



K. S. INSTITUTE OF TECHNOLOGY

An Autonomous Institution under VTU, Approved by AICTE
Department of Master of Computer Applications
SECOND SEMESTER SYLLABUS

Course: Artificial Intelligence and Machine Learning	Semester	II	
Course Code:	25MMC201	CIE Marks	50
Teaching Hours/Week (L:P:T)	3:2:0	SEE Marks	50
Total Hours of Pedagogy	40(Theory) +10 (Lab)	Total Marks	100
Credits	04	Exam Hours	03
Examination type (SEE)	Theory		

Course Objectives (Course Skill Set)

1. Understand foundational concepts in AI and machine learning.
2. Gain proficiency in Python for data privacy and machine learning tasks.
3. Learn and apply various machine learning algorithms and techniques.
4. Develop skills in data preprocessing and model evaluation.
5. Prepare students for industry roles involving data-driven decision making and predictive modeling.

Module-1

Introduction to AI: What is AI? Foundations and History of AI Intelligent Agents: Agents and environment, Concept of Rationality, The nature of environment, The structure of agents.

Problem-solving: Problem-solving agents, Example problems.

Uninformed Search Strategies: Breadth First search, Depth First Search, Iterative deepening depth first search

Number of Hours:8

Module-2

Informed Search Strategies: Heuristic functions, Greedy best first search, A*search. Heuristic Functions **Logical Agents:** Knowledge-based agents, The Wumpus world, Logic, Propositional logic, Reasoning patterns in Propositional Logic

Number of Hours:8

Module-3

Introduction to Machine Learning: Definition and importance of machine learning, Types of machine learning: Supervised, unsupervised, and reinforcement learning, Applications of machine learning in various domains.

Data Preprocessing: Data cleaning and transformation, Handling missing values and outliers, Feature scaling and normalization.

Data Privacy: Introduction to Data Privacy, Data Privacy Issues in Machine Learning, Case Studies and Applications.

Number of Hours:8

Module-4

Supervised Learning:

Regression: Linear regression, Polynomial regression, Model evaluation metrics: MAE, MSE, RMSE. **Classification:** Logistic regression, K-Nearest Neighbors (KNN), Decision Trees and **Random Forests.**

Model Evaluation metrics: Accuracy, precision, recall, F1-score, ROC-AUC.
Model Training and Evaluation: Train-test split and cross-validation, Hyper parameter Tuning using GridSearchCV, Overfitting and underfitting.

Number of Hours:8

Module-5

Unsupervised Learning:

Clustering: K-Means clustering, Hierarchical clustering, Evaluation of clustering results.

Dimensionality Reduction: Principal Component Analysis (PCA), Linear Discriminant Analysis (LDA) t-Distributed Stochastic Neighbor Embedding (t-SNE).

Association Rule Learning: Apriori algorithm, Market Basket Analysis, Evaluation metrics for association rules

Number of Hours:8

Sl. N O	Experiments
1	Implement A* Search algorithm.
2	Implementation of TSP using heuristic approach.
3	Define a function which takes TWO objects representing complex numbers and returns new complex number with a addition of two complex numbers. Define a suitable class 'Complex' to represent the complex number. Develop a program to read N (N >=2) complex numbers and to compute the addition of N complex numbers.
4	Develop a program to print 10 most frequently appearing words in a text file. [Hint: Use dictionary with distinct words and their frequency of occurrences. Sort the dictionary in the reverse order of frequency and display dictionary slice of first 10 items]
5	Write a function named DivExp which takes TWO parameters a, b and returns a value c (c=a/b). Write suitable assertion for a>0 in function DivExp and raise an exception for when b=0. Develop a suitable program which reads two values from the console and calls a function DivExp.
6	Write a program to compute summary statistics such as mean, median, mode, standard deviation and variance of the given different types of data.
7	Write a program to implement k-Nearest Neighbour algorithm to classify the iris data set. Print both correct and wrong predictions.
8	Write a program to demonstrate Regression analysis with residual plots on a given data set.
9	Write a program to implement k-Means clustering algorithm to cluster the set of data stored in .CSV file.
10	Write a program to demonstrate the working of the decision tree based ID3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample

Course outcome (Course Skill Set)

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

CO1: Utilize AI intelligent agents and uninformed search strategies to develop solutions for a real-world scenario.

CO2: Make use of heuristic functions and logical agents to solve computational problems

CO3: Build an understanding of Machine Learning and various Data Pre-processing techniques.

CO4: Apply supervised learning technique to solve real world problems.

CO5: Apply unsupervised learning technique to solve real world applications

Suggested Learning Resources:

Books (Name of the author/Title of the Book/Name of the publisher/Edition and Year) Text

Books:

1. Advance Machine Learning with Python by John Hearty.
2. Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow by Aurélien Géron (O'Reilly, 3rd Edition) – **Chapter sections on Responsible AI and Privacy-Aware ML.**
3. Artificial Intelligence- Saroj Kaushik, CENGAGE Learning.
4. Artificial intelligence, A modern Approach , 2nded, Stuart Russel, Peter Norvig, PEA.

Reference Textbooks:

1. "Python Machine Learning: Machine Learning and Deep Learning with Python, scikit-learn, and Tensor Flow " by Sebastian Raschka and Vahid Mirjalili.

2. "Introduction to Machine Learning with Python".

Privacy-Preserving Machine Learning by Vishnu Kanhere & Jaydip Sen (Springer, 2021).

Web links and Video Lectures (e-Resources):

- <https://youtu.be/kqtD5dpm9C8?si=LBep4HWaMFRrAPsD>
- <https://youtu.be/4SJ7bEILPJK?si=5LurvjzUOuCew1W9>
- <https://youtu.be/7eh4d6sabA0?si=JWHNJRVS6NhQOPYe>

Teaching-Learning Process (Innovative Delivery Methods)

The following are sample strategies that educators may adopt to enhance the effectiveness of the teaching- learning process and facilitate the achievement of course outcomes.

1. Lectures with PowerPoint presentations, Interactive discussions and problem-solving sessions, Assignments and quizzes for assessment.
2. Lab exercises on regression and classification models, Practical coding sessions with real-time problem- solving, Group projects on developing and evaluating supervised learning models, Continuous assessment through quizzes and coding challenges.
3. Lab exercises on clustering and dimensionality reduction, Practical coding sessions with unsupervised learning techniques, Group projects on applying unsupervised learning to real-world data, Continuous assessment through quizzes and practical tests.
4. Practical sessions on advanced machine learning techniques, Interactive coding exercises to Implement neural networks, Group projects on applying advanced techniques to complex data problems, Continuous assessment through quizzes and practical tests.
5. Lectures with PowerPoint presentations, Lab exercises on EDA and Python programs, Assignments and quizzes for assessment.

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 50% of the maximum marks. Minimum passing marks in SEE is 40% of the maximum marks of SEE. 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 50% (50 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

CIE for the theory component of IPCC

1. Three Tests each of 25 Marks (scaled down to 25)
2. Two assignments each of 10 Marks/One Skill Development Activity of 20 marks (scaled down to 5 marks)
3. Total Marks of three tests and two assignments/one Skill Development Activity added will be CIE for 30 marks.

CIE for the practical component of IPCC

- On completion of every experiment/program in the laboratory, the students shall be evaluated and marks shall be awarded on the same day. The 10 marks are for conducting the experiment and preparation of the laboratory record,
- The CIE marks awarded in the case of the Practical component shall be based on the continuous evaluation of the laboratory report. Each experiment report can be evaluated for 10 marks.
- The Two laboratory test at the end /after completion of all the experiments shall be conducted for 50 marks. The test marks will be scaled down to 10 marks. Sum of Observation and Lab test will be the CIE marks for the laboratory component of IPCC for 20 marks.

SEE for IPCC

- The question paper will be set for 100 marks and marks scored will be scaled down proportionately to 50 marks.
- The question paper will have 2 Parts: Part A and Part B. In part B, each question is set for 16 marks.
- There will be 2 questions from each module in Part A. 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 in Part B, selecting one full question from each module.

The theory portion of the IPCC shall be for both CIE and SEE, whereas the practical portion will have a CIE component only. Questions mentioned in the SEE paper shall include questions from the practical component).

- The minimum marks to be secured in CIE to appear for SEE shall be the 15 (50% of maximum marks-30) in the theory component and 10 (50% of maximum marks -20) in the practical component. The laboratory component of the IPCC shall be for CIE only. However, in SEE, the questions from the laboratory component shall be included. The maximum of 04/05 questions to be set from the practical component of IPCC, the total marks of all questions should not be more than the 20 marks.
- SEE will be conducted for 100 marks and students shall secure 40% of the maximum marks to qualify in the SEE. Marks secured will be scaled down to 50. (Student has to secure an aggregate of 50% of maximum marks of the course (CIE+SEE))