BIRLA INSTITUTE OF TECHNOLOGY AND SCIENCE, Pilani
Pilani Campus

Course Handout (Part II)

Date: 11/06/2018

In addition to part-I (General Handout for all courses appended to the time table) this portion gives further specific details regarding the course.

Course No. : **BITS F312**

Course Title : **Neural Networks and Fuzzy Logic**

Instructor-in charge : **Surekha Bhanot**

Team of Instructors : **Ashish patel**

1. **Course Description**: This course aims to introduce basic concepts, mathematics, application of AI techniques mainly neural networks, fuzzy logic, expert systems, evolutionary algorithms in modeling, control, classification, clustering, prediction problems.

2. Scope and Objectives

- Understand concept, techniques, applications, future of the field of "Artificial Intelligence"
- Understand the concepts, mathematics, techniques to implement fuzzy logic in various engineering applications
- Understand basic concepts, mathematic, different learning algorithms in ANNs
- Understand hardware and software of Expert Systems
- Understand Evolutionary algorithms for optimization like GA, PSO etc.

3. Prescribed Text/ Reference Books

1. Neural Networks and Learning Machines Third Edition Simon Haykin
2. Artificial neural networks, B Yegnanarayana, Prentice Hall
3. Introduction to Soft Computing, Samir Roy, Udit Chakraborty, Pearson
4. Process control: principles and applications, Surekha Bhanot, Oxford University Press
5. Fuzzy Logic with engineering application, Timothy J Ross
6. Intelligent Systems and Control Laxmidhar behera , Indrani Kar
7. Nature-inspired metaheuristic algorithms, Xin-She Yang, Luniver Press
8. Neural Network Design, Martin D Hagen et al - http://hagan.okstate.edu/NNDesign.pdf
9. A first course in Fuzzy and Neural Control, By Hung T Nguyen, N R Prasad, C L Walker, E A Walker Chapman & Hall/CRC Press Company
10. Fundamentals of Neural networks, architecture, algorithms and applications, Laurene Fausett, Pearson Education
11. Artificial Intelligence, a modern approach. Stuart J Russell, Peter Norvia, Pearson

5. Course Plan

Module Number	Lecture session/Tutorial Session.	Reference	Learning Outcome
1. Introduction to AI, intelligent systems, soft computing	L1.1. Machine learning, Intelligent Systems, soft computing, achievements, future directions		Get an overview of field of artificial intelligence and the techniques for implementing AI, future implications
2. Fuzzy Logic, .	L3.1 Fuzzy Set theory, fuzzy set operations, fuzzy relations,	R1: Ch2, 3 &4 R3: part of Ch1, 2, 3, 4,11,13 + Class notes	Understanding of mathematics behind Fuzzy Logic, sets, operations, relations. Classification using C means, Fuzzy C means Design of fuzzy logic control system and its implementation in Matlab
	L3.2 Fuzzy applications in classification, pattern recognition,	R6: Ch3 & 4 + Class Notes	
	L3.3 Fuzzy applications in control, Matlab implementation `	R2: Ch18 + Class notes	

3 Artificial neural networks, learning algorithms, ANN for modeling, control, function approximation, prediction	L4.1 model of artificial neuron, Architecture ,Learning methods: Supervised, Unsupervised, Reinforcement,	R1: Ch6 & 10 R2: Ch17 + Class notes	Get an understanding of different learning algorithms in ANNs, applications of ANNs for modeling, control, classification, prediction etc, Matlab implementation
	L4.2 Perceptron, Back propagation, Hebbian, Hopfield, dynamic, competitive, RBF networks, Convolution networks, Deep learning	R1: Ch6 & 10 R2: Ch17 R5: part of Ch2, 3, 4, 7, 11, 14, 15, 16, 17, 21, 23-27 + Class notes	
	L4.3 ANN applications in function approximation, modeling, pattern recognition, prediction, modeling & control, Matlab implementation	R6: Ch5 &6 R7: Ch1,2,3,45,6 +Class Notes	

6. Evaluation Scheme:

Evaluation Component	Weightage (Marks)	Date & Time	Remarks
Mid-Sem.	90 M	13/10 2:00 - 3:30 PM	Closed Book
Comprehensive	120M	12/12 FN	Closed Book + Open Book
Research Paper	30		
Project Assignment	60		
Total	300 M		

After completing this course the students will be able to

1) Understand the techniques used, application, impact of this new emerging area called "AI", "soft computing"
2) Design of Expert Systems
3) Implement different learning algorithms used in Artificial neural networks to apply in applications such as modeling, control, prediction etc.
4) Understand mathematics behind fuzzy sets, implement fuzzy logic systems for decision making, control, classification etc.
5) Design Hybrid AI techniques and evolutionary optimization techniques.

Closed Book Test: No reference material of any kind will be permitted inside the exam hall.

Open Book Exam: Use of any printed / written reference material (books and notebooks) will be permitted inside the exam hall. Loose sheets of paper will not be permitted. Computers of any kind will not be allowed inside the exam hall. Use of calculators will be allowed in all exams. No exchange of any material will be allowed.

Note:

It shall be the responsibility of the individual student to be regular in maintaining the self study schedule as given in the course handout, attend lectures and assignment submission as per the schedule announced in Nalanda. Mid Semester Test and Comprehensive Examination are according to the Evaluation Scheme given in the respective Course Handout. If the student is unable to appear for the Regular Test/Examination due to genuine exigencies, the student must refer to the procedure for applying for Make-up Test/Examination. No make up for the tutorials.

(Surekha Bhanot)
Instructor In charge
BITS F312