

PRASAD V. POTLURI SIDDHARTHA INSTITUTE OF TECHNOLOGY

(Autonomous)

Kanuru, Vijayawada-520007

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (Data Science)

III B. Tech II Semester

Soft Computing

Course Code	23DS4601D	Year	III	Semester	II
Course Category	PEC	Branch	CSE (Data Science)	Course Type	Theory
Credits	3	L-T-P	3-0-0	Prerequisites	Artificial Intelligence
Continuous Internal Evaluation	30	Semester End Evaluation	70	Total Marks	100

Course Outcomes

Upon Successful completion of course, the student will be able to		
CO1	Describe the concepts of soft computing paradigms including neural networks, fuzzy logic, and genetic algorithms, and their significance in solving complex problems.	L2
CO2	Apply neural network architectures like perceptron, ADALINE, and backpropagation for supervised learning tasks and adaptive modeling to demonstrate and solve real-world problems	L3
CO3	Apply fuzzy logic techniques and hybrid models such as neuro-fuzzy and genetic-fuzzy systems for intelligent system design to develop effective and adaptive solutions	L3
CO4	Analyze the behavior and performance of hybrid soft computing systems by integrating neural, fuzzy, and evolutionary techniques for problem-solving to <i>evaluate</i> their effectiveness in real-world applications.	L4

Contribution of course outcomes towards achievement of program outcomes & Strength of correlations (3: Substantial,2: Moderate,1: Slight)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P010	PO11	PSO1	PSO2
CO1	2												
CO2	3												
CO3	3												
CO4		3									2		

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Syllabus		
Unit No	Contents	Map ped CO
I	Introduction to Soft Computing, Artificial neural networks, biological neurons, Basic models of artificial neural networks, Connections, Learning, Activation Functions, McCulloch and Pitts Neuron, Hebb network.	CO1
II	Perceptron networks, learning rule, Training and testing algorithm, Adaptive Linear Neuron, Back propagation Network, Architecture, Training algorithm	CO1, CO2, CO4
III	Fuzzy logic, fuzzy sets, properties, operations on fuzzy sets, fuzzy relations, operations on fuzzy relations, Fuzzy membership functions, fuzzification, Methods of membership, value assignments, intuition, inference, rank ordering, Lambda –cuts for fuzzysets, Defuzzification methods.	CO1, CO2, CO4
IV	Truth values and Tables in Fuzzy Logic, Fuzzy propositions, Formation of fuzzy rules, Decomposition of rules, Aggregation of rules, Fuzzy Inference Systems, Mamdani and Sugeno types, Neuro-fuzzy hybrid systems, characteristics, classification.	CO1, CO3, CO4
V	Introduction to genetic algorithm, operators in genetic algorithm, coding, selection, crossover, mutation, stopping condition for genetic algorithm flow, Genetic-neuro hybrid systems, Genetic Fuzzy rule-based system	CO1, CO3, CO4

Learning Resources
Text Books
1. Principles of Soft Computing , S. N. Sivanandam and S. N. Deepa, 1st Edition, 2007, John Wiley & Sons.
2. Fuzzy Logic with Engineering Applications , Timothy J. Ross, 4th Edition, 2016, John Wiley & Sons.

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1. **Soft Computing & Intelligent Systems: Theory & Applications**, N. K. Sinha and M. M. Gupta, 1st Edition, 2009, Academic Press / Elsevier.
2. **Neural Networks: A Comprehensive Foundation**, Simon Haykin, 2nd Edition, 1998, Prentice Hall International, Inc.
3. **Computational Intelligence: Concepts to Implementation**, R. Eberhart and Y. Shi, 1st Edition, 2007, Morgan Kaufmann / Elsevier.
4. **An Introduction to Fuzzy Control**, D. Driankov, H. Hellendoorn, and M. Reinfrank, 1st Edition, 2001, Narosa Publishing House.
5. **Neural Networks and Fuzzy Systems**, Bart Kosko, 1st Edition, 1992, Prentice Hall, Inc., Englewood Cliffs.
6. **Genetic Algorithms in Search, Optimization, and Machine Learning**, David E. Goldberg, 1st Edition, 1989, Addison-Wesley.

E-Recourses and other Digital Material

1. https://onlinecourses.nptel.ac.in/noc25_ma54/preview