

King Fahd University of Petroleum and Minerals

Department of Mathematics and Statistics

Syllabus of Math 280 (171)

Instructor: Dr. Ibrahim Al-Rasasi

Course: Math 280

Title: Introduction to Linear Algebra

Textbook: Linear Algebra with Applications, Steven J. Leon, 9th edition, Pearson, 2015.

Catalogue Description: Matrices and systems of linear equations. Vector spaces and subspaces. Linear independence. Basis and dimension. Inner product spaces. The Gram-Schmidt process. Linear transformations. Determinants. Diagonalization. Real quadratic forms. (**Co-requisite:** Math 201).

Objective: This course introduces students to the basic concepts and techniques of elementary linear algebra.

Learning Outcomes: Upon completion of this course, a student should be able to:

1. Use elementary row operations to solve systems of linear equations and decide whether a square matrix is singular or nonsingular.
2. Express a nonsingular matrix as a product of elementary matrices.
3. Evaluate the determinant of a matrix using cofactor expansion or elementary row/column operations.
4. Find the inverse of a nonsingular matrix using its adjoint and solve systems of linear equations by Cramer's method.

5. Construct a basis for a given vector space and evaluate its dimension.
6. Represent a linear transformation by a matrix.
7. Construct an orthonormal set using the Gram-Schmidt orthogonalization process.
8. Determine the eigenvalues and eigenspaces of a square matrix.
9. Decide whether a given square matrix is diagonalizable or not.
10. Diagonalize orthogonally a real symmetric matrix.

Attendance: A **DN grade** will be awarded to any student who accumulates **9** unexcused absences.

Grading Policy:

- Projects (5%)
- Three Major Exams ($3 \times 20 = 60\%$)
- Final Exam (35%), Comprehensive.

Class Location: 6-106.

Class Time: UTR: 9:00-9:50.

Resources: Check Blackboard.

Instructor's Contact Information:

Office Hours: UTR: 8:00-8:50 & 10:00-10:50.

Office Location: 5-326.

Office Phone #: 1268.

E-mail: irasasi@kfupm.edu.sa

King Fahd University of Petroleum and Minerals

Department of Mathematics and Statistics

Syllabus of Math 280 (171)

Instructor: Dr. Ibrahim Al-Rasasi

| Week | Dates | Sections | Topics (26 sections) |
|---|-----------------------|------------|---|
| 1 | Sep. 17-21 | 1.1 1.2 | Systems of Linear equations Row Echelon Form |
| 2 | Sep. 26-28 | 1.3 1.4 | Matrix Arithmetic Matrix Algebra |
| 3 | Oct. 1-5 + Oct. 7* | 1.5 2.1 | Elementary Matrices The Determinant of a Matrix |
| Exam I (Sunday, Oct. 8); Chapter 1 | | | |
| 4 | Oct. 8-12 | 2.2 2.3 | Properties of Determinants Additional Topics and Applications |
| 5 | Oct. 15-19 | 3.1 3.2 | Vector Spaces: Definition and Examples Subspaces |
| 6 | Oct. 22-26 | 3.3 3.4 | Linear Independence Basis and Dimension |
| 7 | Oct. 29- Nov. 2 | 3.5 3.6 | Change of Basis Row Space and Column Space |
| Exam II (Sunday of Week 8) | | | |
| 8 | Nov. 5-9 | 4.1 4.2 | Linear Transformations Matrix Representations of Linear Trans. |
| 9 | Nov. 12- 16 | 4.3 5.1 | Similarity Orthogonality |
| 10 | Nov. 19- 23 | 5.2 5.4 | Orthogonal Subspaces Linear Product Spaces |
| 11 | Nov. 26- 30 | 5.5 5.6 | Orthonormal Sets The Gram-Schmidt Orthogonalization Process |
| Exam III (Sunday of Week 12) | | | |
| 12 | Dec. 3-7 | 5.7 | Orthogonal Polynomials |
| 13 | Dec. 10-14 | 6.1 | Eigenvalues and Eigenvectors |
| 14 | Dec. 17-21 | 6.3 | Diagonalization |
| 15 | Dec. 24-28 | 6.6 | Quadratic Forms |
| Final Exam: Sunday, Jan. 7, 2018; 8-11 am. | | | |