Course Code	PAD21D04T	Course Name	MACHINE LEARNING MODEL MANAGEMENT	Course Category	D	Discipline Specific Elective	L	T	P	C
							4	0	0	4

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Computer Applications		Data Book / Codes/Standards	Nil	

Course Learning Rationale (CLR):	The purpose of learning this course is to,	Learning

CLR-1 :	To learn how to Data architects help companies manage, store and secure their data.
CLR-2 :	To learn about SQL and NoSQL databases
CLR-3 :	To get a clear understanding about Hadoop
CLR-4 :	To get in-depth knowledge of the Big Data framework using Hadoop
CLR-5 :	To analyze large data sets to find trends, correlations or other insights not visible with smaller data sets or traditional processing methods.
CLR-6 :	To observe various customer related patterns and trends.

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	1 Level of Thinking (Bloom)	2 Expected Proficiency (%)	3 Expected Attainment (%)
CLO-1 :	To gather extensive knowledge in Big Data and its architecture	2	85	80
CLO-2 :	To improve and understand ETL process and relevant ETL tools	3	85	80
CLO-3 :	To differentiate between a batch layer for large volumes of data and a speed layer for real time processing of data streams	3	85	80
CLO-4 :	To understand Distributed systems	3	85	80
CLO-5 :	To understand Data modelling techniques	3	85	80
CLO-6 :	To incorporate data from all sources is key to optimizing the insights gained with Big Data.	3	85	80

Program Learning Outcomes (PLO)

	1 Disciplinary Knowledge	2 Critical Thinking	3 Problem Solving	4 Analytical Reasoning	5 Research Skills	6 Team Work	7 Scientific Reasoning	8 Reflective Thinking	9 Self-Directed Learning	10 Multicultural Competence	11 Ethical Reasoning	12 Community Engagement	13 ICT Skills	14 Leadership Skills	15 Life Long Learning
CLO-1 :	L	H	H	H	H	M	-	H	M	H	-	H	-	-	-
CLO-2 :	L	H	H	H	H	-	-	M	M	L	-	H	-	-	-
CLO-3 :	L	H	H	H	H	-	-	M	M	L	-	H	-	-	-
CLO-4 :	L	H	H	H	H	-	-	M	M	L	-	H	-	-	-
CLO-5 :	L	H	H	H	H	-	-	M	M	L	-	H	-	-	-
CLO-6 :	L	H	H	H	H	-	-	M	M	L	-	H	-	-	-

Duration (hour)		12	12	12	12	12
S-1	SLO-1	**ML Model Evaluation and Selection-Introduction**	**MLModel Management Introduction**	**Hyperparameter tuning, versioning**	**Recommendation Algorithms**	**-Recommendation Evaluation and Validation**

S-2	SLO-1	Cross-validation	Creating and saving ML models with scikit-learn	**Deployment -** Hyperparameter tuning with grid search	Recommendation algorithms design	Describing Recommendation Engines
S-3	SLO-1	evaluating estimator performance	Models for Regression	reproducing study	– User-based-Collaborative-Filtering (UBCF) Algorithm	Types of Recommendation Engines
S-4	SLO-1	Computing cross- validated metrics	Getting started with Regression model example	Machine Learning metrics	Collaborative Filtering based Online Recommendation Systems	Comparing the Types of Recommendation Engines
S-5	SLO-1	Cross validation iterators, A note on shuffling, Cross validation and model selection	Classification management	Machine learning model versioning	Item-based Collaborative Filtering (**IBCF)**	Collecting and Manipulating Data
S-6	SLO-1	Tuning the hyper-parameters of an estimator, Exhaustive GridSearch–Randomized – Parameter Optimization	Building machine Learning pipelines	Machine learning Model versioning with git and DVC	Rule- real-life sequential recommendation systems	Describing Similarity and Neighbourhoods
S-7	SLO-1	Alternatives to brute force parameter search– Metrics and scoring, quantifying the quality of predictions–	Overview-Pipelines	Model management framework	SVD algorithm for recommender systems	creating a Recommendation Engine
S-8	SLO-1	defining model evaluation rules– Classification metrics	Machine Learning pipeline Tools	Studio ml setup	An incremental algorithm-Incremental Appro SVD.	Recommending Another Item
S-9	SLO-1	Multilabel ranking metrics, Regressionmetrics,Clusteringmetrics–Dummyestimators–Model persistence	Machine Learning Pipeline Techniques and tools -Example	Machine learning model creation	Singular Value Decomposition VS Matrix Factorization in Recommender Systems.	Finding Items to Recommend
S-10	SLO-1	&maintainability I imitations– Validation curves	Machine Learning Pipeline implementation	Machine learning model in production	collaborative filtering algorithm	Recommending Items Based on Other Items –
S-11	SLO-1	plotting scores to evaluate models	Iterative Machine Learning model	**Deploying model process**	Online Recommendation Systems	Evaluating a Recommendation System –
S-12	SLO-1	Validationcurve– Learningcurve	Comparisons of Different Models	Deployed machine learning model in production	Comparisons	**Validating Recommendation System**

Learning Resources	1 Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow, 2nd Edition, Aurélien Géron, September 2019 2.Building Recommendation Engine, By Suresh K Gorakala,December 2016	1. Hands-On Recommendation Systems with Python: Start Building Powerful and Personalized, Recommendation Engines with Python, Rounak Banik, July 2018

Learning Assessment											
Level	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (10%)		CLA – 3 (20%)		CLA – 4 (10%)#			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember Understand	40%	-	40%	-	40%	-	40%	-	40%	-
Level 2	Apply Analyze	40%	-	40%	-	40%	-	40%	-	40%	-
Level 3	Evaluate Create	20%	-	20%	-	20%	-	20%	-	20%	-
	Total	100 %		100 %		100 %		100 %		100 %	

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers		
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
Mr.G.Muruganandam, Group Project Manager, HCL Technologies, Chennai	Dr.Muthu, Professor, Loyola College, Chennai	*Mrs.M.R.Sudha, SRMIST*
Mr.M. Hemachandar, Tech Lead, Wipro Limited, Chennai	Dr.Vincent, Associate Professor, VIT	