Course No	Course Name	L-T-P-Credits
MA 533	**Operations Research**	**3-0-0: 3**

Prerequisite: nil

Course Objectives: The objective of the course is to introduce quantitative tools and techniques, which are frequently applied to business decision-making and to provide quantitative approaches for better decision making.

Course Outcomes: After successful completion of the course, students will be able to:
1. Identify and develop operational research models from the verbal description of the real system.
2. Analyze and solve linear programming by simplex method and duality
3. Analyze and solve Transportation Models and Assignment Models.
4. Develop mathematical skills to analyse and solve integer programming and network models arising from a wide range of applications.
5. Design new simple models, like: CPM, MSPT to improve decision-making and develop critical thinking and objective analysis of decision problems.
6. Analyze and solve Cargo-loading and replacement Models.
7. Understand the relation between game theory and linear programming.

SYLLABUS

Module	Contents	Hours
I	Formulation of linear programming problem, theory of simplex method, simplex algorithm, Charne's M-method, two phase method, computational complexity of simplex algorithm, duality in linear programming, dual simplex method, sensitivity analysis	10
II	Transportation problem, MODI method, degeneracy, unbalanced problem; assignment problem, Hungarian method	8
III	Definition of network models, Minimal spanning tree algorithm, shortest-route problem, network representation, critical path (CPM) computations, PERT calculation, distinction between PERT and CPM, linear programming formulation	6
IV	Integer linear programming, traveling salesman problem (TSP); Dynamic programming problem: cargo loading problem, replacement problem, rectangular games, two persons zero sum games, pure and mixed strategies, 2xn and mx2 games, relation between theory of games and linear programming.	12

Essential Readings:

1. H. A. Taha, "*Operation Research: An Introduction*", Pearson Education, 10th edition, 2019.
2. M. S. Bazaara, J. J. Jarvis and H. D. Sherali, "*Linear programming and Network flows*", Wiley India Pvt. Ltd, 2nd edition, 2008.

Supplementary Readings:

1. F S Hillier, G J Lieberman, B. Nag and P. Basu, "*Introduction to Operations Research*", 9th edition, McGraw Hill Education, 2009.
2. N. S. Kambo, "*Mathematical Programming Techniques*", Affiliated East-West Press Pvt. Ltd, 2008.