OPTIMIZATION TECHNIQUES

Course Code:13EE2205 **L P C**
4 0 3

Pre requisites: Partial differentiation, Matrices.

Course Educational Objectives:

1. To expose the student to the theory of classical optimization techniques
2. To use the optimization techniques for solving practical problems in engineering systems.
3. To use the Optimization Techniques to design and produce products and systems both economically and efficiently.
4. To solve linear, non linear, dynamic and integer problems by using optimization techniques

Course Outcomes: After the completion of the course, the student will be able

1. to analyze any problem of optimization in an engineering system by formulating a mathematical model to the problem and solving it by using appropriate optimization technique(s).
2. to design and produce products and systems both economically and efficiently by using optimization techniques.
3. to solve linear, non linear, and integer problems by using optimization techniques.

UNIT-I

INTRODUCTION AND CLASSICAL OPTIMIZATION TECHNIQUES: Statement of an Optimization problem – design vector – design constraints – constraint surface – objective function – objective function surfaces – classification of Optimization problems – Single variable Optimization – multi variable Optimization without constraints – necessary and sufficient conditions for minimum/maximum – multivariable Optimization with equality constraints: Solution by

method of Lagrange multipliers – multivariable Optimization with inequality constraints: Kuhn – Tucker conditions.

UNIT-II

A. LINEAR PROGRAMMING: Standard form of a linear programming problem – geometry of linear programming problems– motivation to the simplex method–simplex algorithm, dual LP.

B. INTEGER PROGRAMMING:

Gomory's cutting plane method, Branch and bound method.

UNIT-III

TRANSPORTATION PROBLEM:

Finding initial basic feasible solution by north – west corner rule, least cost method and Vogel's approximation method – testing for optimality of balanced transportation problems.

UNIT-IV

UNCONSTRAINED NONLINEAR PROGRAMMING: One – dimensional minimization methods:Classification, Fibonacci method and Quadratic interpolation method, Univariate method, Powell's method, steepest descent method, Davidon-Fletcher-Powell method.

UNIT-V

CONSTRAINED NON LINEAR PROGRAMMING: Characteristics of a constrained problem, Classification, Basic approach of Penalty Function method; Basic approaches of Interior and Exterior penalty function methods, Introduction to Convex Programming problem.

TEXT BOOK:

1. S.S.Rao,"*Engineering optimization: Theory and practice*", 4th edition, New Age International (P) Limited, 2009.

REFERENCE BOOKS:

1. K.V. Mital and C. Mohan " *Optimization Methods in Operations Research and systems Analysis*" , 3rd edition, New Age International (P) Limited Publishers, 1996.
2. KanthiSwarup, P.K.Gupta and Man Mohan "*Operations Research*", 15th Edition, Sultan Chand & Sons New Delhi, 2010.
3. S.D. Sharma, "*Operations Research*", 15th Edition, published by Kedarnath Ramnath, 2009.
4. G. Hadley, "*Linear Programming*", 1st edition Narosa publishing house 1997.