FACULTY OF ENGINEERING, SCIENCE AND THE BUILT ENVIRONMENT

Unit title: Unit number: Unit Level: Unit value:	Computing and Numerical BCE/1/120 1 1.0	Methods
Unit co-ordinator: Contact time:	Ivana Kraincanic Lectures Computer sessions Tutorials	12 hours 18 hours 9 hours
Private study time: Total study time: Unit pre-requisites:	111 hours 150 hours None.	

SHORT DESCRIPTION

This unit teaches mathematical problem solving using computer tools. Students' previous knowledge is reinforced and applied, with the use of IT. Software taught is MathCAD, for mathematical processing, Excel for tabulation and graphs and Visual Basic for programming. Numerical methods are introduced and applied.

AIMS

To introduce students to IT tools and techniques that will help them solve engineering problems during their study and beyond.

LEARNING OUTCOMES

The student should be able to:

- select the appropriate tool for the particular problem
- carry out explicit or symbolic calculations using computer
- understand the usefulness of programming and its main principles; write simple programs
- appreciate and demonstrate relationships graphically; use graphs of functions to find their roots
- recognise the need for numerical methods and apply them
- produce reports including calculations.

TEACHING AND LEARNING PATTERN

Lectures and problem-based tutorials supplemented by printed handouts; computer sessions supported by printed and online resources.

INDICATIVE CONTENT

Numerical methods

Newton-Raphson method, trapezium and Simpson's method of integration, finite differences

MathCAD

Introduction, operations, constants, variables, functions; symbolic calculations; entering text and producing reports

Excel

Entering numbers, text and formulae; producing graphs of functions

Visual Basic

Introduction to programming; constants, variables, functions; data input and output; arrays; loops; conditional statements; debugging

ASSESSMENT METHOD

The unit is assessed continuously, with three assignments as follows:

Mathcad report, with calculations including trigonometry, differentiation, integration, maximum and minimum of functions, vectors, exponentials, quadratic equations, roots of polynomials in-class assessment: solution of a simple problem using Excel, Mathcad and Visual

basic solution of a problem using numerical methods

INDICATIVE SOURCES

Core

Bostock, L. and Chandler, S., A Level Core Maths, Stanley Thornes, 1999. Croft, A. and Davision, R. Mathematics for Engineers, Addison Wesley, 1999 Stroud, K.A, and Booth, D. Engineering Mathematics, Palgrave MacMillian, 2001 (5th Edition). Chapra, S. C. and Canale R.P., Numerical methods for engineers : with programming and software applications, WCB McGraw-Hill, 1998.

Background

James, G., Modern Engineering Mathematics, Prentice Hall, 2001 (3rd Edition). Jeffrey, A., Essentials of engineering mathematics: worked examples and problems, Chapman & Hall/CRC Press, 2004. Kreyszig, E., Advanced Engineering Mathematics, Wiley, 1992