LINEAR ALGEBRA (THEORY) BS-212

Pre-requisite: None
Credit Hours 03
Contact Hours 48

RECOMMENDED BOOKS

Linear Algebra and its applications by David C. Lay. 4th Edition, Addison Wesley,

REFERENCE BOOKS

Introduction to Linear Algebra by Gilbert Strang, 4th Edition

OBJECTIVE OF COURSE

Linear algebra is a very important course in the start of any Engineering. It is the study of abstract vector spaces and linear transformations. The subject is rich in mathematical structures, supports many applications in engineering, science, and operations research. The goal of this course is to master the fundamentals of abstract linear algebra by emphasizing concepts and proofs. The course will also provide student with practical problem from real world so that the student start feeling the importance of this subject throughout their remaining Engineering program.

S.NO	CLO/PLOS MAPPING	DOMAIN	PLO
01	**Interpret** the vector equations and linear transformations.	**C5**	**01**
02	**Illustrate** how to solve a system of linear equations that appears in different engineering applications.	**C3**	**01**
03	**Apply** the basic knowledge of vector spaces, eigen value and eigen vectors.	**C3**	**02**
04	**Implement** key concepts developed in the course using a mathematical simulation software.	**C3**	**05**

COURSE CONTENTS

System of Linear Equations and Matrices

- Introduction to system of linear equations
- Matrix form of system of Linear Equations

- Gaussian Elimination method
- Gauss-Jorden Method
- Consistent and inconsistent systems
- Homogeneous system of equations

Vector Equations

- Introduction to vector in plane
- Vector in Rn
- Vector form of straight line
- Linear Combinations
- Geometrical interpretation of solution of Homogeneous and Non-homogeneous equations

Applications of Linear Systems

- Traffic Flow Problem
- Electric circuit Problem
- Economic Model

Linear transformations

- Introduction to linear transformations
- Matrix transformations
- Domain and range of linear transformations
- Geometric interpretation of linear transformations
- Matrix of linear transformations

Inverse of a matrix

- Definition of inverse of a matrix
- Algorithm to find the inverse of matrices
- LU factorization

Determinants

- Introduction to determinants
- Geometric meaning of determinants
- Properties of determinants
- Crammer Rule
- Cofactor method for finding the inverse of a matrix

Vector Spaces

- Definition of vector spaces
- Subspaces
- Spanning set
- Null Spaces and column spaces of linear transformation
- Linearly Independent sets and basis
- Bases for Null space and Kernel space
- Dimension of a vector space

Eigen Values and Eigen vectors

- Introduction to Eigen value and Eigen vectors
- Computing the Eigen values
- Properties of Eigen values
- Diagonalization
- Applications of Eigen values

Inner product and Orthogonality

- Introduction to inner product
- Computing L2 norm
- Introduction to orthogonality
- Gram-Schmidt process