Artificial Intelligence
BIT351CO

Year III **Semester: II**

Teaching Schedule Hours/Week			Examination Scheme				
			Internal Assessment		Final		Total
Theory	Tutorial	Practical	Theory	Practical*	Theory**	Practical	
3	1	2	20	50	80	-	150

Course Objectives:

- To provide basic knowledge of Artificial Intelligence
- To proved the knowledge of Machine Learning, Natural Language, Expert Systems and Neural Network
- To develop entrepreneurship skills and leadership in practical fields

Course Contents:

Unit 1: Introduction **[2 Hrs]**

1.1 Definitions
1.2 Goals of AI
1.3 Challenges of AI
1.4 AI approaches
1.5 AI techniques
1.6 Applications of AI

Unit2 2: Agents **[5 Hrs]**

2.1 Introduction to agents
2.2 Agent's performance
2.3 Example of Agents
2.4 Rationality and omniscience
2.5 Types of agent environment
2.6 Agent architecture

2.7 PEAS (vaccum cleaner agent, human agent, robotic agent, taxi driving agent, 8-queen problem etc)

2.8 Types of agent (simple reflex, goal based, model based, utility agent, learning agent)

Unit 3: Problem solving using searching **[8 Hrs]**

3.1 Uninformed Search

- 3.1.1 Problem solving agents
- 3.1.2 Problem types
- 3.1.3 Problem formulation
- 3.1.4 Example problems
- 3.1.5 Basic search algorithms (BFS, DFS, Depth limited search, uniform cost search, iterative deepening, bidirectional search)
- 3.1.6 Comparative study of all uninformed search strategies (completeness, optimality, time complexity and space complexity)

3.2 Informed Search

- 3.2.1 Best first (greedy) search
- 3.2.2 A* Search
- 3.2.3 Heuristic function
- 3.2.4 Hill Climbing and problems
- 3.2.5 Comparative Study of each type of searching
- 3.2.6 Simulated annealing
- 3.2.7 Genetic Algorithm

Unit 4: Adversial Search and Constraint satisfaction problem **[5 Hrs]**

4.1 Games

4.2 Perfect games

4.3 Game tree and formal definition

4.4 Min Max problem

4.5 Alpha beta pruning algorithm

4.6 CSP Problem and examples

4.7 Crypto arithmetic problems and solutions

Unit 5: Knowledge Representations **[8 Hrs]**

5.1 Knowledge and its types

5.2 Logic

5.3 Semantic Nets

5.4 Propositional logic vs FOPL

5.5 Resolution in FOPL

5.6 Frames

Unit 6: Learning System **[4 Hrs]**

6.1 Rote learning
6.2 Learning from example: inductive learning methods
6.3 Decision trees
6.4 Explanation based learning
6.5 Reinforcement learning

Unit 7: Reasoning **[4 Hrs]**

7.1 Monotonic Reasoning
7.2 Statistical Reasoning (Bayesian Network)
7.3 Uncertainty in reasoning
7.4 Case based reasoning

Unit 8: Expert System **[4 Hrs]**

8.1 Human Expert vs expert system
8.2 Expert System Structure
8.3 Expert system example
8.4 Characteristics of expert system
8.5 Knowledge acquisition
8.6 Knowledge base
8.7 Inference engine
8.8 Forward chaining and backward chaining
8.9 Design of expert system

Unit 9: Artificial Neural Networks **[3 hrs]**

9.1 Research history
9.2 Model of artificial neuron
9.3 Neural networks architectures
9.4 Learning methods in neural networks
9.5 Perceptron Network, Multi-layered feed forward network, Hopfield networks
9.6 Application of neural networks

Unit 10: Natural language processing **[2 Hrs]**

10.1 Introduction
10.2 Components of natural language processing
10.3 Natural language understanding
10.4 Natural language generation
10.5Steps in Natural language processing.

Laboratory work:

There shall be following labs using prolog or LISP

- solving family relation problem
- GCD
- Tower of Hanoi
- Using prolog or LISP to understand (variable, rules, input output, arithematic operations, recursion)
  Students must do case study on expert system or natural language processing.

Reference Books:

1. E. Rich & K. Knight, "*Artificial Intelligence*", McGraw-Hill, 1991
2. Haykin "Neural Networks: *A Comprehensive Fundamentals*", Macmillan, 1994
3. E. Turban, "*Decision Support and Expert Systems*" , Macmillan, 1993
4. R. Shingal, "*Formal Concepts in Artificial Intelligence*" , Chapman & Hall, 1992
5. G. Gazadar& C. Mellish, "*Natural Language Processing in Prolog: and introduction to computational linguistics*", Addison-Wesley, 1989
6. D. Crookes, "*Introduction to Programming in Prolog*", Prentice Hall, 1988.
7. P. H. Winston, "*Artificial Intelligence* ", Addison-Wesley, 1984
9. Hecht-Neilson "*Neurocomputing*", Addison-Wesley, 1990
10. G. F. Luger & W. A Stubblefield, "*Artificial Intelligence*" , Benjamin Cummings, 1993