OPTIMIZATION TECHNIQUES

CourseCode		Year		Semester	
Course Category	HONORS	Branch	ME	Course Type	Theory
Credits	3	L – T – P	3 – 0 – 0	Pre requisites	Operations Research
Continuous Internal Evaluation	30	Semester End Evaluation	70	Total Marks	100

Course Outcomes: Upon successful completion of the course, the student will be able to

	Statement	Skill	BTL	Units
CO1	Explain basics concepts various optimization techniques	Understand, Communication	L2	1,2,3,4,5
CO2	Select suitable Classical, Numerical and Integer programming techniques for optimization of Engineering Problems	Apply, Communication	L3	1,2,3,4,5
CO3	Apply modern methods to optimize engineering problems	Apply, Communication	L3	5
CO4	Analyze multi stage decision making process through dynamic programming	Analyze Communication	L4	4

Contribution of Course Outcomes towards achievement of Program Outcomes & Strength of correlations (3:High, 2: Medium, 1:Low)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	3	3	2		2		2		2		2	2	2
CO2	2	3	3	2		2		2		2		2	2	2
CO3	2	3	3	2		2		2		2		2	2	2
CO4	2	2	3	2		2		2		2		2	2	2

Syllabus

UNIT	Contents	Mapped COs
I	**Introduction to optimization**: Introduction, engineering applications of optimization, statement of an optimization problem-design vector, design constraints, constraint surface, objective function, classification of optimization problems, optimization techniques. **Classical Optimization techniques:** Introduction, single variable optimization, multi variable optimization with no constraints, multi variable optimization with equality constraints-Lagrange multiplier method.	CO1 CO2
II	**Non-linear programming, I**: One Dimensional Minimization Methods: Introduction, unimodal function, Elimination methods- unrestricted search, exhaustive search, interval halving method, Fibonacci method, golden section method, interpolation method,	CO1 CO2
III	**Non-linear programming II:** Direct Search Method- Nelder- Mead Simplex method,	CO1 CO2

	Indirect search methods- steepest descent method (Cauchy's method), Newton Method, Marquardt Method	
IV	**Dynamic Programming:** Multistage decision processes, Concepts of sub optimization- calculus method and tabular methods, Linear programming as a case of D.P **Integer Programming**: Introduction, Graphical Representation, Gomory's cutting plane method, Branch-and- bound method, Penalty Function method; Basic approaches of Interior and Exterior penalty function methods.	**CO1, CO2 CO4**
V	**Non-Traditional Optimization Techniques:** Introduction to Genetic Algorithms, Particle swarm optimization, Ant colony optimization, Fuzzy optimization, Neural-network-based methods	**CO1 CO3**

Learning Resources
Text books
1.S.S.Rao, Engineering optimization theory and practice, , 3rd Edition, New age international,2007. 2.Van Wylen, Fundamentals of Classical Thermodynamics, .John Wylie.
Reference books
1. H.A.Taha, Operations Research, , 9th Edition, Prentice Hall of India, 2010. 2. F.S.Hillier, and G.J.Lieberman, Introduction to Operations Research, , 7th Edition, TMH, 2009.
E- Resources & other digital material
1.https://nptel.ac.in/courses/111/105/111105039/ 2.https://nptel.ac.in/courses/106/108/106108056/ 3.https://nptel.ac.in/courses/111/104/111104071/ 4.https://nptel.ac.in/courses/112/105/112105235/