Lesson Plan

School: Engineering

Department: Mechanical Engineering

Course Code: ME-529

Course Name: Artificial Intelligence in Engineering (3-0-0-3-3) Instructor: Polash Pratim Dutta, Asst. Professor, Department of Mechanical Engineering, Phone: +91 3712275856, Email: polashd@tezu.ernet.in

Abstract: This is an important course in mechanical engineering. In this course different aspects of artificial intelligence used in advanced technologies will be discussed. As AI is an emerging field in the domain of robotics and other automated systems the theoretical knowledge is much more important. This course will cover artificial neural network, Fuzzy set and Fuzzy Logic and Genetic algorithm also.

Objectives: The main objectives of this course are -

- To impart the knowledge of different Artificial intelligence-based systems.
- Utilize computer programs, toolboxes and functions in manufacturing system to develop solutions to practical engineering problems.
- Students can learn and understand the relation between real life system and its model and analysis to deal with such system.
- Understand advanced technology in the field of engineering with intelligent system.
- Since the modern artificial intelligence system has been growing both in quality and quantity, this course will give a wide field for discussion of such advances.

Prerequisites of the course: Basic programming knowledge. **Lesson Plan:**

| Sl. | Topics | Contents | L+T |
|-----|---------------------------------------|---|-----|
| 1. | Introduction to AI, Expert Systems | artificial intelligence, history of ES, basic concepts of ES, definition and components of ES, inference engines and reasoning mechanisms e.g. knowledge representation methods and development of the rule based knowledge base, dealing with uncertainty, and selected case studies of ES applications to engineering and sciences | 6+0 |
| 2. | Fuzzy sets and fuzzy logic | Basic principle, Fuzzy set theory, application, FLC. | 7+0 |
| 3. | Artificial Neural Networks (ANNs) | background and history of ANNs, definitions and basic concepts of ANNs, biological and artificial neural networks, feed-forward and feed-back networks, | 7+0 |

| 4. | Genetic Algorithms (GAs) | fundamentals and preliminary concepts of evolution and GA, preliminaries of optimization, genetic operators-selection, crossover, and mutation, binary and real-coded | 7+0 |
|----|-------------------------------------|---|-----|
| 5. | Introduction to swarm intelligence. | Ant colony and other biologically inspired intelligence. | 6+0 |
| 6. | Engineering Applications of AI | Real life application in robotics, expert system. | 6+0 |

Total number of classes = L+T=39+0=39

Evaluation Plan:

- (i) Two sessional tests = $(10 \times 2=)$ 20 Marks
- (ii) Major-I (Mid-Sem) = 30 Marks (Time: 1.5 Hour)
- (iii) Major-II (End-Sem) = 50 Marks (Time: 2 Hours)

Pedagogy: Lecture and discussion, Tutorials, Class Tests, Quiz, Home assignments etc.

Expected outcome:

Expected outcome: On completion of this course, students will be able to -

- ✓ Understand advanced techniques of AI in design and manufacturing process.
- Critical thinking and critical judgment on practical implementation of artificial intelligent tools.
- ✓ Interpretation on design and analysis of engineering problems and use the artificial module in different applications.
- ✓ Establish links between theoretical and practical applications.
- ✓ In hand practice to software packages, programming and problem solving.
- ✓ Students would be able to know the different technologies involved in advanced automated systems, robotics and expert systems
- ✓ Students will learn how to design and work with systems by imparting human cognitive intelligence.

Referred books:

Books:

- 1. Nilsson, N. J, Principle of AI, Narosa Publ. House.
- 2. Artificial Intelligence And Intelligent Systems by N.P.Padhy
- 3. Pitterson, D.N, Introduction to AI & Expert Sys.
- 4. Rusell, Stuart & Norvig, Peter, Artificial Intelligence, Prentice Hall, 1995.
- 5. Rich & Knight, Artificial Intelligence, 2nd edition, TMH, 1991.

Class scheduled:

<u>Day</u>

Class Room