

**Discipline Specific Elective Course****Discipline Specific Elective Course for B.A.(Prog) Semester-VII****DISCIPLINE SPECIFIC ELECTIVE COURSE – 5A: LINEAR PROGRAMMING TECHNIQUES****CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE**

| Course title & Code           | Credits | Credit distribution of the course |          |                     | Eligibility criteria            | Pre-requisite of the course (if any) |
|-------------------------------|---------|-----------------------------------|----------|---------------------|---------------------------------|--------------------------------------|
|                               |         | Lecture                           | Tutorial | Practical/ Practice |                                 |                                      |
| Linear Programming Techniques | 4       | 3                                 | 0        | 1                   | Class XII pass with Mathematics | Nil                                  |

**Learning Objectives:**

The learning objectives include:

- Concept of mathematical formulation to a real-life problem through Linear Programming.
- This course develops the ideas underlying the Simplex Method for Linear Programming Problem.
- The course covers Linear Programming with applications to Transportation and Assignment problem. Such problems arise in manufacturing, resource planning and financial sectors.

**Learning Outcomes:**

After completing this course, students should be able to:

- Learn about the graphical solution of linear programming problem with two variables.
- Learn about the relation between basic feasible solutions and extreme points.
- Understand the theory of the simplex method used to solve linear programming problems.
- Learn about two-phase and Big-M methods to deal with problems involving artificial variables
- Solve transportation and assignment problems.

**SYLLABUS OF DSE – 5a****Theory****Unit I:****(14 Hours)****Introduction to Linear Programming:**

Linear programming problem: Standard, Canonical and matrix forms, Formulation of Linear Programming Problem, Graphical solution; Basic solutions, Basic feasible solutions.

**Unit II:****(16 Hours)****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; Artificial variables, Two-phase method, Big-M method.

**Unit III:****(15 Hours)****Transportation and Assignment Problems:**

Transportation Problem: Definition and formulation; Methods of finding initial basic feasible solutions; Northwest-corner rule. Least-cost method; Vogel's approximation method; Algorithm for solving transportation problem. Assignment Problem: Mathematical formulation and Hungarian method of solving Assignment problem.

**PRACTICAL/LAB WORK – (30 hours)****List of Practical:**

1. Graphical representation of Linear Programming Problem and its solution.
2. Graphical identification of basic solutions, basic feasible solution and optimal solution.
3. Solution of Linear Programming Problem by Simplex method.
4. Solution of Linear Programming Problem by Big-M method.
5. Solution of Transportation Problem as a Linear Programming Problem.
6. Solution of Assignment Problem as a Linear Programming Problem.

**Practical work to be conducted using electronic spreadsheet / EXCEL/ Statistical Software Package/ SPSS/ calculators.**

**Essential Reading:**

- Hadley, G. (2002). Linear Programming. Narosa Publishing House. New Delhi.
- Taha, H.A. (2014). Operations Research. An Introduction, 9<sup>th</sup> Ed, Pearson.
- Swarup, K. Gupta, P.K. and Mohan, M. (2019). Operations Research, 15<sup>th</sup> Ed, Sultan Chand & Sons.

**Suggested Readings:**

- Hillier, Frederick S. & Lieberman, Gerald J. (2017). Introduction to Operations Research (10<sup>th</sup> ed.). McGraw-Hill Education (India) Pvt. Ltd.
- Sharma, J. K. (2017). Operations Research: Theory and applications, 6<sup>th</sup> Edition, Trinity Press.

**Note: Examination scheme and mode shall be as prescribed by the Examination Branch University of Delhi, from time to time.**