22PCM408T					Optimization Techniques					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hours/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
2	0	0	2	2	25	50	25	--	--	100

COURSE OBJECTIVES

- Gain knowledge on the methodology of how to specify the '3' components of optimization problems.
- Understand the concept of optimization by giving examples of different types of problems that may be encountered in chemical engineering.
- Provide with basic mathematical concepts of optimization.
- Learn the modelling skills necessary to describe and formulate optimization problems.
- Provide with the skills necessary to solve and interpret optimization problems in Engineering.
- Enhance the skills related to optimization in chemical engineering, open ended problem solving, critical thinking and lifelong learning.

Unit –I: Introduction to Optimization **6 Hr.**

Introduction: Design Vector –Design Constraints, constraint surface, Objective function, Objective function surfaces, classification of optimization problems, optimization techniques, and solution of optimization Problems using MATLAB. Critical optimization Techniques, Single variable optimization, multi-variable optimization with no constraints- Multivariable optimization with equality constraints and inequality constraints.

UNIT-II: Linear programming **7 Hr.**

Simplex method: Applications of linear programming -Standard form of a linear programming problem -Geometry of linear programming problems -Definitions and theorems -Solution of a system of linear Simultaneous equations -Pivotal reduction of a general system of equations -Motivation of the simplex method -Simplex algorithm - Two phases of the simplex method-MATLAB solution of LP problems.

UNIT-III: Nonlinear Programming **7 Hr.**

One dimensional minimization methods: Unrestricted search- Interval halving method -Fibonacci method -Golden section method, etc., unconstrained optimization Techniques - Direct search methods, Indirect Search (descent) methods; constrained optimization techniques.

UNIT- IV: **Geometric and Dynamic Programming** **6 Hr.**

Geometric programming, Dynamic programming, Modern methods of optimization. Application of optimization in fluid flow, heat transfer, and mass transfer problems.

Max. 26 Hr.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 : Analyse the optimization criterion for solving problems.
CO2: Apply different methods of optimization and to suggest a technique for specific problem.
CO3: Utilize simplex method for linear optimization problems.
CO4: Solve linear and nonlinear model problems.
CO5: Make use of optimization solve the industrial problems of relevance with petrochemical industry.
CO6: Estimate Optimum Values using advanced optimization techniques like Genetic algorithms and dynamic programming.

TEXT/REFERENCE BOOKS:

1. Dutta, Suman. *Optimization in chemical engineering*. Cambridge University Press, 2016.
2. F. Edgar and Himmelblau D, Optimization of chemical processes Mc-Graw. Hill.2001.
3. Kalyanmoy Deb, Optimization for Engineering Design: Algorithms and Examples, PHI-2009.
4. Singaresu S. Rao Engineering Optimization: Theory and Practice, 4th Edition, John Wiley & Sons, 2009.
5. Ashok Belegundu, Tirupathi R. Chandrupatla, Optimization Concepts and Applications in Engineering, Cambridge University Press, 2011.
6. Andreas Antoniou, Wu- shing Lu Practical Optimization: Algorithms and Engineering Applications, Springer, 2007.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100	**Exam Duration: 3 Hrs.**
Part A: 10 Questions each carrying 5 marks	50 Marks
Part B: 5 Questions each carrying 10 marks	50 Marks