

UMA035-OPTIMIZATION TECHNIQUES (all branches except for Mechanical)

L	T	P	Cr
3	0	2	4.0

Course Objective: The main objective of the course is to formulate mathematical models and to understand solution methods for real life optimal decision problems. The emphasis will be on basic study of linear and non-linear programming problems, Integer programming problem, Transportation problem, Two person zero sum games with economic applications and project management techniques using CPM.

Scope of Operations Research: Introduction to linear and non-linear programming formulation of different models.

Linear Programming: Geometry of linear programming, Graphical method, Linear programming (LP) in standard form, Solution of LP by simplex method, Exceptional cases in LP, Duality theory, Dual simplex method, Sensitivity analysis.

Integer Programming: Branch and bound technique, Gomory's Cutting plane method.

Network Models: Construction of networks, Network computations, Free Floats, Critical path method (CPM), optimal scheduling (crashing). Initial basic feasible solutions of balanced and unbalanced transportation problems, optimal solutions, assignment problem.

Multiobjective Programming: Introduction to multiobjective linear programming, efficient solution, efficient frontier.

Nonlinear Programming:

Unconstrained Optimization: unimodal functions, Fibonacci search method, Steepest Descent method.

Constrained Optimization: Concept of convexity and concavity, Maxima and minima of functions of n-variables, Lagrange multipliers, Karush-Kuhn-Tucker conditions for constrained optimization

Laboratory Work: Lab experiments will be set in consonance with materials covered in the theory using Matlab.

Course learning outcome: Upon Completion of this course, the students would be able to:

- 1) formulate the linear and nonlinear programming problems.
- 2) solve linear programming problems using Simplex method and its variants.
- 3) construct and optimize various network models.
- 4) construct and classify multiobjective linear programming problems.
- 5) solve nonlinear programming problems.

Text Books:

- 1) Chandra, S., Jayadeva, Mehra, A., Numerical Optimization and Applications, Narosa Publishing House, (2013).
- 2) Taha H.A., Operations Research-An Introduction, PHI (2007).

Recommended Books:

- 1) Pant J. C., Introduction to optimization: Operations Research, Jain Brothers (2004)
- 2) BazaarraMokhtar S., Jarvis John J. and ShiraliHanif D., Linear Programming and Network flows, John Wiley and Sons (1990)
- 3) Swarup, K., Gupta, P. K., Mammohan, Operations Research, Sultan Chand & Sons, (2010).
- 4) H.S. Kasana and K.D. Kumar, Introductory Operations research, Springer publication, (2004)
- 5) Ravindran, D. T. Phillips and James J. Solberg: Operations Research- Principles and Practice, John Wiley & Sons, Second edn. (2005).

Evaluation Scheme:

Sr.No.	Evaluation Elements	Weight age (%)
1.	MST	30
2.	EST	45
3.	Sessionals (May include assignments/quizzes/projects)	25