

MODULE DESCRIPTOR

MODULE TITLE	INTRODUCTION TO ALGEBRA AND LINEAR ALGEBRA		
MODULE CODE	MA1811 (L4)	CREDIT VALUE	20 CREDITS (10 ECTS)
CAMPUS	UCLAN CYPRUS		
SCHOOL	SCHOOL OF SCIENCE		

MODULE AIMS

The aims of the module are to:

- 1) Develop students' skills in the use of the basic techniques of matrices, polynomials and algebra.
- 2) Give students confidence in developing their own mathematical skills.

MODULE CONTENT

Algebra

Set Theory: Definition of a set, equality, subsets, power sets (including order). Venn diagrams. Union, intersection, difference, complement, Cartesian product (and properties).

Mappings: Domain, codomain and range. Surjective, injective and bijective mappings. Sums, products and compositions of mappings. Inverses.

Equivalence Relations and Classes: Definition and properties of. Congruence relations and classes.

The Integers: Multiples & Divisors. Divisibility. Greatest Common Divisor (and properties of). Euclid's algorithm. Linear combinations of integers. Prime numbers. Fundamental Theorem of Arithmetic.

Polynomials: Definition, sum, difference, product. Factor and division. Euclid's algorithm. Statement of unique factorisation in real and complex numbers. Remainder theorem and its consequences. Fundamental Theorem of Algebra, irreducible polynomials in real and complex numbers, Nth roots of unity and integers.

Linear Algebra

Matrices: Definition, order, equality. Special types. Addition, scalar multiplication and transpose. Matrix multiplication. Determinants and basic properties. Inverse of a matrix using cofactors and determinants.

Systems of Linear Equations: Elementary row operations and reduced echelon form, method for finding inverses. Solution of linear equations by Gaussian Elimination and matrix inversion. Linear independence and dependence.

Eigenvalues and Eigenvectors: Definition. Characteristic equation and polynomial. Independence of eigenvectors.

Vector spaces: Definition, subspaces, linear combinations and spanning, linear dependence and independence, basis and dimension.

INTENDED LEARNING OUTCOMES

On successful completion of this module a student will be able to:	
1.	Prove basic properties of divisibility of the integers, find greatest common divisors and calculate integer solutions to certain integer equations.
2.	Check mappings for injective and bijective conditions, show certain maps are invertible and calculate the inverse, and calculate the composition of given mappings.

3.	Perform basic polynomial algebra and find greatest common divisors and roots of polynomials, evaluate the complete factorisation of certain polynomials.
4.	Perform matrix calculations, and apply matrix algebra to solving systems of linear equations.
5.	Apply the definitions and properties of vector spaces and eigenvalues/eigenvectors.

TEACHING METHODS

The module will be delivered on campus, with weekly lecture/tutorial sessions. The class contact will consist of lectures together with tutorials. Lectures will introduce the theory and provide examples of its application. Key elements of the learning strategy are regular worksheets in which students are encouraged to practise their mathematical techniques. These will be discussed in the tutorials.

To facilitate and monitor the formative learning process a portfolio of formative assessments will be set, with diagnosis of any deficiencies students may have in their learning and skills development being fed back during tutorials. Summative assessment is by closed-book examination.

ASSESSMENT METHODS

The module is assessed through a Portfolio of 10 assessed questions and an examination.