# Virginia Western Community College MTH 266 Linear Algebra 

## Prerequisites

Completion of MTH 263 Calculus I or equivalent with a grade of B or better or MTH 264 Calculus II or equivalent with a grade of $C$ or better.

## Course Description

Covers matrices, vector spaces, determinants, solutions of systems of linear equations, basis and dimension, eigenvalues, and eigenvectors. Features instruction for mathematical, physical and engineering science programs.

## Semester Credits: 3

Lecture Hours: $\mathbf{3}$

## Required Materials

## Textbook:

Elementary Linear Algebra with Applications. Hill. 3rd edition. Thomson. ISBN: 9780030103476.

## Other Required Materials:

Click here to enter text.

## Course Outcomes

At the completion of this course, the student should be able to:

- Solve linear systems using Gaussian Elimination.
- Manipulate matrices using the basic matrix operations.
- Compute determinants and use them in applications.
- Be familiar with vector spaces and their basic properties.
- Use matrices to perform linear transformations.
- Use the Gram-Schmidt Process.
- Find eigenvalues and their corresponding eigenspaces.
- Apply eigenvalues to applications.


## Topical Description

| 1 | Introduction to Linear Equations and Matrices |
| :--- | :--- |
| 1.1 | Introduction to Linear Systems and Matrices |
| 1.2 | Gaussian Elimination |
| 1.3 | The Algebra of Matrices: Four Descriptions of the Product |
| 1.4 | Inverse and Elementary Matrices |
| 1.5 | Gaussian Elimination as a Matric Factorization |
| 1.6 | Transposes, Symmetry, and Band Matrices; an Application |
| 2 | Determinants |
| 2.1 | The Determinant Function |
| 2.2 | Properties of Determinants |
| 2.3 | Finding detA Using Signed Elementary Products |
| 2.4 | Cofactor Expansion; Cramer's Rule |
| 3 | Vector Spaces |
| 3.1 | Vectors in 2 and 3 Spaces |
| 3.2 | Euclidean n-space |
| 3.3 | General Vector Spaces |
| 3.4 | Subspaces, Span, Null Spaces |
| 4 | Linear Trans., Orthogonal Projections, and Least Squares |
| 4.1 | Matrices as Linear Transformations |
| 4.2 | Relationships Involving Inner Products |
| 4.3 | Least Squares and Orthogonal Projections |
| 4.4 | Orthogonal Bases and the Gram-Schmidt Process |
| 4.5 | Orthogonal Matrices, QR Decompositions, and Least Squares |
| 5 | Eigenvectors and Eigenvalues |
| 5.1 | A Brief Introduction to Determinants |
| 5.2 | Eigenvalues and Eigenvectors |
| 5.3 | Diagonalization |
| 5.4 | Symmetric Matrices |

## Notes to Instructors

None.

