MATH 102, Applied Linear Algebra

3 Credits, 3 hours lecture, 1 hour lab

3.5 Engineering units for the University of Alberta

Course Description

This course covers vector and matrix algebra, systems of linear equations, vector geometry in the plane and in space, determinants, orthogonality and applications, eigenvalues and eigenvectors with applications, complex vector spaces. The course will also introduce students to the use of the computer algebra system MATLAB in solving problems in Linear Algebra.

Pre and Co-requisites

MATH 100

Course Learning Outcomes (CLOs)

Upon successful completion of the course, the student shall be able to:

CLO1: Perform basic algebraic operations with matrices and vectors (addition, scalar multiplication, products).
CLO2: Use vectors and matrices to represent equations, geometrical relationships, transformations, and other concepts.
CLO3: Row-reduce a matrix to its reduced row echelon form and use this form to solve linear equations, test independence, determine fundamental matrix spaces, and solve other matrix problems.
CLO4: Compute the determinant of a matrix and use it to determine properties of the matrix.
CLO5: Determine a basis for a given space/subspace and create a set of coordinates with respect to this basis.
CLO6: Determine the fundamental spaces associated with a matrix (row space, column space, null space, eigenspace) and describe the relationships between the geometry of these spaces.
CLO7: Determine whether a given matrix is diagonalizable, and, if it is, determine a diagonalization.
CLO8: Use the Gram-Schmidt process to determine an orthogonal (or orthonormal) basis of an inner product space and use this basis to perform projections.

Evaluation

Assessment Type	Percentage
Assignments (At-home, In-class, etc.)	13%
Term Tests (Midterms, Quizzes, etc.)	37%
Final Exam	50%

Course Completion Requirements

Minimum passing mark of 50% or D is required. Note: A C- is required to use this course as a prerequisite for subsequent courses or to often transfer this credit successfully to other institutions. It is the student's responsibility to be aware of their specific program requirements.

Grading Scale

4.0 Grade Scale	Alpha Grade	Percentage Grade
4.0	A+	93-100
4.0	A	85-92.9
3.7	A-	80-84.9
3.3	B+	77-79.9
3.0	B	74-76.9
2.7	B-	70-73.9
2.3	C+	67-69.9
2.0	C	64-66.9
1.7	C-	60-63.9
1.3	D+	55-59.9
1.0	D	50-54.9
0.0	F	0-49.9

Land Acknowledgement

We respectfully acknowledge that Keyano College is located on Treaty 8 territory, the traditional & contemporary meeting grounds and gathering places of the Denesuline, Cree and Métis Peoples of this region. Our name, Keyano (kiyânaw in nêhiyawêwin - Cree language), translates to "we, us, our" and speaks to the connection we have as a community and our commitment to being in right relationships with the First Peoples of these lands.

Course Outline Review Date: June 2025