KING FAHD UNIVERSITY OF PETROLEUM & MINERALS
College of Sciences
Department of Mathematics and Statistics

Syllabus of MATH 225 (191)

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Course: MATH 225

Title: Introduction to Linear Algebra

Textbook: *Linear algebra with applications*, Steven J. Leon, 9th edition, Pearson.

Course 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.

Prerequisite: MATH 102

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

Students Learning Outcome: Upon successful completion of this course, a student should be able to:

- Use elementary row operation to solve systems of linear equations and decide whether a square matrix is singular or nonsingular.
- Express a nonsingular matrix as a product of elementary operations.
- Evaluate the determinant of a matrix using cofactor expansion or elementary row (column) operations.
- Find the inverse of a nonsingular matrix using its adjoint and solve some systems by Cramer's method.
- Construct a basis for a given vector space and evaluate its dimension.
- Represent a linear transformation by a matrix.
- Construct an orthonormal set using the Gram-Schmidt orthogonalization process
- Determine the eigenvalues and eigenspaces of a square matrix.
- Decide whether a given square matrix is diagonalizable or not.
- Diagonalize orthogonally a real symmetric matrix.

Attendance: KFUPM attendance policy will be enforced.

Grading Policy:

1. Two Major Exams (2 X 20%)
2. Final Exam (30%) (Comprehensive)
3. Homework (10%)
4. MATLAB projects (10%)
5. Quizzes (5%)
6. Participation (5%)

Academic Integrity: All KFUPM policies regarding ethics apply to this course.

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Week	Section	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 space: Definition and examples Subspaces
Exam I: (1.1- 3.2)		
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	Orthogonal subspaces
Exam II: (3.3- 5.2)		
11	5.4 5.5	Inner product spaces Orthonormal sets
12	5.6 5.7	The Gram-Schmidt orthogonalization process Orthogonal polynomials
13	6.1	Eigenvalues and eigenvectors
14	6.3	Diagonalization
15	6.6	Quadratic forms
Final Exam: (comprehensive)		