Module specification

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Module Code	ENG537
Module Title	Further Engineering Mathematics
Level	5
Credit value	20
Faculty	FAST
HECoS Code	100403
Cost Code	GAME

Programmes in which module to be offered

Programme title	Is the module core or option for this programme
BEng / MEng Aeronautical Engineering	Core
BEng / MEng Automotive Engineering	Core
BEng / MEng Electrical and Electronic Eng	Core
BEng / MEng Renewable Energy and Sustainable Engineering	Core
BEng / MEng Mechanical Engineering	Core
Engineering Summer School	Stand-alone
BEng Industrial Engineering Design (Mechanical)	Core
BEng Industrial Engineering Design (Electrical)	Core
BEng Production Engineering	Core
BEng Low Carbon Energy, Efficiency and Sustainable Engineering	Core
FdEng Industrial Engineering (Mechanical)	Core
FdEng Industrial Engineering (Electrical)	Core

Pre-requisites

None

Breakdown of module hours

Learning and teaching hours	42hrs
Placement tutor support	0 hrs
Supervised learning e.g. practical classes, workshops	0hrs
Project supervision (level 6 projects and dissertation modules only)	0 hrs
Total active learning and teaching hours	42 hrs
Placement / work-based learning	0 hrs

Learning and teaching hours	42hrs
Guided independent study	158 hrs
Module duration (total hours)	200 hrs

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Initial approval date	Feb 2017
With effect from date	September 2022
Date and details of revision	Aug 2022: Module learning outcomes and assessment update in Engineering revalidation March 25 AM2 to change assessment type and increase teaching hours. Addition to FdEng and Degree Apprenticeship programme titles
Version number	3

Module aims

- To further develop knowledge of functions suitable for solving a range of mathematical and engineering problems
- To demonstrate a repertoire of problem-solving skills and an ability to generalise and transfer ideas, appropriate to engineering applications of mathematical concepts, including by means of mathematical modelling software.

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

1	Solve differential equations (linear second order and partials) Apply mathematical methods of Laplace transform theory to solve engineering problems.
2	Use partial differentiation for analysing functions of two and more variables.
3	Manipulate linear algebra involving matrices, determinants, and their applications.
4	Use statistical methods to collect and analyse data for experimental work including the use of probability to predict performance.
5	Use mathematical modelling software (such as MATLAB etc.) to apply mathematical techniques in solving engineering problems.

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: is by means of a 2-hour examination covering outcomes 2,3,4 . It is an unseen time-constrained one with a fixed number of questions at the end of the trimester.

Assessment Two: is by means of a 2000 word coursework covering outcomes 1 and 5, utilising software to model mathematical problems

Assessment number	Learning Outcomes to be met	Type of assessment	Weighting (%)
1	2,3,4	Examination	50%
2	1, 5	Coursework	50%

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 presented to students through lectures and tutorials. An active and inclusive approach is used to engage learners in the topics and will involve individual, group work and flipped learning experiences aligned to the university's Active Learning Framework (ALF). The approach offers students a flexible and adaptive learning experience that can accommodate a range of options that includes both on campus learning and remote learning where appropriate.

The Moodle VLE and other on-line materials and resources will be available to support learning. ALF offers a balance between the classroom elements and digitally enabled activity incorporating flexible and accessible resources and flexible and accessible feedback to support learning.

Tutorials – Close interaction with students ensuring that the work presented during lectures has been understood, with specific help being given in order to overcome any learning problems, should they occur.

Indicative Syllabus Outline

Second Order Differential Equations with Constant Coefficients: Method of undetermined coefficients for finding particular integrals.

Laplace Transforms: The Laplace transform and its existence, standard functions and use of look-up tables. Use of Laplace transforms in solving simple ODEs with constant coefficients and given boundary conditions.

Partial differentiation: Partial differentiation rules, total differentials, and partial fractions. Minimum, maximum and saddle points of functions of 2 independent variables.

Partial Differential Equations: Methods of direct integration and separation of variables. Initial and boundary value problems.

Linear Algebra: Matrices and their properties, manipulation and applications, involving determinants, inverses, Gaussian elimination. Applications to systems of first order differential equations.

Probability and Statistics: Presentation of statistical data; mean, median and mode for grouped data; standard deviation. The binomial and Poisson distributions.

Software: Mathematical modelling software to support other elements of this module, emphasising potential as an analytical tool.

Indicative Bibliography:

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

Essential Reads

J. Bird, *Bird's Higher Engineering Mathematics*, 9th ed. Routledge, 2021.

Other indicative reading

K.A. Stroud, *Advanced Engineering Mathematics*, 6th ed. Red Globe Press, 2020.

S. Attaway, *Matlab: A Practical Introduction to Programming and Problem Solvin*g, 6th ed. Oxford: Butterworth-Heinemann, 2022.

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
Enterprising
Creative
Ethical

Key Attitudes

Commitment
Curiosity
Resilience
Confidence
Adaptability

Practical Skillsets

Digital Fluency
Organisation
Leadership and Team working
Critical Thinking

Emotional Intelligence
Communication