GANPAT UNIVERSITY

FACULTY OF ENGINEERING & TECHNOLOGY

Programme	Bachelor of Technology	Branch/Spec.	Computer Engineering/ Information Technology/ Computer Engineering(Artificial Intelligence)
Semester	VIII	Version	1.0.0.0
Effective from Academic Year	2025-26	Effective for the Batch admitted in	July 2022
Course Code	2CEIT8PE5	Course Name	Engineering Optimization

Teaching Scheme						Examination Scheme (Marks)			
(Per week)	Lecture (DT)		Practical (Lab.)		Total		CE	SEE	Total
	L	TU	P	TW					
Credit	2	-	1	-	3	Theory	40	60	100
Hours	2	-	2	-	4	Practical	30	20	50

Pre-requisites

Mathematics, Programming

Course Outcomes

On successful completion of the course, the students will be able to:

CO1	articulate and identify operational research models from the verbal description of the real system.
CO2	Implement and develop model of the real world problems.
CO3	examine the mathematical tools & software that are needed to solve optimization problems.
CO4	analyse the results to resolve resource optimization.

Theory Syllabus

Unit	Content	Hrs.
1	Need of Optimization, Development of Optimization, Engineering Applications of Optimization, Design Vector, Design Constraints and Constraint Surface, Objective Function, Objective Function Surfaces, Stationary Points: Functions of Single and Two variables, Convexity and Concavity of Functions of One and Two Variables, Optimization of Functions of Single and Two Variables, Multiple Variables Subject to Equality Constraints, Lagrangian Function, Hessian Matrix Formulation, Eigen Values Kuhn-Tucker Conditions.	08
2	Linear Programming (LP) Problem, Canonical Form of LP Problem, Assumptions in LP Models, Elementary Operations, Graphical Method for Two Variable Optimization Problem, Branch-and-Bound Method, Sequential Linear Discrete Programming, Generalized Penalty Function Method, Geometry and Formulation of LPP, Graphical Solution, Duality Theory, Duality in LP, Primal- dual Relations, Dual Simplex Method, Post Optimality Analysis, Karmarkar's Projective Scaling Method, Network Models, Shortest-Route Problem, Maximal Flow Model, CPM and PERT, Transportation Model, Nontraditional Transportation Models, Transportation Algorithm, Hungarian Method, Probability Theory, Random Variables and Probability Density Functions, Stochastic Linear Programming, Stochastic Nonlinear Programming, Objective Function and Constraints, Stochastic Geometric Programming, Heuristic Programming, Local Search Heuristics, Tabu Search Algorithm, Simulated Annealing Algorithm.	12
3	Genetic Algorithms, Differential Evolution, Particle Swarm Optimization, Ant Colony Optimization, Crow Search Algorithm, Firefly Optimization Algorithm, Harmony Search Algorithm, Teaching-Learning-Based Optimization, Honey Bee Swarm Optimization Algorithm, Reduced Basis Technique, Design Variable Linking Technique, Incremental Response Approach, Basis Vector Approach, Derivatives of Static Displacements and Stresses, Multi-objective Optimization, Parallel Processing, Utility Function Method, Inverted Utility Function Method, Global Criterion Method, Bounded Objective Function Method, Lexicographic Method, Goal Programming Method, Goal Attainment Method, Game Theory Approach, Inventory Problem: A Supply Chain Perspective, Static Economic-Order-Quantity Models, Dynamic EOQ Models, Sticky Issues in Inventory Modeling.	10

Practical Content

Practicals, assignments and tutorials are based on the above syllabus.

Text Books	
1	Engineering Optimization Theory and Practice by Singiresu S. Rao, John Wiley & Sons
Reference Books	
1	Operations Research: An Introduction by H.A. Taha, Pearson Global Edition
2	Optimization Concepts and Applications in Engineering by Ashok D. Belegundu & Tirupathi R. Chandrupatla
ICT/MOOCs Reference	
1	https://nptel.ac.in/courses/111105039
2	https://archive.nptel.ac.in/courses/106/108/106108056/

Mapping of CO with PO and PSO:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	2	2	2	1	1	2	2	2	3	3	2	2
CO2	3	3	3	3	3	2	2	1	2	2	3	3	3	3	3
CO3	3	3	3	3	3	2	2	1	2	2	3	3	3	3	3
CO4	3	3	3	3	3	3	2	2	2	2	3	3	2	3	3