Advanced Mathematics

Module Information

2022.01, Approved

Summary Information

Module Code	5503ICBTCE
Formal Module Title	Advanced Mathematics
Owning School	Civil Engineering and Built Environment
Career	Undergraduate
Credits	15
Academic level	FHEQ Level 5
Grading Schema	40

Teaching Responsibility

LJMU Schools involved in Delivery
LJMU Partner Taught

Partner Teaching Institution

Institution Name
International College of Business and Technology

Learning Methods

Learning Method Type	Hours
Lecture	30
Tutorial	15

Module Offering(s)

Display Name	Location	Start Month	Duration Number Duration Unit
APR-PAR	PAR	April	12 Weeks
JAN-PAR	PAR	January	12 Weeks

SEP-PAR	PAR	September	12 Weeks

Aims and Outcomes

Aims	To develop skills in advanced engineering mathematics for application to the solution of Civil and Building Services Engineering problems.

After completing the module the student should be able to:

Learning Outcomes

Code	Number	Description
MLO1	1	Use number systems to model & solve engineering problems
MLO2	2	Apply graphical and numerical methods to model and solve engineering problems
MLO3	3	Apply vector geometry and matrix methods to model and solve engineering problems
MLO4	4	Use ordinary differential equations to model and solve engineering problems

Module Content

Outline Syllabus	Error arithmetic: significant figures and estimation techniques, error arithmetic operations, systematic and random errors, application to experimentation and general laboratory workNumber systems: natural, integer, rational, reals, dinary, binary, octal and hexadecimal number systems. Complex numbers: real and imaginary parts of complex numbers, complex number notation. Cartesian and polar forms, Argand diagrams, powers and roots and the use of de Moivre's theorem, use of phasor and Argand diagramsNumerical integral: determine the integral of functions using mid-ordinate, trapezoidal and Simpson's rulesNumerical estimation methods: method of bisection, Newton-Raphson iteration method, estimates of scientific functionsVector notation and operations: Cartesian co-ordinates and unit vectors, types of vector and vector representation, addition and subtraction, multiplication by a scalar, graphical methodsMatrix operations and vectors: carry out a range of matrix operations, e.g. vectors in matrix form, square and rectangular matrices, row and column vectors, significance of the determinant, determinant for 2x2 matrix, the inverse of a 2x2 matrix, Gaussian elimination to solve systems of linear equations (up to 3x3), Vector geometry: determine scalar product, vector product, angle between two vectors, equation of a line, norm of a vector, dot and cross productsFirst order differential equations: engineering use, separation of variables, integrating factor method, complementary function and particular integralNumerical methods for first order differential equations: need for numerical solution, Euler's method, improved Euler method, Taylor series methodApplication of second order differential equations: Engineering situations: applications, e mechanical systems, fluid systems, etc.Finite Difference and finite element methods
Module Overview	
Additional Information	

Assessments

Assignment Category	Assessment Name	Weight	Exam/Test Length (hours)	Module Learning Outcome Mapping
Report	Coursework	30	0	MLO2
Exam	Written Examination	70	2	MLO1, MLO3, MLO4

Module Contacts

Module Leader

Contact Name	Applies to all offerings	Offerings
Karl Jones	Yes	N/A

Partner Module Team

Contact Name	Applies to all offerings	Offerings