ROWAN UNIVERSITY
Department of Mathematics

Syllabus

Math 01.210 - Linear Algebra

CATALOG DESCRIPTION:

Math 01.210 Linear Algebra, 3 s.h.
Prerequisite: C- or better in Math 01.131 (Calculus II)

Linear Algebra is about linear operations and functions on generalized quantities with a magnitude and a direction. Examples of such a quantity are common in the world, thus the content of this course is widely used in mathematics, statistics, science, engineering and computer science. Topics include: linear equations and matrices, vector spaces, linear dependence and independence, dimension and basis of a vector space, linear transformations, inner product and cross product, orthogonality, and eigenvalues and eigenvectors. Use of graphing calculators is required and computers may be used at the option of the instructor.

OBJECTIVES:

This course covers materials essential to many of the subsequent mathematics, statistics or CS courses. In particular, courses such as multivariable calculus, differential equations, modern algebra, and operations research depend heavily on the topics to be studied here. The purpose of the course is to provide a background in linear algebra required by advanced studies in mathematics, statistics, physics or CS. In addition to its applied side value, this course will strengthen the ability of abstract reasoning by its attention to mathematical proof.

CONTENT:

1. **The Matrix**
   - 1.1 The Matrix and Matrix Operations
   - 1.2 Inner Product and Cross Product
   - 1.3 Geometric Vectors
   - 1.4 Orthogonal Vectors
2. **Systems of Linear Equations**
   - 2.1 Equivalent Systems of Equations
   - 2.2 The General Solution of a Linear System
   - 2.3 The Row-Reduced Form of a Matrix and Rank
   - 2.4 Homogeneous Systems
3. **Square Matrices**
   - 3.1 The Multiplicative Inverse of a Square Matrix
   - 3.2 The Determinant of a Square Matrix
   - 3.3 Cofactors and Inverses
   - 3.4 The Determinant of a Product and Nonsingular Matrix

3.5 Eigenvalues and Eigenvectors

4. Vector Spaces

4.1 Vector Spaces and Subspaces
4.2 Linear Independence, Spanning Set and Basis
4.3 Coordinate and Dimension
4.4 Null Space, Row space and Column Space
4.5 Change of Basis

5. Linear Transformations

5.1 Linear Transformations
5.2 Matrix Representation
5.3 Composition of Transformations
5.4 Change of Basis

6. Diagonalization

6.1 Representation of a Linear Transformation by a Diagonal Matrix
6.2 The Eigenvalues and Eigenvectors of a Symmetric Matrix
6.3 Quadratic Form
6.4 Functions of a Square Matrix

7. Inner Product Spaces

7.1 Definition and examples
7.2 Cauchy-Schwartz inequality
7.3 Orthogonality
7.4 Orthonormal Basis and Gram-Schmidt Process

TEXTBOOK(S):

Elementary Linear Algebra: Applications Version, Anton, Rorres, and Kaul, 12/E Wiley

Elementary Linear Algebra w/Applications (Classic Verson), Kolman & Hill, 9/E, Pearson

Linear Algebra and Its Applications, Lay, Lay and McDonald, 5/E, Pearson

Updated: 1.20.21

Edited: 04/2021