GUJARAT TECHNOLOGICAL UNIVERSITY

INSTRUMENTATION & CONTROL ENGINEERING (17)
SOFT COMPUTING IN CONTROL - Department Elective-III
SUBJECT CODE: 2181710
B.E. 8th SEMESTER

Type of course: Core Engineering

Prerequisite: Basic of process control loop, Control system design,

Rationale: To meet the requirement of control complexity and speed, the soft computing base control demands for modern control theories. In this subject, theory of soft computing is to be explored so that it can be applied to improve the performance of the control systems. It can be used for non-linear control applications also. This subject may be useful for those who aspire for the post graduation.

Teaching and Examination Scheme:

TeachingScheme			Credits	Examination Marks						Total Marks
L	T	P	C	TheoryMarks			PracticalMarks			
				ESE (E)	PA(M)		ESE (V)		PA (I)	
					PA	ALA	ESE	OEP		
4	0	2	6	70	20	10	20	10	20	150

Content:

S. N.	Content	Total Hrs	% Weightage
1.	Introduction of fuzzy logic, Fuzzy sets, Membership functions, Fuzzification, Membership value assignment	06	12
2.	Defuzzufication, Fuzzy Rule base, Fuzzy Inference system, Fuzzy Decision making	08	16
3.	Fuzzy Control, Convention control systems, Fuzzy logic control vs. PID control, Stability.	08	16
4.	Application of fuzzy logic: Power plants, Industrial Control, AC Induction motor control, Traffic control, water treatment system, Chilling systems, Washing machine Control, Fuzzy logic in DCS &PLC, Industrial Index motion control, Automatic generation control, power control, Automotive applications, Drying process control.	18	40
5.	Neuro-Fuzzy systems, Basic of neural network, Supervise neural learning, Neuro-fuzzy modeling example.	08	16

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
7	**21**	**28**	**14**	**7**	**-**

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Reference Books:

1. Introduction of fuzzy logic using matlab, S.N. Sivananddam, S. N. Deepa, Dr. S. Sumathi, Springer Publication, 2007
2. Introduction to applied Fuzzy electronics by Ahmad M. Ibrahim, Prentice-Hall of india.
3. Fuzzy logic for embedded systems application by Ahmad M. Ibrahim, Elsevier science, USA, 2004
4. Computational Intelligence Paradigms by S. Sumathi, Surekha P. CRC press, Taylor and Francis Publication, 2011.
5. Fuzzy Logic Intelligence, Control and Information by John Yen, Reza Langar, Pearson Education, 2003
6. Neural networks, fuzzy logic, and genetic Algorithms by S. Rajasekaran, G.A. Vijayalakshmi Pai , PHI Learning Publication, 2014
7. Neuro-Fuzzy and Soft computing, A computational Approach to learning and machine intelligence by J. Jang, T. Sun and E. Mizutani, Prentice Hall Publication, 2011.
8. Introduction to fuzzy sets, fuzzy logic & Fuzzy control systems by G. Chen and T. Pham, CRC Press, 2001.

Course Outcome:

After learning this course, the students should be able to:

CO1. understand concept of fuzzy logic.
CO2. do programming of fuzzy logic.
CO3. Design and utilization of fuzzy logic controller for various industrial applications.

List of Experiments:

1. Study of fuzzy logic tool in any technical programming language.
2. Study of membership functions.
3. Study of defuzzification methods.
4. Study of Fuzzy PID control.
5. Study and design fuzzy logic control for level control.
6. Study of fuzzy base washing machine control.
7. Study of temperature control in shower.
8. Study of temperature control in reactor.
9. Study of motor control using LabVIEW base fuzzy logic.
10. Study of fuzzy control in PLC.

Design based Problems (DP)/Open Ended Problem:

Fuzzy logic related applications.

Major Equipment:

Computers, Fuzzy logic software, PLC, Technical software as Matlab, LabVIEW, Scilab etc.

List of Open Source Software/learning website:

http://nptel.ac.in/video.php

ACTIVE LEARNING ASSIGNMENTS: Preparation of power-point slides, which include videos, animations, pictures, graphics for better understanding theory and practical work – The faculty will allocate chapters/ parts of chapters to groups of students so that the entire syllabus to be covered. The power-point slides should be put up on the web-site of the College/ Institute, along with the names of the students of the group, the name of the faculty, Department and College on the first slide. The best three works should submit to GTU.