First Semester 2016-2017
Instruction Division
Course Handout (Part-II)

Date: 02/08/2017

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. **:CE F417**
Course Title **: Applications of Artificial Intelligence in Civil Engineering**
Instructor-in-Charge **: Rajiv Gupta**

Course Description: Genetic algorithm and its applications in problem solving and optimization; neural network and its application in functional mapping, flood forecasting, remote sensing; fuzzy logic and its application in decision making, clustering and linear programming

Scope and Objectives of the Course: Artificial Intelligence (AI) may be considered a field of computer science that attempts to build technology to inculcate human cognition in computer systems, but applications are not limited to. A primary goal of AI is to build intelligent entities. This course is structured to give an overview of the area, as well as some important soft computing techniques which are essential to solve the complex problems in terms of the fundamentals. The attributes of human intelligence such as reasoning, planning, learning etc. will be attempted to be understood to incorporate in problem solving.
By the end of the course, the students should have a general knowledge of the field of AI. They should be able to recognize when and how to use AI techniques to solve civil engineering problems. The students should also be able to evaluate new techniques they encounter. Out of various techniques, emphasis will be on Genetic algorithm, Artificial Neural Network, and Fuzzy Systems.
Students will take up a group project/ term paper to study in detail the theoretical details of an intelligent system and implement that during the semester.

Text Books:

T1: Artificial Intelligence A Modern Approach; Stuart J.Russell, Peter Norvig, Third Edition Pearson Education, Inc., India
T2: Neural Networks, Fuzzy logic, and Genetic Algorithms Synthesis and Applications; S. Rajasekaran, G.A. Vijayalakshmi Pai, PHI Learning Pvt. Ltd, Delhi

Course Plan:
(Schedule of each lecture may change depending on the time required for each topic)

Lecture No.	Modules	Topics to be covered	Reference	Learning Outcome
1	Overview of AI	Application of AI	T1	Applications of AI in real world and future scope for civil engineers
2		Introduction to AI		
3-4		Projects and Implementation		
5	Knowledge, Reasoning, and	Logical Agents	T1	Basic functions of AI
6		First order Logic		

7	Planning	Classical Planning	T1	
8-9		Knowledge Representation		
10	Uncertain Knowledge and reasoning	Quantifying Uncertainty	T1	Decision Making
11		Probabilistic Reasoning		
12		Making Simple decision		
13-14		Making Complex Decision		
15	Learning	Forms of Learning	T1	Basic Models of AI
16		Supervised Learning		
17		Learning Decision Trees		
18-19		Regression and Classification with Linear Models		
20-21	Artificial Neural Networks	Fundamentals of ANN	T2	ANN and its applications in different conditions
22		Back propagation ANN		
23-27		Variation and Applications		
28		Research Directions		
29-30	Fuzzy Systems	Fuzzy Set theory	T2	FS and its applications in different conditions
31-34		Fuzzy Systems		
35		Applications		
36-37	Genetic Algorithms	Fundamentals of GA	T2	GA and its applications in different conditions
38		GA Modeling		
39		Applications		
40	Hybrid Systems	GA based Back Propagation Network	T2	Tackling more complex system
41		Fuzzy Back Propagation Networks		
42	Future Direction and Applications	Application, Implementation of Civil Engineering projects	Class notes	Future use
43		Presentation		

Note: Additional lecture notes (LN) would be given in class for few topics

Evaluation Scheme[$]

EC No.	Evaluation Component	Duration (min)	Marks	Date & Time	Remarks
1	Mid-semester test	90	100	12/10 2:00 - 3:30 PM	CB
2	*Project	Cont.	60		
3	Comp. Exam.	180	140	9/12 FN	OB

* ***Final Project Marks will be awarded only if the student completes project as per the course requirement.***

$ Missing any component completely will lead to NC

Make-up Policy: Take prior permission.

Notices: Nalanda/ Civil Engineering Notice Board.

Chamber Consultation Hour: To be announced in the class

Instructor-In-Charge