Prifysgol Wrecsam
Wrexham University

Module specification

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Module Code	ENG7A6
Module Title	Electrical Systems Modelling & Simulation
Level	Level 7
Credit value	20
Faculty	FACE
HECoS Code	100160
Cost Code	GAME
Pre-requisite module	N/A

Programmes in which module to be offered

Programme title	Core/Optional/Standalone
MSc Engineering (Electrical)	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 develop students' ability to model, simulate, and critically evaluate advanced electrical systems using computational and analytical techniques that reflect modern industrial practice and emerging engineering challenges.

Module Learning Outcomes

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

1	Develop and justify advanced modelling strategies for complex electrical systems by integrating multiple theoretical frameworks and addressing uncertainty, nonlinearity, and multi-domain interactions (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:

Coursework

Students will produce a technical report demonstrating their ability to design advanced models, critically evaluate modelling techniques, and conduct simulation-based investigations that address the module's learning outcomes.

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

- Mathematical Foundations of Electrical System Modelling
  Introduces core mathematical methods for formulating electrical system models.
- Modelling of Linear and Non-Linear Electrical Systems
  Covers modelling approaches for linear and nonlinear electrical behaviours.
- Computational Methods for Electrical System Simulation
  Outlines key numerical techniques used to simulate dynamic electrical systems
- Electromechanical and Power-Electronic System Representation
  Explores modelling of electromechanical devices and power-electronic converters.
- Uncertainty, Sensitivity, and Parameter Identification
  Introduces methods for handling uncertainty and determining model parameters.
- Simulation-Driven Performance Evaluation
  Using simulation outputs to assess and optimise electrical system behaviour.

Indicative Bibliography

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

Essential Reads:

Esfandiari, R.S. and Lu, B. (2014) Modeling and Analysis of Dynamic Systems. 2nd ed. CRC Press. Available at: https://ia800809.us.archive.org/25/items/CambridgeInternationalASAndALevelMathematicsPureMathematics1/Second_Edition_Modeling_and_Analysis_of.pdf

Other indicative reading:

Iqbal, A., Moinoddin, S. and Reddy, B.P. (2021) Electrical Machine Fundamentals with Numerical Simulation Using MATLAB/Simulink. Wiley.

MathWorks (no date) Electrical Systems – MATLAB & Simulink Documentation Examples. Available at: https://uk.mathworks.com/help/simscape/electrical-systems.html

Plus, various others to be signposted on Moodle.

Administrative Information

For office use only	
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Date and details of revision	
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