MODULE TITLE: **Engineering Mathematics V**		**CODE:** **MA3E1**
LEVEL: **Junior Sophister**	**CREDITS:** **5**	**PREREQUISITES:** **None**
LECTURER(S): **Dr Joe O'Hogain**	johog@maths.tcd.ie	
TERMS: **Semester 1** **DURATION (WEEKS):** **12**	**LECTURES/WEEK:** **3** **TOTAL:** **33**	**TUTORIALS/WEEK:** **1** **TOTAL:** **11**

AIMS/OBJECTIVES

Engineering Mathematics V is a one-semester module available to all JS Engineering streams and continues and extends the material from the previous mathematics modules in the first and second years - 1E1, 1E2, 2E1 and 2E2. The emphasis is primarily on the development of analytical techniques.

SYLLABUS

- Review of Fourier Methods
  definition of complex and real Fourier series;
  application of Fourier series to solve ordinary differential equations;
  even and odd half-range expansions;
  definition of Fourier transform;
  interpretation of Fourier modes as frequencies;
  convolution.
- Partial Differential Equations
  Laplace's equation;
  the heat equation;
  the wave equation;
  D'Alembert's solution;
  fundamental solutions;
  separation of variables;
  application of Fourier analysis to initial value problems.
- Probability and Statistics
  Basic probability. Random variables. Discrete and continuous distributions. Descriptive and inferential statistics.
  Sample theory. Confidence intervals and null hypothesis.

RECOMMENDED TEXT(S)

Advanced Engineering Mathematics, E. Kreyszig

LEARNING OUTCOMES

Upon completion of this module, students will be able to:

1. Calculate the coefficients of both the complex and the real Fourier series for a variety functions, and to use them to solve some ordinary differential equations.
2. calculate Fourier transforms, discrete or continuous, for a variety of simple functions - students will then be able to use these to compute convolutions in simple cases.

3. Solve the Laplace, heat and wave equations for a variety of boundary conditions in domains of simple geometry and with simple boundary conditions; the techniques available will include, separation of variables, Laplace and Fourier Transform methods.
4. Apply various probability distributions to solve practical problems.
5. Construct confidence intervals using sampling analysis.

TEACHING STRATEGIES

The teaching strategy is a mixture of lectures and problem-solving tutorials. Whilst the format of lectures is conventional and the atmosphere is informal, some interaction and discussion is common and students are encouraged to ask questions. In the 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 MODE(S)

Assessment for this module is carried out by means of a written two-hour examination at the end of the academic year. The subject mark is based entirely on the result of this written examination.