OPTIMIZATION TECHNIQUES AND APPLICATIONS
(Elective-II)

Course Code: 13ME2314

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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

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

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

UNIT- III

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

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

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:

1. 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.