AI TECHNIQUES IN ELECTRICAL ENGINEERING

Course Code	20EE4703B	**Year**	IV	**Semester(s)**	I
Course Category	Professional Elective-V	**Branch**	EEE	**Course Type**	Theory
Credits	3	**L-T-P**	3-0-0	**Prerequisites**	Power System Analysis
Continuous Internal Evaluation:	**30**	**Semester End Evaluation:**	**70**	**Total Marks:**	**100**

Course Outcomes	
Upon successful completion of the course, the student will be able to	
CO1	**Understand** the concepts of artificial intelligence techniques. (L2)
CO2	**Categorize** feed forward and feedback neural networks (L4)
CO3	**Analyze** and appreciate the concepts of fuzzy set over classical set theory. (L4)
CO4	**Examine** the concept of genetic algorithm(L4)
CO5	**Apply** ANN, fuzzy logic control and GA to electrical engineering problems (L3)
CO6	**Learn** the computational and mathematical theory, and application of fundamental AI algorithms for electrical engineering problems and **submit the report**.

Contribution of Course Outcomes towards achievement of Program Outcomes & Strength of correlations (3: High, 2: Medium, 1: Low)														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1														
CO2	2	2	1	2	2						2	2	3	1
CO3	2	2	1	1	1						1	1	3	1
CO4		2	3	2	2						2	2	3	1
CO5	2	2	2	2	1	1	1	1			1	1	3	1
CO6		3	3						3	3		3	3	1

SYLLABUS		
Unit No.	**Contents**	**Mapped CO**
I	**Artificial Neural Networks:** Introduction, Biological Neuron and organization of the brain, Biological and Artificial Neuron Models, Characteristics of ANN, McCulloch-Pitts Model, Types of Neuron Activation Functions, ANN Architectures, Learning process – Error correction learning – Hebbian learning – Competitive learning – Boltzmann learning – Supervised learning – Unsupervised learning – Reinforcement learning.	**CO1, CO2, CO5, CO6**
II	**ANN Paradigms**: Perceptron - Limitations of the Perceptron Model, Back propagation	**CO1, CO2, CO5,**

	Algorithm with example problem – Radial Basis Function Network - Hopfield Network.	**CO6**
III	**Fuzzy Logic:** Introduction to classical sets - properties, Operations and relations, Introduction to Fuzzy sets - Fuzzy versus crisp, Membership function, Basic Fuzzy set operations, Properties of Fuzzy sets, Fuzzy cartesian Product, Defuzzification methods.	**CO1, CO3, CO5, CO6**
IV	**Genetic Algorithms:** Introduction, Fitness Function, Reproduction operators, Genetic operators – Crossover – Single–site crossover – Two-point crossover – Multi point crossover-Uniform crossover – Matrix crossover – Crossover Rate – Inversion & Deletion, Mutation operator –Mutation – Mutation Rate, Generational cycle, convergence of Genetic Algorithm.	**CO1 CO4, CO5, CO6**
V	**Applications of AI Techniques:** Load flow studies, Economic load dispatch, Load frequency control – Single area system and two area system, Small Signal Stability, speed control of DC and AC Motors.	**CO1, CO5, CO6**

Learning Resources
Text Books
1. Rajasekharan and Pai, Neural Networks, Fuzzy logic, Genetic Algorithm - Synthesis and Applications, PHI second edition, 2017 2. S. N. Sivanandam, S. Sumathi, S. N. Deepa, "Soft computing techniques", Wiley Publications third edition 2018
Reference Books
1. Jacek M Zurada, Introduction to Artificial Neural Systems Jaico Publishing House, First edition, 1994. 2. K. Deb, Optimization for Engineering Design – Algorithms and Examples, Prentice Hall of India, New Delhi, second edition, 2012. 3. F. Karray and C. De Silva, "Soft Computing and Intelligent Systems Design, Theory, Tools and Applications", Prentice Hall, first edition 2009.
e-Resources
1. https://nptel.ac.in/courses/106105173