

# FIRST SEMESTER 2019-2020

Course Handout Part II

01/08/2019

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 (2007), Principles of Soft Computing, 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

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| --- | --- | --- | --- |
| **Lect.**  **No.** | **Learning Objective** | **Topics to be covered** | **Chapter in the Text Book** |
| 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 | Basics of Linear Programming, Numerical examples; Various applications in Civil  Engineering | CH-2(R1), R3  Class notes |
| 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:**

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| --- | --- | --- | --- | --- | --- |
| **Component** | **Duration** | **Weightage** | **Date & Time** | **Venue** | **Nature of Component** |
| Mid-term Test | 90 Min | 25 | 30/9, 9.00 -- 10.30 AM |  | CB |
| Term Paper |  | 15 |  |  | OB |
| Assignments |  | 20 |  |  | OB |
| Comprehensive | 3 Hrs. | 40 | 04/12, FN |  | CB |

**Chamber Consultation Hour:** To be announced in the class.

**Notices:** Notices if any, concerning the course will be displayed on the CMS and Civil Engineering Group Notice Board only.

**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