UKA TARSADIA UNIVERSITY

M.C.A. (3rd Semester) Syllabus, 2024-2025

Course Code: AI8001 Course Title: Machine Learning

Course Credits: [Lecture: 03, Tutorial: 00, Practical: 01]

Prerequisites: Basic mathematical background and knowledge of programming in Python.

Objectives: To exploit and apply machine learning theories and models.

Course Outcomes: Upon completion of the course, students shall be able to

CO1: Express the importance of machine learning and its fundamental concepts.

CO2: Interpret regression models and relate them with real-world applications.

CO3: Distinguish classification, clustering, and learning algorithms, also formulate and experiment the same on real-world problems.

CO4: Analyze the need for dimensionality reduction and apply PCA, LDA, and Kernal PCA based on the situation.

Course Objective and Course Outcomes Mapping:

- To exploit and apply machine learning theories and models: CO1, CO2, CO3, & CO4

Programme Outcomes: The student will have

PO1: Proficiency in and ability to identify problems related to computer science as well as design and apply computational knowledge to solve them.

PO2: Ability to design, develop, test and maintain system, component, product or process as per needs and specification.

PO3: Understanding of professional and ethical role and responsibility.

PO4: Recognition of the need for and an ability towards life-long learning.

PO5: Knowledge of programming languages, database systems, operating systems, software engineering, Web & Mobile technology and relevant modern issues.

PO6: Ability to demonstrate the use of modern tools, models and languages to solve problems related to software development.

PO7: An ability to communicate and present knowledge effectively.

Programme Outcomes and Course Outcomes mapping:

Course Outcomes	Programme Outcomes						
	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	✓						
CO2	✓	✓	✓	✓			
CO3	✓	✓	✓	✓	✓	✓	
CO4	✓	✓		✓	✓		

Curriculum Unit Titles

Units	Unit Description	Weightage
1	Introduction to Machine Learning	[15%]
	1.1. Applications of Machine Learning	
	1.2. Types of Learning – Supervised and Unsupervised	
	1.3. Training versus Testing	
	1.4. Data Processing – Missing Data, Categorical Data, Feature Scaling	

2 Regression [20%]

2.1. Simple Linear Regression

2.2. Multiple Linear Regression

2.3. Polynomial Regression

2.4. Decision Tree Algorithm

2.5. Random Forest Algorithm

3 Classification [15%]

3.1. Logistic Regression

3.2. *k*-nearest Neighbour (kNN)

3.3. Support Vector Machine (SVM)

3.4. Naive Bayes

4 Unsupervised Learning [15%]

4.1. K-Means Clustering

4.2. Hierarchical Clustering

4.3. Apriori Algorithm

5 Reinforcement and Deep Learning [20%]

5.1. Upper Confidence Bound Algorithm

5.2. Thompson Sampling

5.3. Artificial Neural Network

5.4. Convolutional Neural Network

6 Dimensionality Reduction [15%]

6.1. Principal Component Analysis (PCA)

6.2. Linear Discriminant Analysis (LDA)

6.3. Kernel PCA

Course Units and Course Outcomes Mapping:

Unit No.	Unit	Course Outcomes			
		CO1	CO2	CO3	CO4
1	Introduction to Machine Learning	✓			
2	Regression		✓		
3	Classification			✓	
4	Unsupervised Learning			✓	
5	Reinforcement and Deep Learning			✓	
6	Dimensionality Reduction				✓

Computing Environment:

A student must have the following computing environment in the laboratory and/or on his/her laptop.

- CE#1: Python 3

Text Books

1. Y. S. Abu-Mostafa, M. Magdon-Ismail, H. T. Lin, “Learning from Data”, AMLBook Publishers, 2012.

References :

1. Saikat Dutt, Subramanian Chandramouli, and Amit Das, “Machine Learning”, Pearson.
2. “Machine Learning A-ZTM: Hands-On Python & R in Data Science”, Udemy.

3. E. Alpaydin, “Introduction to Machine Learning”, MIT Press, Second Edition.
4. T. M. Mitchell, “Machine Learning”, McGraw Hill, 1997.
5. P. Flach, “Machine Learning: The Art and Science of Algorithms that Make Sense of Data”, Cambridge University Press, 2012.