Liverpool John Moores University

Title:	ENGINEERING MATHEMATICS
Status:	Definitive
Code:	**4500ICBTEG** (127008)
Version Start Date:	01-08-2021
Owning School/Faculty:	Engineering
Teaching School/Faculty:	ICBT, Colombo

Team	Leader
Alison Cotgrave	Y

Academic Level:	FHEQ4	**Credit Value:**	15	**Total Delivered Hours:**	62
Total Learning Hours:	150	**Private Study:**	88		

Delivery Options
Course typically offered: S2 and Non Std S2 (S2 for Jan)

Component	Contact Hours
Lecture	45
Tutorial	15

Grading Basis: 40 %

Assessment Details

Category	Short Description	Description	Weighting (%)	Exam Duration
Exam	AS1	Exam	70	2
Essay	AS2	Coursework (1500 words)	30	

Aims

This module will provide the analytical knowledge and techniques needed to carry out a range of engineering tasks and will provide a base for further study of engineering mathematics.

Learning Outcomes

After completing the module the student should be able to:

1	Apply the principles of differential equations and partial differentiation to solve problems in Engineering.
2	Evaluate Grad, Div, Curl, line integrals and double integrals.
3	Evaluate simple Laplace transforms and their inverses using tables with application to initial value problems.
4	Demonstrate the knowledge of differential equations and mathematical modelling of physical systems and simulation using MATLAB and Simulink.

Learning Outcomes of Assessments

The assessment item list is assessed via the learning outcomes listed:

Exam	2	3
Essay	1	4

Outline Syllabus

Basic algebra: transposition, simplification, quadratic equations, simultaneous equations.

Basic trigonometry: functions sin, cos, tan, inverses, sec, cosec, cot; identities, Rsin (x+a).

Basic calculus: Derivative as slope and rate of change, standard derivatives; product, quotient and function of a function rules; integration as reverse of differentiation, standard integrals, area under a curve; differential equations and solution by direct integration.

Complex numbers: addition, subtraction, multiplication, complex conjugate and division in algebraic form. The Argand diagram. Polar form and exponential form, with multiplication and division. De Moivre's theorem (powers and roots). Locus problems.

Calculus: Implicit, parametric and logarithmic differentiation. Maxima and minima. McLaurin's series. Partial differentiation, first order change, analysis of errors, method of least squares. Integration techniques (substitution, partial fractions, by parts) and simple applications of integration.

Matrices and Determinants: second and third order determinants, evaluation, properties, Cramer's Rule for solution of simultaneous equations; matrices, addition, subtraction, multiplication, transpose, inverse (via adjoint), solution of simultaneous linear equations by matrix inversion.

Vectors: sum, difference, magnitude, components, Cartesian representation in three dimensions; scalar and vector products, application to simple geometrical and physical problems.

Differential Equations: solution of first order by separation of variables and integrating factor; second order with constant coefficients, auxiliary equation, complementary function, particular integral by substitution (including snag case), application to, for example, mass-spring-damper and / or L-C-R circuits.

Learning Activities

Students will be supported in their learning, to achieve the above learning outcomes, in the following ways:

Mathematical and analytical skills are acquired through lectures, seminars, tutorials and group work.

Lecture notes and module guide in the form of comprehensive guidance notes; include theory examples and Q&A will guide to achieve the outcome.

MATLAB computer simulation used to simulate the mathematical function to cover all the learning outcomes.

Notes

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