

Liverpool John Moores University

Title: ENGINEERING MATHS FOR ENGINEERS
Status: Definitive
Code: **4500ICBTCE** (126959)
Version Start Date: 01-08-2021

Owning School/Faculty: Civil Engineering and Built Environment
Teaching School/Faculty: ICBT, Colombo

Team	Leader
Alison Cotgrave	Y

Academic Level: FHEQ4
Credit Value: 15
Total Delivered Hours: 62
Total Learning Hours: 150
Private Study: 88

Delivery Options

Course typically offered: Semester 1

Component	Contact Hours
Lecture	36
Seminar	15
Tutorial	9

Grading Basis: 40 %

Assessment Details

Category	Short Description	Description	Weighting (%)	Exam Duration
Report	AS1	Analytical Report (1500 words)	30	
Exam	AS2	Written Examination (Closed Book)	70	2

Aims

This unit will provide the analytical knowledge and techniques needed to carry out a range of engineering tasks and will provide a base for further study of engineering mathematics.

Learning Outcomes

After completing the module the student should be able to:

- 1 Identify the use of basic algebraic manipulations and mathematical functions in the solution of engineering problems and apply trigonometric methods to solve engineering problems.
- 2 Demonstrate the knowledge of calculus and apply techniques in differentiation and integration to the solution of engineering problems.
- 3 Demonstrate the knowledge statistics and probability and apply to solve engineering problems.
- 4 Use and apply mathematical software to the solution of engineering mathematics problems such as Mini Tab, excel etc;

Learning Outcomes of Assessments

The assessment item list is assessed via the learning outcomes listed:

Analytical Report (1500 words)	1	2
Written Examination	3	4

Outline Syllabus

Algebraic methods: Substitution, simplification, factorization, indices, evaluation and transposition of formulae, fractions and partial fractions. Linear and quadratic equations, linear simultaneous equations.

Functions: Notation, types of function, composite and inverse, graphs. polynomial division, quotients and remainders, use of factor and remainder theorem, rules of order for partial fractions (including linear, repeated and quadratic factors), reduction of algebraic fractions to partial fractions.

Revision of elementary coordinate geometry: Distance between two points, the straight line, simple polynomial curves. Cartesian and polar co-ordinate systems, properties of the circle.

Arithmetic and geometric: notation for sequences, arithmetic and geometric progressions, the limit of a sequence, sigma notation, the sum of a series, arithmetic and geometric series, Pascal's triangle and the binomial theorem.

Trigonometric :Introduction, Trigonometric ratios of acute angles, evaluating trigonometric ratios, solution of right angled triangles, Angles of elevation and depression, sine and cosine rules, area of any triangle, solving engineering applications.

Calculus: the concept of the limit and continuity, definition of the derivative, derivatives of standard functions, notion of the derivative and rates of change, differentiation of functions using the product, quotient and function of a function rules, integral calculus as the calculation of area and the inverse of differentiation, the indefinite integral and the constant of integration, standard integrals and the application of algebraic and trigonometric functions for their solution, the definite integral and area under curves.

Further differentiation: second order and higher derivatives, logarithmic differentiation, differentiation of inverse trigonometric functions, differential

coefficients of inverse hyperbolic functions.

Further integration: integration by parts, integration by substitution, integration using partial fractions.

Applications of the calculus: e.g. maxima and minima, points of inflexion, rates of change of temperature, distance and time, electrical capacitance, rms values, electrical circuit analysis, AC theory, electromagnetic fields, velocity and acceleration problems, complex stress and strain, engineering structures, simple harmonic motion, centroids, volumes of solids of revolution, second moments of area, moments of inertia, rules of Pappas, radius of gyration, thermodynamic work and heat energy.

Tabular and graphical form: data collection methods, histograms, bar charts, line diagrams, cumulative frequency diagrams, scatter plots.

Central tendency and dispersion: the concept of central tendency and variance measurement, mean, median, mode, standard deviation, variance and interquartile range, application to engineering production.

Regression, linear correlation: determine linear correlation coefficients and regression lines and apply linear regression and product moment correlation to a variety of engineering situations.

Probability: Introduction, Laws of probability, engineering applications of probability.

Learning Activities

Students will be supported in their learning, to achieve the above learning outcomes, in the following ways:

By a series of lectures and tutorials and through participation within tutorial discussion sessions for problem solving.

Self-managed analytical study to understand applications related to the industry.

A recommended resource list - indicating key reading, internet support and physical learning assistance, is provided to help enable students to undertake self-directed study.

Notes

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