

## Liverpool John Moores University

Title: Engineering Mathematics 2  
Status: Definitive  
Code: **5321ELE** (121917)  
Version Start Date: 01-08-2021

Owning School/Faculty: Engineering  
Teaching School/Faculty: Engineering

Team	Leader
Elon Correa	Y

**Academic Level:** FHEQ5      **Credit Value:** 10      **Total Delivered Hours:** 44

**Total Learning Hours:** 100      **Private Study:** 56

### Delivery Options

Course typically offered: Semester 1

Component	Contact Hours
Lecture	22
Tutorial	22

**Grading Basis:** 40 %

### Assessment Details

Category	Short Description	Description	Weighting (%)	Exam Duration
Test	AS1	Online coursework delivered using a virtual learning environment	100	

### 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, constant coefficient ordinary differential equations by the method of integrating factor and apply to the modelling of engineering problems
- 2 Solve linear, second order, constant coefficient ordinary differential equations and apply to the modelling of engineering problems
- 3 Find first and second order partial derivatives for functions of several variables and apply to engineering problems using optimisation and errors
- 4 Use eigenvectors and eigenvalues in the solution of engineering problems
- 5 Solve simultaneous homogeneous ordinary differential equations with constant coefficients and apply to the solution of a two degree of freedom system
- 6 Use Laplace transforms in the solution of engineering problems involving ordinary differential equations
- 7 Use Fourier series in the solution of engineering problems
- 8 Find numerical solutions of ordinary differential equations
- 9 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:

Online assessment	1	2	3	4	5	6	7	8	9
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### Outline Syllabus

*The solution of first order ODE's by the integrating factor method.*

*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.*

*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 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 MapleTA software.