Course Title:	**Engineering Mathematics I**
Course Code:	**ENGE501**
Descriptor Start Date:	**28/02/2025**
POINTS:	**15.00**
LEVEL:	**5**
PREREQUISITE/S:	**AK3719: ENGE401** **AK3751: None**
COREQUISITE/S:	**None**
RESTRICTION/S:	**ENGE502**

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

Gives the student an understanding of differential and integral calculus, and develops the ability to formulate and solve models of simple engineering and scientific systems.

Key to Graduate Capabilities Profile :
a. Engineering knowledge
b. Problem analysis
c. Design/development of solutions
d. Investigation
e. Tool usage
f. The engineer and the world
g. Ethics h. Individual and collaborative team-work
i. Communication
j. Project management and finance
k. Lifelong learning

LEARNING OUTCOMES

1. Manipulate and describe many of the important functions used in Mathematics and Engineering applications (a,b,c,d,e,f,i,k)
2. Thoroughly understand and apply differentiation and integration. (a,b,c,d,e,f,j,k)
3. Comprehend and apply vector geometry. (a,b,c,d,e,f,j,k)
4. Manipulate matrices and understand systems of linear equations and appreciate their notation in matrix form. (a,b,c,d,e,f,j,k)
5. Recognise the importance of complex numbers and apply them to engineering problems (a,b,c,d,e,f,j,k)
6. Understand and apply sequences and series

CONTENT

Calculus:
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
Sequences and series

Algebra (non-calculus):
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

Course content is presented through lectures per week conveying the theory, providing worked examples and applications, along with computer labs and tutorial reviews each week. The student will apply this theory through assignments and tests, which form an integral part of the course. The course will introduce students to Matlab and will further on include Matlab as a standard computer tool to solve problems related to the content taught.

ASSESSMENT PLAN

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

Grade Map **MAP1**

A+ A A- Pass with Distinction
B+ B B- Pass with Merit
C+ C C- Pass
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

Croft, A., Davison, R. Engineering mathematics: a foundation for electronic, electrical, communications and systems engineers, 2017. Bird, J. Higher engineering mathematics, 2017.

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

Principal Programme: **AK3751, Bachelor of Engineering (Honours)**

Related Programme/s: **AK2005**
AK3719
ICE1
INEXCH1
SABRD1

Disclaimer: Course descriptors may be amended between teaching periods/semesters