Faculty Name/s: **Dr. Pavithra A C**								Academic Year: **2025-26**
Department: **Computer Science & Design**								
Course Code	Course Title	Core/Elective	Prerequisite	Teaching Hours/Week				Total Hrs/ Sessions
				L	T	P	S	
BCM601	**MACHINE LEARNING**	**IPCC**	AI, Python	**3**	**-**	**2**	**-**	**40**

Course objectives: This course (BCM601) will enable students to:

CLO1: To understand the basic theory underlying machine learning, types, and the process.

CLO2: To become familiar with data and visualize univariate, bivariate, and multivariate data using statistical techniques and dimensionality reduction.

CLO3: To understand various machine learning algorithms such as similarity-based learning, regression, decision trees, and clustering.

CLO4: To familiarize with learning theories, probability-based models, and reinforcement learning, developing the skills required for decision-making in dynamic environments.

Topics Covered as per Syllabus

MODULE-I

Introduction to Machine Learning: Need for Machine Learning, Machine Learning Explained, Machine Learning in Relation to Other Fields, Types of Machine Learning, Challenges of Machine Learning, Machine Learning Process, Machine Learning Application.

Understanding Data: Introduction, Big Data Analytics and Types of Analytics, Big Data Analysis Framework, Descriptive Statistics, Univariate Data Analysis and Visualization, Bivariate Data and Multivariate Data.

(Textbook 1: Chapter – 1 (1.1-1.7), 2 (2.1-2.6))

MODULE-2

Understanding Data: Multivariate Statistics, Essential Mathematics for Multivariate Data, Overview of Hypothesis, Feature Engineering and Dimensionality Reduction Techniques.

Basics of Learning Theory: Introduction to Learning and its Types, Introduction to Computation Learning Theory, Design of a Learning System, Introduction to Concept Learning, Induction Biases, Modelling in Machine Learning.

(Textbook 1: Chapter –2 (2.7-2.10), 3 (3.1 – 3.6))

MODULE - 3

Similarity-based Learning: Introduction to Similarity or Instance-based Learning, Nearest-Neighbor Learning, Weighted K-Nearest-Neighbour Algorithm, Nearest Centroid Classifier, Locally Weighted Regression (LWR).

Regression Analysis: Introduction to Regression, Introduction to Linearity, Correlation, and Causation, Introduction to Linear Regression, Validation of Regression Methods, Multiple Linear Regression, Polynomial Regression, Logistic Regression.

(Textbook 1: Chapter – 4 (4.1 – 4.5), 5 (5.1 – 5.7))

MODULE-4

Models Based on Decision Trees: Introduction to Decision Tree, Decision Tree for Classification, Impurity Measures for Decision Tree Construction, Properties of Decision Tree Classifier (DTC), Applications in Breast Cancer Data, Regression Based on Decision Tress.

Bayesian Learning: Introduction to Probability-based Learning, Fundamentals of Bayes Theorem, Classification Using Bayes Model.

(Textbook 2: Chapter – 3 (3.1 – 3.6), Textbook 1: Chapter –8 (8.1 – 8.3))

MODULE-5

Clustering: Introduction to Clustering, Clustering of Patterns, Divisive Clustering, Agglomerative Clustering, Partitional Clustering.

Reinforcement Learning: Overview and Scope of Reinforcement Learning, Components of Reinforcement Learning, Q-Learning.

(Textbook 2: Chapter – 7 (7.1 – 7.5), Textbook 1: Chapter - 14 (14.1, 14.2, 14.4, 14.9))

List of Text Books

1. S Sridhar and M Vijayalakshmi, "Machine Learning", Oxford University Press, 2021.
2. M N Murty and Ananthanarayana V S, "Machine Learning: Theory and Practice", Universities Press (India)
Pvt. Limited, 2024.

Reference Books:

1. Tom M. Mitchell, "Machine Learning", McGraw-Hill Education, 2013.
2. Miroslav Kubat, "An Introduction to Machine Learning", Springer, 2017.

Web links and Video Lectures (e-Resources): Web links and Video Lectures (e-Resources):

- https://www.drssridhar.com/?page_id=1053
- https://www.universitiespress.com/resources?id=9789393330697
- https://onlinecourses.nptel.ac.in/noc23_cs18/preview
- https://www.geeksforgeeks.org/machine-learning/
- https://www.w3schools.com/python/python_ml_getting_started.asp
- https://www.tutorialspoint.com/machine_learning/index.htm

- Integrated Electronics: Analog and Digital Circuits and Systems, Jacob Millman, Christos C.
- Halkias, McGraw-Hill, 2015. Electronic Devices and Circuit, Boylestad & Nashelsky, Eleventh Edition, Pearson, January 2015.

Course Outcomes: Students will be able to

CO1: At the end of the course, the student will be able to: Demonstrate the need for machine learning, its relationship to other fields, and different types of machine learning	L1, L2
CO2: Illustrate the fundamental principles of multivariate data and apply dimensionality reduction techniques.	L1, L2, L3
CO3: Apply similarity-based learning methods and perform linear, polynomial regression analysis	L1, L2
CO4: Apply decision trees for classification and regression problems, and Bayesian models for probabilistic learning	L1, L2, L3
CO5: Analyze the clustering algorithms and reinforce their understanding by applying Q-learning for decision making tasks	L1, L2

Internal Assessment Marks (50): The sum of three tests (20 marks each), two assignments (10 marks each), and quiz/seminar/group discussion (20 marks) will be out of **100 marks** and will be scaled down to **50 marks**

The Correlation of Course Outcomes (CO's) and Program Outcomes (PO's)

Subject Code:	BCM601		MACHINE LEARNING					Faculty Name:		Dr. Pavithra A C			
List of Course Outcomes	Program Outcomes												Total
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	
CO-1	1	2	1	-	-	3	-	1	-	-	-	3	**11**
CO-2	1	2	1	-	-	3	-	1	-	-	-	3	**11**
CO-3	1	2	1	-	-	3	-	1	-	-	-	3	**11**
CO-4	1	2	1	-	-	3	-	1	-	-	-	3	**11**
CO-5	1	2	1	-	-	3	-	-	-	-	-	3	**10**
Total	**5**	**10**	**5**	**0**	**0**	**12**	**0**	**4**	**0**	**0**	**0**	**12**	**54**

Note: 3 = Strong Contribution 2 = Average Contribution 1 = Weak Contribution - = No Contribution