DISCIPLINE SPECIFIC ELECTIVE COURSE : Artificial Intelligence (INDSE6A)

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Course title & Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course (if any)
		Lecture	Tutorial	Practical / Practice		
Artificial Intelligence (INDSE6A)	04	03	-	01	Class XII passed with Physics + Mathematics /Applied Mathematics + Chemistry / Computer Science/Informatics Practices	Class XII Mathematics, Any programming language

Learning Objectives

The Learning Objectives of this course are as follows:
- To realize the significance of Artificial Intelligence and expert systems in today"s era
- To study neural networks and become able to design neural network based algorithms
- To study fuzzy logic and use it as an alternative tool for modeling.
- To study genetic algorithms and learn about optimizing solutions using genetic algorithms
- Become able to apply the knowledge of artificial control tools to any control application
- To be able to work with imprecise and uncertain solution data for solving problems.

Learning outcomes

The Learning Outcomes of this course are as follows:
- Realize the significance of Artificial Intelligence and expert systems

- Learn the neural network algorithms, modeling using fuzzy logic and optimizing
- solutions using genetic algorithms
- Apply the knowledge of artificial control tools to any control application
- Work with imprecise and uncertain solution data for solving problems

SYLLABUS OF DSE

UNIT – 1   (12 hours)

The concept and importance of Artificial Intelligence, human intelligence vs machine intelligence, General concept of knowledge, Acquisition, Knowledge representation and organization, Expert systems: advantages, disadvantages, Expert system architecture, functions of various parts, mechanism and role of inference engine, Role of expert systems in instrumentation and control.

UNIT – 2   (11 hours)

Neural Networks: Biological Neural-system, Mathematical Models of Neurons, ANN architecture, Artificial neuron models, Types of activation functions, Learning rules, Learning Paradigms-Supervised, Unsupervised and Reinforcement Learning, ANN training algorithms perceptron, training rules, Delta, Back Propagation Algorithm, parameters in BPN, Hopfield Networks, Recurrent networks, Associative Memories, Applications in identification, optimization, pattern recognition etc.

UNIT – 3   (11 hours)

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, Approximate reasoning, Aggregation, Fuzzy logic modeling and control, fuzzification, inferencing and defuzzification, Linguistic Variables, Arithmetic Operations on Intervals & Numbers. Applications of Fuzzy Logic in process Control and motion control.

UNIT – 4   (11 hours)

Genetic Algorithm: An Overview: Introduction and concept as a process modeling tool, creation of off-springs, encoding, fitness function, reproduction, cross over, insertion, deletion and mutation scaling, Fitness, Implementation of Genetic algorithm, applications.
Hybrid Systems: Introduction to Neuro-fuzzy systems, Fuzzy-Expert system, Fuzzy-GA systems.

Practical component: (30 hours)

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

Essential/recommended readings
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. N.P.Padhy, Artificial Intelligence and Intelligent Systems, Oxford University Press, 1st Edition.
4. Rajasekaran S., VijayalakshmiPai G. A., Neural Networks, PHI Learning Pvt. Ltd., 2003, 1st Edition.

Suggestive readings
1. Klir George J , Yuan B, Fuzzy Sets and Fuzzy Logic Theory and Applications, Prentice Hall PTR, 1st Edition.
2. J. Nilsson, "Artificial Intelligence: A new Synthesis", Elsevier Publishers.

Note: Examination scheme and mode shall be as prescribed by the Examination Branch, University of Delhi, from time to time.