MCAE313: SOFT COMPUTING PARADIGM

Hours/Week: 3 I.A. Marks: 30

Credits: 3 Exam. Marks: 70

Course Learning Objectives: Students will able to try,

1. Understand Soft Computing concepts, technologies, and applications.
2. Understand the underlying principle of soft computing with its usage in various applications.
3. Understand different soft computing tools to solve real life problems.
4. Develop application on different soft computing techniques like Fuzzy, GA and Neural network.

Course Outcomes: After completing the course, the students will be able to,

CO1: Understand the fundamentals of Soft computing approaches and demonstrate the basic functionalities

CO2: Apply the soft computing techniques to solve problems

CO3: Analyze the results of soft computing techniques to handle various problems

CO4: Evaluate the solutions of soft computing algorithms for optimization

CO5: Aware of concepts with the real time applications

CO6: Implement Neuro - Fuzzy and Neuro - Fuzz - GA expert system.

CO7: Understand the Neural Networks, architecture, functions and various algorithms involved.

UNIT-I 9 Hrs.

Introduction To Soft Computing Paradigm, Artificial Neural Networks – Fundamental Concepts, Evolution, Basic Models, Important Terminologies, MP – Neuron, Linear Separability, Hebb Network. Supervised Learning Networks – Perceptron Network: Theory, Learning Rule, Architecture, Training Process, Training Algorithm For Single Output Class. Back-Propagation Network: Theory, Architecture, Training Process, Learning Factors, Testing.

UNIT-II 9 Hrs.

Associative Memory Networks: Introduction, Training Algorithms for Pattern Association: Hebb Rule, Outer Products Rule. Auto Associative Memory Networks: Theory, Architecture, Training Process and Algorithm, Testing. Unsupervised Learning Networks: Kohenen Self-Organizing Feature Maps: Theory, Architecture, Training Algorithm.

UNIT-III 9 Hrs.

Introduction: Fuzzy Systems – Historical Perspective, Utility and Limitations, Uncertainty and Information, Fuzzy Sets and Membership, Chance Vs Fuzziness. Classical Sets and Fuzzy Sets: Classical Set (Operations, Properties, Mapping To Functions). Fuzzy Sets (Operations, Properties, Alternative Fuzzy Set Operations). Classical Relations and Fuzzy Relations: Cartesian product, Crisp Relations, Fuzzy Relations, Tolerance And Equivalence Relation, Crisp Equivalence and Tolerance Relations, Fuzzy Tolerance And Equivalence Relations

UNIT-IV 9 Hrs.

Properties of Membership Functions, Fuzzification and Defuzzification: Features of the membership functions, Fuzzification, Defuzzification to crisp sets, α-cuts for fuzzy relations, Defuzzification to scalars. Logic and Fuzzy systems: Classical Logic, Fuzzy logic, Approximate Reasoning, Genetic Algorithms: Fundamentals of Genetic Algorithm: Basic Concepts, Creation of

Off-Springs, Working Principle, Encoding, Fitness Function, Reproduction. Genetic Modeling: Inheritance Operators, Cross Over, Inversion and Deletion, Mutation Operators, Bitwise Operators, Generational Cycle, Convergence.

REFERENCE BOOKS:

1. B. Yegnanarayana, Artificial Neural Networks, PHI
2. Ross, Fuzzy Logic with Engineering Applications, 3rdEdn, Wiley India.
3. Sivanandan, Deepa, Principles of Soft Computing, 2ndEdn, Wiley India.
4. Rajasekharan and Viajayalakshmipai, Neural Networks, Fuzzy Logic and Genetic Algorithm, PHI, 2003. (For Unit 4).
5. B. K. Tripathi, J. Anuradha, Soft Computing Advances and Applications, 2015, Cengage Learning India Pvt Ltd, ISBN-13: 978-81-315-2619-4, ISBN-10: 81-315-2619-4.
6. James A. Anderson, An Introduction to Neural Networks, Prentice Hall of India, ISBN-81-203- 1351-8.