

Liverpool John Moores University

Title: Engineering Mathematics 2
Status: Definitive
Code: **5321CIT** (125314)
Version Start Date: 01-08-2020

Owning School/Faculty: Engineering
Teaching School/Faculty: Changshu Institute of Technology

Team	Leader
Clifford Mayhew	Y

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

Delivery Options

Course typically offered: Semester 1

Component	Contact Hours
Lecture	40
Practical	8

Grading Basis: 40 %

Assessment Details

Category	Short Description	Description	Weighting (%)	Exam Duration
Exam	Exam	Examination	40	2
Test	Mid-Term	Mid Term Test	20	
Report	Coursework	Short Coursework	10	
Essay	Report	Report	30	

Aims

To provide a foundation in 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, First Order and Constant Coefficient Ordinary Differential Equation (ODE's) with Integral Factor and Applied to Modelling of Engineering Problems.
- 2 Solve linear, second order and constant coefficients ODE's and apply to the modelling of engineering problems.
- 3 Solve first and second order partial derivatives of the multivariate functions and apply to the optimization and error estimation of the engineering problem
- 4 Discuss the basic principles of thermal physics and the concept of energy in the conversion of thermal processes and use them to derive and apply the basic equations of these principles.
- 5 Solve the Constant Coefficient Homogeneous Helmholtz Ordinary Differential Equations and Applied to Solving Two Degrees of Freedom.
- 6 Apply Numerical Solution of Ordinary Differential Equations
- 7 Apply symbolic mathematical software, such as MATHCAD, to solve the problem related to this course.

Learning Outcomes of Assessments

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

Examination	4	5	6	7
Mid-Term Test	1	2	3	
Coursework	1	2	3	
Report	4	5	6	7

Outline Syllabus

1. *The solution of first order ODE's by the integrating factor method*
2. *The solution of second order ODE's by the method of undetermined coefficients*
3. *Application to single degree of freedom oscillating systems*
4. *Functions of several variables. Partial differentiation with application to optimization and error estimation*
5. *Eigenvalues and eigenvectors. By manual calculation for low order matrices. Use of software for matrices of larger order*
6. *Solution of two first and second order, homogeneous simultaneous ODE's with constant coefficients. Application to normal modes for a two degree of freedom*
7. *Laplace transforms. Concepts. Use of tables. The inverse transform. Application to the solution of ODE's. Transfer functions and stability*
8. *Periodic functions. Fourier series for functions of any period. Harmonics.*
9. *Numerical solution of ODE's. Euler's method and application of software.*
10. *The use of a symbolic mathematical package eg Mathcad in the solution of problems involving the above topics.*

Learning Activities

A combination of series of lectures and tutorials

Notes

This module provides a basis in advanced engineering mathematics for level five 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 Maple TA software.