SOFT COMPUTING

COURSE CODE: 20ITH101

L	T	P	C
3	0	0	3

COURSE OUTCOMES:

At the end of the Course the student shall be able to

CO 1: Describe various soft computing concepts for practical applications. (L2)

CO 2: Apply suitable neural network for real time problems. (L3)

CO 3: Apply fuzzy rules and reasoning to develop decision making and expert system. (L3)

CO 4: Explain the importance of optimization techniques and genetic programming. (L2)

CO 5: Apply the various hybrid soft computing techniques in real time problems. (L3)

UNIT- I **10 Lectures**

INTRODUCTION

Artificial neural network: Introduction, characteristics- learning methods – taxonomy – Evolution of neural networks- basic models - important technologies - applications. Fuzzy logic: Introduction - crisp sets- fuzzy sets - crisp relations and fuzzy relations: cartesian product of relation - classical relation, fuzzy relations, tolerance and equivalence relations, non-iterative fuzzy sets. Genetic algorithm- Introduction - biological background - traditional optimization and search techniques - Genetic basic concepts.

Learning Outcomes: At the end of the unit, the student will be able to

1. Describe the structure of biological neuron. (L2)
2. Differentiate between soft computing and hard computing. (L2)
3. Classify the various types of soft computing technique(L2)

UNIT- II **10 Lectures**

NEURAL NETWORKS

McCulloch-Pitts neuron - linear separability - hebb network - supervised learning network: perceptron networks - adaptive linear neuron, multiple adaptive linear neuron, BPN, RBF, TDNN- associative memory network: auto-associative memory network, hetero-associative memory network, BAM, hopfield networks, iterative autoassociative memory network & iterative associative memory network – unsupervised learning networks: Kohonen self organizing feature maps, LVQ – CP networks, ART network.

Learning Outcomes: At the end of the unit, the student will be able to

1. Draw the basic model of adaline network. (L3)
2. Differentiate between recurrent and non recurrent networks. (L3)
3. Explain the Kohonen self-organizing feature maps with suitable example. (L2)

UNIT- III **10 Lectures**

FUZZY LOGIC

Membership functions: features, fuzzification, methods of membership value assignments- Defuzzification: lambda cuts - methods - fuzzy arithmetic and fuzzy measures: fuzzy arithmetic - extension principle - fuzzy measures - measures of fuzziness -fuzzy integrals - fuzzy rule base and approximate reasoning : truth values and tables, fuzzy propositions, formation of rules-decomposition of rules, aggregation of fuzzy rules, fuzzy reasoning-fuzzy inference systems-overview of fuzzy expert system-fuzzy decision making.

Learning Outcomes: At the end of the unit, the student will be able to

1. Illustrate the different types of defuzzification methods. (L3)
2. Differentiate between mamdani FIS and Sugeno FIS . (L2)
3. Explain the types of FIS with relevant diagram. (L2)

UNIT- IV **10 Lectures**

GENETIC ALGORITHM

Genetic algorithm and search space - general genetic algorithm – operators - Generational cycle - stopping condition – constraints - classification - genetic programming – multilevel optimization – real life problem- advances in GA.

Learning Outcomes: At the end of the unit, the student will be able to

1. Explain the genetic operators and fitness function in respect of evolutionary computing. (L2)
2. Differentiate between mamdani FIS and Sugeno FIS . (L3)
3. Explain the types of FIS with relevant diagram. (L2)

UNIT-V **10 Lectures**

HYBRID SOFT COMPUTING TECHNIQUES & APPLICATIONS

Neuro-fuzzy hybrid systems - genetic neuro hybrid systems - genetic fuzzy hybrid and fuzzy genetic hybrid systems - simplified fuzzy ARTMAP - Applications: A fusion approach of multispectral images with SAR, optimization of traveling salesman problem using genetic algorithm approach, soft computing based hybrid fuzzy controllers.

Learning Outcomes: At the end of the unit, the student will be able to

1. Compare and Contrast ARTMAP and BPN (L3)
2. Analyze the stability of ANN. (L4)
3. Describe few optimization techniques. (L2)

TEXT BOOKS :

1. S.N.Sivanandam and S.N.Deepa,,*Principles of Soft Computing*,,3rd Edition Wiley India Pvt Ltd, 2018.
2. J.S.R.Jang, C.T. Sun and E.Mizutani, *Neuro-Fuzzy and Soft Computing*, 2nd Edition PHI / Pearson Education 2014.

REFERENCES:

1. S.Rajasekaran and G.A.Vijayalakshmi Pai, *Neural Networks, Fuzzy Logic and Genetic Algorithm: Synthesis & Applications*, 4th edition,Prentice-Hall of India Pvt. Ltd., 2016.
2. David E. Goldberg, *Genetic Algorithm in Search Optimization and Machine Learning*, 2nd Edition, Pearson Education India, 2013.

WEB REFERENCES:

1. https://onlinecourses.nptel.ac.in/noc20_cs17/preview
2. https://www.coursera.org/learn/cnns-and-rnns
3. https://www.udemy.com/topic/fuzzy-logic