

Course Code	Course Title	L	T	P	C
OLMCA602	Machine Learning	3	1	0	4
Pre-requisite	NIL	Syllabus version			
		1.0			
Course Objectives:					
1. To have sound knowledge on the foundations of Machine Learning algorithms and methodologies.					
2. To have a good understanding of the importance of Machine Learning in various application areas and their significances.					
3. To have adequate knowledge on the advanced machine learning models and ensemble models for solving of complex problems.					
Course Outcomes:					
1. Comprehensive knowledge of various machine learning approaches and data preprocessing techniques.					
2. Capability of developing learning models for solving the problems related to supervised and advanced supervised learning.					
3. Ability to apply different clustering approaches to handle unsupervised learning.					
4. Efficiency in developing & understanding various ensemble models and utilization of reinforcement learning method.					
Module:1	Introduction				
Types of Learning- Different types of learning methods: A Formal Model- PAC Learning; A framework for mathematical analysis of machine learning					
Module:2	Data Pre-processing				
Feature Selection- Filters and Greedy Selection Approaches- Dimensionality Reduction- Principal Component Analysis (PCA)- Random Projections- Compressed Sensing- Linear Discriminant Analysis(LDA).					
Module:3	Supervised Learning				
Linear Predictors: Linear Regression, Logistic Regression, Stochastic Gradient Descent, Learning with SGD, Decision Trees-Pruning, Naïve Bayes Classifier					
Module:4	Advanced Supervised Learning				
Neural Networks- Feed forward Neural Networks- SGD and Back propagation- Support Vector Machines-Linear and Non Linear-One class Kernel Machine.					
Module:5	Unsupervised Learning				
Clustering- k-Means and Other Cost Minimization Clustering- Hierarchical Clustering- Spectral Clustering- K-Mode Clustering- k-Nearest Neighbor Estimator.					
Module:6	Ensemble Learning				
Bias – Variance Tradeoff – Bagging and Boosting (Random forests, Adaboost, XG boost inclusive) – Metrics & Error Correction.					
Module:7	Reinforcement Learning				
Basics of RL – RL Framework – Markov Decision Process – Exploration Vs Exploitation - Policies, Value Functions and Bellman Equations – Solution Methods – Q-learning.					
	Total Lecture hours:				120 Hours
Text Book(s)					
1.	Ethem Alpaydi, Introduction to Machine Learning, Fourth Edition, The MIT Press, 2020.				

2.	Richard S. Sutton and Andrew G. Barto, Reinforcement Learning: An Introduction (Adaptive Computation and Machine Learning series) 2nd edition, A Bradford Book; 2018.		
Reference Books			
1.	Tom M Mitchell, Machine Learning, Indian Edition, McGraw Hill Education, 2017.		
2.	Andriy Burkov, The Hundred-Page Machine Learning Book, First edition, Notion Press, 2019.		
3.	Miroslav Kubat, An Introduction to Machine Learning, Second Edition, Springer, 2017		
Mode of Evaluation: Quiz / Assignment / Mid-Term, FAT			
Recommended by Board of Studies		01-11-2023	
Approved by Academic Council		No. 72	Date: 13-12-2023