V Semester

ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING			
Course Code	21CS54	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. Familiarize with the basics of Machine Learning & Machine Learning process, basics of Decision Tree, and probability learning
CLO 4. Understand the working of Artificial Neural Networks and basic concepts of clustering algorithms

Teaching-Learning Process (General Instructions)

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

1. Lecturer method (L) need not to be only a traditional lecture method, but alternative effective teaching methods could be adopted to attain the outcomes.
2. Use of Video/Animation to explain functioning of various concepts.
3. Encourage collaborative (Group Learning) Learning in the class.
4. Ask at least three HOT (Higher order Thinking) questions in the class, which promotes critical thinking.
5. Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop design thinking skills such as the ability to design, evaluate, generalize, and analyze information rather than simply recall it.
6. Introduce Topics in manifold representations.
7. Show the different ways to solve the same problem with different logic 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

Problem-solving: Problem-solving agents, Example problems, Searching for Solutions, Uninformed Search Strategies: Breadth First search, Depth First Search,

Textbook 1: Chapter 1- 1.1, 1.2, 1.3
Textbook 1: Chapter 3- 3.1, 3.2, 3.3, 3.4.1, 3.4.3

Teaching-Learning Process	Chalk and board, Active Learning. Problem based learning

Module-2

Informed Search Strategies: Greedy best-first search, A*search, Heuristic functions.
Introduction to Machine Learning , Understanding Data

Textbook 1: Chapter 3 - 3.5, 3.5.1, 3.5.2, 3.6
Textbook 2: Chapter 1 and 2

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

Module-3

Basics of Learning theory
Similarity Based Learning
Regression Analysis

Textbook 2: Chapter 3 - 3.1 to 3.4, Chapter 4, chapter 5.1 to 5.4	
Teaching-Learning Process	Chalk and board, Problem based learning, Demonstration
Module-4	
Decision Tree learning Bayesian Learning **Textbook 2: Chapter 6 and 8**	
Teaching-Learning Process	Chalk and board, Problem based learning, Demonstration
Module-5	
Artificial neural Network Clustering Algorithms **Textbook 2: Chapter 10 and 13**	
Teaching-Learning Process	Chalk and board, Active Learning.

Course Outcomes Course Skill Set)

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

CO 1. Apply the knowledge of searching and reasoning techniques for different applications.
CO 2. Have a good understanding of machine leaning in relation to other fields and fundamental issues and challenges of machine learning.
CO 3. Apply the knowledge of classification algorithms on various dataset and compare results
CO 4. Model the neuron and Neural Network, and to analyze ANN learning and its applications.
CO 5. Identifying the suitable clustering algorithm for different pattern

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. Marks scored shall be proportionally reduced to 50 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

Suggested Learning Resources:

Textbooks

1. Stuart J. Russell and Peter Norvig, Artificial Intelligence, 3rd Edition, Pearson,2015
2. S. Sridhar, M Vijayalakshmi "Machine Learning". Oxford ,2021

Reference:

1. Elaine Rich, Kevin Knight, Artificial Intelligence, 3rdedition, Tata McGraw Hill,2013
2. George F Lugar, Artificial Intelligence Structure and strategies for complex, Pearson Education, 5th Edition, 2011
3. Tom Michel, Machine Learning, McGrawHill Publication.

Weblinks 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/
4. https://www.javatpoint.com/history-of-artificial-intelligence
5. https://www.tutorialandexample.com/problem-solving-in-artificial-intelligence
6. https://techvidvan.com/tutorials/ai-heuristic-search/
7. https://www.analyticsvidhya.com/machine-learning/
8. https://www.javatpoint.com/decision-tree-induction
9. https://www.hackerearth.com/practice/machine-learning/machine-learning-algorithms/ml-decision-tree/tutorial/
10. https://www.javatpoint.com/unsupervised-artificial-neural-networks

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

Role play for strategies– DFS & BFS, Outlier detection in Banking and insurance transaction for identifying fraudulent behaviour etc. Uncertainty and reasoning Problem- reliability of sensor used to detect pedestrians using Bayes Rule