INTRODUCTION TO FUZZY SET THEORY, ARITHMETIC AND LOGIC

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INTENDED AUDIENCE : M.Sc Mathematics, M.Sc Computer Science

COURSE OUTLINE :
The primary purpose of this course is to introduce students to the areas of Fuzzy set theory and Fuzzy logic. No previous knowledge is needed regarding Fuzzy set theory or Fuzzy logic. But familiarity with Classical set theory, and Two-valued logic will be helpful. In most real-life applications of any decision making one needs to face many types on uncertainty. While as humans we can deal with this uncertainty with our reasoning prowess, it is not clear how to deal with this uncertainty in a system. Fuzzy sets and Fuzzy logic gives us one way of representing this uncertainty and reasoning with them. This course is aimed at providing a strong background for the subject. This course will be useful as an elective course for senior undergraduates, and master degree students. Weekly assignments will be provided and their solutions will be given in the following week to help students to solve the problems.

ABOUT INSTRUCTOR :
Prof. Niladri Chatterjee is a professor of Department of Mathematics, IIT Delhi. He is B.Stat and M.Stat from Indian Statistical Institute Kolkata. He is an M.Tech in Computer Science and PhD in Computer science from University College London. His major research interests are Artificial Intelligence, Machine Learning, Natural Language Processing, Statistical Modeling among others. He has more than 30 years of research and teaching experience. He is also member of several Government committees related to AI and Machine Learning.

COURSE PLAN :

Week 1: Introduction to Fuzzy sets , Crisp vs Fuzzy Types of Fuzzy sets, Membership functions , Alpha cuts Contd alpha cuts

Week 2: Operation on fuzzy sets, t-norm, complements t-conorm, combination of operartions continued

Week 3: Introduction to Fuzzy arithmetic Interval arithmetic

Week 4: +,-,,* using alpha cuts MIN and MAX fuzzy numbers

Week 5: Fuzzy arithmetic using Alpha cuts continued Decomposition principle

Week 6: Extension principle Fuzzy arithmetic using Extension Principle Fuzzy Equations

Week 7: Relations, Introduction to fuzzy relations Projections, Equivalence relation, transitive closure, compatibility relation

Week 8: Introduction to propositional Logic, Boolean Algebra Multi valued logic

Week 9: Fuzzy Logic, Linguistic hedges, Fuzzy propositions (conditional and unconditional)

Week 10: Inference from conditional and qualified fuzzy propositions

Week 11: Fuzzy Quantifiers, Inference from quantified fuzzy propositions

Week 12: Introduction to possibility theory Possibility vs probability Belief and Plausibility, Dempsters rule