GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering
Subject Code: 3171715
Semester – VII
Subject Name: SOFT COMPUTING CONTROL

Type of course: Professional Elective Course -1

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:

Teaching Scheme			Credits	Examination Marks				Total Marks
				Theory Marks		Practical Marks		
L	T	P	C	ESE (E)	PA (M)	ESE (V)	PA (I)	
3	0	2	4	70	30	30	20	150

Content:

Sr. No.	Content	Total Hrs
1	Introduction of fuzzy logic, Fuzzy sets, Membership functions, Fuzzification, Membership value assignment	06
2	Defuzzufication, Fuzzy Rule base, Fuzzy Inference system, Fuzzy Decision making	06
3	Fuzzy Control, Convention control systems, Fuzzy logic control vs. PID control, Stability.	06
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 processcontrol.	10
5	Neuro-Fuzzy systems, Basic of neural network, Supervise neural learning, Neuro-fuzzy modeling example.	08

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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 ofindia.
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. VijayalakshmiPai , 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.

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Course Outcome:

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

CO1 Understand concept of fuzzy logic.

CO2 Design Fuzzy logic control and its stability analysis.

CO3 Learn programming of fuzzy logic.

CO4 Design and utilization of fuzzy logic controller for various industrial applications.

CO5 Understanding of neural network and neuro fuzzy system.

List of Experiments:

1. Study of fuzzy logic tool in any technical programminglanguage.
2. Study of membershipfunctions.
3. Study of defuzzificationmethods.
4. Study of Fuzzy PIDcontrol.
5. Study and design fuzzy logic control for levelcontrol.
6. Study of fuzzy base washing machinecontrol.
7. Study of temperature control inshower.
8. Study of temperature control inreactor.
9. Study of motor control using LabVIEW base fuzzylogic.
10. Study of fuzzy control inPLC.

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:
https://nptel.ac.in/courses/106/105/106105173/
https://nptel.ac.in/courses/127/105/127105006/
https://onlinecourses.nptel.ac.in/noc20_cs17/preview