Birzeit University

Mathematics Department

Math 234

Course Outline

Second Summer 2024/2025

Textbook: Steven J. Leon, *Linear algebra with applications*, **9th ed.**, Pearson Prentice Hall.

Instructor: Prof. Ahmad Al-Dweik

Description:

Linear algebra covers material, which is essential to anyone who does any mathematical computations in engineering and in science. The subject divides naturally into two parts: computations and formal structure.

Topics include: systems of linear equations and their solutions, matrices and matrix algebra, inverse matrices, determinants, vector spaces, subspaces, linear independence, bases for vector spaces, dimension, matrix rank, linear transformations and their matrix representation, eigenvalues, eigenvectors, matrix diagonalization.

We will cover (more or less) the following sections from the textbook:

Chapter	Sections
Chapter 1. Matrices and Systems of equations	1.1, 1.2, 1.3, 1.4, 1.5
Chapter 2. Determinants	2.1, 2.2, 2.3
Chapter 3. Vector spaces	3.1, 3.2, 3.3, 3.4, 3.5, 3.6
Chapter 4. Linear transformation	4.1, 4.2
Chapter 6. Eigenvalues	6.1, 6.3

Course Objectives:

- To understand several important concepts (for details see the topics above) in linear algebra;
- Solve linear systems of equations Ax=b using different methods, (eg. Gauss elimination method);
- Understand the definitions of Vector Space, Linear Independence, Basis and Dimension;
- Identify the four fundamental subspaces of a matrix, find a basis and dimension for each;
- Understand the properties of determinants, apply formulas for computing its value;
- Compute eigenvalues and eigenvectors of a matrix and diagonalizing it;
- To improve your ability (or to learn!) to prove mathematical theorems;
- To improve your ability to think logically, analytically, and abstractly;
- To improve your ability to communicate mathematics, both orally and in writing; and
- To develop abstract and critical reasoning by studying logical proofs and the axiomatic method as applied to linear algebra.

Assignments & tests: There will be quizzes throughout the semester, a midterm exam and a final exam during final exams period.

Grading policy: (Depending on circumstances)

Quizzes: 20%
Midterm Exam: 35%
Final Exam: 45%

University policy regarding exams will be applied.

Assigned Problems:

Section	Problems
1.1	1(b, c), 5, 6(e,h),7,10
1.2	1, 2, 3, 5(c,d,f,g,i,j) 6(d), 8, 9, 10
1.3	4(b), 9, 11, 12, 13, 15, 16
1.4	4, 10,12, 14, 15, 16, 17, 19, 24(c), 25, 28, 29,30, 35, 36
1.5	1, 2, 3, 5, 6, 8, 10(d,g), 13, 15, 16, 17, 18, 22, 29, 30, 31, 32
2.1	1, 3(d,g), 5, 6, 9, 11
2.2	2, 3(e,f), 4, 5, 6, 7, 8, 9, 14, 16
2.3	1(b,c), 2(b,d), 3, 4, 6, 8, 10, 11, 12
3.1	4, 5, 6, 10, 11, 12
3.2	1, 2, 3, 4, 5, 6, 8, 9(c), 11(b,d), 12, 14, 15, 17, 19, 22, 23, 24,
3.3	2, 4, 5, 7, 8, 12, 15, 16, 17, 18, 19, 20
3.4	2, 4, 7, 9, 10, 11, 14, 15
3.5	4, 6, 8, 9, 10, 11
3.6	1(c), 2(c), 3, 4(a,d), 6, 8, 9, 13, 14, 15, 16, 17, 18, 24, 25
4.1	4, 5, 6, 9, 14, 17, 18, 19, 21, 22, 25
4.2	2, 4, 5, 6, 13, 14, 15, 18
6.1	1(a,b,g,h), 2, 3, 4, 8, 14, 16, 26
6.3	1(d,f), 2, 4, 6, 8(a,b,e), 9