Module Specification

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Module Code	ENG6A5
Module Title	Mechanical Engineering Modelling and Simulations
Level	Level 6
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
BEng (Hons) Aeronautical Engineering BEng (Hons) Aeronautical and Mechanical Engineering BEng (Hons) Automotive Engineering BEng (Hons) Mechanical Engineering MEng Aeronautical Engineering MEng Automotive Engineering MEng Mechanical Engineering BEng (Hons) Industrial Engineering (Mechanical) Level 6 Top-up BEng (Hons) Industrial Engineering Design (Mechanical)	Core
BEng (Hons) Renewable & Sustainable Engineering MEng Renewable & Sustainable Engineering	Optional

Pre-requisites

None

Breakdown of module hours

Learning and teaching hours	4 hrs
Placement tutor support	0 hrs
Supervised learning e.g., practical classes, workshops	20 hrs
Project supervision (level 6 projects and dissertation modules only)	0 hrs
Total active learning and teaching hours	**24** hrs
Placement / work-based learning	0 hrs
Guided independent study	176 hrs

Module duration (total hours)	200 hrs

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Initial approval date	22nd Aug 2022
With effect from date	Sept 22
Date and details of revision	Addition of BEng (Hons) Aero and Mechanical Engineering
Version number	2

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 currently available programme ANSYS

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

1	Critically evaluate the key stages associated with utilising design parameters in performing complex computer modelling.
2	Demonstrate a proficiency in the use of and an ability to produce representative models with proprietary numerical modelling.
3	Evaluate advanced modelling and analysis techniques for the solution of practical and complex design problems.

In addition, to the module learning outcomes, student will also cover the following accreditation of higher education programme (AEPH) fourth edition learning outcomes: C2, C3, C4 & C6 for BEng programmes and B2, B3, B4 & B6 for BEng Industrial Engineering (Mechanical) level 6 top-up programme.

Assessment

Indicative Assessment Tasks:

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 assignment (4000 words) and represents 100% of the overall mark.

Assessment number	Learning Outcomes to be met	Type of assessment	Weighting (%)
1	1, 2, 3	Coursework	100

Derogations

A derogation from regulations has been approved for this programme which means that whilst the pass mark is 40% overall, each element of assessment (where there is more than one assessment) requires a minimum mark of 30%.

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.
- Modelling of static structural analysis using Finite Element Analysis (FEA)

Indicative Bibliography:

Essential Reads

J. Ferziger, and M. Peric*, Computational Methods for Fluid Dynamics.* Springer, 2020.

Other indicative reading

S. Pope*, Turbulent Flows.* 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