BSc. Physical Sciences/ Mathematical Sciences with Operational Research as one of the Core Disciplines

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		
Introduction to Operational Research and Linear Programming	4	3	0	1	Class XII pass with Mathematics	Nil

Learning Objectives

The Learning Objective of the course is to introduce:

- Basic concepts of Operational Research and Linear Programming to the students.

Learning Outcomes:

After completion of the course, students will possess knowledge and skills required to:

- Gain an understanding of key concepts of Operational Research and Linear Programming and their role in various organizations.
- Describe the basic concepts of convex analysis and explain the theoretical foundations of various issues related to linear programming modelling.
- Formulate real-world problems as a linear programming model and describe the theoretical workings of the graphical and simplex method, demonstrate the solution process by hand and solver.
- Implement advanced and more economic algorithm to solve linear programming problems.

SYLLABUS OF DSC-1

Theory

Unit – 1 **(9 hours)**

Basics of Operational Research: Origin & Development of Operational Research, Definition and Meaning of Operational Research, Different Phases of an Operational Research Study, Scope and Limitations of Operational Research, Mathematical Formulation of Real-Life Problems.

Unit – 2 **(15 hours)**

Introduction to Linear Programming, Linear Programming Problem Formulation, Solution by Graphical Method. Concepts of Basis and Basic Feasible solution. Convex sets, Extreme points, Hyperplanes and Halfspaces, Convex cones, Polyhedral sets and cones.

Unit – 3 **(9 hours)**

Theory of Simplex Method, Simplex Algorithm, Two phase Method, Charne's-M Method.

Unit – 4 **(12 hours)**

Degeneracy in Linear Programming, Charnes' Perturbation method, Revised Simplex method.

Practical **(30 hours)**

Practical/Lab to be performed on a computer using OR/Statistical packages

1. To solve Linear Programming Problem (LPP) using Graphical Method with
   (iv) Unbounded solution.
   (v) Infeasible solution.
   (vi) Alternative or multiple solutions.
2. Solution of LPP with simplex method.
3. Problem solving using Charnes-M method.
4. Problem solving using Two Phase method.
5. Illustration of following special cases in LPP using Simplex method
   (v) Unrestricted variables.
   (vi) Unbounded solution.
   (vii) Infeasible solution.
   (viii) Alternative or multiple solutions.
6. Solution to linear programming problem through revised simplex method.

Essential Readings

- Hadley, G. (2002). Linear programming. New Delhi: Narosa Publishing House.
- Hadley, G. (2002). Linear Algebra. New Delhi: Narosa Publishing House.
- Hillier, F.S., & Lieberman, G. J. (2010). Introduction to operations research- concepts and cases (9th ed.). New Delhi: Tata McGraw Hill (Indian print).
- Taha, H. A. (2017). Operations research - An Introduction (10th ed.). Pearson Education.
- Ravindran, A., Phillips, D. T., & Solberg, J. J. (2005). Operations research- principles and practice (2nd ed.). New Delhi: Wiley India (P.) Ltd. (Indian print).

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