

Branch Name:	Bachelor of Computer Application (BCA)
Program Code:	CS101
Course Title:	Introduction to ML
Course Code:	24-DSE206-2C
Pre-requisite Course:	Basic Knowledge of Object-Oriented Programming (OOP).

Course Objective (CO):

This course is intended to make the students:

- To introduce basic concepts of Machine Learning.
- To understand different learning techniques.
- To develop simple ML models using Python.
- To apply ML in real-world problems.

Teaching and Examination Scheme:

Teaching Scheme (Hours per week)				Evaluation Scheme (Marks)								
Lecture (L)	Tutorial (T)	Practical (P)	Credit	Theory				Practical				Total
				University Assessment		Continuous Assessment		University Assessment		Continuous Assessment		
				Min. Marks	Max. Marks	Min. Marks	Max. Marks	Min. Marks	Max. Marks	Min. Marks	Max. Marks	
2	-	2	3	09	25	09	25	-	-	09	25	75

Course Contents:

Sr. No	Topic	Total Hours	Weightage (%)
1.	Introduction to Machine Learning Introduction to Machine Learning, Difference between Traditional Programming and Machine Learning, Applications of Machine Learning, Types of Machine Learning: Supervised Learning, Unsupervised Learning Machine Learning Process: Data Collection, Data Preprocessing, Model Training and Testing Basic Concepts: Dataset, Features, Labels, Training vs Testing Data, Overfitting and Underfitting (concept only) Tools Introduction: Introduction to Python, Overview of NumPy and Pandas	08	20
2.	Supervised Learning Introduction to Supervised Learning Regression: Simple Linear Regression Classification: K-Nearest Neighbors (KNN) Concepts: Independent and Dependent Variables, Model Accuracy Evaluation: Confusion Matrix, Accuracy (basic idea)	10	30
3.	Unsupervised Learning Introduction to Unsupervised Learning, Clustering: K-Means Clustering Concepts: Clusters and Centroids, Basic Distance Measure Data Handling: Data Cleaning, Handling Missing Values Visualization: Graphs using Matplotlib (bar, scatter)	08	25
4.	ML Applications & Tools Real-life Applications: Recommendation Systems, Spam Detection, Fraud Detection ML Tools: Scikit-learn, Google Colab / Jupyter Notebook, Basic Steps in ML Model Building Introduction to Ethical Issues: Bias in ML, Data Privacy	06	25

Course Learning Outcomes (CLO):

At the end of this course, the student would be able

1. **CLO1:** Understand fundamental concepts, terminology, and applications of Machine Learning.
2. **CLO2:** Identify and differentiate between various types of Machine Learning techniques such as supervised and unsupervised learning.
3. **CLO3:** Apply basic supervised learning algorithms such as Linear Regression and K-Nearest Neighbors for solving simple problems.
4. **CLO4:** Implement unsupervised learning techniques like K-Means clustering for grouping data.
5. **CLO5:** Utilize Python libraries (NumPy, Pandas, Matplotlib, Scikit-learn) for data handling, visualization, and model building.
6. **CLO6:** Analyze basic Machine Learning models and interpret their performance using simple evaluation techniques.

List of Text Book:

1. Machine Learning using Python — by U. Dinesh Kumar, Manaranjan Pradhan, Wiley India Pvt. Ltd.
2. Machine Learning with Python — by Abhishek Vijayvargia, BPB Publications.
3. Handbook of AI and Machine Learning with Python — by Dr. Veerendra Dakulagi, Dr. B.N. Umesh, Kavya Shivashankar, Indian Academic Publication.

List of Reference Book:

1. Machine Learning Cookbook with Python— by Rehan Guha, BPB Publications.
2. Handbook of Python: Navigating AI and Machine Learning — by Dr. Preeti Yadav, GEH Press

E-Resource / Web Links:

1. Machine Learning with Python Tutorial – DataCamp
<https://www.datacamp.com/tutorial/machine-learning-python>
2. Machine Learning and Data Science with Python (Free Course) – XLearnAI
<https://xlearnai.com/courses/machine-learning-and-data-science-with-python-for-free/>
3. Python Libraries for Machine Learning (NumPy, Pandas, Matplotlib) – Great Learning (YouTube / Class Central)
4. <https://www.classcentral.com/course/youtube-python-libraries-for-machine-learning-scipy-numpy-pandas-matplotlib-great-learning-95218>
5. Data Science Tutorials (NumPy, Pandas, ML Basics) – Class Central
<https://www.classcentral.com/course/youtube-data-science-simplified-512572>
6. Scikit-learn Tutorial – GeeksforGeeks <https://www.geeksforgeeks.org/machine-learning/scikit-learn-tutorial/>
7. Scikit-learn Step-by-Step Tutorial – Codes of Phoenix <https://codesofphoenix.com/sklearn>
8. Google Colab (Online Python Execution Platform) <https://colab.research.google.com/>
9. Kaggle (Datasets and Practice Platform) <https://www.kaggle.com/>

List of Experiments:

Note: The experiment list provided beneath is for reference only. The course teacher may change/formulate it as per his/her methodology and requirement.

Practical List

Practical 1: Installation and Setup of Python Environment

Task:

- Install Python using Anaconda or access Google Colab
- Launch Jupyter Notebook / Colab
- Write and execute basic Python programs:
 - Print statement
 - Arithmetic operations
 - Simple input/output program

Expected Outcome:

Students can set up environment and execute basic Python code

Practical 2: NumPy Operations

Task:

- Create 1D and 2D arrays
- Perform:
 - Indexing and slicing
 - Array reshaping
 - Mathematical operations (sum, mean, max)

Expected Outcome:

Students can manipulate numerical data using NumPy

Practical 3: Pandas Data Handling

Task:

- Create DataFrame from dictionary/CSV
- Perform:
 - Data selection (rows/columns)
 - Filtering data
 - Basic analysis (describe, head, info)

Expected Outcome:

Students can handle structured datasets

Practical 4: Data Preprocessing Techniques

Task:

- Load dataset (CSV file)
- Identify missing values
- Handle missing data:
 - Remove null values
 - Replace with mean/median
- Perform basic data cleaning

Expected Outcome:

Students can prepare data for ML models

Practical 5: Data Visualization using Matplotlib

Task:

- Plot:
 - Bar chart
 - Scatter plot
- Use dataset to visualize relationships between variables

Expected Outcome:

Students can visualize data for better understanding

Practical 6: Implementation of Simple Linear Regression

Task:

- Load dataset (e.g., student marks/house price)
- Split into training and testing data
- Train Linear Regression model
- Plot regression line

Expected Outcome:

Students can build and visualize regression model

Practical 7: Implementation of K-Nearest Neighbors (KNN)

Task:

- Load classification dataset
- Apply KNN algorithm
- Predict output for test data

Expected Outcome:

Students can perform basic classification

Practical 8: Model Evaluation Techniques

Task:

- Evaluate KNN model using:
 - Confusion Matrix
 - Accuracy score
- Interpret results

Expected Outcome:

Students can analyze model performance

Practical 9: Implementation of K-Means Clustering

Task:

- Load dataset
- Apply K-Means algorithm
- Visualize clusters using scatter plot

Expected Outcome:

Students can perform clustering and interpret groups

Practical 10: Mini Project (Simple ML Application)

Task:

- Select a simple problem:
 - Prediction (Regression) OR
 - Classification OR
 - Clustering
- Perform:
 - Data preprocessing
 - Model building
 - Visualization
 - Result analysis

Expected Outcome:

Students can develop a basic end-to-end ML application

Mapping of CLO with PO and PSO

Course Learning Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CLO1	H	H	M	M	L				M				H	M	
CLO2	H	H	H	M	M	M		L	M				H	M	M
CLO3	M	H			M								M		
CLO4	H		H			M			M				H	M	
CLO5		H	H	H	M	M	M		H	M	M		H	M	H
CLO6		H	H	H	M	M	M		H	M	M		H	M	H

H: High, M: Medium, L: Low