Fuzzy Control System Design and Analysis

Course Code	19EE4501C	Year	III B.Tech	Semester	I
Course Category	Program Elective-I	Branch	EEE	Course Type	Theory
Credits	3	L-T-P	3-0-0	Prerequisites	
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 basic concepts of Neural Networks and Fuzzy logic (L2)
CO2	Develop Neural Network based control system for engineering applications (L3)
CO3	Develop Fuzzy logic-based control system for engineering applications (L3)
CO4	Develop hybrid neuro-fuzzy architecture for engineering optimization problems (L3)
CO5	Apply Machine and deep learning algorithms to solve real-world Engineering problems (L3)

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	2	3	3		3								3	
CO2			2		3						3	3		
CO3					3								1	
CO4	2			3										2
CO5			3	3	3							3	1	2

SYLLABUS		
Unit No.	Contents	Mapped CO
I	**Introduction to fuzzy logic and neural networks:** Classification , Merits and demerits of intelligent techniques compared to conventional techniques. Need of an intelligent technique for real world Engineering applications.	**CO1**
II	**Supervised and Unsupervised Neural networks:** Perception, Standard back propagation Neural network: Architecture, Algorithm and other issues. Discrete Hopfield's networks, Kohnen's self-organizing maps, adaptive resonance theory (ART1).	**CO2**
III	**Fuzzy set and operations :** Fuzzy relations, Fuzzifications, Fuzzy rule-based systems, defuzzification fuzzy learning algorithms.	**CO3**
IV	**Fuzzy logic for control system with case studies:** Introduction to neuro-fuzzy system and genetic algorithm.	**CO4**

V	**Machine learning & Deep learning :** Learning from agents - inductive learning - Types of Machine learning - Supervised learning - learning decision trees - support vector machines. Deep Networks ,Deep Feed forward Networks - Learning XOR - Gradient Based learning - Hidden Units - Back-propagation and other Differential Algorithms - Regularization for Deep Learning - Optimization for training Deep Models.	**CO5**

Learning Resources
Text Books:
Timothy J. Ross, Fuzzy Logic with Engineering Applications, John Wiley & Sons Ltd Publications, 4th edition, 2016.
Reference Books:
1. S. Haykin, Neural Networks: A comprehensive Foundation, Prentice Hall Inc., New Jersey, 2nd Edition, 1999. 2. Klir G.J and Folger T.A, Fuzzy sets, Uncertainty and Information, Prentice Hall, New Delhi, 1994. 3. Zdenko Kovacic, Stjepan Bogdan, Fuzzy Controller Design Theory and Applications, CRC Press, 1st edition, 2006. 4. Satish Kumar, Neural Networks–A classroom approach, Tata McGraw-Hill Publishing Company Limited, 2013.. 5. Laurene Fausett, Fundamentals of Neural networks, Pearson education, Eight Impression, 2012. 6.Tom Mitchell, “Machine Learning”, McGraw Hill, 1997. 2. E. Alpaydin, “Introduction to Machine Learning”, Second Edition, Prentice-Hall of India, 201. 7. Ian Goodfellow, Yoshua Bengio, Aaron Courville, “Deep Learning”, The MIT Press, 2016
Learning Resources: **http://www.nptelvideos.in/2012/11/intelligent-systems-and-control.html**