

**King Fahd University of Petroleum and Minerals**  
**Department of Mathematics and Statistics**

**Syllabus of Math 225 (182)**

**(Introduction to Linear Algebra)**

**Instructor: Dr. Abdulilah Kadri**

**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 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.**

**Instructor:**

**Dr. Kadri**

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**Office Hours:**

**Sunday – Tuesday – Thursday: 11:05 – 12:05.**

**Exams and Distribution of Marks:**

**Classwork: 15%**

**Exam I: 25%**

**Exam II: 25%**

**Final Exam: 35% (Comprehensive)**

**(Time and location TBA)**

Week	Sections	Material
1	1.1 1.2	Systems of linear equations Row Echelon Form
2	1.3 1.4	Matrix Arithmetic Matrix Algebra
3	1.5 2.1	Elementary Matrices The Determinant of a Matrix
4	2.2 2.3	Properties of Determinants Additional topics and Applications
5	3.1 3.2	Vector Spaces: Definition and Examples Subspaces
6	3.3 3.4	Linear Independence Basis and Dimension
7	3.5 3.6	Change of Basis Row Space and Column Space
8	4.1 4.2	Linear Transformations Matrix Representations of Linear Transformations
9	4.3 5.1	Similarity Orthogonality
10	5.2 5.4	Orthogonal Subspaces Inner Product Spaces
11	5.5 5.6	Orthonormal Sets The Gram-Schmidt Orthogonalization Process
12	5.7	Orthogonal Polynomials
13	6.1	Eigenvalues and Eigenvectors
14	6.3	Diagonalization
15	6.6	Quadratic Forms

**Plagiarism and Cheating:** (Please read carefully)

KFUPM instructors follow “zero tolerance” approach with regard to cheating and plagiarism. During examinations (quizzes, major exams) cheating or any attempt of cheating by use of illegal activities, techniques and forms of fraud will result in a grade of **F** in the course along with reporting the incident to the higher university administration.