

FIRST SEMESTER 2020-2021

Course Handout Part II

Date: 17/08/2020

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 : JAGADEESH ANMALA

Scope and Objective of the course

The primary objective of the course is to explain the potentiality and applicability of Artificial Intelligence and relevant methodologies to various facets of Civil engineering. The recent developments in the field of neural networks (ANNs), fuzzy logic in decision making, expert systems, genetic algorithms (GAs), clustering, optimization, support vector machine (SVM) and linear programming etc. can be explained with case study examples which may increase the practical perspective.

Text Books

T1. S.N.Sivanandam, S.N.Deepa (2019), Principles of Soft Computing, 3rd Edition, Wiley India Pvt. Ltd, New Delhi

Reference Books and other sources of reference

- R1: Taha, H.A (2007), Operations Research, An introduction, Prentice-Hall of India Private Limited, New Delhi.
- R2: Deb, K. (2003), Multiobjective optimization using Evolutionary Algorithms, John Wiley and Sons limited.
- R3: Relevant ASCE Journal papers
- R4. Patterson, D.W (1990), Introduction to Artificial Intelligence & Expert Systems, PHI.

Course Plan

Lect. No.	Learning Objective	Topics to be covered	Reference	
1-3	Role of Artificial Intelligence in Civil Engineering; Brief overview of optimization techniques	Definitions of Artificial Intelligence, various perspectives, overview of civil engineering applications; An over view of traditional and nontraditional optimization techniques	CH-1(T1) CH-1 (R4) Class notes	
4-7	Linear Programming	bgramming Basics of Linear Programming, Numerical examples; Various applications in Civil Engineering		
8-18	Neural Networks and its application in functional mapping; flood forecasting	Introduction; Basics of Neural Networks; Learning Algorithms; Feed forward with back propagation, Radial basis functions; Self organizing feature maps; Numerical examples; Various applications of Neural Networks in Civil Engineering including flood forecasting;	CH-2,3 (T1) R3, Class notes	
19-25	Fuzzy logic and its application in decision making	Introduction; Classical and Fuzzy Sets; Properties of membership functions; Fuzzification and defuzzification; Development of membership functions; Fuzzy Linear Programming; Numerical examples; Various applications of Fuzzy logic in Civil Engineering	CH- 7,8, 9,10,11,13(T1) R3, Class notes	
26-31	Genetic Algorithms and its applications in problem solving and optimization	Introduction, Necessity of non-traditional optimization, Binary coding GA, real coding GA, Multiobjective GA; Various applications of Genetic Algorithms in Civil Engineering	CH-15 (T1) R2,R3, Class notes	
32-34	Multi-Criterion Decision Making and Clustering	Multiobjective Optimization, Cluster Analysis, Various Applications in Civil Engineering	Class notes, R2, R3	
35-37	Expert Systems	Basics of expert systems, demonstrative examples	CH-15 (R4) R3 Class Notes	
38-42	Introduction to machine learning: Support Vector Machine; Remote Sensing	Support Vector Machine and Applications in Civil Engineering; Applications and case studies of Remote Sensing and Geographical Information Systems.	R3 Class Notes	

Evaluation Scheme:

Evaluation	Duration	Weightage	Date & Time	Nature of
Component	(Minutes)	(%)		Component
Test 1	30	12	To be announced	Open Book
Test 2	30	12	To be announced	Open Book
Test 3	30	11	To be announced	Open Book
Assignments		20	To be announced	Open Book
Term Paper		10	To be announced	Open Book
Comprehensive	120	35	To be announced	Open Book

Chamber Consultation Hour: Friday (4 PM to 5 PM).

Notices: Notices if any, concerning the course will be displayed on the CMS or Google class room.

Make up policy: Makeup will be given only to the genuine cases with prior permission.

Academic Honesty and Integrity Policy: Academic honesty and integrity are to be maintained by all the students throughout the semester and no type of academic dishonesty is acceptable.

Instructor-in-charge CE F417