Module Code	ZZ-1104			
Module Title	Essential Mathematics for Digital Science			
Degree/Diploma	Bachelor of Digital Science			
Type of Module	Degree Core			
Modular Credits	4	**Total Student Workload**	10	hours/week
		Contact Hours	4	hours/week
Prerequisite	None			
Anti-requisite	SM-1201 Mathematical Methods for the Sciences ZZ-1101 Mathematical Methods for the Sciences			

Aims

This module aims to teach the foundational concepts and techniques in mathematics to solve computing/digital sciences and engineering problems.

Learning Outcomes

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

Lower order:	20%	- Recall pre-calculus algebra, sets, functions
Middle order:	30%	- Apply differentiation and integration to simple functions - Apply vector algebra to solve problems involving lines and planes and other 3-dimensional geometry - Apply matrix operations to solve simple systems of linear equations - Analyse and interpret Venn diagrams, connective logic, graphs, and trees
Higher order:	50%	- Perform mathematical computations to solve a wide variety of real-world problems, especially in digital science - Compute eigenvalues, eigenvectors - Compute conditional probabilities and correlations - Perform differentiations of determinants, sequences/series and parametric functions to find maxima, minima & partial derivatives - Use mathematical induction and recurrence relations - Perform simple modelling of world-systems using differential equations - Use a scientific library to perform mathematical operations

Module Contents

- Pre-calculus algebra: polynomials, linear equations, exponents/logs, quadratic, factoring, functions, limits, continuity
- Vector algebra: scalar, dot and cross products, norm, and unit vectors; use of vectors to define lines, planes and spheres, finding distances from a point to a line, a point to a plane, a line to a line and a line to a plane
- Matrices: matrix transpose and matrix inverse; determinant, differentiation of a determinant, systems of linear equations, eigenvalues, and eigenvectors- Differentiation: derivatives rules, application to parametric functions, finding maxima and minima, and partial derivatives
- Integration: integral as anti-derivative and area under the curve
- Introduction to ordinary and partial differential equations and their application to modelling systems
- Statistics & Probability: standard deviation, variance, probability, distributions, correlations, conditional probability, and Bayes theorem
- Discrete Maths: sets, Venn diagrams, connective logic, graphs/trees, permutations, sequences, series relations, recurrence, and mathematical induction
- Introduction to a scientific software library for performing mathematical operations

Assessment	Formative Assessment	Tutorials and feedback
	Summative Assessment	Examination: 30%
		Coursework: 70% - Three class tests (30%) - Two individual written assignments (40%)