OPTIMIZATION TECHNIQUES AND APPLICATIONS

(Elective-II)

Course Code: 15ME2315

L	P	C
3	0	3

Course Outcomes: At the end of the course, the student will be able to

CO1: Solve optimization problems using classical optimization techniques

CO2: Solve simple non-linear multivariable optimization problems

CO3: Solve optimization problems using geometric programming

CO4: Explain the working of different operators used in genetic algorithms for optimization.

CO5: Explain concepts of stochastic programming and solve problems using integer programming.

UNIT-I (10-Lectures)

Introduction-Classification of optimization problems, classical optimization techniques: single variable optimization, multivariable with no constraints, multivariable with equality constraints, direct substitution method, method of Lagrange multipliers.

Unimodal function, methods of single variable optimization -, bisection method, unrestricted, Dichotomous, Fibonacci.

UNIT-II (10-Lectures)

Univariate search, Pattern search methods, Hookes-Jeeves method, Powell's method, steepest descent method. Penalty approach- interior and exterior penalty function methods.

UNIT- III (10-Lectures)

Geometric programming: Solution from differential calculus point of view, solution from arithmetic-geometric inequality point of view, degree of difficulty, optimization of zero degree of difficulty problems with and without constraints, optimization of single degree of difficulty problems without constraints.

UNIT-IV (10-Lectures)

Genetic algorithms: Differences and similarities between conventional and evolutionary algorithms, working principle, reproduction, crossover, mutation, termination criteria, different reproduction and crossover operators, GA for constrained optimization, drawbacks of GA.

UNIT-V (10-Lectures)

Integer Programming: Introduction, formulation, Gomory cutting plane algorithm, Zero or one algorithm, branch and bound method.

Stochastic programming - Basic concepts of probability theory, random variables- distributions-mean, variance, correlation, co variance, joint probability distribution- stochastic linear, dynamic programming.

TEXT BOOK:

Singiresu S. Rao, "Engineering Optimization -Theory and Practice", 4th Edition, Wiley, 2009.

REFERENCES:

1. Kalyanmoy Deb, "Optimization for Engineering Design- Algorithms and Examples", PHI, 8th reprint, 2005.
2. Ashok D. Belegundu and Tirupathi R. Chandrupatla, "Optimization concepts and applications in engineering", 2nd Edition, PHI, 2011.