AIL 333	AI ALGORITHMS LAB	CATEGORY	L	T	P	Credit	Year of Introduction
		PCC	0	0	3	2	2022

Preamble: This laboratory course enables the students to get the fundamental concepts in the area of Artificial Intelligence. This course covers the AI based Algorithms, logical reasoning agents and implementation of these reasoning systems using either backward or forward inference mechanisms. This course helps the learners to apply AI techniques to solve real world problems.

Prerequisite: A sound knowledge of the basics of programming, Discrete Mathematics.

Course Outcomes: After the completion of the course, the student will be able to:

CO#	Course Outcomes
CO1	State the basics of learning problems with hypothesis and version spaces **(Cognitive Knowledge Level: Understand).**
CO2	Demonstrate real-world problems as state space problems, optimization problems or constraint satisfaction problems. **(Cognitive Knowledge Level: Apply)**
CO3	Simulate given problem scenario and analyze its performance. **(Cognitive Knowledge Level: Apply)**
CO4	Develop programming solutions for given problem scenario. **(Cognitive Knowledge Level: Apply)**
CO5	Design and develop an expert system by using appropriate tools and techniques. **(Cognitive Knowledge Level: Apply)**

Mapping of course outcomes with program outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	✓	✓	✓					✓				✓
CO2	✓	✓	✓	✓				✓				✓
CO3	✓	✓	✓	✓	✓			✓				✓
CO4	✓	✓	✓	✓	✓	✓		✓				✓
CO5	✓	✓	✓	✓	✓			✓				✓

Abstract POs defined by National Board of Accreditation			
PO#	**Broad PO**	**PO#**	**Broad PO**
PO1	Engineering Knowledge	**PO7**	Environment and Sustainability
PO2	Problem Analysis	**PO8**	Ethics
PO3	Design/Development of solutions	**PO9**	Individual and teamwork
PO4	Conduct investigations of complex problems	**PO10**	Communication
PO5	Modern tool usage	**PO11**	Project Management and Finance
PO6	The Engineer and Society	**PO12**	Lifelong learning

Assessment Pattern

Bloom's Category	Continuous Assessment Test (Internal Exam) Marks in percentage	End Semester Examination Marks in percentage
Remember	**20**	**20**
Understand	**20**	**20**
Apply	**60**	**60**
Analyze		
Evaluate		
Create		

Mark Distribution

Total Marks	CIE Marks	ESE Marks	ESE Duration
150	75	75	3 hours

Continuous Internal Evaluation Pattern:

Attendance : **15 marks**
Continuous Evaluation in Lab : **30 marks**
Continuous Assessment Test : **15 marks**
Viva voce : **15 marks**

Internal Examination Pattern:

The internal examination shall be conducted for 100 marks, which will be converted to out of 15, while calculating internal evaluation marks. The marks will be distributed as, Algorithm - 30 marks, Program - 20 marks, Output - 20 marks and Viva - 30 marks.

End Semester Examination Pattern:

The end semester examination will be conducted for a total of 75 marks and shall be distributed as, Algorithm - 30 marks, Program - 20 marks, Output - 20 marks and Viva- 30 marks.

Operating System to Use in Lab : Linux/Windows

Programming Language to Use in Lab : C++/Java/Python/Prolog

Fair Lab Record:

All the students attending the Artificial Intelligence Algorithms laboratory should have a fair record. Every experiment conducted in the lab should be noted in the fair record. For every experiment, in the fair record, the right-hand page should contain experiment heading, experiment number, date of experiment, aim of the experiment, procedure/algorithm followed, other such details of the experiment and final result. The left-hand page should contain a print out of the respective code with sample input and corresponding output obtained. All the experiments noted in the fair record should be verified by the faculty regularly. The fair record, properly certified by the faculty, should be produced during the time of end semester examination for the verification by the examiners.

SYLLABUS

***Mandatory**

1. Installation and working on various AI tools viz. Python, R, GATE, NLTK, MATLAB etc.*****
2. Implement basic search strategies for selected AI applications*****.
3. Implement state space search algorithms*****
4. Implement informed search algorithms*****
5. Implement backtracking algorithms for CSP*****
6. Implement local search algorithms for CSP*****
7. Implement propositional logic inferences for AI tasks*****
8. Implementation of Knowledge representation schemes*****
9. Implement travelling salesman problem*****
10. Implementation of Game playing (adversarial search)
11. Mini Project that implement a real world application using AI techniques (Group project with a maximum of four students)

PRACTICE QUESTIONS

1. Implementation of Depth-First Search (DFS).
2. Write a program to implement water jug problem.
3. Implement variants of hill-climbing and genetic algorithms.
4. Implement tic tac toe game for 0 and X.
5. Develop a program to construct a pruned game tree using Alpha-Beta pruning. Take the sequence, [5, 3, 2, 4, 1, 3, 6, 2, 8, 7, 5, 1, 3, 4] of MINIMAX values for the nodes at the cutoff depth of 4 plies. Assume that branching factor is 2, MIN makes the first move, and nodes are generated from right to left.
6. Write a program to implement production system.
7. Write a program to implement heuristic search procedure.
8. Write a program to implement Expert system.
9. Write a program to implement search problem of 3 x 3 puzzles.

References:

1. Dan W. Patterson, “Introduction to AI and ES”, Pearson Education, 2007
2. Kevin Night, Elaine Rich, and Nair B., “Artificial Intelligence”, McGraw Hill, 2008
3. Patrick H. Winston, "Artificial Intelligence", Third edition, Pearson Edition, 2006
4. Deepak Khemani, “Artificial Intelligence”, Tata McGraw Hill Education, 2013 (http://nptel.ac.in/)
5. Artificial Intelligence by Example: Develop machine intelligence from scratch using real artificial intelligence use cases -by Dennis Rothman, 2018
6. Padhy, N.P. 2009. Artificial Intelligence and Intelligent Systems, Oxford University Press
7. Brachman, R. and Levesque, H. 2004. Knowledge Representation and Reasoning, Morgan Kaufmann.