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| Course Title: | **Algebra and Calculus I** |
| Course Code: | **MATH505** |
| Descriptor Start Date: | **01/01/2026** |
| POINTS: | **15.00** |
| LEVEL: | **5** |
| PREREQUISITE/S: | **None** |
| COREQUISITE/S: | **None** |
| RESTRICTION/S: | **None** |

## LEARNING HOURS

Hours may include lectures, tutorials, online forums, laboratories. Refer to your timetable and course information in Canvas for detailed information.

**Total learning hours: 150**

## PRESCRIPTOR

An introduction to linear algebra and single variable calculus. Students will develop skills and techniques in these areas with a focus on applications in the areas of science, engineering, and business. Provides a solid foundation in mathematics and is recommended for those that are intending to pursue mathematics beyond this course.

## LEARNING OUTCOMES

1. Manipulate and describe many of the important functions used in Mathematics and Scientific applications
2. Apply differentiation and integration.
3. Comprehend and apply vector geometry.
4. Manipulate matrices, and use Gaussian elimination to solve systems of linear equations.
5. Manipulate complex numbers in Cartesian and polar form.
6. Understand and apply sequences and series
7. Use MATLAB to solve basic mathematical problems and communicate mathematical ideas

## CONTENT

Content may include but need not be limited to:
• Sets and functions
□,□,□,□, open & closed intervals, sets defined by inequalities, sums, products, quotients & composites of functions, polynomials, rational & trig functions, implicitly defined functions.
• Inverse functions
The concept of inverse functions, inverse trigonometric functions, exponential and logarithmic functions, applications.
• Limits and continuity
Informal definition of limits, limit rules, continuous functions, applications.
• Differentiation
Derivatives, differentiable functions, rules of differentiation, implicit differentiation, applications.
• Integration
Definite integrals, indefinite integrals, integration by substitution and by parts, applications.
• Introduction to vectors
Vector quantities, analytic geometry, parametric vector equations, planes, linear combinations.
• Vector geometry
Length, angle and dot product, orthogonality, projection of one vector on another, distance of a point to a line, cross product.
• Complex numbers
Definition and basic operations, complex conjugates and division, polar form, powers and roots of complex numbers.
• Matrices
Matrix notation, operations on matrices, transposes, inverses and definition of determinants, properties of determinants, elementary row operations.
• Linear equations and matrices
Introduction to systems of linear equations, geometrical interpretations, solving systems of equations via inverse matrices and via Gaussian elimination.
• Infinite sequences and series:
Convergence & divergence of sequences, combination of sequences, partial sums, convergence of series, various tests of convergence of series
• Taylor series:
Power series, Taylor and Maclaurin series, Taylor and Maclaurin series of basic functions (trigonometric, exponential, logarithmic)

## LEARNING & TEACHING STRATEGIES

A range of teaching and learning strategies may include lectures, computer labs, tutorials, and online learning.

## ASSESSMENT PLAN

| Assessment Event | Weighting % | Learning Outcomes |
|---|---|---|
| Assignment 1: Vectors, Functions | 30.00 | 1,2,6,7 |
| Assignment 2: Matrices, Elementary Functions, Differentiation | 30.00 | 3,4,5,7 |
| Final Exam | 40.00 | 1 - 6 |

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| **Grade Map** | **MAP1** |
| | A+ A A- Pass with Distinction<br>B+ B B- Pass with Merit<br>C+ C C- Pass<br>D Fail |

**Overall requirement/s to pass the course:**

To pass this course, students must attempt all summative assessments and achieve a minimum overall grade of C-.

## LEARNING RESOURCES

Readings will be recommended by the lecturer.

**For further information, contact:** Te Ara Auaha - Faculty of Design & Creative Technologies

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| Principal Programme: | **DJ1041, Bachelor of Science** |
| Related Programme/s: | **AK1018**<br>**AK3750**<br>**DJ1042**<br>**DJ1043**<br>**HA1041**<br>**HA1042**<br>**HA1043**<br>**ICE1**<br>**INEXCH1**<br>**SABRD1** |