Liverpool John Moores University

Title:	Engineering Mathematics
Status:	Definitive
Code:	**4553SAM** (122672)
Version Start Date:	01-08-2020

Owning School/Faculty: Engineering
Teaching School/Faculty: Springdale Academy Of Maritime Education (SAMET)

Team	Leader
Geraint Phylip-Jones	Y

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

Delivery Options
Course typically offered: Runs Twice - S1 & S2

Component	Contact Hours
Lecture	44
Tutorial	22

Grading Basis: 40 %

Assessment Details

Category	Short Description	Description	Weighting (%)	Exam Duration
Test	AS1	Series of online assessment pertinent to each LO in turn	40	
Exam	AS2	Examination	60	2

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 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:

VLE ssessment	1	2	3	4	5	6	7
Examination	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. The Newton-Raphson method as an example of the approximate solution of equations.
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. The integrating factor method. Application to modelling

Learning Activities

A combination of lectures and tutorials.

Notes

This module provides a foundation in engineering mathematics for level four students in mechanical and electrical engineers.
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 a virtual learning environment, these will be held on a regular basis pertinent to the particular LO.The examination will be online also delivered using a virtual learning environment. Examinees will have access to the same symbolic mathematical software used in the module eg. Mathcad.