SRI VENKATESWARA COLLEGE OF ENGINEERING

COURSE DELIVERY PLAN - THEORY

Department of Information Technology	LP: IT22601 Rev. No: 00 Date: 20/01/2025
~~B.E~~/B.Tech/~~M.E/M.Tech~~ : Information Technology Regulation:2022 PG Specialisation : NA Sub. Code / Sub. Name : **IT22601 – MACHINE LEARNING TECHNIQUES** **Unit : I**	

UNIT I INTRODUCTION TO MACHINE LEARNING

Definition- Machine learning Process -ML application –types of ML –-Terminologies-basic Concepts in Testing ML- Testing ML algorithms-Design of a Learning system-perspectives and issues of ML-Data Preprocessing Techniques.

Objective: To provide solid understanding of the fundamental concepts and techniques of Machine Learning.

Session No *	Topics to be covered	Ref	Teaching Aids
1.	Definition- Machine learning Process – Data Collection and preparation, Feature selection, algorithm choice, parameter and model selection, training, and evolution.	T2- Ch.1(Pg.10-13)	PPT/BB
2.	ML applications	T2- Ch.1 (Pg.11-12) Internet	PPT/BB
3.	Types of ML – Supervised, Unsupervised, Reinforcement and Evolutionary learning	T2- Ch.4 (Pg.5-10)	PPT/BB Experiential Learning
4.	Terminologies – weight space and curse of dimensionality	T2- Ch.1 (Pg.15-19)	PPT/BB
5.	Basic Concepts in Testing ML- Testing ML algorithms	T2- Ch.1 (Pg.19-25)	PPT/BB
6.	Turning data into probabilities	T1- Ch.1 (Pg.27-32)	PPT/BB
7.	Design of a Learning System	T1- Ch.1 (Pg.5-14)	PPT/BB
8.	Perspectives and issues of ML	T1- Ch.1 (Pg.14-16)	PPT/BB
9.	Data Preprocessing Techniques	Internet	PPT/BB
Content beyond syllabus covered (if any):			

* Session duration: 50 minutes

Sub. Code / Sub. Name: IT22601 – MACHINE LEARNING TECHNIQUES
Unit : II

UNIT II SUPERVISED LEARNING ALGORITHMS 9

Linear Models: Linear, Logistic Regression- LDA – Tree based methods: Decision Trees-, ID3- Random Forest- Instance-Based Methods: KNN. Probabilistic Methods: Naive Bayes Classifier- Standard regularization techniques and Model validation.

Objective: To equip students with the knowledge and skills to apply various supervised learning algorithms.

Session No *	Topics to be covered	Ref	Teaching Aids
10.	Linear Models: Linear Regression	R2-Ch.9(Pg. 117-130)	PPT/BB Problem solving methods
11.	Logistic Regression	R2-Ch.9(Pg. 117-130)	PPT/BB Problem solving methods
12.	Linear Discriminant Analysis LDA	T2- Ch.10 (Pg.223-226)	PPT/BB
13.	Tree based methods: Decision Trees-, ID3 – hypothesis space search, inductive bias, issues in decision tree learning	T1- Ch.3 (Pg.52-78) T2- Ch.6 (Pg.134-143)	PPT/BB
14.	Random Forest	R2-Ch.18(Pg. 255-256)	PPT/BB
15.	Instance-Based Methods: KNN – distance weighted nearest neighbor algorithm	T1- Ch.8 (Pg.230-238)	PPT/BB
16.	Probabilistic Methods: Naive Bayes Classifier	R1-Ch.8 (Pg.380-383)	PPT/BB Problem solving methods
17.	Standard regularization techniques	R2-Ch.13(Pg.171-184)	PPT/BB
18.	Model validation	R2-Ch.11(Pg.144-154)	PPT/BB
Content beyond syllabus covered (if any):			

* Session duration: 50 minutes

Sub. Code / Sub. Name: IT22601 – MACHINE LEARNING TECHNIQUES
Unit : III

UNIT III INTRODUCTION TO BIG DATA ANALYTICS & R PROGRAMMING

Introduction - Clustering Algorithms - K- Means – Hierarchical Clustering - Cluster Analysis – Association Rules –Apriori Algorithm -Dimensionality Reduction –PCA - EM algorithm. Reinforcement Learning – learning Task-Q learning.

Objective: To introduce students to unsupervised learning techniques.

Session No *	Topics to be covered	Ref	Teaching Aids
19.	Introduction	T2- Ch.9 (Pg.196-206)	PPT/BB
20.	Clustering Algorithms - K- Means clustering	T2- Ch.9 (Pg.196-206)	PPT/BB Problem solving methods
21.	Hierarchical Clustering	Internet	PPT/BB
22.	Cluster Analysis	T2- Ch.9 (Pg.204-207)	PPT/BB
23.	Association Rules –Apriori Algorithm	Internet	PPT/BB Problem solving methods
24.	Dimensionality Reduction –PCA – Relation with multilayer perceptron, kernel PCA	T2- Ch.10 (Pg.226-234)	PPT/BB
25.	EM algorithm – estimating means of k Gaussian, General statement and derivation	T1- Ch.8 (Pg.191-199)	PPT/BB
26.	Reinforcement Learning – Learning Task-example	T1- Ch.13 (Pg.367-373) T2- Ch.9 (Pg.293-312)	PPT/BB Activity based assignment
27.	Q learning- Q function, algorithm for learning Q, Experimentation strategies, Convergence, updating sequence.	T1- Ch.1 (Pg.373-388)	PPT/BB
Content beyond syllabus covered (if any):			

* Session duration: 50 mins

Sub. Code / Sub. Name: IT22601 – MACHINE LEARNING TECHNIQUES
Unit : IV

UNIT IV ADDITIONAL LEARNING METHODS

Optimization and Search-Learning set of Rules –Kernel methods-SVM -Hidden Markov Models-RBF. Evolutionary Learning – Genetic Algorithm- Neural Networks –Perceptrons, Back propagation Algorithm- Ensemble Learning Techniques - Bagging and boosting

Objective: To pioneer the concept of reinforcement learning and familiarize students with learning tasks.

Session No *	Topics to be covered	Ref	Teaching Aids
28.	Optimization and Search-Learning set of Rules-first order rules, FOIL, induction as inverted deduction, inverting resolution	T1- Ch.10 (Pg.274-304)	PPT/BB
29.	Kernel methods-SVM – Optimal separation and kernels	T2- Ch.5 (Pg.119-131)	PPT/BB Participatory learning
30.	Hidden Markov Models- Radial Basis function - RBF	T2- Ch.4 (Pg.95-116) T2- Ch.15 (Pg.347-356)	PPT/BB
31.	Evolutionary Learning – Genetic algorithm representation, genetic operators	T2- Ch.12 (Pg.269-290)	PPT/BB
32.	Genetic Algorithm – Introduction, hypothesis space search, genetic programming, models of evolution and learning, parallelizing genetic algorithm.	T1- Ch.9 (Pg.249-270)	PPT/BB
33.	Neural Networks – Perceptron's – Representation, perceptron training rule, gradient descent and delta rule.	T1- Ch.5 (Pg.81-95)	PPT/BB
34.	Backpropagation Algorithm - derivation of backpropagation rule, hypothesis space search, hidden layer representation, generalization, over fitting and stopping criteria	T1- Ch.5 (Pg.95-122)	PPT/BB
35.	Ensemble Learning Techniques - Introduction	T2- Ch.7 (Pg.153-167)	PPT/BB
36.	Bagging and boosting – AdaBoost, stumping, Subagging, different ways to combine classifier	T2- Ch.7 (Pg.153-167)	PPT/BB Participatory learning
Content beyond syllabus covered (if any):			

* Session duration: 50 mins

Sub. Code / Sub. Name: IT22601 – MACHINE LEARNING TECHNIQUES
Unit : V

UNIT V TIME SERIES ANALYSIS

Time series analysis and its components-Forecasting process -Stationary and Non-Stationary Process-Testing methods - DFT, ACF, PACF-Time series analysis techniques - AR, MA ARMA and ARIMA.

Objective: To expose students to advanced learning models and their applications.

Session No *	Topics to be covered	Ref	Teaching Aids
37.	Time series analysis and its components	T3- Ch.1 (Pg.1-18)	PPT/BB
38.	Forecasting process - Problem definition, Data collection, Data analysis, Model selection and fitting, Model validation, Forecasting model deployment, Monitoring forecasting model performance	T3- Ch. 2 (Pg.19-60)	PPT/BB
39.	Stationary and Non-Stationary Process	T3- Ch. 5 (Pg.231-235) T3- Ch. 5 (Pg.256-265)	PPT/BB
40.	Testing methods - DFT	Internet	PPT/BB
41.	Autocorrelation functions - ACF	T3- Ch. 2 (Pg.28-34)	PPT/BB
42.	Partial Autocorrelation function - PACF	T3- Ch. 5 (Pg.248-253)	PPT/BB
43.	Time series analysis techniques – Finite order Autoregressive process AR, finite order Moving average process MA	T3- Ch. 5 (Pg.235-248)	PPT/BB Problem solving methods
44.	Mixed Autoregressive moving average process - ARMA	T3- Ch. 5 (Pg.253-256)	PPT/BB Problem solving methods
45.	Autoregressive Integrated Moving Average (ARIMA) Models - ARIMA.	T3- Ch. 5 (Pg.275-286)	PPT/BB Problem solving methods
Content beyond syllabus covered (if any):			

* Session duration: 50 mins

Sub Code / Sub Name: **IT22601 – MACHINE LEARNING TECHNIQUES**

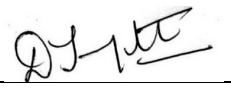
Course Outcome 1: Understand ML and its significance in real-time industry applications.
Course Outcome 2: Design and implement algorithms for an application and analyze the results
Course Outcome 3: Distinguish between, supervised, unsupervised and semi-supervised learning and suggest suitable learning algorithms for any given problem.
Course Outcome 4: Modify existing machine learning algorithms to improve its efficiency.
Course Outcome 5: Demonstrate an understanding of advanced learning models

Text Books:

1. Machine Learning. Tom Mitchell. First Edition, McGraw- Hill, 1997.
2. Stephen Marsland, ―Machine Learning – An Algorithmic Perspective‖, Second Edition, Chapman and Hall/CRC Machine Learning and Pattern Recognition Series, 2014.
3. "Introduction to Time Series Analysis and Forecasting" by Douglas C. Montgomery, Cheryl L. Jennings, and Murat Kulahci,Wiley ,2008

References:

1. Christopher Bishop, ―Pattern Recognition and Machine Learning‖ Springer, 2007.
2. Shalev-Shwartz, S., & Ben-David, S. (2014). "Understanding Machine Learning: From Theory to Algorithms." Cambridge University Press.
3. Kevin P. Murphy, ―Machine learning: A Probabilistic Perspective‖, MIT Press, 2012.

	Prepared by	Approved by
Signature		
Name	Dr. D. Jayanthi Dr. A. Kala	Dr.V.Vidhya
Designation	Associate Professor (IT)	Professor & HOD/IT
Date	20/01/2025	20/01/2025
Remarks *:		

* If the same lesson plan is followed in the subsequent semester/year it should be mentioned and signed by the Faculty and the HOD