

Programme	B. Sc. Mathematics Honours			
Course Code	MAT3MN205			
Course Title	OPTIMIZATION TECHNIQUES			
Type of Course	Minor			
Semester	III			
Academic Level	200 - 299			
Course Details	Credit	Lecture/Tutorial per week	Practical per week	Total Hours
	4	4	-	60
Pre-requisites	Basic understanding of linear algebra and introductory optimization concepts.			
Course Summary	This course provides a comprehensive exploration of linear programming and optimization techniques, focusing on graphical methods, the simplex method, and specialized problems like transportation and assignment. Students will gain practical skills in formulating, solving, and analyzing linear programming models, with applications in various optimization scenarios.			

Course Outcomes (CO):

CO	CO Statement	Cognitive Level	Knowledge Category	Evaluation Tools Used
CO1	Describe fundamental properties and types of Linear Programming Problems	U	C	Internal Exam/ Assignment/ Seminar/ Viva/ End Sem Exam
CO2	Apply graphical and Simplex Method to solve LPP	Ap	P	Internal Exam/ Assignment/ Seminar/ Viva/ End Sem Exam
CO3	Demonstrate the usage of artificial variables in LP problems and apply Two Phase method for the solution	Ap	P	Internal Exam/ Assignment/ Seminar/ Viva/ End Sem Exam
CO4	Apply transportation algorithm for the solution of transportation problems	Ap	P	Internal Exam/ Assignment/ Seminar/ Viva/ End Sem Exam
CO5	Apply Hungarian method to solve assignment problems	Ap	P	Internal Exam/ Assignment/ Seminar/ Viva/ End Sem Exam

Detailed Syllabus:

Text book		Operations Research (2/e), P Rama Murthy ,New Age International Publishers		
Module	Unit	Content	Hrs (48 +12)	Ext. Marks (70)
I	Linear Programming Models: (Graphical Method)		10	Min 15
	1	Section 2.1- Introduction. 2.2- Properties of Linear Programming Model		
	2	Section 2.3-Maximization Models		
	3	Section 2.4- Minimization Models		
	4	Section 2.5- Methods for the Solution of a Linear Programming Problem (up to Problem 2.9)		
	5	Section 2.5- Methods for the Solution of a Linear Programming Problem (From Problem 2.9)		
II	Linear Programming Models: (Simplex Method)		13	Min 15
	6	Section 3.1- Introduction, 3.2- Comparison Between Graphical and Simplex Methods		
	7	Section 3.3- Maximisation Case		
	8	Section 3.4- Minimisation Case		
	9	Section 3.5- Worked Out Problems- Maximization		
	10	Section 3.7- Minimisation Problems		
III	Linear Programming Models: (Two Phase Simplex Method and Transportation Problem)		11	Min 15
	11	Section 3.8- Mixed Problems		
	12	Section 3.10- Artificial Variable Method or Two Phase Method		
	13	Section 3.11- Degeneracy in Linear Programming Problems		
	14	Section 4.1 ,4.2 Transportation model		
	15	Section 4.3 – Comparison between Transportation model and general linear programming model, 4.4- Approach to solution to a transportation problem by Transportation Algorithm.		
IV	Linear Programming Models: (Transportation Problem and Assignment Problem)		14	Min 15
	16	Section 4.4.3- Basic feasible solution by North -West corner method		
	18	Section 4.4.4- Solution by Least Cost cell method		
	19	Section 4.4.5- Solution by Vogel's approximation method		
	20	Section 4.4.6- Optimality test- Stepping stone method (Modified distribution method is in open ended module)		
	21	Section 5.1, 5.2 – Assignment model,		
	22	Section 5.4- Approach to solution-Hungarian method(Other methods of solution are optional)		
V	Open Ended Module		12	
	Simplex method special Cases- Alternate solution. Unbound Solutions ,Problem with Unrestricted Variables Transportation model- Modified distribution method Game theory			

References :

1. KV Mittal and C Mohan, Optimization methods in Operations research and system analysis(3/e)
2. Kanti Swarup, PK Gupta and Manmohan, Operations Research(20/e)

Note: 1) Optional topics are exempted for end semester examination. (2) Proofs of all the results are exempted for external exam. (3) 70 external marks are distributed over the first four modules subjected to a minimum of 15 marks from each module.

Mapping of COs with PSOs and POs :

	PSO5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO 1	3	3	3	0	3	2	2	2	3
CO 2	3	3	3	0	3	2	2	1	3
CO 3	3	3	3	0	2	2	2	1	3
CO 4	3	3	3	0	3	2	2	1	3
CO 5	3	3	3	0	3	2	2	1	3