## **DSE244 Operational Research**

Semester: IV	Course Title: Operational Research	Credit: 4
Course No.: DSE244		(3 T + 1 P)

## Course Outcomes: On successful completion of the course the learner will be able to

CO	COGNITIVEABILITIES	COURSEOUTCOMES
		Remember the fundamental principles, history, and scope of
CO 1	REMEMBERING	OR and its importance in decision-making processes
		Understand the optimization models to represent decision
CO 2	UNDERSTANDING	problems effectively.
		Apply algorithms like the Simplex Method, Transportation
		Method, Hungarian method, and Maximin-Minimax
CO 3	APPLYING	principles.
		Evaluate the feasibility of the solutions and find the optimum
CO 4	ANALYSING	solution.
		Implement OR techniques such as Excel-Solver, Python
CO 5	EVALUATING	(PuLP, Pyomo)
CO 6	CREATING	Demonstrate the application of OR in real-life situations.

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
<b>CO 1</b>	3	2			
<b>CO 2</b>	3	3	3	2	1
<b>CO 3</b>	3	3	2	2	1
<b>CO 4</b>	3	3	2	3	2
<b>CO 5</b>	2	3	3	3	3
<b>CO 6</b>	3	3	3	3	2

Unit No.	Detailed Syllabus		
		Hours	
Ι	Introduction to Operation Research:		
	Introduction to OR: History and Applications, Role of OR in Data Science.		
	Linear Programming:		
	Linear Programming Fundamentals, Problem formulation, Decision		
	Variables, Objectives and Constraints.		
	Graphical Method for LP.		
	Linear Programming Techniques:		
	Simplex Method: Theory and Implementation. Charne's M-technique.		
	Related Examples.		
II	Transportation and Assignment Problems:	15	
	Transportation problems:		
	Balanced and Unbalanced. An initial solution using the North-West Corner		
	Method, Row Minima, Column Minima, Least Cost Entry, and Vogel's		
	Approximation methods. Optimal method using UV-Method for Solving		
	Transportation Problem.		
	Assignment Problems:		

	Balanced and Unbalanced problems. Hungarian Algorithm.	
III	Game Theory:	15
	Introduction to Game Theory, Two-Person Zero-Sum Games, Basic Terms	
	of Game Problem. Maximin-Minimax Principle: Rules for determining a	
	saddle point and the value of the game.	
	The game without Saddle points (Mixed Strategies).	
	Dominance & Graphical Property.	
IV	Practical Components:	15
	Practicals based on Units I to III using Excel-Solver or Python.	

## **Suggested Reference Books:**

- 1. Hillier, F.S. and Liebermann G.J. (1970): Introduction to Operations Research, Tata McGraw.Hill.
- 2. Taha, H.A. (1976): Operational Research: An Introduction, 2nd Ed.
- 3. Kanti Swarup, Gupta, P.K. and Singh, M.M. (1985): Operations Research, Sultan Chand and Sons.
- 4. Gass, S.I. (1975): Linear Programming, Methods and Applications, 4th Ed
- 5. Sivazlian, B.D. and Stanfel, L.E.(1975): Analysis of Operations Research.
- 6. Philips, D.T., Ravindran, A. And Solberg, J. (1976): Operations Research, Principles and Practice.
- 7. Heardly, G. (1962): Linear Programming.

Plavile H.O.D

Dept of DATA SCIENCE & ANALYTICS M.G. Science Institute, Ahmedabad-9.