PRINCIPLES OF ARTIFICIAL INTELLIGENCE			
Course Code	21AI54	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	3:0:0:0	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	03	Exam Hours	03

Course Learning Objectives

CLO 1. Gain a historical perspective of AI and its foundations
CLO 2. Become familiar with basic principles of AI toward problem solving
CLO 3. Get to know approaches of inference, perception, Uncertain Knowledge and Reasoning

Teaching-Learning Process (General Instructions)

These are sample Strategies, which teacher can use to accelerate the attainment of the various course outcomes.

1. Lecturer method (L) does not mean only traditional lecture method, but different type of teaching methods may be adopted to develop the outcomes.
2. Show Video/animation films to explain functioning of various concepts.
3. Encourage collaborative (Group Learning) Learning in the class.
4. Ask at least three HOTS (Higher order Thinking) questions in the class, which promotes critical thinking.
5. Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop thinking skills such as the ability to evaluate, generalize, and analyze information rather than simply recall it.
6. Topics will be introduced in a multiple representation.
7. Show the different ways to solve the same problem and encourage the students to come up with their own creative ways to solve them.
8. Discuss how every concept can be applied to the real world - and when that's possible, it helps improve the students' understanding.

Module-1

Introduction: What is AI? Foundations and History of AI

Intelligent Agents: Agents and environment, Concept of Rationality, The nature of environment, The structure of agents.

Text book 1: Chapter 1- 1.1, 1.2, 1.3 Chapter 2- 2.1, 2.2, 2.3, 2.4

Teaching-Learning Process	Chalk and board, Active Learning.

Module-2

Problem-solving: Problem-solving agents, Example problems, Searching for Solutions Uninformed Search Strategies: Breadth First search, Depth First Search, Iterative deepening depth first search;

Text book 1: Chapter 3- 3.1, 3.2, 3.3, 3.4

Teaching-Learning Process	Chalk and board, Active Learning, Demonstration

Module-3

Informed Search Strategies: Heuristic functions, Greedy best first search, A*search. Heuristic Functions

Logical Agents: Knowledge–based agents, The Wumpus world, Logic, Propositional logic, Reasoning patterns in Propositional Logic

Text book 1: Chapter 4 – 4.1, 4.2 Chapter 7- 7.1, 7.2, 7.3, 7.4, 7.5

Teaching-Learning Process	Chalk and board, Problem based learning, Demonstration

Module-4

First Order Logic: Representation Revisited, Syntax and Semantics of First Order logic, Using First Order logic.

Inference in First Order Logic : Propositional Versus First Order Inference, Unification, Forward Chaining, Backward Chaining, Resolution

Text book 1: Chapter 8- 8.1, 8.2, 8.3 Chapter 9- 9.1, 9.2, 9.3, 9.4, 9.5

Teaching-Learning Process	Chalk and board, Problem based learning, Demonstration

Module-5

Uncertain Knowledge and Reasoning: Quantifying Uncertainty: Acting under Uncertainty, Basic Probability Notation, Inference using Full Joint Distributions, Independence, Baye's Rule and its use. Wumpus World Revisited

Text Book 1: Chapter 13-13.1, 13.2, 13.3, 13.4, 13.5, 13.6

Teaching-Learning Process	Chalk and board, Active Learning.

Course Outcomes

At the end of the course the student will be able to:

CO 1. Apply knowledge of agent architecture, searching and reasoning techniques for different applications.
CO 2. Analyse Searching and Inferencing Techniques.
CO 3. Develop knowledge base sentences using propositional logic and first order logic
CO 4. Demonstrating agents, searching and inferencing
CO 5. Illustrate the application of probability in uncertain reasoning.

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 35% (18 Marks out of 50) in the semester-end examination (SEE), and a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together

Continuous Internal Evaluation:

Three Unit Tests each of **20 Marks (duration 01 hour**)

1. First test at the end of 5th week of the semester
2. Second test at the end of the 10th week of the semester
3. Third test at the end of the 15th week of the semester

Two assignments each of **10 Marks**

4. First assignment at the end of 4th week of the semester
5. Second assignment at the end of 9th week of the semester

Group discussion/Seminar/quiz any one of three suitably planned to attain the COs and POs for **20 Marks** (**duration 01 hours**) **OR** Suitable Programming experiments based on the syllabus contents can be given to the students to submit the same as laboratory work(for example; Implementation of concept learning, implementation of decision tree learning algorithm for suitable data set, etc…)

6. At the end of the 13th week of the semester

The sum of three tests, two assignments, and quiz/seminar/group discussion will be out of 100 marks and will be **scaled down to 50 marks**

(to have less stressed CIE, the portion of the syllabus should not be common /repeated for any of the methods of the CIE. Each method of CIE should have a different syllabus portion of the course).

CIE methods /question paper has to be designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester End Examination:

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the subject (**duration 03 hours)**

1. The question paper will have ten questions. Each question is set for 20 marks.
2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.

The students have to answer 5 full questions, selecting one full question from each module. Marks scored out of 100 shall be proportionally reduced to 50 marks

Suggested Learning Resources:

Text Books

1. Stuart J. Russell and Peter Norvig , Artificial Intelligence, 3rd Edition, Pearson,2015

Reference:

1. Elaine Rich, Kevin Knight, Artificial Intelligence, 3rd edition,Tata McGraw Hill,2013
2. George F Lugar, Artificial Intelligence Structure and strategies for complex, Pearson Education, 5th Edition, 2011

Web links and Video Lectures (e-Resources):

1. https://www.kdnuggets.com/2019/11/10-free-must-read-books-ai.html
2. https://www.udacity.com/course/knowledge-based-ai-cognitive-systems--ud409
3. https://nptel.ac.in/courses/106/105/106105077/

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

Role play for strategies – DFS & BFS, Reasoning and Uncertainty problems - reliability of sensor used to detect pedestrians using Bayes Rule , A teacher does not know exactly what a student understand etc.