# FACULTY OF ENGINEERING, SCIENCE AND THE BUILT ENVIRONMENT

Unit title:	Mathematics	
Unit number:	BCE/1/121	
Unit Level:	1	
Unit value:	1.0	
Unit co-ordinator:	I Kraincanic	
Contact time:	Lectures	26 hours
	Tutorials	13 hours
	Assessment	3 hours
Private study time:	108 hours	
Total study time:	150 hours	
Unit pre-requisites:	None.	

## SHORT DESCRIPTION

Mathematical theory and its applications relevant to civil engineering are covered. Topics include logarithms, matrices, simultaneous equations, differentiation, integration, differential equations and complex numbers.

### AIMS

To present key mathematical concepts for engineering profession.

## LEARNING OUTCOMES

The student should be able to:

- manipulate relations including logarithms and exponentials,
- differentiate relationships, find maximum and minimum of functions
- evaluate indefinite and definite integrals
- apply integration to find areas, volumes, moments
- carry out matrix operations
- use matrices to solve simultaneous equations
- solve first and second order differential equations
- use mathematical software to solve problems

## **TEACHING AND LEARNING PATTERN**

Lectures and tutorials supplemented by printed handouts.

## **INDICATIVE CONTENT**

#### Logarithms

Introduction to logarithms; the use of logarithms in the graphical representation of relationships

### Complex Numbers

Addition, subtraction, division, and multiplication of complex numbers; De Moivre's theorem; roots of complex numbers

#### Differentiation

Differentiation by first principles; differentiation of a function of a function; differentiation of products, quotients, and implicit functions; partial differentiation

#### Integration

Differentiation as a reverse of integration; integration by substitution and by partial fractions; integration of products; areas under curves; moments, volumes

### **Matrices**

Addition, subtraction, and multiplication of matrices; inverse of matrices; solutions of simultaneous equations by matrix methods

#### **Differential Equations**

First order linear equations; second order linear equations; the significance of these types of equations in structural, fluid and soil mechanics

# ASSESSMENT METHOD

- 70% 3 hour end of unit examination
- 30% Coursework consisting of two pieces of work.

### **INDICATIVE SOURCES**

Core

Boas, M. Mathematical methods in the physical sciences, J. Wiley, 1998. Stroud, K.A, and Booth, D. Engineering mathematics, Palgrave, Macmillan, 2001 (5<sup>th</sup> Edition).

## Background

Bostock, L. and Chandler, S., Core maths for advanced level, Stanley Thornes Ltd, 2000.

Bostock, L. and Chandler, S., Pure mathematics, Stanley Thornes Ltd, 1979.

Bird, J., Engineering mathematics, Newnes, 2001.

Jeffrey, A., Essentials of engineering mathematics: worked examples and problems, Chapman & Hall/CRC Press, 2004.

Singh K., Engineering mathematics through applications, Palgrave Macmillan, 2003.