SRI KRISHNA INSTITUTE OF TECHNOLOGY

(Accredited by NAAC, Approved by A.I.C.T.E. New Delhi, Recognised by Govt. of Karnataka & Affiliated to V.T U., Belagavi)
#29, Chimney Hills, Hesaraghatta Main Road, Chikkabanavara Post, Bengaluru- 560090

Dept. of Artificial Intelligence & Machine Learning

Academic Year: 2022-2023	Semester: 5th
Course Name: Principles of Artificial Intelligence	Course Code: 18AI55
Total Contact hours: 40	Credits: 03
SEE Marks: 60; CIE: 40	Total Marks: 100
Course Plan Author: Prof. Manzoor Ahmed	Date: 06-10-2022

Course Prerequisites: Basics of mathematics, programming, statistics, Algorithms etc.

Course Objectives:

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

Course Outcomes:

1. Apply the knowledge of Artificial Intelligence to write simple algorithm for agents.
2. Apply the AI knowledge to solve problem on search algorithm.
3. Develop knowledge base sentences using propositional logic and first order logic.
4. Apply first order logic to solve knowledge engineering process.

CO Number	Course Outcome At the end of the course, student should be able to . . .	Blooms' Level
CO1	Apply the knowledge of Artificial Intelligence to write simple algorithm for agents.	L1,L2
CO2	Apply the AI knowledge to solve problem on search algorithm.	L1,L2
CO3	Develop knowledge base sentences using propositional logic and first order logic.	L1,L2
CO4	Apply first order logic to solve knowledge engineering process.	L1,L2

Program Outcomes and Program Specific Outcomes

PO, PSO	*1.Engineering Knowledge;* *2.Problem Analysis;* *3.Design / Development of Solutions;* *4.Conduct Investigations of Complex Problems;* *5.Modern Tool Usage;* *6.The Engineer and Society;* *7.Environment and Sustainability;* *8.Ethics;* *9.Individual and Teamwork;* *10.Communication;* *11.Project Management and Finance;* *12.Life-long Learning;* *PSO1.: Graduates will have the ability to adapt, contribute and innovate ideas in the field of Artificial Intelligence and Machine Learning* *PSO2: To provide a concrete foundation and enrich their abilities to qualify for Employment, Higher studies and Research in various domains of Artificial Intelligence and Machine Learning such as Data Science, Computer Vision, Natural Language Processing with Ethical Values.* *PSO3: Graduates will acquire the practical proficiency with niche technologies and open-source platforms and to become Entrepreneur in the domain Artificial Intelligence and Machine Learning*

CO – PO Mapping

Course Outcomes	Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	2	2								1	1	2	
CO2	2	2	2	2					1			1	1	2	
CO3	2	2	2	2					1			1	1	2	
CO4	2	2	2	2					1			1	1	2	

Course Content (Syllabus)

PRINCIPLES OF ARTIFICIAL INTELLIGENCE (Effective from the academic year 2018 -2019) SEMESTER – V			
Course Code	**18AI55**	**CIE Marks**	40
Number of Contact Hours/Week	3:0:0	**SEE Marks**	60
Total Number of Contact Hours	40	**Exam Hours**	03 Hrs
Module-1 **Introduction to AI:** history, Intelligent systems, foundation and sub area of AI, applications, current trend and development of AI. Problem solving: state space search and control strategies. **Chapter 1 and 2** **RBT: L1, L2**			
Module-2 **Problem reduction and Game playing:** Problem reduction, game playing, Bounded look-ahead strategy, alpha-beta pruning, Two player perfect information games **Chapter 3** **RBT: L1, L2**			
Module-3 **Logic concepts and logic Programming:** propositional calculus, Propositional logic, natural deduction system, semantic tableau system, resolution refutation, predicate logic, Logic programming. **Chapter 4** **RBT: L1, L2**			
Module-4 **Advanced problem solving paradigm: Planning:** types of planning sytem, block world problem, logic based planning, Linear planning using a goal stack, Means-ends analysis, Non linear planning strategies, learning plans **Chapter 6** **RBT: L1, L2**			
Module-5 **Knowledge Representation , Expert system** Approaches to knowledge representation, knowledge representation using semantic network, extended semantic networks for KR, Knowledge representation using Frames. Expert system: introduction phases, architecture ES verses Traditional system **Chapter 7 and 8 (8.1 to 8.4)** **RBT: L1, L2**			

Schedule of Instruction

Sl.no	Class no	Module	Topic	Reference (Book, Page no.)	Course Outcome	Delivery mode
1	2	**Module1:**	**Introduction to AI:** history, Intelligent systems, foundation and sub area of AI, Applications	T1, 1-9	CO1	PPTs
2	3		Current trend and development of AI.	T1, 9-18	CO1	Seminar
3	4		**Problem solving: state space search and control strategies:** Introduction, General Problem Solving: Production System-Water Jug Problem, Missionaries and Cannibals Problem, State-Space Search.	T1, 23-30	CO1, CO2	PPTs , Chalk & Talk
4	5		The Eight-Puzzle Problem, Control Strategies, Characteristics of Problem, **Exhaustive Searches:** BFS	T1, 30-35	CO1, CO2	PPTs , Chalk & Talk
5	6		DFS, Depth-First Iterative Deepening, Bidirectional Search, Analysis of Search methods,	T1, 35-42	CO1, CO2	PPTs , Chalk & Talk
6	7		Travelling Salesman Problem, **Heuristic Search Techniques:** General Purpose Heuristics, Branch and Bound Search, Hill Climbing, Beam Search	T1, 42-49	CO1, CO2	PPTs , Chalk & Talk
7	8		BFS, A* Algorithm, Optimal Solution by A* Algorithm,	T1, 49-55	CO1, CO2	PPTs , Chalk & Talk
8	9		Iterative-Deepening A*, Constraint Satisfaction, Crypt-Arithmetic Puzzle,	T1, 55-61	CO1,CO2	PPTs , Chalk & Talk
9	10	**Module2:**	**Problem Reduction and Game Playing:** Introduction, Problem Reduction,	T1, 65-72	CO1,CO2	PPTs , Chalk & Talk
10	11		Algorithmic Steps for AND-OR Graph, Cyclic Graphs, Interaction between Sub-Goals	T1, 72-75	CO1,CO2	PPTs , Chalk & Talk
11	12		**Game Playing:** Game Problem versus State Space Problem, Status Labelling Procedure in Game Tree,	T1, 75-78	CO1,CO2	PPTs , Chalk & Talk
12	13		Nim Game Problem. Validity of Cases for winning of MAX player-Case1 & 2	T1, 78-83	CO1,CO2	PPTs , Chalk & Talk
13	14		Validity of Cases for winning of	T1, 84-86	CO1,CO2	PPTs ,

			MAX player-Case3 & 4			Chalk & Talk
14	15		Bouned Look-Ahead Strategy and Use of Evaluation Functions, MINIMAX Procedure	T1, 87-93	CO1,CO2	PPTs , Chalk & Talk
15	16		Alpha-Beta Pruning	T1, 93-98	CO1,CO2	PPTs , Chalk & Talk
16	17		Two-Player Perfect Information Games	T1, 99-100	CO1,CO2	PPTs , Chalk & Talk
17	18	**Module 3:**	**Logic Concepts and Logic Programming:** Introduction, Propositional Calculus,	T1, 102-105	CO3	PPTs , Chalk & Talk
18	19		Propositional Logic	T1, 105-107	CO3	PPTs , Chalk & Talk
19	20		Natural Deduction System,	T1, 107-109	CO3	PPTs , Chalk & Talk
20	21		Axiomatic System,	T1, 109-111	CO3	PPTs , Chalk & Talk
21	22		Semantic Tableau System in Propositional Logic, Semantic Tableau Rules, Satisfiability and Unsatisfiability	T1, 111-117	CO3	PPTs , Chalk & Talk
22	23		Resolution Refutation in Propositional Logic, Conversion of Formula into a Set of Clauses, Conversion of a Formula to its CNF, Resolution of Clauses	T1, 117-121	CO3	PPTs , Chalk & Talk
23	24		Predicate Logic, Predicate Calculus, First Order Predicate Calculus, Interpretations of Formulae in FOL, Satisfiability and Unsatisfiability in FOL	T1, 121-124	CO3	PPTs , Chalk & Talk
24	25		Transformation of a Formula into Prenex Normal Form, Conversion of PNF to its Standard Form, Clauses in FOL,	T1, 125-128	CO3	PPTs , Chalk & Talk
25	26		Resolution Refutation Method in FOL	T1, 128-130	CO3	PPTs , Chalk & Talk
26	27		Logic Programming	T1, 131-136	CO3	PPTs , Chalk &

						Talk
27	28	**Module 4:**	**Advanced Problem-Solving Paradigm: Planning,** Introduction, Types of Planning Systems,	T1, 185-191	CO2,CO3	PPTs , Chalk & Talk
28	29		Block World Problem: Description, Logic Based Planning	T1, 191-195	CO2,CO3	PPTs , Chalk & Talk
29	30		Linear Planning Using a Goal Stack	T1, 195-206	CO2,CO3	PPTs , Chalk & Talk
30	31		Means-Ends Analysis	T1, 207-211	CO2,CO3	PPTs , Chalk & Talk
31	32		Non-linear Planning Strategies, Goal Set Method	T1, 211-217	CO2,CO3	PPTs , Chalk & Talk
32	33			T1, 211-217	CO2,CO3	PPTs , Chalk & Talk
33	34		Constraint Posting Method, Compact Representation	T1, 217-224	CO3	PPTs , Chalk & Talk
34	35		Learning Plans	T1, 225-228	CO2,CO3	PPTs , Chalk & Talk
35	36	**Module 5:**	**Knowledge Representation, Expert System:** Introduction, Approaches to Knowledge representation,	T1, 231-234	CO3,CO4	PPTs , Chalk & Talk
36	37		Knowledge representation using Semantic Network	T1, 234-238	CO3, CO4	PPTs , Chalk & Talk
37	38		Extended Semantic Networks for KR, Inference Rules,	T1, 238-244	CO3, CO4	PPTs , Chalk & Talk
38	39		Examples for Illustrating Inferencing Methods	T1, 244-254	CO3, CO4	PPTs , Chalk & Talk
39	40		Knowledge Representation using Frames	T1, 254-262	CO3, CO4	PPTs , Chalk & Talk
40	41		**Expert System and Applications:** Introduction, Phases in Building Expert Systems	T1, 264-268	CO3, CO4	PPTs , Chalk & Talk
41	42		Expert System Architecture	T1, 269-274	CO3, CO4	PPTs , Chalk & Talk

42	43		Expert Systems versus Traditional Systems	T1, 274-277	CO3, CO4	PPTs , Chalk & Talk

**L – Lecture, V- Videos or any other mode*

Textbooks	
T1	Saroj Kaushik, Artificial Intelligence, Cengage learning, 2014
Reference books	
R1	Elaine Rich, Kevin Knight, Artificial Intelligence, Tata McGraw Hill
R2	Nils J. Nilsson, Principles of Artificial Intelligence, Elsevier, 1980
R3	StaurtRussel, Peter Norvig, Artificial Intelligence: A Modern Approach, Pearson Education, 3rd Edition, 2009
R4	George F Lugar, Artificial Intelligence Structure and strategies for complex, Pearson Education, 5th Edition, 2011

Web links and Video Lectures (e-Resources):	
1	https://sites.google.com/view/manzoorahmed/home
2	
3	
4	
5	

Assessment Schedule:

Sl.No.	Assessment type	Contents	CO	Duration In Hours	Marks	Date & Time
1	**CIE Test 1**	Module1 & Module 2	CO1, CO2	1.5	30	
2	**CIE Test 2**	Module 3 & Module 4	CO3, CO4	1.5	30	
	CIE Test 3	Module 5 & Module 1	CO3, CO4, CO1	1.5	30	
3	**Assignment 1**	Module1 & Module 2	CO1, CO2		10	
4	**Assignment 2**	Module 3 & Module 4	CO3, CO4		10	
5	**Seminar *(or any planned activtiy)***	Module 1	CO1		10	
6	**Semester End Examination**	Modules 1 to 5	CO1 to CO4	3	100	

Seminar: Group of 1 or 2 students
Module 1

The Average of total marks of three tests, two assignments, and seminar will be out of 40 marks and final exam will be for 100 marks scaled down to 60 marks.

CIE + SEE = 40 + 60 = 100 marks

Faculty Incharge DAC Chairman