

## Liverpool John Moores University

Title: FUNDAMENTAL MATHEMATICS  
Status: Definitive  
Code: **4040TECH** (105258)  
Version Start Date: 01-08-2016

Owning School/Faculty: Maritime and Mechanical Engineering  
Teaching School/Faculty: Applied Mathematics

Team	Leader
Ian Jones	Y

**Academic Level:** FHEQ4      **Credit Value:** 24      **Total Delivered Hours:** 74  
**Total Learning Hours:** 240      **Private Study:** 166

### Delivery Options

Course typically offered: Standard Year Long

Component	Contact Hours
Lecture	24
Practical	12
Tutorial	36

**Grading Basis:** 40 %

### Assessment Details

Category	Short Description	Description	Weighting (%)	Exam Duration
Exam	AS1	Examination	50	2
Essay	AS2	In class test	25	
Essay	AS3	On-line computer coursework	25	

### Aims

*To provide a fundamental foundation in mathematical techniques for application to the solution of problems in technology and engineering.*

### Learning Outcomes

After completing the module the student should be able to:

- 1 Apply basic arithmetical and algebraic techniques to the solution of problems in technology and engineering.
- 2 Apply commonly occurring algebraic and trigonometric functions to the solution of problems in technology and engineering.
- 3 Present, analyse and interpret data arising in technology and engineering problems.
- 4 Apply the laws of probability to the solution of problems in technology and engineering.
- 5 Apply complex numbers to the solution of problems in technology and engineering.
- 6 Apply calculus techniques to the solution of problems in technology and engineering.
- 7 Apply basic vector and matrix techniques to the solution of problems in technology and engineering.
- 8 Use a computer algebra package in the solution of problems in technology and engineering.

### Learning Outcomes of Assessments

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

EXAM	1	2	3	4	5	6	7	
CW	1	2	3	4	5	6	7	
CW	1	2	3	4	5	6	7	8

### Outline Syllabus

*Numbers: decimal system, place value, decimal places, significant figures, scientific notation. Arithmetic of fractions and directed numbers. Percentages, ratios, powers and roots.*

*Basic algebraic techniques: substitution, brackets, simplification, factorisation, indices, evaluation and transposition of formulae, fractions and simple partial fractions.*

*Equations and inequalities: linear and quadratic equations, linear simultaneous equations. (with two unknowns). Simple inequalities.*

*Elementary coordinate geometry: distance between two points, the equation of a straight line, elementary problems involving the straight line. Simple polynomial curves.*

*Functions: Notation. Graphs. Types of functions, odd even, implicit, parametric. Composite and inverse of a function.*

*Trigonometry: angles and circular measure. Pythagoras theorem. Trigonometric ratios for right-angled triangles. Sine and cosine rules. Trigonometric functions and*

*their graphs, simple trigonometric identities and equations.*

*Exponential function: properties and graph. Natural logarithm as inverse of exponential function, graph and properties.*

*Representation of data (pie charts, histograms, etc), measures of centrality and spread, simple probability.*

*Complex numbers: Complex arithmetic, Complex conjugate. Argand diagram. Rectangular, polar forms. Magnitude and phase.*

*Differential calculus of one variable: gradient of graph, derivatives of standard functions, linearity, derivatives of composite functions, products and quotients. Applications. Stationary points. Rate of change*

*Integration as inverse of differentiation and as a summation, standard integrals, Applications.*

*Basic vector algebra including Cartesian components. Applications.*

*Basic matrix manipulation including the inverse matrix. Application to solution of systems of linear equations.*

*Introduction to a computer algebra system eg. DERIVE.*

## **Learning Activities**

A combination of lectures, tutorials and computer laboratories. The laboratories will enable students to use and apply mathematical software to the solution of engineering mathematics problems.

## **Notes**

This module is intended for delivery to students from a wide background of mathematical knowledge prior to entry into level one. Students will experience both consolidation of known techniques from earlier school and college courses, together with an introduction to new techniques for application in technology and engineering. The module deliverer will need to be responsive to the needs of the students in pacing the delivery of these two aspects.