STRUCTURAL OPTIMIZATION

Course Code: 13CE 2202

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Course Educational Objectives:

1. To impart the knowledge of problem formulation in structural optimization
2. To familiarize the student about various methods of optimization

Course Outcomes:

1. Student should be able to form a problem formulation for a given structure
2. Student should be able to get optimized structure using classical and modern methods of optimization.
3. To impart the students, with the knowledge of Formulation of Structural Optimization problems.
4. Formulation of Structural Optimization problems: Design variables - Objective function – Constraints.
5. 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 – 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

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

UNIT – IV

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

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 application

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.

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