<table>
<thead>
<tr>
<th>Module Code</th>
<th>MAU33E01</th>
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<tbody>
<tr>
<td>Module Name</td>
<td>Engineering Mathematics V</td>
</tr>
<tr>
<td>ECTS Weighting</td>
<td>5 ECTS</td>
</tr>
<tr>
<td>Semester taught</td>
<td>Semester 1</td>
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<tr>
<td>Module Coordinator/s</td>
<td>Dr Joe Ó hÓgáin</td>
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**Module Learning Outcomes** with reference to the **Graduate Attributes** and how they are developed in discipline

- LO1. Calculate the coefficients of the Fourier series for a variety of functions and use them to solve various differential equations.
- LO2. Calculate Fourier transforms of simple functions and apply the Fourier transform to solve the heat and wave equations over infinite domains.
- LO3. Solve the heat, wave and Laplace equations for a variety of boundary conditions, using separation of variables and Fourier methods.
- LO4. Solve linear optimization problems using the simplex and two-phase simplex methods.
- LO5. Find the dual of a linear programming problem and use the Duality theorems to solve such problems.

**Graduate Attributes: levels of attainment**

- To act responsibly - Choose an item.
- To think independently - Choose an item.
- To develop continuously - Choose an item.
- To communicate effectively - Choose an item.
Module Content

Fourier Methods:
- Definition and calculation of Fourier series for piecewise-continuous functions on a symmetric interval;
- even and odd function expansions;
- half-range expansions;
- Definition of Fourier transform
- Calculation of Fourier transform for various functions

Partial Differential Equations:
- The heat equation;
- The wave equation;
- Laplace’s equation;
- Separation of variables;
- Application of Fourier analysis to initial and boundary value problems;
- D’Alembert’s solution of the wave equation.

Linear Programming
- Formulation of linear optimization problems;
- Standard and canonical form;
- Use of the simplex and the two-phase simplex methods in solving such problems;
- The geometry of the simplex method;
- The dual of a linear programming problem;
- The use of the Duality theorems in solving linear programming problems.

Teaching and Learning Methods

The teaching strategy is a mixture of lectures and problem-solving tutorials. Whilst the format of lectures is conventional, some interaction and discussion is common and the students are encouraged to ask questions. In tutorials all students work on problems which practice and apply the methods introduced in the lectures. Discussion of problems in small groups is encouraged and facilitated.
### Assessment Details

Please include the following:

- Assessment Component
- Assessment description
- Learning Outcome(s) addressed
- % of total
- Assessment due date

<table>
<thead>
<tr>
<th>Assessment Component</th>
<th>Assessment Description</th>
<th>LO Addressed</th>
<th>% of total</th>
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<tbody>
<tr>
<td>Final examination</td>
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<tr>
<td>Continuous assessment</td>
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### Reassessment Requirements

### Contact Hours and Indicative Student Workload

- Contact hours: 33 lectures of one hour each
- Independent Study (preparation for course and review of materials):
- Independent Study (preparation for assessment, incl. completion of assessment): 10 tutorials of 1 hour each

### Recommended Reading List

- Advanced Engineering Mathematics, E. Kreyszig

### Module Pre-requisite

### Module Co-requisite

### Module Website


### Are other Schools/Departments involved in the delivery of this module? If yes, please provide details.

- School of Mathematics

### Module Approval Date

- Approved by
- Academic Start Year: September 9th 2019
- Academic Year of Date: 2019/2020

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*TEP Guidelines on Workload and Assessment*