Course Code	Course Title	L	T	P	C
MCSE602L	Machine Learning	2	0	0	2
Pre-requisite	NIL	Syllabus version			
		1.0			

Course Objectives

1. Acquire theoretical Knowledge on setting hypothesis for pattern recognition
2. Apply suitable machine learning techniques for data handling and knowledge extraction
3. Evaluate the performance of algorithms and to provide solutions for various real-world applications

Course Outcomes

1. Recognize the characteristics of machine learning strategies
2. Analyze and Apply the suitable supervised learning methods for real-world problems
3. Identify and integrate more than one technique to enhance the performance of learning
4. Create a suitable unsupervised learning model for handling unknown patterns
5. Design a model to handle large datasets with online learning

Module:1	**Introduction**	**4 hours**
PAC Learning-Consistent and inconsistent hypothesis, FIND-S, Candidate Elimination, deterministic and stochastic generalities, error, VC Dimensions, lower bounds-Convex optimization review- Probability review		
Module:2	**Dimensionality Reduction**	**4 hours**
Feature representation in different domains: text, image, video and audio, Feature selection: Filter, wrapper and embedded models, Feature Reduction: PCA, t-SNE		
Module:3	**Model Selection and Validation**	**3 hours**
Estimation and approximation errors: ERM-SRM- Validation- Regularization-based algorithms		
Module:4	**Classification Models**	**5 hours**
Supervised Learning , Perceptron – Single layer & Multi-layer – Linear SVM – Hard, Soft Margins, kernel Methods, Lazy SVM for Instance Based Learning, Handling imbalanced data: One Class SVM		
Module:5	**Ensemble Learning**	**3 hours**
Bagging-Committee Machines and Stacking-Boosting-Ranking based aggregation		
Module:6	**Clustering**	**5 hours**
Unsupervised Learning, Partitional Clustering-K-Means-Linkage-Based Clustering Algorithms-Birch Algorithm-CURE Algorithm-Density-based Clustering- Spectral Clustering.		
Module:7	**Online Learning**	**5 hours**
Online Classification in the Realizable Case- Online Classification in the Unrealizable Case-Online Convex Optimization- The Online Perceptron Algorithm- On-line to batch conversion – Federated Learning		
Module:8	**Contemporary Issues**	**1 hours**
	Total Lecture hours:	**30 Hours**

Text Book(s)

1	S. Shalev-Shwartz, S.Ben-David, “Understanding Machine Learning: From Theory to Algorithms”, Cambridge University Press, 2014.

Reference Books

1	Mehryar Mohri, Afshin Rostamizadeh, Ameet Talwalkar "Foundations of Machine Learning", MIT Press, 2nd Edition, 2018.
2	Duda, Richard, Peter Hart, and David Stork, "Pattern Classification," 2nd Edition, John Wiley & Sons, Hoboken, 2000.
3	Tom Mitchell, "Machine Learning", McGraw Hill, 3rd Edition, 1997.

Mode of Evaluation: CAT / Written Assignment / Quiz / FAT			
Recommended by Board of Studies	26-07-2022		
Approved by Academic Council	No. 67	Date	08-08-2022