Liverpool John Moores University

Title: ENGINEERING MATHEMATICS
Status: Definitive
Code: **4000ME**   (115875)
Version Start Date: 01-08-2016

Owning School/Faculty: Maritime and Mechanical Engineering
Teaching School/Faculty: Maritime and Mechanical Engineering

Team	Leader
Ian Jones	Y

Academic Level:	FHEQ4	**Credit Value:**	20	**Total Delivered Hours:**	68
Total Learning Hours:	200	**Private Study:**	132		

Delivery Options
Course typically offered: Standard Year Long

Component	Contact Hours
Lecture	32
Practical	36

Grading Basis: 40 %

Assessment Details

Category	Short Description	Description	Weighting (%)	Exam Duration
Test	AS1	Examination online using Mapleta	50	2
Test	AS2	Coursework - weekly online coursework delivered using Mapleta software	50	

Aims

To provide a foundation in engineering mathematics for its application to the solution of engineering problems

Learning Outcomes

After completing the module the student should be able to:

1	Use basic algebraic manipulations in the solution of engineering problems
2	Use basic mathematical functions in the solution of engineering problems
3	Use basic complex numbers in the solution of engineering problems
4	Apply techniques in differentiation and integration to the solution of engineering problems
5	Use vectors and matrices in the solution of engineering problems
6	Solve first order ordinary differential equations by the method of separation of variables and apply to the modelling of engineering problems
7	Use and apply mathematical software to the solution of engineering mathematics problems

Learning Outcomes of Assessments

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

Examination online using Maple	1	2	3	4	5	6	7
weekly online coursework deliv	1	2	3	4	5	6	7

Outline Syllabus

Introduction of the use of a computer algebra system e.g. MATHCAD. Use of the software applied to the syllabus items below

Revision of basic algebraic techniques:
Substitution, simplification, factorisation, indices, evaluation and transposition of formulae, fractions and partial fractions. Linear and quadratic equations, linear simultaneous equations.

Revision of elementary coordinate geometry: Distance between two points, the straight line, simple polynomial curves.

Functions: Notation, types of function, composite and inverse, graphs.

Trigonometry: Angles and circular measure. Trigonometric ratios for right-angled triangles. Sine and cosine rules. Trigonometric functions and their graphs, simple trigonometric identities and equations.

Exponential function: Properties and graph. Natural logarithm as inverse of exponential function, graph and properties. Definitions and calculation of hyperbolic functions including inverse functions.

Complex numbers: Complex arithmetic, complex conjugate, Argand diagram. Rectangular, polar forms. Magnitude and phase. Very basic treatment of Euler's formula.

Differential calculus of one variable: Gradient of curve, derivatives of standard

functions, linearity, derivatives of composite functions, products and quotients. Applications. Stationary points. Rates of change.

Integral calculus as inverse of differentiation and as a limit of a sum. Standard integrals, linearity, integration of composite functions. Other methods of integration. Numerical integration.

Basic vector algebra including Cartesian components and products. Differentiation of vectors. Applications.

Basic matrix manipulation including the inverse matrix. Solution of systems of linear equations.

Ordinary differential equations. First order linear, constant coefficient equations. Separation of variables. Application to modelling

Learning Activities

A combination of lectures and computer laboratory based tutorials. The laboratories will enable students to use and apply mathematical software to the solution of engineering mathematics problems.

Notes

This module provides a foundation in engineering mathematics for level one students in mechanical, electrical and civil engineering.
For each topic area of the syllabus, relevant commands will be given for application of a symbolic algebra package, e.g. Mathcad to harder problems.
Coursework assessment will be through online questions delivered using the Mapleta software. The examination will be online also delivered using the Mapleta software. Examinees will have access to the same symbolic mathematical software used in the module eg. Mathcad