ST. JOSEPH'S COLLEGE FOR WOMEN (AUTONOMOUS) VISAKHAPATNAM

IV SEMESTER **MATHEMATICS** TIME: 2HRS/WEEK

M 4354 (2) **LINEAR ALGEBRA** MAX. MARKS: 50

w.e.f. (AH Batch) **PRACTICAL SYLLABUS**

COURSE OBJECTIVES: To enable the students to -

- Define Vector Space, Quotient space Direct sum, linear span and linear independence, basis and inner product.
- Discuss the linear transformations, rank, nullity
- Find the characteristic equation, eigen values and eigen vectors of a matrix.
- Provecayley- Hamilton theorem, Schwartz inequality, Gramschmidt orthogonalisation process.
- Solve the system of simultaneous linear equations and be able to apply matrices, systems of equations, regression, and eigenvectors to real world situations.
- Know vocabulary, notation, and operations for matrices and vectors.
- Solve linear systems of equations using a variety of techniques and to select the best technique for a given system.
- Be able to define Linear Transformations and find the find the Domain, Range, Kernel, rank, and nullity of a linear transformation.
- Be able to apply vectors, inner products, and linear transformations to real world situations.
- Develop lesson plans that demonstrate their ability to explain concepts related to vectors and matrices.

COURSE OUTCOMES: At the end of the course student will -

- **CO1:** Apply theoretical / analytical / statistical knowledge gained in various courses of B.Sc to solve numerical problems based on real life situations during practicals and draw meaningful solutions to day to day problems
- **CO2:** Enabling students to develop a positive attitude towards mathematics as an interesting and valuable subject of study
- **CO3:** Enhancing students overall development and to equip them with mathematical abilities, problem solving skills, creative talent and power of communication necessary for various kinds of employment.
- **CO4:** Problem solving on Vector Spaces, Linear Transformations, Matrices and Inner Product Spaces
- **CO5:** Be able to gain proficiency in solving systems of Linear equations using matrices and demonstrate a working knowledge of algebraic properties of matrices.
- **CO6:**Be able to understand Euclidean Vector spaces, their inherent and algebraic structure and the accompanying geometry.
- **CO7:**Be able to acquire facility working with general vector spaces, linear transformations, coordinate vectors and the changing of bases.
- **CO8:**Be able to develop an algebraic and geometric understanding of eigenvalues and eigenvectors.

- **CO9:**Be able to prove Cayley - Hamilton theorem, Schwartz inequality, Gramschmidt orthogonalisation process
- **CO10:**Be able to solve linear systems of equations using a variety of techniques and to select the best technique for a given system.
- **CO11:** Be able to define Linear Transformations and find the find the domain, range, kernel, rank, and nullity of a linear transformation.
- **CO12:**Be able to apply vectors, inner products, and linear transformations to real world situations.

COURSE SYLLABUS :

UNIT – I : VECTOR SPACES-I :

Vector Spaces, General properties of vector spaces, n-dimensional Vectors, Addition and Scalar multiplication of Vectors, Internal and External composition, Null space, Vector subspaces, Algebra of subspaces, Linear Sum of two subspaces, Linear combination of Vectors, Linear span Linear independence and Linear dependence of Vectors.

UNIT –II : VECTOR SPACES-II :

Basis of Vector Space, Finite Dimensional Vector spaces, Basis extension, Co-ordinates, Dimension of a Vector space, Dimension of a subspace, Quotient space and Dimension of Quotientspace.

UNIT –III : LINEAR TRANSFORMATIONS :

Linear transformations, Linear operators, Properties of L.T, Sum and Product of L.Ts, Algebra of Linear Operators, Range and Null space of Linear Transformation, Rank and Nullity of Linear transformations – Rank and Nullity Theorem.

UNIT –IV : MATRIX :

Characteristic Roots, Characteristic Values & Vectors of Square Matrix, Cayley – Hamilton Theorem., Derogatory, non Derogatory, Diagonalizability

UNIT –V : INNER PRODUCT SPACE :

Inner Product Spaces, Euclidean and Unitary Spaces, Norm or length of a Vector, Schwartz Inequality, Triangular Inequality, Parallelogram law, Orthogonality, Orthonormal Set, Complete Orthonormal set, Gram – Schmidt Orthogonalization Process, Bessel's inequality and Parseval's Identity.

PRESCRIBED TEXT BOOK : A Text of Mathematics B.Sc. Mathematics Vol – III by S. CHAND Publications(2016)

REFERENCE BOOKS :

1. Linear Algebra by J.N. Sharma and A.R. Vasista, published by Krishna PrakashanMandir, Meerut- 250002.(1996)

2. Matrices by Shanti Narayana, published by S.Chand Publications.(1998)

3. Linear Algebra by Kenneth Hoffman and Ray Kunze, published by Pearson Education (low priced edition),New Delhi. (1992)

4. Linear Algebra by Stephen H. Friedberg et al published by Prentice Hall of India Pvt. Ltd. 4th Edition (2007).

** ** **