Module Specification

Engineering Mathematics

Version: 2023-24, v5.0, 11 May 2023

Contents

Part 1: Information

Module title: Engineering Mathematics

Module code: UFMFJ9-30-1

Level: Level 4

For implementation from: 2023-24

UWE credit rating: 30

ECTS credit rating: 15

Faculty: Faculty of Environment & Technology

Department: FET Dept of Engineering Design & Mathematics

Partner institutions: None

Field: Engineering, Design and Mathematics

Module type: Module

Pre-requisites: None

Excluded combinations: None

Co-requisites: None

Continuing professional development: No

Professional, statutory or regulatory body requirements: None

Part 2: Description

Overview: Not applicable

Features: Not applicable

Educational aims: Knowledge of a range of mathematical tools which are used to synthesise, analyse and evaluate different engineering situations is fundamental to engineering. The student is introduced to a range of basic mathematical tools which are required and developed in later modules.

Outline syllabus: Algebra and Functions
Dimensions of physical quantities, revision of standard engineering functions such as polynomials, rational functions, partial fractions, exponential and logarithmic functions and trigonometric functions.

Complex Numbers: Roots of polynomial equations, basic algebraic operations, rectangular, polar and exponential forms, Argand diagram, principal branch, Euler's formula, De Moivre's theorem.

Matrix and Vector Algebra: Properties of matrices and determinants, the inverse matrix, Gaussian elimination, applications to systems of linear equations. Vector and scalar quantities, resolution of forces, properties of vector quantities, vector addition, unit vectors, position vectors, scalar product, vector product. Eigenvalues and eigenvectors.

Calculus
Differential Calculus: Concept of a limit, revision of standard derivatives, linear properties, product rule, quotient rule and chain rule. Higher order derivatives, classification of turning points, parametric differentiation. Sequences and Series, Binomial theorem, MacLaurin series and Taylor series expansions.

Integral Calculus: Revision of standard integrals, indefinite and definite integration, integration by parts, applications of the definite integral such as finding the average value of a function, root mean square calculations, centre of mass and moments of inertia.

Solution of Differential Equations: Modelling of simple systems, solution of first and second order linear constant co-efficient ordinary differential equations, natural and forced response; applications such as cooling problems, mechanical and electrical dynamical systems.

Laplace Transforms: definition, manipulation, standard transforms, inverse transform, solution of linear differential equations.

Computing Methods
Introduction to numerical methods: time-step approach to dynamics problems. Using (for example) Matlab as a tool for engineering analysis, command line, m-files, functions.

Programming structure, “if/then” commands, for loops.
Using software to solve differential equations.

Part 3: Teaching and learning methods

Teaching and learning methods: Scheduled teaching hours will take the form of:

Whole group lectures, used to deliver new material and to consolidate previous material

Small-group tutorials, with activities designed to enhance the understanding of the material delivered in the lectures and to apply the skills and knowledge learned from the lectures. These will also include practical sessions to work on PC’s where this is appropriate.

Scheduled classes: 84 hours

Assimilation and development of knowledge: 140 hours

Coursework preparation: 36 hours

Examination preparation: 40 hours

TOTAL: 300 HOURS

The module is delivered by means of lectures and tutorials or workshops. To prepare for assessment, students will be expected to undertake self-directed learning in addition to the directed learning which supports taught classes.

Module Learning outcomes: On successful completion of this module students will achieve the following learning outcomes.

MO1 Demonstrate understanding and competency with respect to a range of algebra and functions mathematical techniques which are the basis of the mathematics required in engineering

MO2 Demonstrate understanding and competency with respect to a range of calculus mathematical techniques which are the basis of the mathematics required in engineering

MO3 Demonstrate understanding and competency with respect to a range of mathematical techniques required in the solution of differential equations which are required when analysing engineering problems.

MO4 Design and implement simple numerical algorithms to demonstrate competence in the use of computer software to analyse and solve engineering problems including the writing of simple programs

Hours to be allocated: 300

Contact hours:

Independent study/self-guided study = 216 hours

Face-to-face learning = 84 hours

Total = 300

Reading list: The reading list for this module can be accessed at readinglists.uwe.ac.uk via the following link https://uwe.rl.talis.com/modules/ufmfj9-30-1.html

Part 4: Assessment

Assessment strategy: The examinations are summative and assess the students' understanding of concepts and techniques, and their ability to apply them in relatively straightforward problems.

The coursework (written assignment) is both summative and formative. The

computer-based tests (online assignment) assess competency with the mathematical methods taught in the course. Feedback from the coursework is intended to assist students to prepare for the end-of-year examination. The assignment will assess understanding of numerical techniques and competency at writing and implementing software code and as a solution method.

The resit assessment repeats the same pattern as given in sit exam.

The GCET delivery of this exam is a 2 hour face-to-face/invigilated exam. It was agreed that GCET can deliver the exam in a different way to UWE for in-country reasons.

Assessment tasks:

Examination (Online) (First Sit)
Description: Online Written examination (24 hours)
Weighting: 50 %
Final assessment: Yes
Group work: No
Learning outcomes tested: MO1, MO2, MO3

Written Assignment (First Sit)
Description: MATLAB Assignment
Weighting: 25 %
Final assessment: No
Group work: No
Learning outcomes tested: MO1, MO2, MO3, MO4

Online Assignment (First Sit)
Description: E-assessment tests (1 hour)
Weighting: 25 %
Final assessment: No
Group work: No
Learning outcomes tested: MO1, MO2, MO3, MO4

Examination (Online) (Resit)

Description: Online Written examination (24 hours)

Weighting: 50 %

Final assessment: Yes

Group work: No

Learning outcomes tested: MO1, MO2, MO3

Written Assignment (Resit)

Description: MATLAB Assignment

Weighting: 25 %

Final assessment: No

Group work: No

Learning outcomes tested: MO1, MO2, MO3, MO4

Online Assignment (Resit)

Description: E-assessment tests (1 hour)

Weighting: 25 %

Final assessment: No

Group work: No

Learning outcomes tested: MO1, MO2, MO3

Part 5: Contributes towards

This module contributes towards the following programmes of study:

Mechanical Engineering [UCS] FdSc 2023-24

Mechanical Engineering [Gloscoll] FdSc 2023-24

Mechatronics [UCS] FdSc 2023-24

Mechatronics [GlosColl] FdSc 2023-24

Mechanical Engineering and Technology (Manufacturing) {Foundation} [GCET] BEng (Hons) 2022-23

Mechanical Engineering and Technology (Vehicle Technology) {Foundation} [GCET] BEng (Hons) 2022-23

Mechanical Engineering and Technology (Mechatronics) {Foundation} [GCET] BEng (Hons) 2022-23

Mechanical Engineering and Technology {Foundation} [GCET] BEng (Hons) 2022-23

Instrumentation and Control Engineering {Foundation} [GCET] BEng (Hons) 2022-23

Electronics and Telecommunication Engineering {Foundation} [GCET] BEng (Hons) 2022-23

Automation and Robotics Engineering {Foundation} [GCET] BEng (Hons) 2022-23

Instrumentation and Control Engineering {Foundation} [Feb][PT][GCET][8yrs] BEng (Hons) 2021-22

Instrumentation and Control Engineering {Foundation} [Oct][PT][GCET][8yrs] BEng (Hons) 2021-22