Prifysgol Wrecsam
Wrexham University

Module specification

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Module Code	ENG6C7
Module Title	Electrical Modelling and Simulation
Level	6
Credit value	20
Faculty	FACE
HECoS Code	100164
Cost Code	GAME
Pre-requisite module	N/A

Programmes in which module to be offered

Programme title	Core/Optional/Standalone
BEng (Hons) Industrial Engineering (Electrical) BEng (Hons) Electrical Engineering with Manufacture BEng (Hons) Electrical Engineering	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 immerses students in a fully applied environment where knowledge is demonstrated through independent investigation and experimentation. Learners plan, implement, and analyse practical work to address defined challenges, showing mastery of specialist techniques. The approach promotes innovation, professional integrity, and confidence in leading complex projects.

This module aims to equip students with the knowledge and skills required to model and simulate complex electrical systems using advanced computational tools, enabling them to analyse performance, optimise system behaviour, and develop innovative solutions for real-world engineering applications.

Module Learning Outcomes

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

1	Construct and validate models of industrial electrical systems using mathematical techniques, demonstrating accuracy and relevance to real-world applications (AHEP-4 C1, C3).
2	Evaluate and justify the selection of computational and analytical techniques for modelling and simulation, recognising limitations and proposing improvements (AHEP-4 C3).
3	Critically interpret and integrate simulation outputs to develop evidence-based recommendations for optimising the performance of industrial electrical systems, demonstrating professional judgement and consideration of practical constraints.

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 technical portfolio demonstrating the modelling and simulation of electrical systems using industry-standard computational tools. The portfolio will include system design, implementation and programming, simulation outputs, and a critical evaluation of modelling assumptions and computational trade-offs.

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 is fully immersive and practice-driven, requiring students to apply advanced knowledge through sustained experimental and investigative work. Independent planning, execution, and analysis of complex tasks are central to study. Digital learning tools support data handling and reflection, while supervision ensures critical engagement and alignment with professional and research standards.

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

Electrical System Modelling Principles:
Development of modelling frameworks and system representations for complex electrical networks, ensuring models accurately reflect real-world industrial systems.

Transfer Functions and State-Space Representation:
Application of advanced mathematical methods, including transfer functions and state-space models, to construct and validate dynamic system models.

Frequency Response and Stability Analysis:
Application and evaluation of frequency-domain techniques to analyse system behaviour, assess stability, and inform the selection of appropriate modelling approaches.

Method Selection and Analytical Justification:
Critical evaluation of computational and analytical methods, recognising their limitations and identifying opportunities for refinement and improvement.

Numerical Methods for Time-Domain Simulation:
Application of numerical algorithms to solve differential equations and simulate transient system behaviour, supporting accurate performance analysis.

Interpretation and Performance Optimisation:
Critical interpretation of simulation results to generate evidence-based recommendations for improving system performance, considering practical constraints and professional engineering judgement.

Indicative Bibliography

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

Essential Reads:

R. S. Esfandiari and B. Lu, *Modelling and Analysis of Dynamic Systems*, 3rd ed. Boca Raton, FL, USA: CRC Press, 2018.

Other indicative reading:

A. Iqbal, S. Moinoddin, and B. P. Reddy, *Electrical Machine Fundamentals with Numerical Simulation Using MATLAB/Simulink*. Hoboken, NJ, USA: Wiley, 2021.

Administrative Information

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