# Module Proforma

**Approved, 2022.01**

## Summary Information

| Module Code | 5515USST |
| --- | --- |
| Formal Module Title | Engineering Mathematics 2 |
| Owning School | Engineering |
| Career | Undergraduate |
| Credits | 20 |
| Academic level | FHEQ Level 5 |
| Grading Schema | 40 |

## Module Contacts

### Module Leader

| Contact Name | Applies to all offerings | Offerings |
| --- | --- | --- |
| Dante Matellini | Yes | N/A |

### Module Team Member

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

### Partner Module Team

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

## Teaching Responsibility

| LJMU Schools involved in Delivery |
| --- |
| LJMU Partner Taught |

## Partner Teaching Institution

| Institution Name |
| --- |
| University of Shanghai For Science and Technology |

## Learning Methods

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

## Module Offering(s)

| Offering Code | Location | Start Month | Duration |
| --- | --- | --- | --- |
| SEP-PAR | PAR | September | 12 Weeks |

## Aims and Outcomes

| Aims | To provide a further course in engineering mathematics and its application to the solution of engineering problems. |
| --- | --- |

## Learning Outcomes

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

| Code | Description |
| --- | --- |
| MLO1 | Solve linear, first order and second order constant coefficient ordinary differential equations by the method of integrating factor and apply to the modelling of engineering problems. |
| MLO2 | Solve linear, first order and second order constant coefficient ordinary differential equations by the method of integrating factor and apply to the modelling of engineering problems. |
| MLO3 | Use eigenvectors and eigenvalues in the solution of engineering problems. |
| MLO4 | Solve simultaneous homogeneous ordinary differential equations with constant coefficients and apply to the solution of a two degree of freedom system. |
| MLO5 | Use Laplace transforms in the solution of engineering problems involving ordinary differential equations. |
| MLO6 | Use Fourier series in the solution of engineering problems. |
| MLO7 | Find numerical solutions of ordinary differential equations. |

| MLO8 | Apply mathematical software in the solution to problems involving topics on the syllabus. |

## Module Content

| **Outline Syllabus** |
| --- |
| The use of a computer algebra system (for example MATLAB or similar). Use of the software applied to the syllabus items below. |
| The solution of first order Ordinary Differential Equations (ODE) 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. |
| Introduction to programming in MATLAB or similar symbolic mathematical software. |
| Use numerical methods to solve engineering problems using appropriate software (e.g. MATLAB). |

**Module Overview**

**Additional Information**

This module provides a basis in advanced engineering mathematics for level 5 students in mechanical and electrical engineering to enable them to apply this to the solution of engineering problems.

## Assessments

| Assignment Category | Assessment Name | Weight | Exam/Test Length (hours) | Learning Outcome Mapping |
|---|---|---|---|---|
| Test | In-Test | 80 | 2 | MLO1, MLO2, MLO3, MLO4, MLO5, MLO6, MLO7 |
| Report | Coursework | 20 | 0 | MLO1, MLO2, MLO3, MLO4, MLO5, MLO6, MLO7, MLO8 |