Module Specification

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Module Code	ENG778
Module Title	Electrical and Electronic Engineering Systems Modelling and Simulations
Level	Level 7
Credit value	20
Faculty	FAST
HECoS Code	101027
Cost Code	GAME

Programmes in which module to be offered

Programme title	Is the module core or option for this programme
MSc Engineering (Electrical and Electronic Engineering) MSc Engineering (Electrical and Electronic Engineering) with Advanced Practice MEng Electrical & Electronic Engineering	Core
MSc Engineering (Renewable & Sustainable Energy) MSc Engineering (Renewable & Sustainable Energy) with Advanced Practice MSc Engineering (Management) MSc Engineering (Management) with Advanced Practice MEng Renewable & Sustainable Engineering	Optional

Pre-requisites

None

Breakdown of module hours

Learning and teaching hours	3 hrs
Placement tutor support	0 hrs
Supervised learning e.g., practical classes, workshops	18 hrs
Project supervision (level 6 projects and dissertation modules only)	0 hrs
Total active learning and teaching hours	**21** hrs
Placement / work-based learning	0 hrs
Guided independent study	179 hrs
Module duration (total hours)	200 hrs

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Initial approval date	22nd Aug 2022
With effect from date	Sept 2022
Date and details of revision	
Version number	1

Module aims

- To develop an understanding of the analytical skills and knowledge required in the engineering design process and how it can be improved using engineering modelling and simulations.
- To develop industry-standard software techniques to model and solve specific engineering problems using engineering software (MATLAB + Simulink and ANSYS Workbench).

Module Learning Outcomes - at the end of this module, students will be able to:

In addition, to the module learning outcomes, student will also cover the following accreditation of higher education programme (AHEP) fourth edition learning outcomes: **M1, M2** & **M3**

1	Apply computer modelling and analysis to the solutions of practical electrical and electronic design problems.
2	Apply and identify the key stages associated with utilising design specifications and parameters in performing simulation-based modelling and characterisation of electrical and electronic engineering systems.
3	Demonstrate proficiency in the use of and an ability to produce representative models of electrical and electronic engineering systems with proprietary numerical modelling tools or platforms.

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 One: An individual report in which interpretation, specification and implementation of physical systems and real-world electrical and electronic engineering design challenges are to be analysed through model-based design, computer modelling and simulations. Assessment one is a written coursework (5000 words) and represents 100% of the overall mark.

Assessment number	Learning Outcomes to be met	Type of assessment	Weighting (%)
1	1-3	Coursework	100%

Derogations

Credits shall be awarded by an assessment board for those Level 7 modules in which an overall mark of at least 50% has been achieved with a minimum mark of 40% in each assessment element.

Learning and Teaching Strategies

The module will be delivered mainly through lead lectures and student-driven investigative work. It is assumed that the student will have an engineering background and have previously acquired knowledge of engineering mathematics, control theory and circuit theory. The study time will be made up of formal lectures, tutorials, and individual investigative studies; but also, with access to computer laboratory facilities for directed activities. It is expected that the student will regularly access analytical and dynamic software (MATLAB + Simulink and Ansys Workbench) to develop familiarity, understanding and skills as directed by the lecturer. Detailed software tutorial guides will be issued with problems and solutions that will form a foundation for students' subsequent problem-based learning activities. Problems, without tutorial instruction, will then require the student to explore the capabilities of the software. This initial familiarization will equip the student with the skills necessary to complete any numerical and model-based analysis as required for the coursework.

This module will also follow the ALF (Active Learning Framework) guidelines, which will include alternative methods of assessment and a blended approach to delivery, with some theory and software sessions being delivered online (depending on requirements and student experience).

Indicative Syllabus Outline

- Introduction to Engineering Systems Modelling and Simulations.
- Analysing Physical Systems Using Ordinary Differential Equations.
- Analysing Physical Systems Using Laplace Transform.
    - Low Pass Filter.
    - High Pass Filter.
- Analysing Physical Systems Using Z-Transform,
    - Discrete Filter.
    - Moving Average Filter
- Regulation and Control of Physical Systems
    - Proportional-Integral-Derivative (PID) Controller for Real-world Applications in Electrical and Electronic Engineering Systems.
- Introduction to ANSYS Workbench.
    - Modelling, Analysis and Characterization of a Simply Supported Heated Beam for Potential Applications in Electrical and Electronic Engineering Systems.

Indicative Bibliography:

Essential Reads

C. P. Lopez, *MATLAB Control Systems Engineering,* Apress, 2014.

Other indicative reading

S. K. Mitra, *Digital Signal Processing,* 3rd ed. McGraw-Hill, 2012.

W. J. Palm, *Introduction to MATLAB for Engineers,* 3rd ed. Mc Graw-Hill, 2011.

C. P. Lopez, *MATLAB Differential Equations,* Apress, 2014.

H. Moore, *MATLAB for Engineers,* 3rd ed. Pearson, 2012.

Plus, various others to be signposted on Moodle.

Employability skills – the Glyndŵr Graduate

Each module and programme is designed to cover core Glyndŵr Graduate Attributes with the aim that each Graduate will leave Glyndŵr having achieved key employability skills as part of their study. The following attributes will be covered within this module either through the content or as part of the assessment. The programme is designed to cover all attributes and each module may cover different areas.

Core Attributes
Engaged
Creative

Key Attitudes
Commitment
Curiosity
Resilience
Confidence
Adaptability

Practical Skillsets
Digital Fluency
Organisation
Critical Thinking
Communication