



GUJARAT TECHNOLOGICAL UNIVERSITY

Master of Engineering
Subject Code: 3720821
OPTIMIZATION TECHNIQUES
SEMESTER: II

Type of course: Program Elective

Prerequisite: Zeal to learn the subject

Rationale: This course deals with optimization techniques used in engineering.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks				Total Marks
L	T	P		Theory Marks		Practical Marks		
				ESE (E)	PA (M)	ESE (V)	PA (I)	
3	0	2	4	70	30	30	20	150

Contents:

Sr. No	Topic	Hours
1	Introduction to Optimization Historical Development, Engineering applications of Optimization, Design vector and constraints, Constraint surface, Objective function, Classification of Optimization Problems	04
2	Classical Optimization Techniques Single variable optimization, Constrained and unconstrained multi-variable optimization, Direct substitution method, Lagrange's method of multipliers, Karush-Kuhn-Tucker conditions	06
3	Linear Programming Statement of an LP problem, Graphical Solution of an LP problem, Simplex method, Dual simplex method	05
4	Non-linear Programming: One-dimensional minimization method Unimodal function, Unrestricted search, Exhaustive search, Dichotomous search, Interval halving method, Fibonacci method, Golden section method, Direct root methods	06
5	Non-linear Programming: Unconstrained Optimization Techniques Direct Search Methods: Random search methods, Grid search method, Univariate method, Hookes and Jeeves' method, Powell's method Indirect Search Methods: Steepest descent method, Fletcher-Reeves method, Newton's method	08
6	Non-linear Programming: Constrained Optimization Techniques Direct Methods: Random search method, Sequential linear programming Indirect methods: Transformation techniques, Exterior penalty function method, Interior penalty function method	08
7	Evolutionary Algorithms An overview of evolutionary algorithms, Simulated annealing algorithm, Genetic algorithm, Particle swarm optimization	06

Reference Books:

1. Engineering Optimization Theory and Practice, S.S.Rao, New Age International (P) Ltd, Publishers
2. Kalyanmoy Deb Multi-objective optimization using evolutionary algorithms John Wiley Publications



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3. Jasbir S. Arora Introduction to Optimum Design McGraw Hill Publication

Course Outcome:

After learning the course the

Sr. No.	Course Outcome	Percentage weightage
CO-1	Students will be able to understand basic theoretical principles for formulation of optimization models and its solution.	40%
CO-2	Students will be able to learn the unified and exact mathematical basis as well as the general principles of various soft computing techniques.	25%
CO-3	Students should be able to apply detailed theoretical and practical aspects of intelligent modelling, optimization and control of linear and non-linear systems.	35%

List of Experiments:

Computer programme (using Matlab / Scilab) for optimization techniques mentioned in syllabus like ..

1. Unrestricted Search methods
2. Golden Section Method
3. Fibonacci Method
4. Newton Methods
5. Quasi Newton and Secant methods
6. Univariate methods
7. Indirect search methods

Major Equipment:

1. Computational facility and Matlab / Scilab.

List of Open Source Software/learning website:

Scilab Software