COURSE TITLE: Engineering Analysis		CODE: 3E1a
LEVEL: Junior Sophister	CREDITS: 5	PREREQUISITES: 2E1 AND 2E2, OR PERMISSION OF THE LECTURER
LECTURER: Liam Dowling	TEACHING ASSISTANT:	
TERMS: Semester 1	LECTURES/WEEK: 3	TUTORIALS/WEEK: 1
DURATION (WEEKS): 12	TOTAL: 33	TOTAL: 11

AIMS/OBJECTIVES

This course is developed to strengthen the student's skills in applied engineering analysis and is organised into three main subsections: signal and system analysis; partial differential equations; and optimization. The first section deals with transform analysis applied to engineering signals and systems. The second part of the course deals with methods for solving partial differential equations. The final section focuses on linear and nonlinear optimization for engineering design.

SYLLABUS

Signal and System Analysis:
Properties and applications of Fourier and Laplace transforms.

Linear Time-Invariant Systems: Impulse response and the convolution integral; properties of LTI systems; transfer function and frequency response of an LTI system.

Sampling Theorem: Representation of a continuous-time signal by its samples; undersampling and aliasing; the sampling theorem; reconstruction of a bandlimited signal from its samples.

Partial Differential Equations
Solution by separating variables: the Wave Equation; the Heat Equation; and Laplace's Equation.

Optimization
Linear Programming: The Simplex algorithm
Unconstrained Optimization: The gradient method; the golden section method

RECOMMENDED TEXT

Kreyszig, E., *Advanced Engineering Mathematics.* 9th ed. New York: Wiley, 2006

LEARNING OUTCOMES

On completion of this course the student will be able to:

1. Analyse continuous-time signals using Fourier transforms and Fourier series.
2. Analyse linear time-invariant systems using Fourier and Laplace transform methods.

3. Solve the Wave equation, Heat equation, and Laplace's equation for various initial and boundary conditions.

4. Solve linear programming problems using the Simplex algorithm.

5. Use gradient methods to optimize a function.

TEACHING STRATEGIES

The course is taught using a combination of lectures and problem solving tutorials.

ASSESSMENT

The annual examination counts for 70% and each of the two in-class test counts for 15% of the overall subject mark.