FACULTY OF SCIENCE

CLASS DESCRIPTOR

DEPARTMENT OF MATHEMATICS & STATISTICS

Class Code: MM113		**Class Title: Engineering Mathematics 1E**	
Type: UG **NE**	**Level: 1**	**Credits: 20**	**Semester: 1**
Class Coordinator: Dr G Barrenechea		**Tel: 3652 Email: gabriel.barrenechea@strath.ac.uk**	
Teaching Staff: Dr G Barrenechea/Professor E Estrada			
Pre-requisites: SQA Higher Mathematics (Grade A) or Advanced Higher C or A-Level C or equivalent			
Students: Compulsory: Electrical and Electronic Engineering, Computer and Electronic Systems, Electrical and Mechanical Engineering			
Overlaps: MM101, MM102, MM103, MM110, MM111, MM115, MM116, MM117			

CLASS DELIVERY (HOURS)

LECTURES	TUTORIALS	LABORATORIES	ASSIGNMENTS	SELF STUDY	TOTAL
44	11	11	36	98	200

CLASS ASSESSMENT

Course work on engineering applications (25%); 2 hour degree examination in mathematics (75%) in December. August resit examination (100%). Exemption from degree examination is possible based upon performance in class tests.

GENERAL AIMS

To give a basic understanding of the concepts and applications of mathematical functions, differentiation, integration and complex numbers, and to provide an introductory experience of using mathematical tools to apply these concepts to practical engineering examples.

LEARNING OUTCOMES

On completion of this class, the student should

- understand the concept of a mathematical function;
- be familiar with commonly occurring functions and their properties, and be able to manipulate and solve equations and inequalities involving them;
- know the factorial and binomial coefficient notation, and be able to use the binomial theorem;
- be able to differentiate functions, via combinations of the various differentiation rules;
- be able to locate and classify stationary points of a function of one variable;
- be able to integrate simple functions;
- be able to find definite and indefinite integrals using substitutions, partial fractions and integration by parts;
- be able to manipulate complex numbers in Cartesian, polar and exponential form;
- be able to use De Moivre's Theorem to find roots of a polynomial and obtain trigonometric identities; and
- be able to use mathematics as a tool for investigating and solving foundation-level problems in engineering.

SYLLABUS

Mathematical Foundations:

Algebra – mathematical notation, number sets and inequalities, basic operations (+,−,×,÷), modulus, factorial, indices, rules of precedence, use of brackets, expanding brackets, binomial expansion, simplifying algebraic expressions, factorisation, common denominators, cancelling common factors, proportionality, mathematical formulae and transposition, partial fractions.
Functions – basic concepts and notation, graphs, continuity and limits; composition of functions; inverses; linear and quadratic functions, completing the square; other commonly occurring functions (including polynomials, rational functions, exponentials, logarithms, hyperbolic functions, modulus); odd and even functions; periodic functions.
Solving equations – linear equations, quadratic equations, polynomial equations; simultaneous equations in two unknowns.
Trigonometry – definitions and graphs of sine, cosine and tangent; periodicity; radian measure; definitions of sec, cosec and cot, and of inverse trigonometric functions; important trigonometric identities; solving trigonometric equations.

Introduction to Calculus:
Differentiation – definition of a derivative; notation; simple examples from first principles; graphical interpretation; stationary points.
Standard derivatives – including x^a and trigonometric, exponential and natural log functions.
Rules of differentiation – linearity; product rule; quotient rule; chain rule; higher derivatives; derivatives of inverse functions.
Indefinite integration – reversing differentiation; standard integrals; linearity.
Definite integration – motivation: area under a curve; definition; the Fundamental Theorem of Calculus; finite and infinite limits.

Complex Numbers:
Algebra of complex numbers – motivation and definition of i; real and imaginary parts; arithmetic of complex numbers.
Polar and exponential forms – the Argand diagram; modulus and argument; polar form; Euler's formula; exponential form; products and quotients in exponential form.
De Moivre's Theorem – De Moivre's theorem; nth roots; solving polynomial equations; trigonometric identities.

Introduction to Engineering Applications of Mathematics (taught by EEE):
Using mathematical tools to solve basic engineering problems.

Transferable Skills: See Level 1S spreadsheet for details.

RECOMMENDED TEXT/READING

** Croft, A. & Davison, R., *Mathematics for Engineers, A Modern Interactive Approach,* Harlow, Prentice Hall, 3rd Edition. D510.2462 CRO. ISBN: 0132051567.

DATE MODIFIED: 30 January 2012