

GANPAT UNIVERSITY									
FACULTY OF ENGINEERING & TECHNOLOGY									
Programme		Bachelor of Technology			Branch/Spec.		Mechatronics Engineering		
Semester		VII			Version		1.0.0.0		
Effective from Academic Year			2025-26		Effective for the batch Admitted in			July 2022	
Course Code		2MC71OE1	Course Name		Basics of Machine learning (Open Elective)				
Teaching Scheme					Examination Scheme (Marks)				
(Per week)	Lecture(DT)		Practical(Lab.)		Total		CE	SEE	Total
	L	TU	P	TW					
Credit	2	0	0	0	2	Theory	40	60	100
Hours	2	0	0	0	2	Practical	00	00	00
Pre-requisites:									
Basics of Artificial intelligence									
Course Outcomes:									
On successful completion of this course, the students will be able to:									
CO1	Understanding Various Machine Learning Algorithms & Their area of Applications								
CO2	Demonstrate understanding of the mathematical foundations needed								
CO3	Provide solutionsforclassificationandregressionapproachesinreal-worldapplications								
CO4	Choose an appropriate clustering technique to solve real world problems using Machine Learning.								
Theory syllabus									
Unit	Content								Hrs
1	Introduction to Machine Learning: The origins of machine learning-How machines learn - Machine learning in Practice, Exploring and understanding state-of-the-art methods, Applications of machine learning, Tools for machine learning.								4
2	Introduction to Programming Tools for Data Science: Toolkits Using Python (Matplotlib, NumPy, Scikit), Visualizing Data (Bar Charts, Line Charts, Scatter plots), Working With Data (Reading Files, Scraping the Web, Using APIs (Example: Using the Twitter APIs), Cleaning and Mugging, Manipulating Data, Rescaling, Dimensionality Reduction)								5
3	Mathematical Foundations: Linear Algebra (Vectors, Matrices), Statistics (Describing a Single Set of Data, Correlation, Simpson’s Paradox, Correlation and Causation), Probability (Dependence and Independence, Conditional Probability, Bayes’s Theorem, Random Variables, Continuous Distributions, Normal Distribution, Central Limit Theorem), Hypothesis and Inference (Statistical Hypothesis Testing, Confidence Intervals, P-Hacking, Bayesian Inference)								12
4	Data pre-processing/Data Wrangling Techniques: Aggregation, Feature Cleaning - Missing values, Scaling, Outliers, Special values, Obvious inconsistencies, sampling, discretization, binarization, attribute transformation, Feature Imputation - Hot-Deck, Cold-Deck, Mean-substitution, Feature Engineering - Decompose, Discretization-Continuous Features and Categorical Features, Reframe Numerical Quantities, Crossing, Feature Encoding - Label Encoding, One Hot Encoding, Feature Normalisation or Scaling-Re-scaling, Standardization								5
5	Regression: Linear vs non-linear regression model, simple line regression, multi line regression, poly nominal regression, SVR, Random Forest, Decision Tree, performance measurement matrix.								4
6	Classification: Logistic regression, Naive Bayes, K-Nearest Neighbours, Perception Learning, SVM-Formulation, SVM-Interpretation & Analysis, SVMs for Linearly Non Separable data, SVMK								7

	ernels, Subset Selection, Shrinkage Methods, Decision Tree, Regression trees, Stopping Criteria & Pruning, Loss Function for Classification, Categorical Attributes, Multiway Splits, Instability & Smoothness & Repeated Sub trees.	
7	Clustering: Common distance measures, Hierarchical algorithms – agglomerative and divisive, Partitioning algorithms – k-means & k-Medoids	6
8	Case Study	2

Practical Content

The Practical/term work shall be based on the topics mentioned above and will be defended by the candidates.

Text Books

1	Christopher Bishop, “ Pattern Recognition and Machine Learning” Springer.
2	Kevin P.Murphy, “ Machine Learning: A Probabilistic Perspective”,MITPress.

Reference Books

1	Ethem Alpaydin, “ Introduction to Machine Learning ”, MITPress.
2	Tom Mitchell, " Machine Learning ", McGraw-Hill.
3	Trevor Hastie, Robert Tibshirani, Jerome Friedman, " The Elements of Statistical Learning ", Springer.
4	Stephen Marsland, “ Machine Learning- An Algorithmic Perspective”, Chapman and Hall/ CRC Press.
5	JainV.K., “Data Sciences”, Khanna Publishing House, Delhi.

ICT/MOOCs references

1	https://onlinecourses.nptel.ac.in/noc21_cs24
2	https://www.edx.org/course/machine-learning-with-python-a-practical-introduct
3	https://www.coursera.org/learn/machine-learning-with-python
4	https://nptel.ac.in/courses/106106139/

Mapping of CO with PO and PSO:

	P O 1	P O 2	P O 3	P O 4	P O 5	P O 6	P O 7	P O 8	P O 9	P O 10	P O 11	P O 12	P S O 1	P S O 2	P S O 3
CO1	2	1	0	0	2	0	0	0	0	0	0	2	3	3	2
CO2	2	1	0	1	1	0	0	0	0	1	0	1	3	3	2
CO3	3	2	1	1	2	0	0	0	1	2	2	2	2	3	2
CO4	3	2	1	1	2	0	0	0	1	2	2	2	2	3	2