Prifysgol Wrecsam
Wrexham University

Module specification

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Module Code	ENG4D1
Module Title	Engineering Materials and Processes
Level	4
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
FdEng Industrial Engineering (Mechanical) FdEng Industrial Engineering (Electrical) BEng (Hons) Mechanical Engineering with Manufacture BEng (Hons) Electrical Engineering with Manufacture BEng (Hons) Aerospace Engineering BEng (Hons) Mechanical Engineering BEng (Hons) Motorsport Engineering BEng (Hons) Electrical Engineering BEng (Hons) Renewable Energy Engineering	Core

Breakdown of module hours

Learning and teaching hours	18 hrs
Placement tutor support hours	0 hrs
Supervised learning hours e.g. practical classes, workshops	18 hrs
Project supervision hours	0 hrs
Active learning and teaching hours total	**36 hrs**
Placement hours	0 hrs
Guided independent study hours	164 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 equip students with the fundamental principles of engineering materials and manufacturing processes by introducing different types of materials, their properties and manufacturing processes, and to enable informed and sustainable material selection for real-world engineering applications.

Module Learning Outcomes

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

1	Classify the structure–property–processing relationships of engineering materials using engineering principles to solve simple materials related problems.
2	Select and evaluate technical literature and standards to inform material and manufacturing process selection for simple engineering scenarios.
3	Analyse a broadly defined problem to include the environmental and societal implications of material and process choices in engineering manufacture (AHEP-4 F2).

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

This assessment evaluates students' understanding of engineering materials and manufacturing processes through an evidence-based portfolio.
Students submit a structured digital portfolio developed from a range of activities, including laboratory experiments, material testing (e.g. tensile, compression, or flexural testing), and supporting analytical tasks.

The portfolio may demonstrate:

- understanding of material structure–property–processing relationships
- appropriate interpretation of experimental results
- use of relevant technical information and standards
- consideration of environmental and sustainability factors

The portfolio must include a representative range of activities and provide sufficient evidence of method, results, and interpretation to support academic judgement of achievement of the learning outcomes.

Assessment number	Learning Outcomes to be met	Type of assessment	Duration/Word Count	Weighting (%)	Alternative assessment, if applicable
1	1-3	Portfolio	2000	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 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

Types and properties of engineering materials:
Metals, polymers, ceramics, and an introduction to composite materials. Mechanical properties and behaviour under different loading conditions (tension, compression, shear, torsion, bending).

Structure–property–processing relationships:
Relationship between microstructure, properties, and performance. Effects of processing methods such as heat treatment, cold working, quenching, annealing, and surface treatments.

Manufacturing processes:
Overview of manufacturing techniques for metals, polymers, and ceramics, including forming, casting, and shaping processes.

Material selection and engineering applications:
Use of technical information, standards, and basic selection approaches to choose appropriate materials and processes for simple engineering scenarios.

Sustainability and environmental considerations:
Recycling, lifecycle considerations, and environmental impacts associated with materials and manufacturing processes.

Indicative Bibliography

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

Essential Reads:

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

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.

D. R. Askeland and P. P. Fulay, The Science and Engineering of Materials, 7th ed. Stamford, CT, USA: Cengage Learning, 2016.

D. R. Askeland, B. B. Wheatley and W. J. Wright, *The Science and Engineering of Materials*, 8th ed. Mason, OH: Cengage, 2026.

Administrative Information

For office use only	
Initial approval date	June 2026
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