Course Plan

T.E. (ECS) (Semester VI)

Subject name: System security

Subject code:

Teacher-in-charge: Prajakta Bhangale **Academic**

Term: 2022-2023

Module No.	Unit No.	Contents	Hrs.
1		**Introduction to Artificial Intelligence(CO1)**	03
	1.1	Artificial Intelligence (AI), AI Perspectives: Acting and Thinking humanly, Acting and Thinking rationally	
	1.2	History of AI, Applications of AI, The present state of AI, Ethics in AI	
2		**Intelligent Agents(CO1)**	05
	2.1	Introduction of agents, Structure of Intelligent Agent, Characteristics of Intelligent Agents	
	2.2	Types of Agents, Simple Reflex, Model Based, Goal Based, Utility Based Agents.	
	2.3	Environment Types, Deterministic, Stochastic, Static, Dynamic, Observable, Semi-observable, Single Agent, Multi Agent	
3		**Solving Problems by Searching(CO2)**	12
	3.1	Definition, State space representation, Problem as a state space search, Problem formulation, Well-defined problems	
	3.2	Solving Problems by Searching, Performance evaluation of search strategies, Time Complexity, Space Complexity, Completeness, Optimality	
	3.3	Uninformed Search, Depth First Search, Breadth First Search, Depth Limited Search, Iterative Deepening Search, Uniform Cost Search, Bidirectional Search	
	3.4	Informed Search, Heuristic Function, Admissible Heuristic, Informed Search Technique, Greedy Best First Search, A* Search, Local Search, Hill Climbing Search, Simulated Annealing Search, Optimization, Genetic Algorithm	
	3.5	Game Playing, Adversarial Search Techniques, Mini-max Search, Alpha-Beta Pruning	
4		**Knowledge and Reasoning(CO3)**	10
	4.1	Definition and importance of Knowledge, Issues in Knowledge Representation, Knowledge Representation Systems, Properties of Knowledge Representation Systems	
	4.2	Propositional Logic (PL), Syntax, Semantics, Formal logic-connectives, truth tables, tautology, validity, well-formed-formula	
	4.3	Predicate Logic, FOPL, Syntax, Semantics, Quantification, Inference rules in FOPL, Introduction to logic programming (PROLOG)	
	4.4	Forward Chaining, Backward Chaining and Resolution in FOPL	
		Reasoning Under Uncertainty(CO4)	05

5	5.1	Handling Uncertain Knowledge, Random Variables, Prior and Posterior Probability, Inference using Full Joint Distribution	05
	5.2	Bayes' Rule and its use, Bayesian Belief Networks, Reasoning in Belief Networks	
6		**Planning and Learning(CO5)**	
	6.1	The planning problem, Partial order planning, total order planning.	
	6.2	Learning in AI, Learning Agent, Concepts of Supervised, Unsupervised, Semi -Supervised Learning, Reinforcement Learning, Ensemble Learning.	
	6.3	Expert Systems, Components of Expert System: Knowledge base, Inference engine, user interface, working memory, Development of Expert Systems	
		Total	39

Course Objectives:

- To gain perspective of AI and its foundations.
- To study different agent architectures and properties of the environment.
- To understand the basic principles of AI towards problem solving, inference, perception, knowledge representation, and learning.
- To investigate probabilistic reasoning under uncertain and incomplete information.
- To explore the current scope, potential, limitations, and implications of intelligent systems.

Course Outcomes:

At the end of the course student will be able to

- Identify the characteristics of the environment and differentiate between various agent architectures.
- Apply the most suitable search strategy to design problem solving agents.
- Represent a natural language description of statements in logic and apply the inference rules to design Knowledge Based agents.
- Apply a probabilistic model for reasoning under uncertainty.
- Comprehend various learning techniques and describe the various building blocks of an expert system for a given real world problem.

CO-PO-PSO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	1											
CO2	2	2	2											
CO3	1	2	2	1										
CO4	3													
CO5	2	2												1

CO-PO Mapping:(BL – Blooms Taxonomy, C – Competency, PI – Performance Indicator)

Example:

CO	BL	C	PI	PO
ECC602.1	2	1.2 1.3 1.4	1.2.1 1.3.1 1.4.1	PO1
		2.1	2.1.1 2.1.2 2.1.3 2.1.4	PO2
ECC602.2	4	1.1 1.2 1.3 1.4	1.1.1 1.2.1 1.3.1 1.4.1	PO1
		2.1	2.1.3 2.1.4	PO2
		3.2	3.2.1 3.2.2	PO3
		4.4 4.5 4.6	4.4.2 4.5.1 4.6.1	PO4
ECC602.3	3	1.2 1.3 1.4	1.2.1 1.3.1 1.4.1	PO1

		2.1 2.2	2.1.1 2.1.3 2.2.2 2.2.3 2.2.4	PO2
		3.2	3.2.1	PO3
		4.2	4.2.1	PO4
ECC602.4	3	1.1 1.2 1.3 1.4	1.1.1 1.2.1 1.3.1 1.4.1	PO1
		2.4	2.4.1	PO2
ECC602.5	2	1.2 1.3 1.4	1.2.1 1.3.1 1.4.1	PO1
		2.1 2.2	2.2.3 2.1.3	PO2

Provide justification of PO to CO mapping

CO1	PO1	Students will apply basic engineering laws and concepts to understand real world problems in AI.
	PO2	Understand difference between traditional system and intelligent system
	PO3	Apply knowledge to solve real world problem.
CO2	PO1	Students will apply basic engineering laws and concepts to understand real world problems in AI and agents architectures.
	PO2	Understand difference between traditional system and intelligent system
	PO3	students will able to explore alternate solution for given real word problem
CO3	PO1	Students will apply basic engineering laws and concepts to solve real world problems in AI.
	PO2	Various methods for knowledge representation and reasoning are identified and compared.
	PO3	students will able to explore alternate solution for given real word problem

	PO4	Students will able to produce appropriate method based on the given objectives and parameters in the AI problem.
CO4	PO1	Students will be performing reasoning by using mathematical probabilistic model and will use complex engineering mathematics concepts
CO5	PO1	Engineering Principles in expert system for a given real world problem will be understood.
	PO2	Students will compare existing working principles of Intelligent agents algorithms with expert system.

CO Assessment Tools:

Course Outcome	***Assessment Method***							
	Direct Method (80 %)							***Indirect Method (20%)***
	Unit Tests		**Assignments**		**Activity**	**University Results**		**Course exit survey**
	1	2	1	2		**Theory**	**Oral/Pract.**	
CO1	10	-	20	-	10	30	30	100
CO2	10	-	20	--	10	30	30	100
CO3	-	10	-	20	10	30	30	100
CO4	-	10	-	20	10	30	30	100
CO5	-	10	-	10	20	30	30	100

CO calculation= (0.8 *Direct method + 0.2*Indirect method)

Rubrics for assessing Course Outcome with each assessment tool:

Rubrics for LAB:

1	**Time Line (2)**	N.A	Two sessions late (0)	One session late (1)	Early or on time (2)
2	**Output (3)**	Practical not performed(0)	Practical performed but failed to show output due to some error.(1)	Output shown but not as expected (Partial output)(2)	Expected output shown(3)
3	**Code optimization (3)**	Practical not performed(0)	Code is unstructured and difficult to understand(1)	The code is structured (2)	The code is structured and optimized(3)
4	**Knowledge about the topic (2)**	N.A	Not able to answer any question(0)	Able to answer few questions (1)	Answered all the questions with relevant explanation(2)

Rubrics for Assignment:

Indicator	Very Poor	Poor	Average	Good	Excellent
On time Submission (2)	Assignment not submitted (0)	More than two session late (0.5)	Two sessions late (1)	One session late (1.5)	Early or on time (2)
Organization (2)	N/A	Very poor readability and not structured (0.5)	Poor readability and somewhat structured (1)	Readable with one or two mistakes and structured (1.5)	Very well written and structured without any mistakes (2)
Level of content (4)	N/A	Major points are omitted / addressed minimally (1)	All major topics are covered, the information is accurate. (2)	Most major and some minor criteria are included. Information is Accurate (3)	All major and minor criteria are covered and are accurate. (4)
Depth and breadth of discussion (2)	N/A	None in evidence; superficial at most (0.5)	Minor points/information may be missing and discussion is minimal (1)	Discussion centers on some of the points and covers them adequately (1.5)	Information is presented in depth and is accurate (2)

Content beyond syllabus:

Curriculum gap:

Modes of content delivery

Modes of Delivery	**Brief description of content delivered**	**Attained COs**	**Attained Pos**
Class room lecture	Lectures are taken online and offline both modes as per Timetable		
Online videos Assignments/ Quiz	Informed Search: https://www.youtube.com/watch?v=6hmIKIWBVSI Uninformed search: https://www.youtube.com/watch?v=ayP0KCeBK_U Forward Reasoning: https://www.youtube.com/watch?v=vyU4EoxwXJE Assignment No.:1 Assignment No.:2 Quiz 1 Quiz 2		

Text Books:

1. Stuart J. Russell and Peter Norvig, "Artificial Intelligence A Modern Approach —Second Edition" Pearson Education.
2. Elaine Rich and Kevin Knight —Artificial Intelligencell Third Edition, Tata McGraw-Hill Education Pvt. Ltd., 2008.
3. George F Luger “Artificial Intelligence” Low Price Edition, Pearson Education., Fourth edition.

Reference Books:

1. Ivan Bratko “PROLOG Programming for Artificial Intelligence”, Pearson Education, Third Edition. . D. W. Patterson, Artificial Intelligence and Expert Systems, Prentice Hall.
2. Saroj Kaushik “Artificial Intelligence”, Cengage Learning.
3. Davis E. Goldberg, “Genetic Algorithms: Search, Optimization and Machine Learning”, Addison Wesley, N.Y., 1989.
4. Patrick Henry Winston, “Artificial Intelligence”, Addison-Wesley, Third Edition.
5. N. P. Padhy, “Artificial Intelligence and Intelligent Systems”, Oxford University Press.

Lectures	3 per week	
	Hours	Marks
Theory examination	3	80
Internal Assessment	-	20
Total	--	100
Day	Time	
Tuesday	11.15-12.15pm	
Thursday	12.15-01.15pm	
Friday	10.00-11 am	

Lecture No.	Dates		Topic	Remarks
	Planned	Actual		
1	9/1	9/1	Artificial Intelligence (AI), AI Perspectives: Acting and Thinking humanly, Acting and Thinking rationally	
2	10/1	10/1	History of AI, Applications of AI, The present state of AI, Ethics in AI	
3	12/1	12/1	Introduction of agents, Structure of Intelligent Agent, Characteristics of Intelligent Agents	
4	16/1	16/1	Types of Agents, Simple Reflex, Model Based, Goal Based, Utility Based Agents	
5	17/1	17/1	Environment Types, Deterministic, Stochastic, Static, Dynamic, Observable, Semi-observable, Single Agent, Multi Agent	
6	19/1	19/1	Definition, State space representation, Problem as a state space search, Problem	

			formulation, Well-defined problems	
7	24/1	24/1	Solving Problems by Searching, Performance evaluation of search strategies, Time Complexity, Space Complexity, Completeness, Optimality	
8	26/1	27/1	Uninformed Search, Depth First Search, Breadth First Search	**26/1 holiday adjusted on 27/1**
9	27/1	27/1	Depth Limited Search, Iterative Deepening Search,	
10	31/1	31/1	Uniform Cost Search, Bidirectional Search	
11	2/2	2/2	Informed Search, Heuristic Function, Admissible Heuristic, Informed Search Technique, Greedy Best First Search	
12	3/2	3/2	A* Search,, Local Search, Hill Climbing Search	
13	7/2		Game Playing, Adversarial Search Techniques, Mini-max Search	
14	9/2		Alpha-Beta Pruning	
15	10/2		Simulated Annealing Search, Optimization, Genetic Algorithm	
16	14/2		Definition and importance of Knowledge, Issues in Knowledge Representation, Knowledge Representation Systems, Properties of Knowledge Representation Systems	
17	16/2		Propositional Logic (PL), Syntax, Semantics, Formal logic-connectives, truth tables, tautology, validity, well-formed-formula	
18	17/2		Predicate Logic, FOPL, Syntax, Semantics, Quantification, Inference rules in FOPL,	
19	22/3		Introduction to logic programming (PROLOG)	
20	23/3		Prolog Programs	

21	24/3		Forward Chaining, Backward Chaining	
22	2/3		Resolution in FOPL	
23	3/3		Handling Uncertain Knowledge, Random Variables,	
24	9/3		Prior and Posterior Probability, Inference using Full Joint Distribution	
25	10/3		Remedial lecture	
26	14/3		Bayes' Rule and its use	
27	16/3		Problems based on Bayes rule	
28	17/3		Bayesian Belief Networks, Reasoning in Belief Networks	
29	21/3		Problems based on Belief Network	
30	23/3		The planning problem, Partial order planning, total order planning.	
31	24/3		Learning in AI, Learning Agent, Concepts of Supervised, Unsupervised, Semi -Supervised Learning,	
32	6/4		Reinforcement Learning, Ensemble Learning	
33	11/4		Expert Systems, Components of Expert System: Knowledge base, Inference engine, user interface	
34	13/4		working memory, Development of Expert Systems	
35	20/4		Guest Lecture	

6.

Examination Scheme

Module		Lectur Hours	Marks distribution in Test (For internal assessment/TW)		Approximate Marks distribution in Sem. End Examination
			Test 1	Test 2	
1	Introduction to Artificial Intelligence(CO1)	3	5		10
2	Intelligent Agents(CO1)	5	5		10
3	Solving Problems by Searching(CO2)	12	10		20
4	Knowledge and Reasoning(CO3)	10		10	20
5	Reasoning Under Uncertainty(CO4)	5		5	10
6	Planning and Learning(CO5)	5		5	10

Submitted By	Approved By
Sign:	Sign:
Date of Submission:	Date of Approval:
Remarks by PAC (if any):	