JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA
19ABS21-FUZZY SET THEORY, ARITHMETIC AND LOGIC
(Open Elective -I)

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Course Objectives: This course aims at providing
- the basic knowledge to understand Fuzzy set theory and Arithmetic. and
- Logic, related to a real word problems of engineering, Science etc.

UNIT – 1: Classical (Crisp) Sets To Fuzzy Sets & Fuzzy Sets Versus Crisp Sets   **9 Hrs**

Classical (Crisp) Sets To Fuzzy Sets:

Introduction: Crisp Sets: An Overview, Fuzzy Sets: Basic Types, Fuzzy Sets: Basic Concepts, Characteristics and Significance of the Paradigm Shift.

Fuzzy Sets Versus Crisp Sets:

Alpha -Cuts :Additional Properties of alpha -Cuts, Representations of Fuzzy Sets, Extension Principle for Fuzzy Sets

Learning Outcomes:

At the end of this unit, the student will be able to

• The basic concepts of Sets and Fuzzy sets	L2
• Analyze the Fuzzy Sets Versus Crisp Sets	L3

UNIT – II: Operations On Fuzzy Sets:

Types of Operations, Fuzzy Complements, Fuzzy Intersections: t-Norms Fuzzy Unions: t- Conorms, Combinations of Operations, Aggregation Operations.

Learning Outcomes:

At the end of this unit, the student will be able to

• Do some operations on Fuzzy sets	L2
• Assess t-Norms Fuzzy Unions	L3

UNIT – III: Fuzzy Arithmetic & Fuzzy Relations:

Fuzzy Arithmetic :

Fuzzy Numbers, Linguistic Variables, Arithmetic Operations on Intervals, Arithmetic Operations on Fuzzy Numbers, Lattice of Fuzzy Numbers, Fuzzy Equations.

Fuzzy Relations:

Crisp versus Fuzzy Relations, Projections and Cylindric Extensions, Binary Fuzzy Relations, Binary Relations on a Single Set, Fuzzy Equivalence Relations, Fuzzy Compatibility Relations, Fuzzy Ordering Relations.

Learning Outcomes:

At the end of this unit, the student will be able to

• Perform arithmetic operations on Fuzzy numbers and equations.	L2
• Analyze Fuzzy Relations, Projections and Cylindric Extensions etc.	L3

UNIT – IV: Fuzzy Relation Equations & Possibility Theory

Fuzzy Relation Equations:

General Discussion ,Problem Partitioning , Solution Method , Fuzzy Relation Equations Based on

Sup-i Compositions , Fuzzy Relation Equations Based on Inf- $^{\omega_i}$ Compositions

Possibility Theory:

Fuzzy Measures, Evidence Theory, Possibility Theory, Fuzzy Sets and Possibility Theory, Possibility Theory versus Probability Theory.

Learning Outcomes:
At the end of this unit, the student will be able to
- Solve Fuzzy relation equations.   **L3**
- Analyze Possibility Theory   **L4**

UNIT – V: Fuzzy logic

Classical Logic: An Overview, Multivalued Logics, Fuzzy Propositions, Fuzzy Quantifiers, Linguistic Hedges, Inference from Conditional Fuzzy Propositions, Inference from Conditional and Qualified Propositions, Inference from Quantified Propositions.

Learning Outcomes:
At the end of this unit, the student will be able to
- Understand the Fuzzy logic.   **L1**
- Analyze the Inferences from Conditional, Qualified, and Quantified Propositions.   **L4**

Text Books:
1. Fuzzy Sets and Fuzzy Logic, Geoge J. Klir and Bo Yuan

Reference Books:
1. Fuzzy Mathematical Models in Engineering and Management Science, A. Kaufmann and M.M. Gupta
2. Fuzzy Logic, Timothy J. Ross
3. Fuzzy Set Theory, H.J. Zimmermann
4. Introduction to Fuzzy Logic and Fuzzy Sets, J.J. Buckley and E. Eslami

Course Outcomes:
At the end of this Course the student will be able to
- Understand the basic concepts of Fuzzy sets and logic.   **L1**
- Do some operations of Fuzzy sets.   **L2**
- Solve Fuzzy relation equations.   **L3**
- Analyze the Inferences from Conditional, Qualified, and Quantified Propositions.   **L4**
- Analyze the real word problem through the technique of Fuzzy set theory and logic to have better insight of the real word problems.   **L5**

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