

Course Code	Course Title	L	T	P	C
BITE410L	Machine Learning	3	0	0	3
Pre-requisite	NIL	Syllabus version			
		1.0			
Course Objectives:					
<ol style="list-style-type: none"> 1. To introduce the theoretical foundations, algorithms, methodologies of the Machine Learning. 2. To understand the importance and significance of Machine Learning in various applications. 3. To learn the advanced machine learning based models and ensemble models for complex problem solving 					
Course Outcomes:					
<ol style="list-style-type: none"> 1. Understand the various machine learning approaches and data preprocessing techniques 2. Develop the learning models for the problems using supervised and advanced supervised learning-based approaches 3. Apply the different clustering approaches to handle unsupervised based learning 4. Examine the various ensemble models 5. Infer the reinforcement Learning 					
Module:1	Introduction	6 hours			
Types of Learning- Supervised, Unsupervised, Semi Supervised and Reinforcement Learning - A Formal Model-PAC Learning.					
Module:2	Data Pre-processing	6 hours			
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	6 hours			
Linear Predictors: Linear Regression, Logistic Regression, Stochastic Gradient Descent, Learning with SGD, Decision Trees-Pruning, Naïve Bayes Classifier					
Module:4	Advanced Supervised Learning	7 hours			
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	6 hours			
Clustering- k-Means and Other Cost Minimization Clustering- Hierarchical Clustering- Spectral Clustering- K-Mode Clustering- k-Nearest Neighbor Estimator.					
Module:6	Ensemble Learning	6 hours			
Bias – Variance Tradeoff – Bagging and Boosting (Random forests, Adaboost, XG boost inclusive) – Metrics & Error Correction.					
Module:7	Reinforcement Learning	6 hours			

Basics of RL – RL Framework – Markov Decision Process – Exploration Vs Exploitation - Policies, Value Functions and Bellman Equations – Solution Methods – Q-learning.			
Module:8	Contemporary Issues		2 hours
Total Lecture hours: 45 hours			
Text Books			
1.	Ethem Alpaydi, Introduction to Machine Learning, Fourth Edition, The MIT Press, 2020.		
2.	Shai Shalev-Shwartz and Shai Ben-David, Understanding Machine Learning: From Theory to Algorithms, First edition, Cambridge University Press, 2015.		
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: Continuous Assessment Tests, Assignment, Quiz, Final Assessment Test			
Recommended by Board of Studies		12-10-2022	
Approved by Academic Council		No. 68	Date 19-12-2022