OPTIMIZATION IN CHEMICAL PROCESSES
(Elective-II)

Course Code : 13CH2116	**L**	**P**	**C**
	4	**0**	**3**

PREREQUISITES: The student should have knowledge of matrices, Eigen values and graphical interpretation.

Course Educational Objectives: Optimization plays an important role in all engineering problem. The course introduces the student to
1. Basics of Optimization.
2. Formulation of an optimization problem
3. Role of constraints on the solution of an optimization problem

Course Outcomes: After completion of the course the student would be able to
1. Formulate and solve an optimization problem
2. Apply evolutionary techniques like genetic algorithm and simulated annealing to obtain a global optima

UNIT-I
Introduction to process optimization: Formulation of various process optimization problems and their classification, constrained and unconstrained optimization. Classification of points in the 2D space. Basic concepts of optimization-convex and concave functions, necessary and sufficient conditions for stationary points.

UNIT-II
Linear programming: SIMPLEX algorithm, duality in linear programming**.**
Transportation Problem: Solution of Balanced problems using East-West Rule.

UNIT-III
Unconstrained Optimization: Optimality Criteria, Unidirectional search, Powell's Conjugate direction method, Gradient based method: Cauchy's steepest Descent method; Newton's method.

Constrained Optimization Algorithms: Kuhn-Tucker conditions, Transformation methods: Penalty function method, method of multipliers.

UNIT-IV
Multi objective optimization (MOO): Different methods to solve MOO like Utility function method and bounded function method. Solving 2D MOO problems graphically, identifying the Pareto set.

UNIT-V
Specialized Optimization techniques
Discrete Optimization: Enumeration techniques and Branch and Bound methods to solve discrete optimization problem**.**
Genetic Algorithm, Working principles, differences between GAs and traditional methods. Various operations like crossover and mutation**.**
Simulated annealing. (Qualitative treatment of GA and SA only).

TEXTBOOKS:

1. Kalyanmoy Deb, *"Optimization for Engineering Design",* Prentice Hall of India, 2005.
2. Edgar T.F.and Himmelblau D.M., *"Optimization of Chemical Processes"* 2nd Ed, McGraw Hill, International editions, Chemical Engineering series, 2001.
3. Rao SS, *"Engineering Optimization-Theory & Practices"* New Age International Publishers, New Delhi, 1996

REFERENCES:

1. Beveridge G.S. and Schechter R.S., *"Optimization theory and practice",* McGraw Hill New York, 1970.
2. Ravindran, A., and Ragdell, Reklaitis, G.V K.M., *"Engineering Optimization-Methods and Application"*, John Wiley, NewYork,1983.

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