Nirma University
School of Technology, Institute of Technology
B. Tech (Instrumentation and Control Engineering)

Semester VII

L	T	P	C
2	0	2	3

Course Code	**2ICDE65**
Course Title	**Fuzzy Control Theory**

Course Outcomes (CO):

At the end of the course, students will be able to -

1. interpret basics of fuzzy set theory
2. develop fuzzy inference system
3. design fuzzy based control system
4. apply fuzzy logic controller for various applications

Syllabus — **Teaching Hours**

UNIT 1: Introduction — **04**

Fuzzy control from an industrial perspective, benefits of fuzzy control, limits of fuzzy control, use of fuzzy control, applications, Knowledge based system for process control: process monitoring, fault diagnosis, planning & scheduling, supervisory control

UNIT 2: Theory of Fuzzy logic — **10**

Introduction: fuzzy sets: fuzzy set theory vs. probability theory, classical set theory. fuzzy set theory, properties of fuzzy sets, operations of fuzzy sets, Fuzzy relations: classical relations, fuzzy relations, operations on fuzzy relations, the extension principle, approximate reasoning: introduction, linguistic variables, fuzzy propositions, fuzzy if then statements, inference rules, the compositional rule of inference, Representing a set of rules: properties of rules, completeness of a set of rules, consistency of a set of rules, continuity of a set of rules, interaction of a set of rules.

UNIT 3: Fuzzy Knowledge Based Controller design (FKBC) — **10**

Structure of FKBC: fuzzification, knowledge base, inference engine, defuzzification, Rule base: choice of variables and content of rules, choice of term set, derivation of rules, Data base: choice of membership functions, choice of scaling function, inference engine, choice of fuzzification procedure, choice of defuzzification procedure.

UNIT 4: Applications of Fuzzy Control **06**

Controller tuning using fuzzy logic, fuzzy logic based controller design for inverted pendulum and robots, design of fuzzy decision making systems

Self Study:

The self study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

Laboratory Work:

Laboratory Work will consist of minimum 10 experiments based on the above syllabus.

References:

1. Jang, T. Sun and E. Mizutani, Neuro-Fuzzy and Soft computing, A computational Approach to learning and machine intelligence, Prentice Hall Publication.
2. Kevin Passino, Fuzzy control, Addison Wesley Publication.
3. D.Driankov, H. Hellendoorn and M. Reinfrank, An Introduction to Fuzzy Control, Springer Publication.

L= Lecture, T= Tutorial, P= Practical, C = Credit