

I	Course Code	MA 224001
II	Course Title	Fuzzy Set, Fuzzy Logic and Fuzzy Control - An Introduction
III	Credit Structure	L T P C 3 0 0 3
IV	Prerequisite (If any)	NIL
V	Course Content	<p>Classical Set Theory: Fundamental Concepts, Relations, Operation on Relations, Interval Arithmetic: Fundamental Concepts, Arithmetic operations on intervals, Algebraic Properties of Interval Arithmetic, Width of an Interval, Interval Matrix Operations, Fuzzy Set Theory: Introduction, Fuzzy set, strong cut and weak cut, Convex fuzzy set, Normal fuzzy set, Height and core of a fuzzy set, Resolution Principle, Extension Principle, fuzzy number, Arithmetic operations on fuzzy numbers, Linguistic variables, Fuzzification and Defuzzification, Fuzzy Relations. Fuzzy Logic Theory: Classical logic, Boolean Algebra, Multi-Valued Logic, Fuzzy logic, Fuzzy Logic Rule Base.</p> <p>Fuzzy and expert control (standard, Takagi Sugeno, mathematical characterizations, design examples), Parametric optimization of fuzzy logic controller using genetic algorithm; System identification using fuzzy neural networks; Stability analysis: Lyapunov stability theory and Passivity Theory; Adaptive control using fuzzy neural networks, Applications to flight control, robot manipulator dynamic control, under actuated systems such as inverted pendulum and inertia wheel pendulum control.</p>
VI	Text/References	<ul style="list-style-type: none"> • Ross, T. J., "Fuzzy Logic with Engineering Applications", Wiley India Pvt. Ltd., 3rd Ed. • Zimmerman, H. J., "Fuzzy Set theory and its application", Springer, India Pvt. Ltd., 4th Ed. • Klir, G. and Yuan, B., "Fuzzy Set and Fuzzy Logic: Theory and Applications", Prentice Hall of India Pvt. Ltd. • Klir, G. and Folger, T., "Fuzzy Sets, Uncertainty and Information", Prentice Hall of India Pvt. Ltd. • Guanrong Chen and Trung Tat Pham, "Introduction to fuzzy sets, fuzzy logic and fuzzy control systems" CRC Press, Boca Raton London New York Washington, D.C.