GUJARAT TECHNOLOGICAL UNIVERSITY

Optimization Techniques
SUBJECT CODE: 3712310

Type of course: Elective

Prerequisite: Mathematical concepts such as Linear Algebra, Numerical methods

Rationale:. The objective of this course is to provide insight to the mathematical formulation of real world problems. To optimize these mathematical problems using nature based algorithms. And the solution is useful specially for NP-Hard problems..

Teaching and Examination Scheme:

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

Content:

Sr. No.	Content	Total Hrs	% Weightage
1	**Unit 1:** Engineering application of Optimization, Formulation of design problems as mathematical programming problems.	7	15
2	**Unit 2:** General Structure of Optimization Algorithms, Constraints, The Feasible Region.	7	15
3	**Unit 3:** Branches of Mathematical Programming: Optimization using calculus, Graphical Optimization, Linear Programming, Quadratic Programming, Integer Programming, Semi Definite Programming.	11	25
4	**Unit 4:** Optimization Algorithms like Genetic Optimization, Particle Swarm Optimization, Ant Colony Optimization etc.	11	20
5	**Unit 5:** Real life Problems and their mathematical formulation as standard programming problems.	6	12
6	**Unit 6:** Recent trends: Applications of ant colony optimization, genetics and linear and quadratic programming in real world applications.	6	13

Reference Books:

1. Laurence A. Wolsey (1998). Integer programming. Wiley. ISBN 978-0-471-28366-9.
2. Practical Optimization Algorithms and Engineering Applications Andreas Antoniou.

3. An Introduction to Optimization Edwin K., P. Chong & Stanislaw h. Zak.
4. Dimitris Bertsimas; Robert Weismantel (2005). Optimization over integers. Dynamic Ideas. ISBN 978-0-9759146-2-5.
5. John K. Karlof (2006). Integer programming: theory and practice.CRC Press. ISBN 978-0-8493-1914-3.
6. H. Paul Williams (2009). Logic and Integer Programming. Springer. ISBN 978-0-387-92279-9.
7. Michael Jünger; Thomas M. Liebling; Denis Naddef; George Nemhauser; William R. Pulleyblank; Gerhard Reinelt; Giovanni Rinaldi; Laurence A. Wolsey, eds. (2009). 50 Years of Integer Programming 1958-2008: From the Early Years to the State-of-the- Art. Springer. ISBN 978-3-540-68274-5.
8. Der-San Chen; Robert G. Batson; Yu Dang (2010). Applied Integer Programming: Modeling and Solution. John Wiley and Sons. ISBN 978-0-470-37306-4.

Course Outcome:

After learning the course the students should be able to:

- Formulate optimization problems.
- Understand and apply the concept of optimality criteria for various types of optimization problems.
- Solve various constrained and unconstrained problems in Single variable as well as multivariable.
- Apply the methods of optimization in real life situation.

Practicals & Assignments : Assignments based on Unit 3**,** Practical based on Unit 4, 5 and 6.