17ES011   SOFT COMPUTING

Hours Per Week :

L	T	P	C
3	1	-	4

Total Hours :

L	T	P	WA/RA	SSH/HSH	CS	SA	S	BS
45	15	-	15	30	-	5	5	-

Course Objectives:

- To review the fundamentals of ANN and fuzzy set theory

- To make the students understand the use of ANN for modeling and control of non-linear system and to get familiarized with the ANN and FLC tool box.

- To make the students to understand the use of optimization techniques.

- To familiarize the students on various hybrid control schemes, P.S.O and get

- To familiarized with the ANFIS tool box.

Course Outcomes:

The student will be able to:

- Will be able to know the basic ANN architectures, algorithms and their limitations.

- Will be able to know the different operations on the fuzzy sets.
- Will be capable of developing ANN based models and control schemes for non-linear system.
- Will get expertise in the use of different ANN structures and online training algorithm.
- Will be knowledgeable to use Fuzzy logic for modeling and control of non-linear systems.
- Will be competent to use hybrid control schemes and P.S.O.

SKILLS :

- Familiarization with ANN Tool Box.

- Familiarization with ANFIS Tool Box.

- Familiarization with FLC Tool Box.

ACTIVITIES:

o Performing simple experiments using ANN Tool Box

o Performing simple experiments using FLC Tool Box

o Performing simple experiments using ANFIS Tool Box

Unit – I

Review of fundamentals - Biological neuron, Artificial neuron, Activation function, Single Layer Perceptron – Limitations – Multi Layer Perceptron – Back propagation algorithm (BPA); Fuzzy set theory – Fuzzy sets – Operation on Fuzzy sets - Scalar cardinality, fuzzy cardinality, union and intersection, complement (yager and sugeno), equilibrium points, aggregation, projection, composition, decomposition, cylindrical extension, fuzzy relation – Fuzzy membership functions.

Unit - II

Modeling of non linear systems using ANN- NARX,NNSS,NARMAX - Generation of training data - optimal architecture – Model validation- Control of non linear system using ANN Direct and Indirect neuro control schemes- Adaptive neuro controller – Case study - Familiarization of Neural Network Control Tool Box.

Unit – III

Modeling of non linear systems using fuzzy models(Mamdani and Sugeno) –TSK model -Fuzzy Logic controller – Fuzzification – Knowledge base – Decision making logic – Defuzzification- Adaptive fuzzy systems- Case study - Familiarization of Fuzzy Logic Tool Box.

Unit - IV

Basic concept of Genetic algorithm and detail algorithmic steps, adjustment of free parameters. Solution of typical control problems using genetic algorithm. Concept on some other search techniques like Tabu search, Ant-colony search and Particle Swarm Optimization.

Unit-V

Fuzzification and rule base using ANN–Neuro fuzzy systems-ANFIS –Optimization of membership function and rule base using Genetic Algorithm and Particle Swarm Optimization - Case study– Introduction to Support Vector Regression – Familiarization of ANFIS Tool Box.

TEXT BOOKS:

1. Laurene V.Fausett, "Fundamentals of Neural Networks, Architecture, Algorithms, and Applications", Pearson Education, 2008.

2. Timothy J.Ross, "Fuzzy Logic with Engineering Applications", Wiley, Third Edition, 2010.

3. David E.Goldberg, "Genetic Algorithms in Search, Optimization, and Machine Learning", Pearson Education, 2009.

REFERENCE BOOKS:

1. W.T.Miller, R.S.Sutton and P.J.Webrose, "Neural Networks for Control", MIT Press, 1996.

2. George J.Klir and Bo Yuan, "Fuzzy Sets and Fuzzy Logic: Theory and Applications", Prentice Hall, First Edition, 1995.

3. N.P Padhy, S.P. Simon "Soft Computing With MATLAB Programming",OXFORD print Feburary 2015.