Liverpool John Moores University

Title:	APPLIED MATHEMATICS FOR COMPLEX ENGINEERING PROBLEMS
Status:	Definitive
Code:	**5100BEHN** (118171)
Version Start Date:	01-08-2016
Owning School/Faculty:	Civil Engineering
Teaching School/Faculty:	Civil Engineering

Team	Leader
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Academic Level:	FHEQ5	**Credit Value:**	24	**Total Delivered Hours:**	63
Total Learning Hours:	240	**Private Study:**	177		

Delivery Options
Course typically offered: Standard Year Long

Component	Contact Hours
Lecture	24
Online	12
Tutorial	24

Grading Basis: BTEC

Assessment Details

Category	Short Description	Description	Weighting (%)	Exam Duration
Exam	AS1		70	3
Report	AS2		15	
Practice	AS3		15	

Aims

To provide an introduction to a variety of mathematical techniques, including

trigonometry, the construction and solution of algebraic equations, the use of calculus in engineering, and the basics of probability and statistics.

To ensure that students can apply these methods to engineering problems.

Learning Outcomes

After completing the module the student should be able to:

1	Apply trigonometric functions to engineering problems.
2	Construct and solve algebraic equations representing engineering problems.
3	Use calculus to determine maximum and minimum values.
4	Use calculus to calculate areas and volumes.
5	Define engineering problems using differential equations, and solve these equations using analytical and numerical methods.
6	Use probability and statistics in the solution of engineering problems.
7	Choose and apply the correct mathematical technique(s) to complex problems in Civil Engineering

Learning Outcomes of Assessments

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

Exam	1	2	3	4	5
Report	6				
Solution of engineering prob.	7				

Outline Syllabus

Trigonometry: graphs, wave features, addition of waves, trigonometric identities, applications in surveying and structural analysis.

Algebraic equations: laws of indices and logarithms; direct and inverse proportion; manipulation of algebraic problems; construction of engineering equations. Solution of linear simultaneous equations by inverse methods and Gaussian elimination. Bisection and Newton-Raphson methods.

Calculus: differentiation, stationary values, and use in engineering, for functions of one or two variables. Use of calculus to calculate areas, volumes and centre of gravity. Integration by parts, substitution and partial fractions

Differential equations: use in engineering, linear constant coefficient equation, initial conditions, basic numerical solution of differential equations. Euler's method, and use of MathCad.

Probability and statistics: concept of central tendency; dispersion (standard deviation; variance; interquartile range) binomial, normal and Poisson distributions,

linear regression, confidence intervals, sampling, statistical quality control. Use of Excel for solving statistical problems. Applications in Civil Engineering

Graphical techniques: functions; (straight line, polynomial, exponential, logarithmic); fitting lines to experimental data.

Learning Activities

A combination of lectures and practical problem solving tutorials

Notes

The module presents mathematical techniques and applies them to engineering problems.