

EE658A: FUZZY SET, LOGIC & SYSTEMS & APPLICATIONS

1. Objective(s):

The course is designed to give a solid grounding of fundamental concepts of fuzzy logic and its applications. The level of the course is chosen to be such that all students aspiring to be a part of computational intelligence directly or indirectly in near future should get these concepts.

2. Prerequisite(s): Nil

3. Course Content(s):

Introduction, Uncertainty, Imprecision and Vagueness, Fuzzy systems, Brief history of Fuzzy logic, Foundation of Fuzzy Theory, Fuzzy Sets and Systems, Fuzzy Systems in Commercial Products, Research Fields in Fuzzy Theory, Classical sets and Fuzzy sets, Classical Relations, Fuzzy relations, Membership Functions, Fuzzy to crisp conversions, Fuzzy arithmetic, Numbers, Vectors and the extension principle, Classical logic and Fuzzy logic, Mathematical background of Fuzzy Systems, Classical (Crisp) vs, Fuzzy sets, Representation of Fuzzy sets, Types of Membership Functions, Basic Concepts (support, singleton, height, a cut projections), Fuzzy set operations, Sand T Norms, Properties of Fuzzy sets, Sets as Points in Hypercube, Cartesian Product, Crisp and Fuzzy Relations, Examples, Linguistic variables and hedges, Membership function design. Basic Principles of Inference in Fuzzy Logic, Fuzzy IFTHEN Rules, Canonical Form, Fuzzy Systems and Algorithms, Approximate Reasoning, Forms of Fuzzy Implication, Fuzzy Inference Engines, Graphical Techniques of Inference, Fuzzifications/Defuzzification, Fuzzy System Design and its Elements, Design options. Fuzzy Events, Fuzzy Measures, Possibility Distributions as Fuzzy Sets, Possibility vs, Probability, Fuzzy Systems as Universal Approximations, Additive Fuzzy Systems (standard additive model).

4. Lecture Schedule & Venue: Tuesday (10:30 AM to 12:00 PM) and Thursday (12:00 PM to 01:15 PM) L-2

5. Course Instructor: Prof. Nishchal K Verma, PhD (nishchal@iitk.ac.in)

Course TA(s): Mohd. Aquib (aquib@iitk.ac.in)

6. Recommended mode of contact beyond formal contact hours: EMail

(All Notices for the course will be sent by email to the course email list.)

7. Evaluation Components & Policies: The grading policy and marks distribution for the course is as follows:

Class Performance (Surprise quiz(zes)/ Assignment(s))	10%
Mid Semester Examination	25%
Course Project (Journal/ Research /Term Paper Analysis, Implementation, and Simulation Results)	30%
End Semester Examination	35%
Total	100 %

Exams: Examination will be held during the prescribed examination period.

8. Course Policies: Attendance, Honesty Practices, Withdrawal (as per DOAA Guidelines)

9. Books & References: This being a PG course there is no prescribed text. However, the following book is recommended:

- J.-S. R. Jang, C.-T. Sun, and E. Mizutani, "Neuro-Fuzzy and Soft Computing" (<https://mirilab.org/jang/book/>)