Prifysgol Wrecsam
Wrexham University

Module specification

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Module Code	ENG7A7
Module Title	Energy Systems Modelling & Simulation
Level	Level 7
Credit value	20
Faculty	FACE
HECoS Code	100162
Cost Code	GAME
Pre-requisite module	N/A

Programmes in which module to be offered

Programme title	Core/Optional/Standalone
MSc Engineering (Sustainable Energy)	Core

Breakdown of module hours

Learning and teaching hours	0 hrs
Placement tutor support hours	0 hrs
Supervised learning hours e.g. practical classes, workshops	36 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 delivers a fully immersive, research-intensive experience grounded in advanced laboratory or project activity. Learners exercise initiative and originality in tackling complex, unpredictable problems and in generating new insight within their field. The approach supports the development of professional competence, scholarly independence, and contribution to contemporary knowledge and practice.

This module aims to equip students with advanced skills to model, simulate, and analyse complex energy systems, integrating renewable technologies, optimisation techniques, and sustainability considerations.

Module Learning Outcomes

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

1	Develop and justify advanced modelling strategies for complex energy systems by integrating multiple theoretical frameworks (AHEP-4 M3).
2	Critically evaluate emerging computational and analytical modelling paradigms, proposing and defending methodological enhancements with respect to their limitations, based on current research and practical constraints (AHEP-4 M3).
3	Design and conduct simulation led investigations to explore complex scenarios, generating original, evidence grounded insights that inform strategic engineering decisions and system level optimisation.

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 complete a project to model, simulate, and optimise an integrated energy system, evaluate its technical, economic, and environmental performance, and present their findings.

Assessment number	Learning Outcomes to be met	Type of assessment	Duration/Word Count	Weighting (%)	Alternative assessment, if applicable
1	1-3	Portfolio	4000	100	N/A

Derogations

Credits shall be awarded by an Assessment Board for those modules in which a mark of at least 50% has been achieved, with a minimum mark of 40% in each element of assessment.

Learning and Teaching Strategies

Learning is fully practice-led, with students engaging in intensive, research-oriented investigation and advanced technical application. Study is characterised by autonomy, originality, and critical evaluation of real-world or experimental problems. Virtual tools and recorded resources facilitate reflective practice, while individual supervision ensures professional competence and contribution to knowledge creation.

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

- Apply advanced computational tools and techniques to simulate and analyse the behaviour of complex energy systems under dynamic and uncertain operating conditions.
- Critically evaluate system performance and rigorously validate models against real-world operational and experimental data.
- Design and develop optimisation models to enhance efficiency, reliability, and the integration of renewable energy within complex energy systems.
- Critically assess and manage trade-offs between technical performance, economic viability, and environmental sustainability in energy system design and operation.
- Systematically evaluate the sustainability, cost-effectiveness, and performance implications of strategic energy system decisions using advanced analytical frameworks.

Indicative Bibliography

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

Essential Reads:

[1] H. Chen, H. Yan, and G. He, Integrated Energy System Modeling and Simulation. Singapore: Springer, 2025

Other indicative reading:

Administrative Information

For office use only	
Initial approval date	June 2026
With effect from date	September 2026
Date and details of revision	
Version number	1