

--MODULE DESCRIPTOR

MODULE TITLE	Computational Mathematics for Engineers		
MODULE CODE	EL1903 (L4)	CREDIT VALUE	10 UK CREDITS / 5 ECTS
SCHOOL	SCHOOL OF SCIENCES		

MODULE AIMS

Develop student's knowledge on problems which can be solved using a computer program and develop the skills in using such a computer algebra package (e.g. MATLAB).

MODULE CONTENT

Indicative syllabus content:

- MATLAB: Numerical calculations, Built in functions & constants, Basic algebraic operations, Naming and evaluating expressions, Defining and evaluating functions
- Plotting graphs (Cartesian, polar and parametric, 3D, contour, surfaces)
- Differentiation, 1st and 2nd derivative tests, Integration, approximating integrals, area, Partial differentiation.
- Polynomial arithmetic, Manipulating polynomials (sum, difference, product), Factorisation and division of polynomials. Euclid's Algorithm.
- Limits, Series, Taylor & Maclaurin series
- First and second order differential equations
- Matrices, matrix operations, inverse, determinant, Linear systems of equations, row operations, Gaussian Elimination, eigenvalues, eigenvectors
- Statistics, importing data, Mean, Mode, Median, Variance, Standard Deviation, Percentiles, Interquartile range, Statistical plots, linear regression.
- Programming, boolean algebra, if statements, for loops, error handling, debugging.

The module will present the theory behind the above concepts and will also present the implementation of these in a computer algebra package.

INTENDED LEARNING OUTCOMES

On successful completion of this module a student will be able to:

1. Display basic knowledge of mathematical concepts which can be solved using a computer program
2. Use a computer algebra package to tackle mathematical problems.
3. Demonstrate computer programming skills.

TEACHING METHODS

This module contains theory and practice on mathematical problems which can be solved using a computer program. This aims for the students to learn a computer algebra package such as MATLAB. This is taught in computer room sessions. A theoretical introduction to the weeks material will be given followed by students working from notes and problem sheets to give them practical experience of the package. This part will be assessed using a portfolio of problem sheet questions. For the practical sessions lab assistance will be given by the module tutor and demonstrators where appropriate.

ASSESSMENT METHODS

This module is assessed through a portfolio of computer-based work.