

ELI- 801: Artificial Intelligence Control Techniques

48 Periods

UNIT I

The concept and importance of Artificial Intelligence, human intelligence vs machine intelligence. General concept of knowledge, Acquisition, Knowledge representation and organization, Expert systems: architecture, functions of various parts, Mechanism and role of inference engine, Types of Expert system, Role of Expert systems in instrumentation and process control
08 Periods

UNIT II

Neural Networks: Biological Neuro-system, Mathematical Models of Neurons, ANN architecture, Learning rules, Learning Paradigms-Supervised, Unsupervised and reinforcement Learning, ANN training Algorithms-perceptrons, training rules, Delta, Back Propagation Algorithm, Multilayer Perceptron Model, Hopfield Networks, Associative Memories, Applications in identification, optimization, pattern recognition etc. 16 Periods

UNIT III

Fuzzy Logic: Introduction to Fuzzy Logic, Classical and Fuzzy Sets, Membership Function, Fuzzy rule generation. Operations on Fuzzy Sets: Compliment, Intersections, Unions, Combinations of Operations, Aggregation. Fuzzy Arithmetic: Fuzzy Numbers, Linguistic Variables, Arithmetic Operations on Intervals & Numbers. Applications of Fuzzy Logic in process Control and motion control 16 Periods

UNIT IV

Genetic Algorithm: An Overview: Introduction and concept as a process modeling tool, Implementation of Genetic algorithm. **Hybrid Systems:** Introduction to Neuro-fuzzy systems, Fuzzy-Expert system, Fuzzy-GA systems 08 Periods

UNIT 1

Chapter 2, 3,7 – Padhy N.P., Artificial Intelligence and Intelligent Systems, Oxford University Press, 1st Edition

UNIT 2

Chapter 2,3,4,7,10,11,13,14,18 – Hagan M.T , Demuth H.B, Beale M.H, Neural Network Design, PWS Publishing Company, Thomson Learning, 1st Edition

Chapter 2,3,4,5 – Rajasekaran S., Vijayalakshmi Pai G. A., Neural Networks, PHI Learning Pvt. Ltd., 2003, 1st Edition

UNIT 3

Chapter 1,2,3,4,5,11,12,13 - Ross Timothy J., Fuzzy logic with Engineering Applications, McGraw Hill, New York, 3rd Edition

Chapter 6,7 - Rajasekaran S., Vijayalakshmi Pai G. A., Neural Networks, PHI Learning Pvt. Ltd., 2003, 1st Edition

UNIT4

Chapter 8,9,10 - Rajasekaran S., Vijayalakshmi Pai G. A., Neural Networks, PHI Learning Pvt. Ltd., 1st Edition

Essential Books:

1. Ross Timothy. J, Fuzzy logic with Engineering Applications, McGraw Hill, New York, 3rd Edition
2. Hagan M.T , Demuth H.B, Beale M.H, Neural Network Design, PWS Publishing Company, Thomson Learning, 1st Edition
3. Padhy N.P., Artificial Intelligence and Intelligent Systems, Oxford University Press, 1st Edition
3. Rajasekaran S., Vijayalakshmi Pai G. A., Neural Networks, PHI Learning Pvt. Ltd., 2003 1st Edition

Suggested Books:

1. Klir George J , Yuan B, Fuzzy Sets and Fuzzy Logic Theory and Applications, Prentice Hall PTR, 1st Edition
2. Laurene Fausett, Fundamentals of Neural Networks , Prentice Hall, New Jersey, 1st Edition
3. Driankov D., Helledorn H., Reinframe M., An Introduction to fuzzy control, Narosa publishing Co., New Delhi
4. Kosko.B, Neural Network and fuzzy systems, Prentice Hall of India Pvt. Ltd., New Delhi, 1992

Practicals

Implement programs using Mat lab Fuzzy logic and Neural Network toolbox exemplifying

1. Implementation of perceptron learning model
2. Pattern recognition using Hopfield network
3. Identification using associative memories
4. Implement fuzzy logic operations on fuzzy sets
5. Implement conversion of given crisp temperature into its equivalent fuzzy variable
6. Implement conversion of error into its equivalent fuzzy variable
7. Design model of fuzzy logic PID controller
8. Design fuzzy logic based temperature control system
9. Design fuzzy logic based washing machine/aircraft landing system