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

Math 225 – Syllabus

Semester 211

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Title Introduction to Linear Algebra

Credit 3-0-3

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

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.

Grading Policy:

Exam I	Exam II	HW	Quizzes	Participation	Projects	Final Exam
20%	20%	10%	5%	5%	10%	30%

Learning outcomes: Upon completion of this course, each student should be able to:

1. Use elementary row operation 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 some systems 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.

PACING SCHEDULE

Week	Date	Section	Topic
1	Aug. 29 – Sep. 02	1.1	Systems of Linear Equations
		1.2	Row Echelon Form
2	Sep. 05 – Sep. 09	1.3	Matrix Arithmetic
		1.4	Matrix Algebra
3	Sep. 12 – Sep. 16	1.5	Elementary Matrices
		2.1	The Determinant of a Matrix
4	Sep. 19 – Sep. 23	2.2	Properties of Determinants
		2.3	Additional Topics and Applications
	Thursday, September 23, 2021:		**The National Day Holiday**
5	Sep. 26 – Sep. 30	3.1	Vector Space: Definition and Examples
		3.2	Subspaces
6	Oct. 03 – Oct. 07	3.3	Linear Independence
		3.4	Basis and Dimension
7	Oct. 10 – Oct. 14	3.5	Change of Basis
		3.6	Row Space and Column Space
	Sunday, October 16, 2021:		**Student Break**
8	Oct. 17 – Oct. 21	4.1	Linear Transformations: Definition and Examples
		4.2	Matrix Representations of Linear Transformations
9	Oct. 24 – Oct. 28	4.3	Similarity
		5.1	Orthogonality
10	Oct. 31 – Nov. 04	5.2	Orthogonal Subspaces
11	Nov. 07 – Nov. 11	5.4	Inner Product Spaces
		5.5	Orthonormal Sets
12	Nov. 14 – Nov. 18	5.6	The Gram-Schmidt Orthogonalization Process
		5.7	Orthogonal Polynomials
13	Nov. 21 – Nov. 25	6.1	Eigenvalues and Eigenvectors
	Nov. 28 – Dec. 02, 2021:		**Midterm Break**
14	Dec. 05 – Dec. 09	6.3	Diagonalization
15	Dec. 12 – Dec. 16	6.6	Quadratic Forms
16	Dec. 19 – Dec. 20		Review/ Catching up

Homework:

The only way to learn Mathematics is to do Mathematics!. So I encourage you to form study groups, help each other, and to seek help elsewhere (if needed) to solve the homework seriously. Homework helps to sharpen your mathematical writing skills. An optimal strategy is to try each problem yourself first, then get together with others to discuss your solutions and questions, and finally write up the solutions yourself.

Office Hours:

Every Monday and Wednesday 11AM to 12PM. Try solving the problem before asking about it in the office hours.

Tests:

There will be two major exams and a final exam. There are no makeup exams.

Remark:

Above all, I hope you have fun in this course. This is one of my main two goals in the course (the other one is, of course, to learn basics of Linear Algebra).
