

## MTC-341 MN : B) Operations Research

**Course type: Theory**

**No. of Credits: 02**

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**Course Outcomes:** Students will able to

1. Remember: Recall concepts of linear programming, transportation, and assignment problems, including methods like Simplex, Big-M, and Hungarian.
2. Understand: Explain formulations and mathematical models of linear programming, transportation, and assignment problems.
3. Apply: Apply methods like Simplex, Big-M, North West Corner Rule, VAM, MODI, and Hungarian to solve linear programming, transportation, and assignment problems.
4. Analyze: Analyze types of solutions and optimality of linear programming, transportation, and assignment problems.
5. Evaluate: Evaluate solutions to linear programming, transportation, and assignment problems using Python programming.
6. Create: Formulate and solve real-world problems using linear programming, transportation, and assignment models, and implement solutions using Python.

### Course Contents

#### Unit 1 : Linear Programming Problem

**(12 Hours )**

- 1.1 Basic concepts of linear programming problem
- 1.2 Slack, Surplus variable and standard form of Simplex method.
- 1.3 Artificial variable and Big-M method.
- 1.4 Types of solutions of linear programming problems.
- 1.5 Linear programming in Python Programming.

#### Unit 2 : Transportation Problem

**(10 Hours)**

- 2.1 Mathematical model of transportation problem.
- 2.2 Linear programming formulation of transportation problem.
- 2.3 Initial basic solution of transportation problem.
  - (a) North West Corner Rule.
  - (b) Lowest Cost Entry Method.
  - (c) Vogel's Approximation Method (VAM)

2.4 Optimal solution by Modified Distribution Method (MODI Method).

2.5 Transportation Problem in Python Programming

**Unit 3 : Assignment Problem**

**(08 Hours)**

3.1 Mathematical model of assignment problem.

3.2 Linear programming formulation of assignment problem.

3.3 Hungarian method for solving assignment problem.

3.4 Assignment Problem in Python Programming.

**Reference Book:**

1. Operations Research, S.D. Sharma, Kedar Nath Ram Nath and Co, Meerut, Eighteenth Edition, 2017.
2. Python Programming: Introduction to Computer Science by Zelle, J. Franklin, Beedle & Associates Inc.
3. Hamdy A. Taha, Operations Research, (Eighth Edition, Prentice Hall of India), 2008.
4. Operations Research: Theory and Applications, J. K. Sharma, Macmillan India Ltd., Fifth Edition, 2013.
5. P. K. Gupta and D. S. Hira, Operations Research, (Fifth Edition, S. Chand), 2014.

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