King Fahd University of Petroleum & Minerals
Department of Mathematics
Fall 2025 (Term 251)

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
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

Sun. – Thu. 26 – 30 October, 2025 : Midterm Break

Grading Policy (*)	Weight	Dates	Homework (**)		
Homework	36	-	HW 1 / 8	1.1 – 1.5	8 Pbs
Exam 1 (Sections 1.1-3.6)	72	Tue. **14 Oct.** @ **6 p.m.** Room: 4-149	HW 2 / 8	2.1 – 2.3	8 Pbs
Exam 2 (Sections 4.1-5.7)	72	Tue. **02 Dec.** @ **6 p.m.** Room: 4-149	HW 3 / 8	3.1 – 3.6	8 Pbs
Final Exam (Comp.)	120	**tba**	HW 4 / 8	4.1 – 4.3	8 Pbs
TOTAL	300	Maghrib prayer: Oct. 14 @ **5:13 p.m.** | Dec. 02 @ **4:47 p.m.**	HW 5 / 8	5.1 – 5.2 5.4 – 5.7	8 Pbs

(*) If you miss an exam for a legitimate reason (such as medical emergency), you should bring an official excuse from Students Affairs. No makeup and the final grade will be determined based on the non-missed exams.
(**) The homework should be emailed (in PDF) to the TA (see Email below).

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: Office hours: UT 10:00-11:30 a.m.
Instructor: Salah-Eddine Kabbaj ; Office: 5-428 ; Email: kabbaj@kfupm.edu.sa
TA: Yousef Odeh ; Email: g202416340@kfupm.edu.sa