

GUJARAT TECHNOLOGICAL UNIVERSITY

M.E. Embedded Systems (Branch Code - 54)

Year – I (Semester – II) (W.E.F. January 2014)

Subject Name: Advance Optimization Techniques-Institute Elective II (725407)

Course Content:

Sr. No.	Course Content	Hours
1	Introduction to Optimization: Mathematical formulation, Continuous versus discrete optimization, Constrained and unconstrained optimization, Global and Local Optimization, Stochastic and deterministic optimization, Optimization algorithms, Convexity	04
2	Linear programming: The Simplex method only Non-linear Programming (one-dimensional): Line Search Methods- Unrestricted search, Exhaustive search, Dichotomous search, Interval Halving method, Fibonacci method, Golden section method, Newton's method, Quasi-Newton method, Secant method Non-linear Programming (unconstrained): Random search methods, Uni-variate method, Hooke and Jeeves' method, Powell's method, Steepest Descent method, Fletcher-Reeves method, Newton's method, Test functions Non-linear Programming (constrained): Random search methods, Sequential Linear Programming, Penalty function methods, Test functions	20
3	Evolutionary Computing: Basic Concepts of Genetic Algorithms (GA), Working Principle, Encoding methods, Fitness function, GA Operators- Reproduction, Crossover, Mutation; Convergence of GA, Multi-level Optimization, Real Life Problems	06
4	Particle Swarm optimization (PSO) Algorithm: Basic Concepts and Procedure, PSO to solve Optimization Problems, Behavior Analysis of Individual Particles, Convergence Analysis of the Algorithm, Time Complexity and Rate of Convergence, Parameter Selection and Performance, Inertia and Constriction—Acceleration Techniques for PSO, Local Best Model, Probabilistic Algorithms, Other Variants of PSO; The QPSO Algorithm, Some variants of QPSO	08
5	Differential Evolution (DE): Distinctions and advantages, Strategies of search, Differentiation via mutation, crossover, analysis of Differentiation, Control parameters; New performance measures: Quality (Q)-measure, Entropy, Robustness ®-measure, Population convergence (P)-measure	08
6	Ant colony optimization; Hybridization of optimization algorithms, Advanced Optimization concepts and algorithms	08
	Total	54

Reference Books:

1. Engineering Optimization Theory and Practice by Singiresu S.Rao, New Age International Publishers, Third Enlarged Edition
2. Artificial Intelligence and Intelligent Systems by N P Padhy, Oxford University Press
3. Numerical Optimization with Applications by Suresh Chandra, Narosa Publications
4. Numerical Optimization by Jorge Nocedal, Springer
5. Advances in Differential Evolution by Uday K Chakraborty, 2008 Springer
6. Ant Colony Optimization by Marco Dorigo, Thomas Stutzle, A Bradford Book; First Edition, First Printing edition (June 4, 2004)
7. Numerical Optimization: Theoretical and Practical Aspects by Bonnans and Gilbert, Springer
8. Differential Evolution: In search of Solutions by Vitaliy Feoktistov, Springer
9. Differential Evolution: A practical approach to global optimization (Natural computing series) by Kenneth Price, Rainer Storn, Jouni Lempinen