

# GUJARAT TECHNOLOGICAL UNIVERSITY

## POWER ELECTRONICS (29)

OPTIMIZATION THEORY

SUBJECT CODE: 2722912

SEMESTER: II

**ME Semester-II**

**Type of course:** Major Elective –III

**Prerequisite:** Engineering Mathematics, Difference between basic analysis and synthesis procedure.

**Rationale:** PG Students of Power Electronics Engineering need to possess good understanding of the fundamentals and applications of optimization techniques.

### 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)			
					ESE	OEP	PA	RP		
3	2#	0	4	70	30	30	0	10	10	150

### Content:

Sr. No.	Content	Total Hrs	% Weightage
<b>1</b>	Introduction: Basic concepts, formulation of problems; Optimality conditions classification of optimization Problems, Classical Optimization techniques , single variable algorithms, Multivariable algorithms without and with constraints .	<b>10</b>	20%
<b>2</b>	Multivariable Search : Classification, Linear programming problem- simplex method, duality, Mixed-integer programming. Goal programming, Quadratic Programming, Transportation models and its variants, Sequencing problem, Replacement theory.	<b>10</b>	20%
<b>3</b>	Non- Linear Programming: Introduction, One dimensional methods, Elimination methods, Interpolation methods. Sensitivity method for Unconstrained optimization techniques- Direct search and Descent methods, Constrained optimization techniques, direct and indirect methods.	<b>12</b>	20%
<b>4</b>	Specialized Optimization Techniques: Geometric Programming , Dynamic programming , Integer programming, Simulated Annealing, Swarm Optimization, Ant Colony Optimization.	<b>10</b>	20%
<b>5</b>	Advanced techniques of linear programming problems, Revised simplex method, Stochastic Programming , Network models, Genetic Algorithm, Optimization of Fuzzy Systems, Multi-objective Optimization	<b>8</b>	10%
<b>6</b>	Case studies: Various case studies in engineering field.	<b>5</b>	10%

**Reference Books:**

1. Gordon S. G. Beveridge, Robert S. Schechter, "Optimization: Theory and Practice ", McGraw-Hill, 1970.
2. S. S. Rao, "Engineering Optimization: Theory and Practice", John Wiley & Sons-2009.
3. KALYANMOY DEB, "OPTIMIZATION FOR ENGINEERING DESIGN: Algorithms and Examples". PHI-2012.
4. Johannes Jahn, "Introduction to the Theory of Nonlinear Optimization", Springer, 3rd edition, 2007
5. Hamdy A. Taha, "Operations Research: An Introduction 10th edition, Pearson education, New Delhi, 2010.

**Course Outcome:**

After learning the course the students should be able to:

1. To develop the ability to apply the concepts of linear and Non-Linear programming in Engineering problems.
2. To have knowledge on optimization unconstrained techniques .
3. To understand the application of constrained optimization technique .
4. To provide a basis for further studies in convex and combinatorial optimization.
5. To achieve an understanding of the basic concepts of one dimensional search and Multi-dimensional search and their applications .
6. To learn the concepts and techniques of evolutionary and specialized optimization techniques .

**Learning website:**

<http://www.ee.ucla.edu/~vandenbe...>

<http://www.stanford.edu/~boyd/cv...>

**Review Presentation (RP):** The concerned faculty member shall provide the list of peer reviewed Journals and Tier-I and Tier-II Conferences relating to the subject (or relating to the area of thesis for seminar) to the students in the beginning of the semester. The same list will be uploaded on GTU website during the first two weeks of the start of the semester. Every student or a group of students shall critically study 2 papers, integrate the details and make presentation in the last two weeks of the semester. The GTU marks entry portal will allow entry of marks only after uploading of the best 3 presentations. A unique id number will be generated only after uploading the presentations. Thereafter the entry of marks will be allowed. The best 3 presentations of each college will be uploaded on GTU website