4. Purushothaman,P., *"Reinforced Concrete Structural Elements"*, 3rd Edition, Tata Mc Graw- Hill Publishing Co, 2004.
5. Pillai and Devadas Menon, *"Reinforced Concrete Design"*, 2nd Edition, Tata McGraw Hill Publishing Co. Ltd., 2003.

STRUCTURAL OPTIMIZATION

Course Code: 13CE 2202   **L P C**
                                               4 0 3

Course Outcomes:
At the end of the course the student will be able to
CO1 : Describe problem formulation for a given structure and learn to analysis by classical methods.
CO2 : Prepare solutions for non-linear problems.
CO3 : Discuss the basics and application of Genetic Algorithm for structurs.
CO4 : Explain the concept of Simulated Annealing technique in structurs.
CO5 : Use Artificial Neural Networks in structural application.

UNIT – I
Formulation of Structural Optimization problems: Design variables - Objective function – constraints.
Classical methods of optimization for multivariable with equality or inequality constraints: solution by method of Lagrange Multiplier - Applications in structural engineering, Kuhn-Tucker conditions.

UNIT – II
Nonlinear Programming: Unconstrained and Constrained Optimization - Direct search and gradient methods- Basic approach of the Penalty function method - Interior penalty function method and Exterior penalty function method – design of three bar truss, space truss, welded beam design, etc.

UNIT – III
Genetic Algorithms: – Introduction – basic concept – working principle - Binary coding- Fitness function - Genetic Operators - Application to Two bar pendulum, 3-bar truss, optimum fibre orientation, Genetic Algorithms applications to discrete size variables.

UNIT – IV

Simulated Annealing: problem formulation- steps involved in SA- application to RCC retaining wall, and pre-stressed concrete structure design, etc.

UNIT – V

Artificial Neural Networks based approaches for structural optimization problems- Introduction- basic concept of ANN- Architectures and learning methods of NN- Back propagation networks- structural applications.

TEXT BOOKS

1. Rao, S.S. *"Engineering Optimization, Theory and Applications",* 3rd Edition, New Age International publication, New Delhi, 2010.

2. Rajasekaran, S. and Vijaya Lakshmi Pai, G.A. *"Newral networks, Fuzzy logic, and genetic Algorithms, Synthesis and Application",* 1st Edition, PHI, 2003

REFERENCES

1. Arora, J.S. *"Introduction to Optimum Design"*, 2nd Edition, McGraw-Hill Book Company, 2000.

2. MorrIs A.J., *"Foundations of Structural Optimization - A Unified Approach"*, 3rd Edition, John Wiley and Sons, 2003.

****