22MEHO205	DESIGN OPTIMIZATION & DESIGN THEORY					
PREREQUISITES		**CATEGORY**	**L**	**T**	**P**	**C**
		PE	**3**	**0**	**0**	**3**

COURSE OBJECTIVES:

1.	The primary objective of this course is for students to gain knowledge to translate practical engineering design problems into mathematical optimization problems that can be solved using numerical methods for optimization

UNIT I	**INTRODUCTION**	**9**	**0**	**0**	**9**

General Characteristics of mechanical elements, adequate and optimum design, principles of optimization, formulation of the objective function, design constraints, and classification of optimization problems. Single and multivariable optimization techniques

UNIT II	**DESIGN OPTIMIZATION TECHNIQUE**	**9**	**0**	**0**	**9**

The technique of unconstrained minimization. The golden section, Random, Pattern, and Gradient search methods, interpolation methods, and equality and inequality constraints.

UNIT III	**PROGRAMME**	**9**	**0**	**0**	**9**

Direct methods and indirect methods using penalty function, Lagrange multipliers, Geometric programming, stochastic programming, Genetic algorithms

UNIT IV	**ENGINEERING APPLICATION**	**9**	**0**	**0**	**9**

Engineering applications, structural-design application axial and transverse loaded members for minimum cost, maximum weight. Design of shafts and torsion members, design optimization of springs.

UNIT V	**DYNAMICS APPLICATION**	**9**	**0**	**0**	**9**

Dynamics applications for a two-degree freedom system. Vibration absorbers. Application in mechanisms.

TOTAL(45L) : 45 PERIODS

TEXT BOOKS:

1.	S. S. Rao, Engineering Optimization: Theory and Practice, 4th edition, John Wiley & Sons, 2009. ISBN: 0470183527.
2.	Kalyanmoy Deb, “Optimization for Engineering Design”, Prentice Hall of India, New Delhi, 2005

REFERENCES:

1.	R.C. Johnson, “Optimum Design of Mechanical Elements”, Willey, New York, 1980
2.	Kalyanmoy Deb, “Evolutionary multi-objective optimization, Willey, New York.
3.	S. S. Stricker, “Optimising performance of energy systems” Battelle Press, New York, 1985.
4.	J. S. Arora, “Introduction to Optimum Design”, McGraw Hill, New York, 1989.
5.	L.C.W. Dixon, “Non-Linear Optimisation - Theory and Algorithms”, Birkhauser, Boston, 1980.
6.	R.J. Duffin, E.L. Peterson and C.Zener “Geometric Programming-Theory and Applications”, Willey, New York, 1967.
7.	G.B.Dantzig “Linear Programming and Extensions Princeton University Press”, Princeton, N. J., 1963
8.	R. Bellman “Dynamic Programming-Princeton” University Press, Princeton, N.J. 1957.

COURSE OUTCOMES: Upon completion of this course, the students will be able to:		**Bloom Taxonomy Mapped**
CO1	Demonstrate An Understanding Of How Design Optimization Fits Into The Overall Engineering Design Process	Create
CO2	Formulate Practical Engineering Design Problems As Well-Posed Optimization Problems	Create
CO3	Determine The Advantages And Disadvantages Of Applying Different Optimization Techniques For A Specific Problem	Analyze
CO4	Model And Analyze Multi objective And Multidisciplinary Optimization Problems	Analyze

COURSE ARTICULATION MATRIX

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	3	3	1	0	0	0	0	0	0	2	2	2	0
CO2	2	2	3	3	1	0	0	0	0	0	0	2	2	2	0
CO3	2	2	2	3	1	0	0	0	0	0	0	2	2	2	0
CO4	2	2	2	3	1	0	0	0	0	0	0	2	2	2	0
Avg	**2**	**2**	**2.5**	**3**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**2**	**2**	**2**	**0**

3/2/1 – indicates strength of correlation (3 – high, 2- medium, 1- low)