
Prerequisite: Grade of C or higher in Calculus I-MA2310

COURSE DESCRIPTION: This course discusses the main concepts and terminology of linear algebra. Some of the topics included are systems of linear equations, matrices and determinants, vectors in 2-space and 3-space, Euclidean vector spaces, general vector spaces, subspaces, linear independence, bases and dimension, eigenvectors and eigenvalues, diagonalization, and linear transformations.

COURSE OBJECTIVES: Upon successful completion of this course students should: be able to solve systems of linear equations using a variety of methods; carry out the basic operations of matrix algebra; interpret the geometric properties of vectors in Euclidean n-space; define linear transformation and represent by matrices; comfortable with the axiomatic definitions of general vector spaces; determine whether a specified set of vectors forms a subspace; understand the notion of span and basis; calculate eigenvalues and eigenvectors of a square matrix; determine when a matrix is diagonalizable; write proofs of statements involving vector spaces, subspaces, linear independency, basis, and linear transformation.

COURSE EVALUATION & GRADING: Course grade will be based on quizzes, class work, homework, Midterm Exams, and Final Exam. The Final exam is cumulative and it counts at least 30% of the course grade.

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<th>Grade</th>
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TUTORIAL: Drop-in tutorial is available in the Mathematics Learning Center.
TOPICS TO BE COVERED

Textbook  
Elementary Linear Algebra, 11th Edition, by Howard Anton, published by Wiley,

1. SYSTEMS OF LINEAR EQUATIONS AND MATRICES
   1.1 Introduction to Systems of Linear Equations
   1.2 Gaussian Elimination
   1.3 Matrices and Matrix Operations
   1.4 Inverses; Algebraic Properties of Matrices
   1.5 Elementary Matrices and a Method for Finding A−1
   1.6 More on Linear Systems and Invertible Matrices
   1.7 Diagonal, Triangular, and Symmetric Matrices
   1.8 Matrix Transformations

2. DETERMINANTS
   2.1 Determinants by Cofactor Expansion
   2.2 Evaluating Determinants by Row Reduction
   2.3 Properties of Determinants; Cramer’s Rule

3. EUCLIDEAN VECTOR SPACES
   3.1 Vectors in 2-Space, 3-Space, and n-Space
   3.2 Norm, Dot Product, and Distance in Rn
   3.3 Orthogonality
   3.4 The Geometry of Linear Systems
   3.5 Cross Product

4. GENERAL VECTOR SPACES
   4.1 Real Vector Spaces
   4.2 Subspaces
   4.3 Linear Independence
   4.4 Coordinates and Basis
   4.5 Dimension
   4.6 Change of Basis
   4.7 Row Space, Column Space, and Null Space
   4.8 Rank, Nullity, and the Fundamental Matrix Spaces
   4.9 Basic Matrix Transformations in R2 and R3
   4.10 Properties of Matrix Transformations

5. EIGENVALUES AND EIGENVECTORS
   5.1 Eigenvalues and Eigenvectors
   5.2 Diagonalization

6. INNER PRODUCT SPACES
   6.1 *Inner Products
   6.3 *Gram–Schmidt Process; QR-Decomposition
   8.1 *General Linear Transformation

* - Optional