

**NATIONAL UNIVERSITY OF COMPUTER AND EMERGING SCIENCES
LAHORE CAMPUS**



Linear Algebra Outline according to OBE, FALL-2024

FILE CONTENTS

Outline of Linear Algebra (CS, SE, DS)

DEPARTMENT OF SCIENCES & HUMANITIES

Department	Department of Sciences & Humanities	Dept. Code	S & H
Course Title	Linear Algebra	Course Code	MT1004
Pre-requisite(s)	-	Credit Hrs.	3
Moderator	Dr. Tayyaba Naz		
Course Instructors	Dr. Akhlaq Ahmad (BCS-3C, 3D, 3K), Dr. Tayyaba Naz (BSE-3A, 3B) Dr. Nasir (BCS, 3F, 3J), Mr. Muhammad Rizwan (BCS-3G, 3B), Dr. Nazish (BCS-3A, BDS-3A), Dr. Sonia Hanif (BDS-3B), Dr. Komal Hassan (BDS-3C), Ms. Maria Shabir (BCS-3H, BCS-3E)		
Note:	It is a tentative schedule of the course. Any change(s) will be communicated by the respective instructor (if required).		

Course Objective	The objective is to impart training to the students in this very important branch of Mathematics. Students are expected to learn about system of linear equations, vector spaces, inner products, Eigen values and linear transformations. Attempt will be made to introduce the students to postulation and axiomatic approach in Mathematics. This course also emphasizes the application of linear algebra in science and real life.
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No.	Assigned Program Learning Outcome (PLO)	Level	Tool
01			

I = Introduction, R = Reinforcement, E = Evaluation.

A = Assignment, Q = Quiz, M = Midterm, F = Final, L = Lab, P = Project, W = Written Report.

No.	Course Learning Outcome (CLO) Statements	Tools
01	<ul style="list-style-type: none"> Use concept of elementary row operations to find the inverse of square matrices, determinant of a matrix and solving the system of linear equations. 	Q1, A1, M1, F
02	<ul style="list-style-type: none"> Properties of vectors in 2-space, 3-space and n-space and recognize vector spaces and/or subspaces to compute their bases and its dimension. 	Q2, A2, M2, F
03	<ul style="list-style-type: none"> Perform Eigen Value analysis and use it to Diagonalize a matrix and/or find its powers. 	Q3, A2, M2, F
04	<ul style="list-style-type: none"> Identify inner product spaces and/or perform Gram Schmidt process/QR decomposition using inner products. 	Q4, M2, A3, F
05	<ul style="list-style-type: none"> Express a linear transformation graphically using matrices and to solve problems. 	Q3, A3, F

Text Book(s)	Title	Elementary Linear Algebra
	Author	Howard A. Anton (Latest Edition)
	Publisher	
Ref. Book(s)	Title	Linear Algebra with Applications
	Author	Bernard Kolman (Latest Edition)

Week	Course Contents	Chapter	CLO
01	<u>System of Linear Equations and Matrices</u> 1.1 Introduction to linear system 1.2 Gaussian Elimination 1.3 Matrices and Matrix operations	1	01
02	1.4 Inverses; Algebraic properties of Matrices 1.5 Elementary Matrices and Method of finding matrix inverse	1	01
03	1.6 More on linear systems and Invertible Matrices 1.7 Diagonal, Triangular and Symmetric matrices 1.8 Matrix Transformations	1	01, 05
04	<u>Determinants</u> 2.1 Determinants by Cofactor Expansion 2.2 Evaluating Determinants by row reduction 2.3 Properties of Determinants; Cramer's rule	2	02
05	MID TERM-I		
06	<u>Euclidean Vector Spaces</u> 3.1 Vectors in 2-space, 3-space and n-space 3.2 Norm, Dot Product, and Distance in \mathbb{R}^n 3.3 Orthogonality of vectors 3.4 The Geometry of Linear Systems 3.5 Cross Product	3	03
07	<u>General Vector Spaces</u> 4.1 Real Vector Spaces 4.2 Subspaces	4	05
08	4.3 Linear Independence / Dependence 4.4 Coordinates and Basis for a vector space 4.5 Dimension 4.6 Change of Basis	4	02
09	4.7 Row space, Column Space and Null Space 4.8 Rank and Nullity 4.9 Basic Matrix Transformations in \mathbb{R}^2 and \mathbb{R}^3 4.10 Properties of Matrix Transformations (if time permits at the end)	4	02
10	<u>Eigenvalues and Eigen vectors</u> 5.1 Eigenvalues and Eigenvectors 5.2 Diagonalization of matrices	5	03
11	<u>Inner Product Spaces</u>		

	6.1 Inner product spaces 6.2 Angle and Orthogonality in Inner product Spaces	6	04
12	6.3 Gram-Schmidt Process, QR- Decomposition		
13	MID TERM II		
14	General Linear Transformations 8.1 General Linear Transformations 8.2 Compositions and Inverse Transformations	8	05
15	8.3 Isomorphism 8.4 Matrices for General Linear Transformations 8.5 Similarity	8	05
If time permits	7.1 Orthogonal Matrices 7.5 Hermitian, Unitary and Normal Matrices		
	FINAL EXAM		

Evaluation Procedure & Marks Distribution:

Assessment Tools	Total No. of	Weightage
Quizzes	As announced by instructor (3 at least)	12%
Assignments	As announced by Moderator (3 at least)	8%
Mid Term Exam	2	30%
Final Exam	1	50%

Important Note(s):

1. Student(s) of any section can visit the moderator office in case of any academic issue.
2. Relative grading scheme will be used at the end of the semester.
3. If an instructor is teaching more than one section in a same degree then combined grading scheme will be used for all the sections the instructor is teaching.
4. Moderator will forward all the Assignment(s) questions to all the sections.
5. Any kind of plagiarism will result strict disciplinary action as per university rules.
6. University require 100% attendance in the course. Absence of a maximum of 20% of the total lecture hours may be condoned for genuine reasons, such as medical illness. Failure to meet the attendance requirement the student will not be allowed to sit in final exam.

Best of Luck