Course Code	Course Title	C	H	I	E	T
17U6MMC12	Linear Algebra	4	4	25	75	100

Learning Objectives

- This course is to provide a strong foundation in fundamental concepts of Linear Algebra culminating in abstract vector spaces and linear transformations.
- To understand the use of basic concepts of vector algebra including linear dependence / independence, basis and dimension of a subspace, rank and nullity for analysis of matrices and system of linear equations.

Learning Outcomes

After successful completion of this course, students will be able to

- Understand vector spaces and subspaces and apply their properties.
- Characterize a set of vectors in terms of linear combinations, their span and how they are related geometrically.
- Find a basis for the row space, column space and null space of a matrix and understand the change of basis.
- Compute inner product spaces on a real vector space and compute angle and orthogonality in inner product spaces.
- Create orthogonal and orthonormal bases using Gram Schmidt orthogonalization process and use bases and orthonormal bases to solve application problems.
- Identify linear transformations of finite dimensional vector spaces and compose their matrices in specific bases.
- Compute linear transformations, kernel, range and invertible linear transformations.
- Apply linear algebra concepts to model, solve and analyse real-world situations.

Unit I Vector Spaces

Vector Space – Definition and examples – Subspaces – Sum of Subspaces – Quotient Spaces – Homomorphism or Linear transformation.

Unit II Vector Spaces (Continuation)

Linear span – Linearly independence and linearly dependence– Finite dimensional vector space – Dimension of a vector space.

Unit III Inner Product Spaces

Inner Product Space – Definition – Examples – Norm of a Vector – Orthogonality –Orthonormal set – Bessel's inequality – Gram Schmidt's Orthogonalization Process.

Unit IV Linear Transformations

Linear Transformations – Algebra of Linear Transformations.

Unit V Linear Transformations (Continuation)

Invertible Linear Transformations – Matrixof Linear Transformations.

Text Book:

- Vijay K. Khanna and S. K. Bhambiri, A Course in Abstract Algebra, 5th Edition (3rd Reprint 2018), Vikas Publishing House Private Limited.
- **Chapters:** 10, 11 (Upto Matrix of a Linear transformation), 13 (Excluding operators on Inner product space)

Reference Books:

1. Surjeet Singh and QaziZameeruddin, Modern Algebra, 8th Edition, Vikas Publishing House Private Limited.
2. S.Arumugam and A. ThangapandiIssac, Modern Algebra, July 2006, Scitech Publications Private Limited, India.