Module Specification

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Module Code	ENG777
Module Title	Mechanical 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 (Aeronautical) MSc Engineering (Aeronautical) with Advanced Practice MSc Engineering (Mechanical Manufacture) MSc Engineering (Mechanical Manufacture) with Advanced Practice MSc Engineering (Automotive) MSc Engineering (Automotive) with Advanced Practice MEng Aeronautical Engineering MEng Mechanical Engineering MEng Automotive 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

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

Module aims

- To build upon analytical skills and knowledge of the engineering design process and how it can be improved using advanced engineering systems modelling and simulations.
- To be able to perform in depth analysis of systems and data using currently available programme specific modelling, simulation, and analysis software (ANSYS).

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

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

1	Apply advanced modelling and analysis to the solutions of practical and complex design problems.
2	Define the key stages associated with utilising design parameters in performing advanced modelling.
3	Demonstrate a proficiency in the use of and an ability to produce representative models with proprietary numerical modelling.

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 an engineering system is to be analysed through computer modelling simulation. 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 fluid mechanic system modelling. The study time will be made up from formal lectures, tutorials, and individual study; but also, with access to computer laboratory facilities for directed activities. It is expected that the student will regularly access analytical and dynamic software to develop familiarity, understanding and skills as directed by the lecturer. Detailed software tutorial guides will be issued with problems and solutions which will form a foundation for the students' subsequent problem-based learning activities. Problems, without tutorial instruction, will then require the student to explore the capabilities of the software. This initial familiarisation will equip the student with the skills necessary to complete any numerical analyses as required in assignment work.

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 numerical analysis techniques using ANSYS Workbench, ANSYS Design Modeller, ANSYS Meshing, ANSYS Fluent, ANSYS Steady State Thermal, and ANSYS Static Structural.
- Computational Fluid Dynamics (CFD) modelling strategies and techniques, such as modelling issues, errors, use of symmetry, convergence issues, mesh generation and refinement.
- Fluid Structural Interaction (FSI) using solved output parameters for input boundary conditions on a 1-way FSI coupling.
- Heat transfer, boundary layer, flows in typical complicated geometries
- Modelling of static structural analysis using Finite Element Analysis (FEA)

Indicative Bibliography:

Essential Reads

J.H. Ferziger, and M. Peric, *Computational Methods for Fluid Dynamics.* 3rd ed. Springer, 2004.

Other indicative reading

S. B. Pope, *Turbulent Flow.* Cambridge: University Press, 2000.

P. Riley, *Computer Aided Engineering.* International Business Press, 2000.

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