

Principles of Artificial Intelligence					
Course code	PCC-AI-304G				
Category	Professional Core Course				
Course title	Principles of Artificial Intelligence				
Scheme and Credits	L	T	P	Credits	
	3	0	0	3	
Class work	25 Marks				
Exam	75 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

**Note:** Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

### Objectives of the course:

1. Provide a broad understanding of the basic techniques for building intelligent computer systems and an understanding of how AI is applied to problems.
2. Gain knowledge in problem formulation and building intelligent agents
3. Understand the search technique procedures applied to real world problems
4. Understand the types of logic and knowledge representation schemes
5. Acquire knowledge in planning and learning algorithms
6. Gain knowledge in AI Applications and advances in Artificial Intelligence

### Unit 1

Introduction to AI-AI techniques, Problem solving with AI, AI Models, Data acquisition and learning, aspects in AI, Problem solving- Problem solving process, Formulating problems, Problem types and characteristics , Problem space and search ; Intelligent agent, Rationality and Rational agent with performance measures Flexibility and Intelligent agents, Task environment and its properties , Types of agents, Other aspects of agents ; Constraint satisfaction problems(CSP), Crypto arithmetic puzzles, CSP as a search problem-constraints and representation, CSP-Backtracking, Role of heuristic CSP-Forward checking and constraint propagation, CSP-Intelligent backtracking

### Unit 2

Searching techniques- Uniformed search- General search Algorithm, Uniformed search Methods-Breadth first Search, Depth first search, Depth limited search , Iterative Deepening search, Bi-directional search Informed search- Generate and test, Best First search, A\* Algorithm, AO\* research, Local search Algorithms-Hill Climbing, Simulated Annealing, Local Beam Search , Genetic Algorithms ; Adversarial search Methods-Game playing- Important concepts, Game playing and knowledge structure, Game as a search problem-Minimax approach , Minimax Algorithm , Alpha beta pruning, Game theory problems

### Unit 3

Knowledge and reasoning-Approaches and issues of knowledge reasoning, Knowledge base agents-Logic Basics Logic-Propositional logic-syntax ,semantics and inferences, Propositional logic- Reasoning patterns, Predicate logic – Syntax and semantics, instance and is relationship, Unification and Resolution Knowledge representation using- rules, semantic nets, frames, Inferences ; Uncertain Knowledge and reasoning- Methods, Bayesian probability and belief network, Probabilistic reasoning, Probabilistic reasoning over time, Forward and backward reasoning, Other uncertain techniques-Data mining , Fuzzy logic, Dempster -shafer theory ; Planning- Planning problems, Simple planning agent, Planning languages, Blocks world, Goal stack planning, Mean Ends Analysis, Non-linear Planning, Conditional planning, Reactive planning

### Unit4

Learning- Machine learning , Goals and Challenges of machine learning, Learning concepts, models, Artificial neural network based learning- Back propagation, Support vector machines, Reinforcement learning, Adaptive learning, Multi-agent based

learning , Ensemble learning, Learning for decision making, Distributed learning, Speedup learning; Expert system and its types; Natural language processing-Levels of NLP, Syntactic and Semantic Analysis, Information retrieval, Information Extraction, Machine translation , NLP Applications ; Advance topics in Artificial Intelligence- Cloud Computing and intelligent agent, Business intelligence and analytics, Sentiment Analysis, Deep learning Algorithms, Planning and logic in intelligent agents.

### **Suggested Reference Books:**

1. Parag Kulkarni, Prachi Joshi, Artificial Intelligence –Building Intelligent Systems, 1<sup>st</sup> ed., PHI learning,2015
2. Deepak Kemhani, First course in Artificial Intelligence, McGraw Hill PvtLtd,2013
3. Stuart J. Russell, Peter Norvig , Artificial Intelligence –A Modern approach, 3<sup>rd</sup> Pearson Education, 2016
4. Prateek Joshi, Artificial Intelligence with Python, 1<sup>st</sup> ed. Packet Publishing,2017
5. Denis Rothman, Artificial Intelligence by Example, Packt, 2018

### **Course outcomes**

1. Formulate a problem and build intelligent agents
2. Apply appropriate searching techniques to solve a real world problem
3. Analyze the problem and infer new knowledge using suitable knowledge representation schemes
4. Develop planning and apply learning algorithms on real world problems
5. Design an expert system and implement natural language processing techniques
6. Implement advance techniques in Artificial Intelligence