Prifysgol Wrecsam
Wrexham University

Module specification

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Module Code	ENG6D9
Module Title	Hydrogen and Emerging Energy Technologies
Level	6
Credit value	20
Faculty	FACE
HECoS Code	100175
Cost Code	GAME
Pre-requisite module	N/A

Programmes in which module to be offered

Programme title	Core/Optional/Standalone
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 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' critical understanding of hydrogen technologies, alongside broader emerging energy systems, equipping them to analyse, evaluate, and design engineering solutions that support the transition towards net-zero energy systems.

Module Learning Outcomes

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

1	Critically evaluate hydrogen technologies and emerging energy solutions, assessing their technical, environmental, social, and economic performance (AHEP-4 C7).
2	Analyse, interpret, and critique experimental or simulated data related to hydrogen systems and emerging energy technologies to justify engineering decisions within professional contexts.
3	Develop and justify design-informed solutions for integrating hydrogen and emerging energy technologies into real-world applications, demonstrating awareness of system constraints, sociotechnical issues, sustainability requirements, and Net Zero pathways (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: Written Assessment

The assessment for this module comprises a comprehensive technical report designed to evaluate students' ability to apply engineering principles, analyse relevant data, and critically assess solutions within a defined technical context.

Assessment number	Learning Outcomes to be met	Type of assessment	Duration/Word Count	Weighting (%)	Alternative assessment, if applicable
1	1,2,3	Written Assignment	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

Hydrogen Pathways and Emerging Technologies: Critical comparison and analysis of hydrogen production routes (e.g. green, blue, turquoise, and white hydrogen) alongside a broad range of emerging energy technologies, including advanced electrolysis, methane pyrolysis, photochemical water splitting, biohydrogen, biomethane, fuel cells, efuels, ammonia, small modular nuclear, fusion, osmotic power, geothermal, photovoltaic, wind, tidal systems, and carbon capture, storage, and utilisation (CCUS).

Evaluation Frameworks and Impact Assessment: Application of economic, environmental, societal, and safety considerations, including lifecycle assessment (LCA), technology readiness levels (TRL), and risk-based evaluation approaches, to critically assess the suitability and maturity of hydrogen and emerging energy systems.

Performance Data Analysis and Method Selection: Appraisal and selection of appropriate analytical methods for scoping and evaluating performance data related to hydrogen and emerging energy technologies.

System Behaviour and Technoeconomic Evaluation: Analysis of real-world or case study scenarios to evaluate system performance, uncertainty, and technoeconomic sensitivity using modelling tools and data driven approaches.

Integration of Hydrogen and Emerging Technologies: Design and justification of engineering solutions integrating hydrogen and/or emerging technologies into applications such as transport systems, energy networks, industrial processes, and the built environment.

Scenario Modelling and Decision-making: Application of sociotechnical and technoeconomic analysis, including scenario modelling and time constrained decarbonisation strategies, to support informed and defensible engineering design decisions.

Indicative Bibliography

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

Essential Reads:

United Nations Framework Convention on Climate Change (UNFCCC), *Emerging Climate Technologies in the Energy Sector*, United Nations Association, 2021. [Online]. Available: https://unfccc.int/ttclear/tec/energysupplysector.html. Accessed: Apr. 27, 2026.

Other indicative reading:

Global Hydrogen Review, International Energy Agency (Annual Publication)

U.S. Department of Energy, *AI for Energy: Opportunities for a Modern Grid and Clean Energy Economy,* 2024. [Online]. Available: [insert URL]. Accessed: Apr. 27, 2026

Plus, various others to be signposted on Moodle.

Administrative Information

For office use only	
Initial approval date	June 2026
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Date and details of revision	
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