

Content

Course Code	Course Name	Semester	Theory	Practice	Lab	Credit	ECTS
IND 514	Applications of Fuzzy Sets in Decision Analysis	2	3	0	0	3	6

Prerequisites	
Admission Requirements	

Language of Instruction	English
Course Type	Elective
Course Level	Masters Degree
Objective	Fuzzy sets provide a mathematical framework for the handling of uncertain and vague information and concepts. Fuzzy sets and fuzzy control theory have found many practical applications in a range of fields, such as image processing, expert systems, data mining, signal processing, and bioinformatics. This course provides the foundations of fuzzy set theory and fuzzy reasoning, as well as practical hands on experience of fuzzy techniques in various applications through computer exercises and project work. The main objective is to discuss the fundamental concepts of fuzzy logic, such as fuzzy set theory, fuzzy algebra, approximate reasoning, fuzzy measures and possibility theory. Further objectives are to mediate practical experience in the analysis, design and implementation of these concepts in form of a fuzzy system, by means of sample computational exercises.
Content	Fuzzy Set Theory, Fuzzy sets and classic fuzzy operators, Fuzzy Algebra, Fuzzy if-then rules and fuzzy reasoning, Extension principle, Fuzzy relations, Fuzzy inference systems, Fuzzy Logic, Fuzzy Control.,Fuzzy Expert Systems, Possibility Theory.
References	Fuzzy Logic with Engineering Applications, Timothy J. Ross, McGraw-Hill Introduction to fuzzy systems, Guanrong Chen & Trung Tat Pham, Chapman & Hall/CRC

Theory Topics

Week	Weekly Contents
1	What is a fuzzy set? The basics of fuzzy sets, Crisp Set Theory, Basic Concepts and terminology
2	Classic fuzzy operators, Computing with Words, Fuzzy vs. probability, Extended fuzzy union, intersection, and complement
3	Fuzzy numbers and fuzzy arithmetics
4	QUIZ 1, Information and uncertainty, Properties of Membership Functions
5	Extension Principle
6	Fuzzy implications, Binary fuzzy relations
7	MIDTERM
8	Classical Relations and Fuzzy Relations, Value Assignments, Cosine Amplitude, Max-Min Method, Other Similarity Methods
9	Defuzzification Part 1
10	Defuzzification Part 2, Alpha-Cuts for Fuzzy Relations
11	Fuzzy numbers and Interval Analysis
12	Fuzzy logic and approximate reasoning, Fuzzy if-then rules, Fuzzy reasoning
13	Fuzzy Control
14	Fuzzy inference systems, Mamdani's fuzzy models, Sugeno's fuzzy models