineering applications. It prepares students to design and evaluate high-performance and sustainable solutions within an aerospace engineering context.

Module Learning Outcomes

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

1	Analyse the structure-property-processing relationships of composite materials and lightweight structures to inform engineering design decisions for complex applications.
2	Critically evaluate and analyse the most appropriate materials for specific aerospace engineering applications using technical literature, standards and performance data.
3	Critically evaluate the environmental and societal impacts of composite material and lightweight structural solutions and justify strategies to minimise adverse impacts across the product lifecycle (AHEP-4 C7).

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

Students will produce a written portfolio examining the application of composite materials within a specified engineering context. The portfolio structure and requirements will be defined in the assignment brief. In addition, students can deliver a short presentation to demonstrate and support their understanding of the principles, applications, and limitations of composite materials.

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 combines theoretical exploration with applied laboratory investigation to bridge conceptual understanding and professional competence. Students critically analyse data, test approaches, and evaluate outcomes in practical settings. Blended delivery through the Virtual Learning Environment supports flexibility and reflection. Tutorials focus on independent enquiry, innovation, and readiness for project or dissertation work.

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

Composite Materials Fundamentals:

Introduction to composite materials, examining structure–property–processing relationships and their influence on the performance of lightweight structures in engineering applications.

Composite Material Systems and Manufacturing:

Study of polymer, metal, and ceramic matrix composites, including reinforcement types, material properties, and manufacturing processes, with consideration of standards, procedures, and health and safety requirements.

Mechanical Performance and Material Selection:

Analysis of mechanical behaviour in composites, including strength, fatigue, creep, fracture, and durability, supported by materials selection methods and performance charts relevant to aerospace systems.

Testing and Characterisation of Composites:

Application of mechanical testing, data generation, and characterisation techniques, including destructive and non-destructive testing, to evaluate material suitability using technical literature and standards.

Environmental Impact of Composite Materials:

Evaluation of the environmental implications of composite production, use, and disposal, including lifecycle considerations and sustainability challenges.

Sustainable Design and Lifecycle Strategies:

Justification of approaches to minimise adverse environmental and societal impacts through material selection, design optimisation, and lifecycle extension strategies.

Indicative Bibliography

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

Essential Reads:

S. Rana and R. Figueiro, Eds., *Advanced Composite Materials for Aerospace Engineering: Processing, Properties and Applications*. Oxford, UK: Woodhead Publishing, 2016.

Other indicative reading:

M. F. Ashby, H. Shercliff, and D. Cebon, *Materials: Engineering, Science, Processing and Design*, 4th ed. Kidlington, Oxford, UK: Butterworth-Heinemann, Elsevier, 2019.

Institute of Materials, Minerals and Mining (IOM3), Materials education resources [Online]. Available: <https://www.iom3.org>.

W. D. Callister Jr. and D. G. Rethwisch, *Materials Science and Engineering: An Introduction*, 10th ed. Hoboken, NJ, USA: Wiley, 2018.

Administrative Information

For office use only	
Initial approval date	June 2026
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