SWE1002	Optimization Techniques	L	T	P	J	C
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Pre-requisite	**None**	**Syllabus version**				
		v. 1.1				

Course Objectives:

1. To understand the role of optimization techniques and its importance in engineering
2. To introduce the concept of linear and nonlinear optimization methods.
3. To realize the application of non-traditional optimization algorithms
4. To choose appropriate optimization method and solve real world problems.

Expected Course Outcome:

1. Comprehend the need and applications of the optimization methods
2. Understand the concept of one-dimensional nonlinear optimization methods.
3. Recognize the unconstrained nonlinear optimization methods.
4. Understand and solve the constrained nonlinear optimization methods.
5. Analyze the concept of quadratic programming and its applications.
6. Apply geometric programming..
7. Comprehend the evolutionary computation techniques for nonlinear programming..

Student Learning Outcomes (SLO)	1,2,9

Module:1	**Classical Optimization Techniques**	**6 Hours**

Introduction, methods, engineering applications of optimization-Statement of an optimization problem-classification of optimization problems-Single variable optimization-Multivariable optimization with no constraints-Multi variable optimization with equality and in equality constraints: Lagrange multipliers method, Kuhn-Tucker conditions.

Module:2	**One-Dimensional Nonlinear Optimization**	**6 Hours**

Unimodal function – Region elimination methods: Unrestricted search, Dichotomous Search, Fibonacci method, Golden Section method.

Module:3	**Unconstrained Nonlinear Optimization**	**6 Hours**

Direct Search methods: Univariate method, Pattern directions, Hook and Jeeves' method, Powell's method-Indirect search methods: Gradient of a function, Cauchy method, Fletcher-Reeves method.

Module:4	**Constrained Non-linear Optimization**	**6 Hours**

Characteristics of a constrained optimization problem - Direct methods: Cutting plane method, methods of feasible directions – Indirect methods: Interior and exterior penalty function methods.

Module:5	**Quadratic programming**	**6 Hours**

Introduction-applications-necessary conditions-solution to quadratic programming problem using Wolfe's method.

Module:6	**Geometric programming**	**6 Hours**

Introduction to Geometric programming – Solution from differential calculus point of view – Solution from arithmetic-geometric inequality point of view.

Module:7	**Advanced Non-linear Optimization**	**7 Hours**
Genetic Algorithms -Working principle-Genetic operators-Numerical problem-Simulated Annealing – Numerical problem - Neural network based optimization-Optimization of fuzzy systems-fuzzy set theory-computational procedure		
Module:8	**Contemporary issues:** Applications of Optimization Techniques in industry.	**2 Hours**
	Total Lecture hours:	**45 hours**

Text Book(s)

1. Singiresu S. Rao, S. S. Rao, Engineering Optimization: Theory and Practice, 2009.

Reference Books

1. C. B Gupta ,Optimization Techniques in Operation Research, I.K.International House Pvt.Ltd 2007.
2. Godfrey C. Onwubolu, B. V. Babu,New Optimization Techniques in Engineering, 2004
3. Cesar Lopez,MATLAB Optimization Techniques,2014
4. **Sherali,** H.D., **Shetty**, C.M.,Optimization with Disjunctive Constraints,Springer,2016(e-book)

	Recommended by Board of Studies		12-8-2017	
	Approved by Academic Council	No. 47th	Date	5-10-2017