

PRASAD V. POTLURI SIDDHARTHA INSTITUTE OF TECHNOLOGY

(Autonomous)

Kanuru, Vijayawada-520007

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (AI & ML)

III B. Tech – I Semester CSE (AI&ML)

Soft Computing

Course Code	20AM4501A	Year	III	Semester	I
Course Category	PEC	Branch	CSE(AI&ML)	Course Type	Theory
Credits	3	L-T-P	3-0-0	Prerequisites	Mathematics, Probability and Statistics
Continuous Internal Evaluation	30	Semester End Examination	70	Total Marks	100

Course Outcomes

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

CO1	Describe the fundamental concepts, principles, and techniques in Soft Computing.	L2
CO2	Apply fuzzy logic, genetic algorithms and Particle Swarm Optimization to implementing fuzzy logic controllers and optimization solutions.	L3
CO3	Apply ant colony optimization and firefly algorithm, as well as bat algorithm and cuckoo search, to address real-world optimization problems.	L3
CO4	Analyze the performance and efficiency of various evolutionary algorithms, and compare their suitability for different types of optimization problems	L4

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

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

Syllabus		
Unit No.	Contents	Mapped CO
I	Introduction to Soft Computing: Definition, Importance, Comparison with Hard Computing, Uncertainty, Vagueness, Approximate reasoning. Components of Soft Computing: Fuzzy Logic, Neural Networks, and Evolutionary Computation, Applications of Soft Computing techniques.	CO1
II	Introduction to Fuzzy Logic: Introduction, Fuzzy Sets, Membership Functions, Basic Operations on Fuzzy Sets: Union, Intersection, Complement, Fuzzy Rules, Fuzzy Inference Systems, Fuzzy Decision Making, Control Systems, Applications of Fuzzy Logic.	CO1, CO2, CO4
III	Genetic Algorithm (GA): Introduction, Principles of Natural Evolution, Chromosomes, Genes, Fitness Function, Selection, Crossover, Mutation, Parameter Tuning, GA Algorithm, Applications of Genetic Algorithms. Particle Swarm Optimization (PSO): Introduction, Social Behavior of Particles, Particles, Velocity, Position Updates, Initialization, Iteration, Convergence, Parameter Tuning, PSO Algorithm, Applications of PSO.	CO1, CO2, CO4
IV	Ant Colony Optimization (ACO): Introduction, Ant Colony Behavior, Pheromone Trail, Evaporation, Initialization, Construction, Updating of Pheromone Trails, ACO Algorithm and Applications of ACO. Firefly Algorithm (FA): Introduction, Firefly Behavior, Flashing Characteristics, Attractiveness, Movement, Light Intensity, Initialization, Attractiveness Function, Movement of Fireflies, FA Algorithm, Applications of FA.	CO1, CO3, CO4
V	Bat Algorithm (BA): Introduction, Inspiration from Echolocation Behavior of Bats, Frequency Tuning, Pulse Rate, Loudness, Initialization, Movement, Solution Update, BA Algorithm and Applications of BA. Cuckoo Search (CS): Inspiration from Brood Parasitism of Cuckoos, Cuckoo Breeding Behavior, Levy Flights, Nest Update, Initialization, Generation of New Solutions, Selection, CS Algorithm, Applications of CS.	CO1, CO3, CO4

Learning Resources	
Text Books	
<ol style="list-style-type: none"> Principles of Soft Computing, S. N. Sivanandam and S. N. Deepa, Third Edition, 2018, Wiley. Nature-Inspired Optimization Algorithms, Xin-She Yang, Second Edition, 2020, Elsevier. 	
Reference Books	
<ol style="list-style-type: none"> Soft Computing, Saroj Kaushik and Sunita Tewari, First Edition, 2018, McGraw Hill Education. Machine Learning: A Probabilistic Perspective, Kevin P. Murphy, 2012, MIT Press 	
e- Resources & other digital material	
<ol style="list-style-type: none"> Introduction to soft computing: https://nptel.ac.in/courses/106105173 	