(Master of Science) (Mathematics)
(M.Sc.) (Mathematics) Semester (I)

Course Code	PS01CMTH54	Title of the Course	Advanced Linear Algebra
Total Credits of the Course	4	Hours per Week	4 hours

Course Objective	The aim of this course is making students to learn about abstract concepts of vector spaces, linear transformations and their properties.

Course Content		
Unit	Description	Weightage* (%)
1.	**Vector Space** Elementary Basic Concepts: Definitions, Examples, Subspace, Homomorphism, Isomorphism, Quotient space, First homomorphism theorem, Internal direct sum, External direct sum, Linear combination, Linear spans, Linear dependence and independence, basis, Cardinality, Dual space, dual basis, second dual, Annihilator, dimension of the annihilator, Applications to system of Linear equations.	25%
2.	**Linear Transformation** Algebra of liner transformations, Minimal polynomial of a linear transformation, Regular and Singular linear transformations, Rank of a linear transformation, Characteristic roots, Matrix associated with a linear transformation, Isomorphism between the space of linear transformations and the space of matrices, Similarity of matrices, Examples and similarity of linear transformations.	25%
3.	**Canonical Forms** Triangular forms, Triangular matrix associated to a linear transformation, Nilpotent transformations, Existence and uniqueness of invariants of a nilpotent transformation. Jordan Decomposition Form, Examples	25%

4.	**Certain properties $M_n(F)$ and Quadratics** Trace, Transpose and their properties, Jacobson's lemma, Definition and properties of determinant, Quadratic forms: diagonalization of a symmetric matrix, symmetric matrix associated to a quadratic form, classification of quadratics.	25%

Teaching-Learning Methodology	Interaction based Classroom teaching

Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage
1.	Internal Written / Practical Examination (As per CBCS R.6.8.3)	15%
2.	Internal Continuous Assessment in the form of Quizzes, Assignments, and Attendance (As per CBCS R.6.8.3)	15%
3.	University Examination	70%

Course Outcomes: After completion of this course, student will be able to	
1	understand the properties of vector spaces and related illustrations
2	analyze the properties exhibited by linear transformation and their relationships with matrices
3	apply results of vector spaces and linear transformations to draw valid conclusions.
4	evaluate various types of Canonical forms of linear transformation and matrix theory associated with Vector spaces
5	They would be able to apply the results for Linear Algebra in several courses of higher semesters

Suggested References:	
Sr. No.	References
1.	Herstein I. N., Topics in Algebra, Wiley Eastern Ltd., New Delhi, 1975.
2.	Kwak J. H., Hong S., Linear Algebra, (Second Edition), Birkhauser, 2004.
3.	Simmons G. F., Introduction to Topology and Modern Analysis, McGraw-Hill Co., Tokyo, 1963.
4.	Helson H., Linear Algebra, (Second Edition), Hindustan Book Agency, TRIM-4, 1994.
5.	Ramachandra Rao A. and Bhimasankaram P., Linear Algebra (Second Edition), Hindustan Book Agency, TRIM-19, 2000.

On-line resources to be used if available as reference material

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