# LIVERPOOL JOHN MOORES UNIVERSITY

# Engineering Mathematics 2

# Module Information

**2022.01, Approved**

## Summary Information

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|---|---|
| Module Code | 5321ELE |
| Formal Module Title | Engineering Mathematics 2 |
| Owning School | Engineering |
| Career | Undergraduate |
| Credits | 10 |
| Academic level | FHEQ Level 5 |
| Grading Schema | 40 |

**Teaching Responsibility**

| LJMU Schools involved in Delivery |
|---|
| Engineering |

## Learning Methods

| Learning Method Type | Hours |
|---|---|
| Lecture | 22 |
| Tutorial | 22 |

## Module Offering(s)

| Display Name | Location | Start Month | Duration Number Duration Unit |
|---|---|---|---|
| SEP-CTY | CTY | September | 12 Weeks |

## Aims and Outcomes

| Aims | To provide a foundation in engineering mathematics for application to the solution of engineering problems |
|---|---|

**After completing the module the student should be able to:**

**Learning Outcomes**

| Code | Number | Description |
|------|--------|-------------|
| MLO1 | 1 | Solve linear, first order, constant coefficient ordinary differential equations by the method of integrating factor and apply to the modelling of engineering problems |
| MLO2 | 2 | Solve linear, second order, constant coefficient ordinary differential equations and apply to the modelling of engineering problems |
| MLO3 | 3 | Find first and second order partial derivatives for functions of several variables and apply to engineering problems using optimisation and errors |
| MLO4 | 4 | Use eigenvectors and eigenvalues in the solution of engineering problems |
| MLO5 | 5 | Solve simultaneous homogeneous ordinary differential equations with constant coefficients and apply to the solution of a two degree of freedom system |
| MLO6 | 6 | Use Laplace transforms in the solution of engineering problems involving ordinary differential equations |
| MLO7 | 7 | Use Fourier series in the solution of engineering problems |
| MLO8 | 8 | Find numerical solutions of ordinary differential equations |
| MLO9 | 9 | Apply symbolic mathematical software e.g. Mathcad in the solution to problems involving topics on the syllabus. |

## Module Content

| | |
|---|---|
| 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 e.g. Mathcad in the solution of problems involving the above topics. |
| Module Overview | This module will provide a foundation in engineering mathematics for application to the solution of engineering problems. |
| Additional Information | 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.Where this module is part of a Degree Apprenticeship programme, the knowledge learning outcomes is K1. |

## Assessments

| Assignment Category | Assessment Name | Weight | Exam/Test Length (hours) | Module Learning Outcome Mapping |
|---------------------|-----------------|--------|--------------------------|--------------------------------|
| | | | | |

| Test | Online assessment | 100 | 0 | MLO1, MLO2, MLO3, MLO4, MLO5, MLO6, MLO7, MLO8, MLO9 |
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## Module Contacts

**Module Leader**

| Contact Name | Applies to all offerings | Offerings |
| --- | --- | --- |
| Elon Correa | Yes | N/A |

**Partner Module Team**

| Contact Name | Applies to all offerings | Offerings |
| --- | --- | --- |