.SIDDAGANGA INSTITUTE OF TECHNOLOGY, TUMAKURU

LECTURE PLAN FOR THE ACADEMIC YEAR 2023 – 2024

Teacher	Dr. Nagaratna B. Chittaragi	**Dept.**	Information Science and Engineering.
Class	V Semester	**Course**	Artificial Intelligence and Machine Learning (N5IS04)

Course Objectives

The objectives of this course are:

1.	Understand fundamental concepts in Artificial Intelligence.
2.	Be familiar with basic principles of AI such as problem solving, searching, knowledge representation and learning.
3.	Explain the role of agents in AI and structure of the agents.
4.	Analyze and identify significant characteristics of data sets.
5.	Understand and implement the training, testing, and validation phases of supervised and unsupervised learning algorithms.

Sl. No.	Date	Course Content	Remarks
Artificial Intelligence			
UNIT-I			
1.	06-11-2023	**INTRODUCTION:** What is AI? Acting humanly: The Turing Test approach, Thinking humanly: The cognitive modelling approach,	
2.	07-11-2023	Thinking rationally: The "laws of thought" approach, Acting rationally: The rational agent approach,	
3.	09-11-2023	**INTELLIGENT AGENTS:** Agents and Environments,	
4.	13-11-2023	Rationality, Omniscience, learning, and autonomy, the nature of Environments: Specifying the task environment,	
5.	16-11-2023	Properties of task environments, The Structure of Agents; Agent programs,	
6.	20-11-2023	Simple reflex agents, Model-based reflex agents, Goal-based agents, Utility-based agents, Learning agents	
7.	21-11-2023	**SOLVING PROBLEMS BY SEARCHING:** Problem-solving agents;	Think-Pair-Share
8.	28-11-2023	Well-defined problems and solutions, Formulating problems, Example problems; Toy problems, Real-world problems,	Assignment – 1
UNIT-II			
9.	04-12-2023	**SOLVING PROBLEMS BY SEARCHING (CONTD.):** Searching for solution;	
10.	05-12-2023	Infrastructure for search algorithms, Measuring problem-solving performance,	
11.	07-12-2023	Uninformed search strategies,	
12.	11-12-2023	Uniform-cost search, Depth-limited search,	
13.	12-12-2023	**ADVERSIAL SEARCH: Games,** Optimal Decisions in Games; The minimax algorithm,	Assignment – 2

14.	14-12-2023	**CONSTRAINT SATISFACTION PROBLEMS:** Defining Constraint satisfaction problems	
15.	21-12-2023	Example problem: Map colouring,	
16.	26-12-2023	Example problem: Job-shop scheduling,	
Machine Learning			
UNIT -III			
17.	28-12-2023	**INTRODUCTION:** If Data had Mass, The Earth Would Be A Black Hole, Learning; Machine Learning, Types of Machine Learning, Supervised Learning; Regression, Classification, The Machine Learning Process,	
18.	01-01-2024	**PRELIMINARIES:** Some Terminology; Weight Space, The Curse of Dimensionality,	
19.	02-01-2024	Knowing What You Know; Overfitting, Training, Testing, and Validation Sets,	
20.	04-01-2024	The Confusion Matrix, Accuracy Metrics,	
21.	08-01-2024	The Receiver Operator Characteristic (ROC) Curve, Unbalanced Datasets,	
22.	10-01-2024	Measurement Precision: Testing Machine Learning Algorithms,	Think-Pair-Share
23.	11-01-2024	Turning Data into Probabilities;	
24.	16-01-2024	Some Basic Statistics,	
UNIT-IV			
25.	18-01-2024	**DIMENSIONALITY REDUCTION**: Introduction	Group Discussion
26.	22-01-2024	Linear Discriminant Analysis (LDA),	
27.	23-01-2024	Principal Components Analysis (PCA),	
28.	24-01-2024	Relation with the Multi-layer Perceptron,	
29.	25-01-2024	Kernel PCA, Methods Comparisons,	
30.	29-01-2024	**LEARNING WITH TREES:** Using Decision Trees, Constructing Decision Trees,	
31.	30-01-2024	Classification and Regression Trees (CART);	
32.	31-01-2024	Gini Impurity, Regression in Trees,	Do it Your-self problems
UNIT-V			
33	01-02-2024	**PROBABILISTIC LEARNING:** Nearest Neighbour Methods	Group Assignment 3
34	05-02-2024	k- Nearest Neighbour Algorithm and problem solving	
35	06-02-2024	**UNSUPERVISED LEARNING; CLUSTERING:** Introduction,	
36	08-02-2024	Hierarchical Clustering, and problem solving	
37	12-02-2024	Agglomerative Clustering and problem solving	
38	13-02-2024	The single Linkage Algorithm, The complete linkage Algorithm,	
39	13-02-2024	The Average Linkage Algorithm, Partitional Clustering, Forgy's Algorithm,	

40	15-02-2024	The k-means Algorithm, Vector Quantization, The *K*-Means Algorithm,	

Textbooks:

1	Stuart J. Russell and Peter Norvig	Artificial Intelligence, A Modern Approach, Third Edition, Pearson India Education Services, 2015 (UNIT I and II)
2.	Stephen Marsland	Machine Learning, An Algorithmic Perspective, Second Edition, CRC Press, 2015 (UNIT III and IV)
3.	Earl Gose, Richard Johnson Baugh, Steve Jost	Pattern Recognition, Image Analysis, Pearson Education, 1997 (UNIT V)

References:

1	Elaine Rich, Kevin Knight:	Artificial Intelligence, 3rdEdition, Tata McGraw Hill, 2009. ISBN: 9780070087705.
2	Christopher Bishop	"Pattern Recognition and Machine Learning", CBS Publishers & Distributors- New Delhi.2006
3	Tom M Mitchell	“Machine Learning”, McGraw-Hill, Inc. New York, NY, USA. 2013

Course Outcomes:

Upon completion of this course the student will be able to:

CO1:	**Understand** and **Explore** knowledge representation techniques and problem-solving strategies to common Artificial Intelligence (AI) applications.
CO2:	**Discuss** the structure of the agents and different types of agents commonly used in AI.
CO3:	**Differentiate** between machine learning algorithms based on learning criteria and parameter employed.
CO4:	**Apply** and **illustrate** the significances of dimensionality reduction techniques for supervised and unsupervised problem solving.
CO5:	**Design** applications to solve real world problems by **applying** machine learning algorithms such as classification, regression, and clustering

Mapping of Course Outcomes (COs) to Program Outcomes (POs) & Program Specific Outcomes (PSOs)

Course outcomes	Pos												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	2	-	-	-	-	-	-	-	-	-	-	-	-	-	2
CO2	2	2	-	-	-	-	-	-	-	-	-	-	-	-	2
CO3	-	-	2	-	-	-	-	-	-	-	-	-	-	-	2
CO4	-	-	2	2	-	-	-	-	-	-	-	-	-	-	2
CO5	2	-	2	-	-	-	-	-	-	-	-	-	-	-	2
CO (Average)	2	-	2	2	-	-	-	-	-	-	-	-	2	-	-

Degree of compliance **1**: Low **2**: Medium **3**: High

Assessment Tools	COs				
Direct AT	**CO1**	**CO2**	**CO3**	**CO4**	**CO5**
CIE (Individual)	√	√	√	√	
SEE (Individual)	√	√	√	√	√
Assignments (Individual/Group)		√	√	√	√
Micro Projects (Group)			√	√	
Topic seminar (Individual)					
Case studies (Individual/Group)				√	√
Online courses (Individual)					
Indirect AT					
Course end survey (Students)	√	√	√	√	√
Student profile (Faculty)					

Course delivery methods, assessment tools and sample questions:

CO1	**Understand** and **Explore** knowledge representation techniques and problem-solving strategies to common Artificial Intelligence (AI) applications.
Delivery Methods	Blackboard Teaching, Group Activity
Assessment Tools	Tests and SEE
Sample Questions	1. What are the various applications of AI? (L1) 2. What are agents? (L1) 3. What is an intelligent agent? (L1) 4. Describe the goal based agent with an example. (L2)

CO2	**Discuss** the structure of the agents and different types of agents commonly used in AI.
Delivery Methods	Blackboard Teaching, Group Activity, Power point Presentation
Assessment Tools	Tests and SEE
Sample Questions	1. Discuss how an algorithm's performance is evaluated? (L2) 2. Explain informed Search Strategies. (L2) 3. Illustrate Map-Coloring Problem. (L2) 4. Discuss the variations in CSP formalism. (L2)

CO3	**Differentiate** between machine learning algorithms based on learning criteria and parameter employed.
Delivery Methods	Blackboard Teaching, Power Point Presentation, Think-Pair-Share,
Assessment Tools	Tests and SEE, Assignment
Sample Questions	1. Discuss different types of Machine learning algorithms? (L3) 2. Illustrate Bias/Variance Dilemma with Example. (L2) 3. Give any two suitable examples for supervised algorithms. (L1) 4. Illustrate the curse of dimensionality concept. (L3)
	5. Describe the various metrics used for measuring performances of machine learning algorithms. (L2)

CO4	**Apply** and **illustrate** the significances of dimensionality reduction techniques for supervised and unsupervised problem solving.
Delivery Methods	Blackboard Teaching, Think-pair-share,
Assessment Tools	Tests and SEE, Assignment
Sample Questions	1. Mention the examples of nonlinear dimensionality reduction. (L1) 2. What is Principal Component Analysis? (L1) 3. Discuss the factors involved in choosing suitable smoothing model for an application. (L2) 4. Illustrate the Regression trees with suitable examples. (L2) 5. Explain PCA methodology. (L2)

CO5	**Design** applications to solve real world problems by **applying** machine learning algorithms such as classification, regression, and clustering.
Delivery Methods	Blackboard Teaching, Power-point presentation
Assessment Tools	Tests and SEE, Assignment
Sample Questions	1. Explain the geometry of Linear discriminant classes. (L1) 2. Explain the various types of clustering techniques. (L2) 3. Discuss the K-means clustering algorithm. (L3) 4. Illustrate the regression concept with suitable examples. (L2) 5. Differentiate between supervised and unsupervised classification algorithms. (L2)

Teacher 10/11/2023

HOD 10/11/2023

Principal 10/11/2023

PRINCIPAL
Siddaganga Institute of Technology
TUMKUR - 572 103.