King Fahd University of Petroleum and Minerals

Department of Mathematics

Math 225, Syllabus, Term 241

Instructor: Dr. Ibrahim Al-Rasasi (irasasi@kfupm.edu.sa)

Course Code & Title: Math 225, Introduction to Linear Algebra

Credit Hours: 3-0-3

Prerequisite: Math 102

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

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 transformation. Determinants. Diagonalization. Real quadratic forms.

Course Objective: The objective of the course is to introduce students to the basic concepts and techniques of elementary linear algebra.

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

1. Solve linear systems and compute determinants and matrix inverses.
2. Explain fundamental concepts such as vector spaces, subspaces, linear independence and dependence, spanning sets, basis, dimension, and linear transformation.
3. Determine matrix representations of linear transformations.
4. Discuss inner product spaces and orthonormal bases.
5. Apply the Gram-Schmidt process to construct orthonormal basis.
6. Compute eigenvalues and eigenvectors and use them in diagonalization and in classifying real quadratic forms.

Grading Policy:

Exam I	Exam II	Final Exam	Homework	Project
25%	25%	30%	8%	12%

Letter Grades:

A+	A	B+	B	C+	C	D+	D	F
90	85	80	75	70	65	60	55	< 55

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

Class Time & Location: UTR 9:00-9:50 am; 3-109.

Office Hours: UTR: 10-10:50 & by appointment.

Resources: Check Blackboard.

Academic Integrity: All KFUPM policies regarding ethics apply to this course. See the Undergraduate Bulletin in the Registrar's website.

Undergraduate Attributes: Please check the following link

https://math.kfupm.edu.sa/bsinmathematics/graduate-attributes

Coverage Plan

Week	Dates (2024)	Sections	Title (26 sections)
1	Aug. 25-29	1.1	Systems of Linear Equations
		1.2	Row Echelon Form
2	Sep. 1-5	1.3	Matrix Arithmetic
		1.4	Matrix Algebra
3	Sep. 8-12	1.5	Elementary Matrices
4	Sep. 15-19	2.1	The Determinant of a Matrix
		2.2	Properties of Determinants
Sep. 22-23: National Day Holidays			
5	Sep. 24-26	2.3	Additional Topics and Applications
6	Sep.29- Oct. 3	3.1	Vector Spaces: Definition and Examples
		3.2	Subspaces
↓ Exam I: Sunday, Oct. 6; Chapters 1 & 2			
7	Oct. 6-10	3.3	Linear Independence
8	Oct. 13-17	3.4	Basis and Dimension
		3.5	Change of Basis
9	Oct. 20-24	3.6	Row Space and Column Space
		4.1	Linear Transformation
10	Oct. 27-31	4.2	Matrix Representation of Linear Trans.
		4.3	Similarity
11	Nov. 3-7	5.1	Orthogonality
		5.2	Orthogonal Subspaces
↓ Exam II: Sunday, Nov. 10; Chapters 3 & 4			
12	Nov. 10-14	5.4	Inner Product Spaces
		5.5	Orthonormal Sets
13	Nov. 17-21	5.6	The Gram-Schmidt Orthogonalization Process
		5.7	Orthogonal Polynomials
14	Nov. 24-28	6.1	Eigenvalues and Eigenvectors
		6.2	Diagonalization
15	Dec. 1-5	6.3	Quadratic Forms
16	Dec. 8-9		Projects Presentation

Homework Assignments for Math 225

	Sec.	Exercises
1	1.1	1(c), 3
2	1.2	5(e, g, i), 6(b), 9, 10
3	1.3	2(c, d), 4(b), 5, 9, 10(a, b), 16
4	1.4	3, 4, 7, 9, 10(a, b, d), 13, 19, 28
5	1.5	3, 6, 7, 8(c), 10(e), 11(a), 12(a), 15, 22, 27
6	2.1	
7	2.2	
8	2.3	