ROWAN UNIVERSITY
Department of Mathematics

Syllabus

Math 01.502 - Linear Algebra and Matrix Theory

CATALOG DESCRIPTION:

Math 01.502 Linear Algebra and Matrix Theory, 3 s.h.

This course studies linear operations and transformations on objects that exhibit the characteristics of a directional line segment in a suitable space, e.g. velocities and real-valued functions. By the adjective linear we mean the type of operation or function that retains the flatness. It is rare for a theory in mathematics above Calculus to be as complete and accessible as Linear Algebra. Its content has been applied, readily or through the strategy of linearization, to almost all branches of mathematics and statistics, and to many fields in science and engineering as well. Its value can hardly be overstated. Topics include linear systems, matrices, determinants, vector spaces, linear independence, inner product spaces, orthogonality, linear transformations, eigenvalues and eigenvectors, and canonical forms. This course may not be offered annually.

OBJECTIVE:

This course is intended to provide a sufficient background in linear algebra and matrix theory for students in all M.A. programs offered by the Department of Mathematics.

CONTENTS:

1. **Linear Systems and Matrices**

- System of Linear Equations
- Gaussian Elimination
- Matrices and Operations on Matrices
- Reduced Row Echelon Matrices
- General Solution to a Linear System
- Elementary Matrices and Non-singular Matrices

2. **Determinants**

3. **3-dimensional Space**

- Vectors in 3-dimensional Space
- Inner product
- Cross Product
- Lines and Planes in 3-dimensional Spaces

4. **Vector Spaces**

- Definition of a vector space
- Linear Combination, Linear Span and Subspaces
- Linear Dependence and Independence
- Bases and Dimensions
- Transition Matrices

5. **Inner Product Space**

- Inner Product
- Orthogonality and Gram-Schmidt Process

6. Linear Transformations

- Linear Transformations and Isomorphisms
- Kernels and Ranges
- Dimension Theorems
- Matrix representation

7. Diagonalization

- Eigenvalues and Eigenvectors
- Diagonalization and Similar Matrices
- Characteristic Polynomials and Minimal Polynomials
- Canonical Forms

TEXTS:

Lay, Davis, LINEAR ALGEBRA, AND ITS APPLICATIONS, Addison Wesley, NY

Fridberg, Stephen; Insel, Arnold and Spence, Lawrence, LINEAR ALGEBRA, (3rd edition), Prentice Hall, NJ

Lipschutz, LINEAR ALGEBRA, McGraw-Hill, New York, 1989.

Leon, LINEAR ALGEBRA WITH APPLICATIONS, (5th edition), Prentice Hall, NJ

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