Liverpool John Moores University

Title:	Engineering Mathematics 2
Status:	Definitive
Code:	**5521ENGSBC** (120212)
Version Start Date:	01-08-2018
Owning School/Faculty:	Maritime and Mechanical Engineering
Teaching School/Faculty:	The Sino-British College

Team	Leader
Robert Wilkinson	Y

Academic Level:	FHEQ5	**Credit Value:**	10	**Total Delivered Hours:**	50
Total Learning Hours:	100	**Private Study:**	50		

Delivery Options
Course typically offered: Standard Year Long

Component	Contact Hours
Lecture	24
Tutorial	24

Grading Basis: 40 %

Assessment Details

Category	Short Description	Description	Weighting (%)	Exam Duration
Test	AS1	Weekly online coursework delivered using a virtual learning environment	30	
Exam	AS2	2hrs online using a virtual learning environment	70	2

Aims

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

Learning Outcomes

After completing the module the student should be able to:

1	Solve linear, second order, constant coefficient ordinary differential equations and apply to the modelling of engineering problems
2	Find first and second order partial derivatives for functions of several variables and apply to engineering problems involving optimisation and errors
3	Use eigenvectors and eigenvalues in the solution of engineering problems
4	Solve simultaneous homogeneous ordinary differential equations with constant coefficients and apply to the solution of a two degree of freedom system
5	Use Laplace transforms in the solution of engineering problems involving ordinary differential equations
6	Use Fourier series in the solution of engineering problems
7	Find numerical solutions of ordinary differential equations
8	Find and apply Z transforms to engineering problems.
9	Use differential vector calculus and appreciate its application in engineering.
10	Apply symbolic mathematical software eg. Mathcad in the solution to problems involving topics on the syllabus.

Learning Outcomes of Assessments

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

Weekly online cw using VLE	1	2	3	4	5	6	7	8	9	10
2 hour online exam using VLE	1	2	3	4	5	6	7	8	9	10

Outline Syllabus

The solution of second order ODE's by the method of undetermined coefficients. Application to single degree of freedom oscillating systems.
Functions of several variables. Partial differentiation with application to optimisation and error estimation.
Eigenvalues and eigenvectors. By manual calculation for low order matrices. Use of software for matrices of larger order.
Solution of two first and second order, homogeneous simultaneous ODE's with constant coefficients. Application to normal modes for a two degree of freedom system.
Laplace transforms. Concepts. Use of tables. The inverse transform. Application to the solution of ODE's. Transfer functions and stability.
Periodic functions. Fourier series for functions of any period. Harmonics.
Numerical solution of ODE's. Euler's method and application of software.
Introduction to vector calculus. Divergence, gradient and curl and their physical meanings and applications.
Z transforms. Definition and properties. Inversion. Applications.
The use of a symbolic mathematical package eg Mathcad in the solution of problems involving the above topics.

Learning Activities

A combination of lectures and tutorials

Notes

This module provides a foundation in advanced engineering mathematics for level two students in mechanical and electrical 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 a virtual learning environment. 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.