King Fahd University of Petroleum & Minerals
Department of Mathematics
Fall 2022 (Term 221)

SYLLABUS

Course: **Math 225**

Title: **Introduction to Linear Algebra**

Textbook: Linear Algebra with Applications, Steven J. Leon • Lisette de Pillis, 10th Edition, Pearson, 2021.

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

Week	Section	Title
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
6	3.3 3.4	Linear independence Basis and dimension

Week	Section	Title
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
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

Grading Policy (*)	Weight	Dates
Homework	-	-
Test 1 (Sections 1.1 – 2.3)	40	Tuesday, **September 27**, In-Class
Test 2 (Sections 3.1 – 4.3)	40	Tuesday, **November 01**, In-Class
Midterm Exam (Sections 1.1 – 5.7)	100	Tuesday, **December 06**, **5:30 – 7:30 p.m.** Room: **59 – 2025**
Final Exam (Comprehensive)	120	**tba**
TOTAL	300	

(*) In case a student misses an assessment for a legitimate reason (such as medical emergencies), he must bring an official excuse from Students Affairs. Otherwise, he will get zero. No makeup and the final grade will be determined based on the non-missed assessments.

Learning Outcomes: Upon completion of this course, students should be able to
- Solve linear systems and compute determinants and matrix inverses.
- Explain fundamental concepts such as vector spaces, subspaces, linear independence and dependence, spanning sets, bases, dimensions, and linear transformations.
- Determine matrix representations of linear transformations.
- Discuss inner product spaces and orthonormal bases.
- Apply the Gram-Schmidt process to construct orthonormal bases.
- Compute eigenvalues and eigenvectors and use them in diagonalization and in classifying real quadratic forms.

Academic Integrity: All KFUPM ethic policies apply in this course.

University Policy on Attendance: A DN grade will be awarded to any student who accumulates 9 absences.

Office Hours & Contact Information: Office hours: UTR 9:00-10:00 a.m. Salah-Eddine Kabbaj (صلاح الدين القبّاج)
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