Government PG College, Ambala Cantt.

Course File (Session 2023-24)

Name of Assistant Professor: Dr. Hardish Kaur

Class: B.SC. /B.A. III Year/6th Semester

Course Code and Name: BM 242 Linear Algebra

Time: 3 Hours B.Sc./B.A. Theory : 40

Sessional: 10 Theory: 26 Sessional: 7

Note: The examiner is requested to set nine questions in all, selecting two questions from each section and one compulsory question consisting of five or six parts distributed over all the four sections. Candidates are required to attempt five questions in all, selecting at least one question from each section and the compulsory question.

SECTION-I

Vector spaces, subspaces, Sum and Direct sum of subspaces, Linear span, Linearly Independent and dependent subsets of a vector space. Finitely generated vector space, Existence theorem for basis of a finitely generated vector space, Finite dimensional vector spaces, Invariance of the number of elements of bases sets, Dimensions, Quotient space and its dimension.

SECTION-II

Homomorphism and isomorphism of vector spaces, Linear transformations and linear forms on vector spaces, Vector space of all the linear transformations Dual Spaces, Bidual spaces, annihilator of subspaces of finite dimensional vector spaces, Null Space, Range space of a linear transformation, Rank and Nullity Theorem,

SECTION-III

Algebra of Liner Transformation, Minimal Polynomial of a linear transformation, Singular and non-singular linear transformations, Matrix of a linear Transformation, Change of basis, Eigen values and Eigen vectors of linear transformations.

SECTION-IV

Inner product spaces, Cauchy-Schwarz inequality, Orthogonal vectors, Orthogonal complements, Orthogonal sets and Basis, Bessel's inequality for finite dimensional vector spaces, Gram-Schmidt, Orthogonalization process, Adjoint of a linear transformation and its properties, Unitary linear transformations.

Books Recommended:

1. I.N. Herstein: Topics in Algebra, Wiley Eastern Ltd., New Delhi, 1975

2. P.B. Bhattacharya, S.K. Jain and S.R. Nagpal: Basic Abstract Algebra (2nd edition).

3. Vivek Sahai and Vikas Bist: Algebra, NKarosa Publishing House.

4. I.S. Luther and I.B.S. Passi: Algebra, Vol.-II, Norsa Publishing House.

Lesson Plan: From January 2024 to April 2024

1 Jan to 15 Jan	Vector Spaces and subspaces
16 Jan to 31 Jan	Basis and Dimension ,Quotient Space
1 Feb to 15 Feb	Linear Transformations, Rank and Nullity
16 Feb to 29 Feb	Same
1 March to 15 March	Algebra of LT, Matrix of LT
16 March to 22 March	Same
23 March to 31 March	Holi Break
1 April to 15 April	Dual Space, Eigen Values and Eigen Vectors
16 April to 30 April	Inner Product Spaces, LT on Inner Product Spaces
Examinations	

Course Learning Outcomes:

1. The students will know about vector spaces and subspaces sum and direct sum of subspaces, linear span, linear dependence and independence finite dimensional vector spaces, invariance of the number of elements of basis sets, dimensions, quotient space and its dimension, homomorphism and isomorphism of vector spaces.
2. They will learn linear transformation and linear forms of vector spaces, dual spaces and bidual spaces, null space and range space of a linear transformation, rank and nullity theorem, algebra of linear transformations, minimal polynomial of linear transformation, singular and non-singular linear transformations.
3. They will have the knowledge of inner product spaces, Cauchy-Schwarz inequality, orthogonal vectors, orthogonal complements, orthogonal sets and basis, Bessel inequality of finite dimensional vector spaces, Gram-Schmidt orthogonalization process, adjoint of linear transformation and its properties, Unitary linear transformations.
4. Linear algebra is the study of linear combinations. It is the study of vector spaces, lines and planes, and some mappings that are required to perform the linear transformations.
5. It includes vectors, matrices and linear functions. It is the study of linear sets of equations and its transformation properties.