

Category IV

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

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

DISCIPLINE SPECIFIC CORE COURSE – 4: OPTIMIZATION 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		
Optimization Techniques (DSC-4)	4	3	1	0	Class XII with Maths	Nil

Learning Objectives:

To impart knowledge about the formulations and solution techniques of integer linear and multi-objective goal programming problems.

Learning Outcomes:

Students completing this course will be able to:

- Identify different types of optimization problems and their characteristics in real life.
- Explain the theoretical concepts related to unconstrained optimization problems and demonstrate optimality conditions and solution approaches for them.
- Develop the concepts of a multi-objective programming problem and demonstrate its solution using goal programming.
- Formulate real-life problems as integer linear programming problems and solve them using Branch and Bound method.

SYLLABUS OF DSC-4

Unit I: Unconstrained Optimization

(10 Hours)

Single and multiple variable problems, First and Second order necessary and sufficient conditions for finding extrema, Solution methods: Newton, Gradient search.

Unit II: Convex Functions

(10 Hours)

Local and global maxima/minima for functions of one and two variables, inflection point, positive/negative definite and semi-definite matrices, convex/concave functions, and their properties, Verifying convexity/concavity through a Hessian matrix.

Unit III: Goal Programming**(12 Hours)**

Goal Programming: Basics of goal programming, Weighted and pre-emptive goal programming, Formulation of a goal programming problem, Graphical solution method, Modified Simplex method.

Unit IV: Integer Linear Programming**(13 Hours)**

Introduction to Integer linear programming problem (ILPP), Pure ILPP, Mixed ILPP, and 0-1 ILPP, Formulation of real life ILPPs, Branch and bound solution method.

Practical component (if any) – NIL**Tutorial:[30 Hours]****Essential/recommended readings**

- Chandra, S., Jayadeva, & Mehra, A. (2013). *Numerical optimization with applications*. New Delhi: Narosa Publishing House.
- Ravindran, A., Phillips, D. T., & Solberg, J. J. (2007). *Operations research- principles and practice* (2nd ed.). New Delhi: Wiley India (Indian print).
- Taha , H.(2019). *Operations Research-An Introduction*, 10th edn., Pearson.
- Wayne, Winston, L. (2003). *Operations research: applications and algorithms*, (4th ed.). Duxbury Press.

Suggestive readings Nil

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