Course Type	Course Code	Name of Course	L	T	P	Credit
OE	MEO 402	Optimization Theory	3	0	0	9

Course Objective

- To understand theory of different optimization methods to solve various types of engineering problems.
- To understand physical engineering problem and to construct mathematical formulation towards solving it by selecting proper optimization techniques.
- To understand both computer programming and heuristic approaches to solve optimization problems.

Learning Outcomes

Upon successful completion of this course, students will:

- have a broad understanding formulation of engineering optimization problem.
- have an understanding about single and multivariable engineering problems.
- be able to write MATLAB code for single and multivariable engineering problems.
- be able to understand and write MATLAB code for Nontraditional optimization technique like GA to solve different engineering problems.

Unit No.	Topics to be Covered	Lecture Hours	Learning Outcome
1	Basic Concepts: optimization problem formulation.	5	Understanding the types and basic concept of engineering optimization problem formulation.
2	Single variable optimization algorithms: Exhaustive search method, bounding phase method, Interval halving method, golden search method, Newton Rapshon method, bisection method, secant method. Computer programming to solve the single variable problem	10	This unit discuss about different types of classical single variable optimization algorithms. Student will learn to write MATLAB code for these algorithms also.
3	Multivariable optimization algorithms: Unidirectional search, direct search methods, simplex search and gradient based methods. Computer programming to solve Multivariable optimization algorithm	9	This unit discuss about different types of classical multivariable unconstrained optimization algorithms. Student will learn to write MATLAB code for these algorithms also.
4	Constrained optimization algorithms: Linear programming, nonlinear programming penalty function method, method of multipliers, sensitivity analysis, direct search for constrained minimization. Related computer Programming.	9	Student will learn constrained optimization algorithms and their computer programming.
5	Nontraditional optimization: Introduction to Genetic algorithm: Binary coded GA, Limitation – advantage & disadvantage Real coded GA, Micro GA, Scheduling of GA, computer programming, other evolutionary algorithms.	9	This unit demonstrates basics of Nontraditional optimization techniques. Use of Nontraditional optimization like GA to solve different engineering problem, especially mechanical engineering problems.

Text Books:

1. Deb, K. Optimization for engineering design: algorithms and examples. Prentice Hall of India, New Delhi. 2nd Edition 2012

Reference Books:

1. Rao, S.S. Engineering Optimization: Theory and Practice. Wiley. 3rd Edition, 2014
2. Ravindran, A., Ragsdell, K. M., Reklaitis, G. V. Engineering Optimization: Methods and Applications, Willey, 2nd Edition, 2013
3. Rardin, Ronald L. Optimization in operations research. Prentice Hall.