FUZZY LOGIC

Course Code	20EC4701E	**Year**	IV	**Semester**	I
Course Category	Program Elective III	**Branch**	ECE	**Course Type**	Theory
Credits	3	**L-T-P**	3-0-0	**Prerequisites**	Linear, algebra, Statistics and Probability
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 fundamentals of Fuzzy logic and its applications	L2
CO2	Apply the concepts of fuzzy logic to solve the real world problems	L3
CO3	Design fuzzy systems for various engineering applications	L3
CO4	Analyse the performance of fuzzy systems	L4

Mapping of course outcomes with Program outcomes (CO/ PO/PSO Matrix)
Note: 1- Weak correlation 2-Medium correlation 3-Strong correlation
* - Average value indicates course correlation strength with mapped PO

COs	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO1 0**	**PO1 1**	**PO1 2**	**PSO 1**	**PSO 2**
CO1	2				2					2				
CO2	3				3					3			3	3
CO3	2				2					2			2	
CO4		2			2					2				2
Average * (Rounded to nearest integer)	3	2			2					2			3	3

Syllabus		
Unit No.	**Contents**	**Mapped CO**
I	**Introduction** Different faces of imprecision - inexactness, Ambiguity, Undecidability, Fuzzyness and certainty, Fuzzy sets and crisp sets, Probability and fuzzy logic, Fuzzy control and knowledge based systems	CO1,CO2
II	**Fuzzy Sets and Operations** Impressive concepts, Fuzzyness and imprecision, Properties of fuzzy sets, Fuzzy representation, Conventional set operations, Intersection of Fuzzy sets, Union of fuzzy sets, the complement of fuzzy sets	CO1,CO2
III	**Fuzzy Reasoning** Linguistic variables, Fuzzy propositions, Fuzzy compositional rules of inference-the-Min-Max rules implications and fuzzy additive rules of implication, Methods of decompositions and defuzzyfication -composite moments, composite maximum average of maximum values and centre of maximums	CO1,CO2

IV	**Methodology of Fuzzy Systems** Direct and Indirect methods with single and multiple experts, Construction from sample data - Least square method, adaptive fuzzy controllers - membership function tuning using gradient decent	CO1,CO3, CO4
V	**Applications** Fuzzy controllers - a fuzzy steam turbine controller, DC motor speed control, Fuzzy decisions making, neuro fuzzy systems, fuzzy genetic algorithms	CO1,CO3, CO4

Learning Resources
Text Books
1. Zimmermann H.J., 'Fuzzy Set Theory - and its Applications', Springer, 4th Ed., 2007 2. Timothy J. Ross, 'Fuzzy Logic with Engineering Applications', Wiley Publications, 4th Ed., 2016
References
1. John Yen, Reza Langari, 'Fuzzy Logic, Intelligence, Control & Information', Pearson Education Inc., India, 2007 2. Zdenko Kovacic, Stjepan Bogdan, 'Fuzzy Controller Design Theory and Applications', CRC Press, 1st Ed., 2006 3. Riza C. Berkaan, Sheldon L. Trubatch, 'Fuzzy Systems Design Principles – Building Fuzzy IF THEN Rule Based', IEEE Press, 1997 4. George J Klir and Bo Yuan, 'Fuzzy Sets and Fuzzy Logic: Theory and A: Theory and Applications', Pearson, 2015 5. M. Mitchell, 'Introduction to Genetic Algorithms', Indian Reprint, MIT press Cambridge, 2nd Ed, 2014
e-Resources
1. https://onlinecourses.nptel.ac.in/noc22_ge04/preview 2. https://eopcw.com/find/course/428/courses 3. https://www.wiley.com//legacy/wileychi/fuzzylogic/