Indraprastha College for Women
University of Delhi

Course Name:	B.Sc. (Hons.) Mathematics
Paper Title:	Linear Programming and Applications
Unique Paper Code:	
Semester:	VI
Faculty(s):	Mr. Ashutosh Rajput and Dr. Pradeep Kumar
Year:	2024

Work Plan

Unit No.	Learning Objective	Lecture No.	Topics to be Covered
I	Learn about the graphical solution of linear programming problem with two variables. Learn about the relation between basic feasible solutions and extreme points.	1	Linear programming problem
		2	Linear programming problem
		3	Standard, Canonical and matrix forms
		4	Standard, Canonical and matrix forms
		5	Standard, Canonical and matrix forms
		6	Graphical solution
		7	Convex and polyhedral sets
		8	Convex and polyhedral sets
		9	Hyperplanes, Extreme points
		10	Basic solutions, Basic feasible solutions
		11	Basic solutions, Basic feasible solutions
		12	Reduction of feasible solution to a basic feasible solution
		13	Reduction of feasible solution to a basic feasible solution
		14	Correspondence between basic feasible solutions and extreme points.
		15	Correspondence between basic feasible solutions and extreme points.
II	Understand the theory of the simplex method	16	Simplex method
	used to solve linear programming problems.	17	Simplex method
	Learn about 2-phase & big-M methods to deal	18	Simplex method

	with problems involving artificial variables.	19	Optimal solution
		20	Optimal solution
		21	Optimal solution
		22	Termination criteria for optimal solution
		23	Termination criteria for optimal solution
		24	Termination criteria for optimal solution
		25	Termination criteria for optimal solution
		26	Unique and alternate optimal solutions
		27	Unique and alternate optimal solutions
		28	Unique and alternate optimal solutions
		29	Unique and alternate optimal solutions
		30	Unboundedness
		31	Unboundedness
		32	Unboundedness
		33	Simplex algorithm and its tableau format
		34	Simplex algorithm and its tableau format
		35	Simplex algorithm and its tableau format
		36	Simplex algorithm and its tableau format
		37	Artificial variables
		38	Two-phase method
		39	Two-phase method
		40	Two-phase method
		41	Big-M method
		42	Big-M method

Syllabus		
Unit	**Contents**	**Contac t Hours**
I	**Introduction to Linear Programming** Linear programming problem: Standard, Canonical and matrix forms, Graphical solution; Convex and polyhedral sets, Hyperplanes, Extreme points; Basic solutions, Basic feasible solutions, Reduction of feasible solution to a basic feasible solution, Correspondence between basic feasible solutions and extreme points.	15

II	**Methods of Solving Linear Programming Problem** Simplex method: Optimal solution, Termination criteria for optimal solution of the linear programming problem, Unique and alternate optimal solutions, Unboundedness; Simplex algorithm and its tableau format; Artificial variables, Two-phase method, Big-M method.	25
III	**Duality Theory of Linear Programming** Motivation and formulation of dual problem; Primal-Dual relationships; Fundamental theorem of duality; Complimentary slackness.	15
IV	**Applications** Transportation Problem: Definition and formulation; Methods of finding initial basic feasible solutions; Northwest-corner rule. Least-cost method; Vogel's problems. Assignment Problem: Mathematical formulation and Hungarian method of solving. Game Theory: Basic concept, Formulation and solution of two-person zero-sum games, Games with mixed strategies, Linear programming method of solving a game.	15
	Total	**70**

Text Books/Suggested Readings:

S. No.	Name of Authors/Books/Publishers	Year of Publication/ Repr int
1.	Bazaraa, Mokhtar S., Jarvis, John J., & Sherali, Hanif D. Linear Programming and etwork Flows (4th ed.). John Wiley and Sons.	2010
2.	Hadley, G. Linear Programming. Narosa Publishing House. New Delhi.	1997
3.	Taha, Hamdy A. Operations Research: An Introduction (9th ed.). Pearson.	2010
4.	Hillier, Frederick S. & Lieberman, Gerald J. Introduction to Operations Research (10th ed.). McGraw-Hill Education (India) Pvt. Ltd.	2014

	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 ● Assignment/Quiz/Project/		**25**

	Presentation ● Class Test ● Attendance	10 10 5	
3.	Practical ● Continuous Assessment ● End Term Written/Practical Exam ● Viva	NA NA NA NA	NA
4.	End Semester Examination		75