Indraprastha College for Women
University of Delhi

Course Name:	B.Sc. (Hons.) Mathematics
Paper Title:	Ring Theory and Linear Algebra-II
Unique Paper Code:	
Semester:	VI
Faculty(s):	Ms. Sunita Marwaha and Mr. Ashutosh Rajput
Year:	2024

Work Plan

Unit No.	Learning Objective	Lecture No.	Topics to be Covered
I	Appreciate the significance of unique factorization in rings and integral domains.	1	Polynomial rings over commutative rings
		2	Polynomial rings over commutative rings
		3	Division algorithm and consequences
		4	Division algorithm and consequences
		5	Principal ideal domains
		6	Principal ideal domains
		7	Factorization of polynomials
		8	Factorization of polynomials
		9	Reducibility tests
		10	Reducibility tests
		11	Irreducibility tests
		12	Eisenstein's criterion
		13	Unique factorization in $Z[x]$
		14	Unique factorization in $Z[x]$

Syllabus		
Unit	**Contents**	**Contact Hours**
I	**Polynomial Rings and Unique Factorization Domain (UFD)** Polynomial rings over commutative rings, Division algorithm and consequences, Principal ideal domains, Factorization of polynomials, Reducibility tests, Irreducibility tests, Eisenstein's criterion, Unique factorization in $Z[x]$; Divisibility in integral domains, Irreducibles, Primes, Unique factorization domains, Euclidean domains.	25
II	**Dual Spaces and Diagonalizable Operators** Dual spaces, Double dual, Dual basis, Transpose of a linear transformation and its matrix in the dual basis, Annihilators; Eigenvalues, Eigenvectors, Eigenspaces and characteristic polynomial of a linear operator; Diagonalizability, Invariant subspaces and Cayley−Hamilton theorem; Minimal polynomial for a linear operator.	15
III	**Inner Product Spaces** Inner product spaces and norms, Orthonormal basis, Gram−Schmidt orthogonalization process, Orthogonal complements, Bessel's inequality.	15
IV	**Adjoint Operators and Their Properties** Adjoint of a linear operator, Least squares approximation, Minimal solutions to systems of linear equations, Normal, self-adjoint, unitary and orthogonal operators and their properties.	15
	Total	**70**

Text Books/Suggested Readings:

S. No.	Name of Authors/Books/Publishers	Year of Publication/ Reprint
1.	Friedberg, Stephen H., Insel, Arnold J., & Spence, Lawrence E. Linear Algebra (4th ed.). Prentice-Hall of India Pvt. Ltd. New Delhi.	2003
2.	Gallian, Joseph. A. Contemporary Abstract Algebra (8th ed.). Cengage Learning India Private Limited. Delhi. Fourth impression, 2015.	2013
3.	Herstein, I. N. Topics in Algebra (2nd ed.). Wiley Student Edition. India.	2006
4.	Hoffman, Kenneth, & Kunze, Ray Alden. Linear Algebra (2nd ed.). Prentice- Hall of India Pvt. Limited. Delhi. Pearson Education India Reprint, 2015.	1978

	Paper Components		
Credits	**Lecture (L)**	**Tutorial (T)**	**Practical (P)**
6	**5**	**1**	**0**
Assessment Scheme			

S.No.	Component	Marking Scheme	Total Marks
1	Internal Assessment		**25**
	● Assignment/Quiz/Project/ Presentation	10	
	● Class Test	10	
	● Attendance	5	
3.	Practical		NA
	● Continuous Assessment	NA	
	● End Term Written/Practical Exam	NA	
	● Viva	NA	
4.	End Semester Examination		75