EEOESCN	SOFT COMPUTING TOOLS FOR ELECTRICAL ENGINEERING	L	T	P	C
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Course Objectives:

- To familiarize the students with the various architectures and learning algorithms of Artificial Neural Network.
- To make the students to understand the basis of classifying neural networks and suitability for different applications.
- To enable the students to acquire knowledge on Fuzzy logic and their operations
- To acquire the ability of designing Fuzzy logic controllers and Neuro Controllers.
- To introduce the concept of genetic algorithm and its operators.

Unit–I: Artificial Neural Networks

Motivation for the development of neural networks- biological neural networks- artificial neural networks – Fundamental Concepts - weights – biases and thresholds - common activation functions. McCulloch-Pitts neuron: Architecture, algorithm - Hebb Net- Architecture - algorithm - Perceptron –Architecture- algorithm- applications- Linear separability - Perceptron learning rule convergence theorem - Delta rule.

Unit – II: Neural Network Architecture and Algorithms

Back propagation Neural Net: Standard back propagation -architecture - algorithm - number of hidden layers - Discrete Hopfield neural net- architecture - algorithm – Competitive Neural Networks -Fixed-weight competitive nets – Korhonen self-organizing Maps – Adaptive Resonance Theory- Basic architecture - Algorithm - Introduction to Neuro controllers - Application of ANN for Economic Load Dispatch problem.

Unit – III: Fuzzy Logic

Fuzzy sets - Properties of Classical and Fuzzy sets- Operations on Fuzzy sets- Fuzzy relations- Linguistic variables - Linguistic Hedges- Fuzzy statements- Assignment statements- Conditional statements- unconditional statements- Fuzzy rule base- Canonical rule formation- Decomposition of compound rules.

Unit – IV: Fuzzy Logic Controller

Fuzzy logic controller: Functional diagram - Fuzzification -Membership value assignments using intuition - Membership functions-Defuzzification: Max-Membership principle - centroid method – weighted average method - Inference Engine – Knowledge Base -Rule base –Case studies- Fuzzy logic controller for DC motor speed control.

Unit – V: Genetic Algorithm

Optimization – Traditional optimization methods – Concept of Evolutionary Algorithm – Genetic Algorithm – encoding and decoding of variables – GA operators – reproductions – Cross over – mutation – fitness function –fitness scaling.

Text Books:

1. LawreneFaussett, "Fundamental of neural networks", *Prentice Hall, 2004.*
2. Rajasekaran and VilyalakshmiPai G.A, “Neural Networks, Fuzzy Logic and Genetic Algorithms – Sysnthesis and Apllications”, Prentice Hall, 2015
3. David Goldberg. E,” Genetic algorithms in search optimization and machine learning,” Addison Wesley, Pearson Education, Asia, 2001.

References:

1. Driankov. Hellendoornarow D.H Reinfrank M., "An introduction to Fuzzy Control”, *Narosa Publishing co., New Delhi, 2006.*
2. Ross T.J,"Fuzzy Logic with Engineering Applications", *McGraw-Hill, Newyork, 2005.*
3. Sivanandham. SN and Deepa. SN, “Neural networks with Matlab”, *TMH* 2007.

Course Outcomes:

At the end of this course, students will be able to

1. Analyze and select a suitable technique for the particular problem domain.
2. Recognize the merits and demerits of applying a particular ANN model for a particular problem.
3. Design and apply fuzzy Logic based reasoning to handle uncertainty in engineering problems.
4. Apply Neuro-controller, Fuzzy Logic Controller for non-linear controlling applications.
5. Solve combinatorial optimization problems using genetic algorithm.

Mapping with Program Outcomes														
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	2	3											3	2	
CO2	3	2	3		2								3	3	
CO3		2	3		3				1				2	2	
CO4			3	2	3									2	
CO5		3	2		3								3	2	