UNIT-1: Machine Learning – (14 hours)

UNIT-2: Supervised Learning - (15 hours)

UNIT-3: Unsupervised Learning – (16 hours)

Unit No.	Course Outcome (CO)	Chapters
1-Machine Learning	CO-1	Ch-1-Basics of ML
		Ch-2-Satistical Learning and Exploratory Analysis
		Ch-3 Supervised Learning with Regression and Classification techniques -1:
2- Supervised Learning	CO-2	Ch-4- Supervised Learning with Regression and Classification techniques -1:
3- Unsupervised Learning	CO-3	Ch-5-Unsupervised Learning
		Ch-6- Semi-Supervised Learning

Unit 1 (14 hrs)

Fundamental of Machine Learning: Introduction to Machine Learning (ML), Different types of Machine Learning, Machine Learning Life Cycle: Data Discovery, Exploratory Analysis: Data Preparation, Model Planning, Model Building, Model Evaluation, Real World Case Study. Foundation of ML: ML Techniques.

Statistics Learning and Exploratory Data Analysis: Mean Median, Mode, Correlation, Covariance, Quartile, Maximum Likelihood, Bayesian Inference, Bias, Variance, Distance metrics: Euclidean Distance, Manhattan Distance, Gaussian (or Normal) Distributions, statistical hypothesis testing. Missing Value treatment, Outlier Detection, Feature Engineering, Graphs and Plots.

Supervised Learning with Regression and Classification techniques -1: Linear Regression, Multiple Regression, Bias-Variance Dichotomy, Model Validation Approaches, Evaluation of the performance of an algorithm: Mean Squared Error, Root Mean Squared Error.

Unit 2 (15 hrs)

Supervised Learning with Regression and Classification techniques -2:

Logistic Regression and Support Vector Machine (SVM), Naive Bayesian Classifier, K-Nearest Neighbor (KNN), Cross-Validation, Confusion Matrix. Evaluation of the performance of an algorithm: Accuracy, Error Rate, Precision, Recall, Specificity, F1 Score. Decision Tree: Picking the best splitting attribute: entropy and information gain, overfitting and underfitting, noisy data and pruning. Ensemble Methods: Random Forest,

Unit 3 (16 hrs)

Unsupervised Learning: Clustering, Partitioning Method - K-means, K-medoids, Hierarchical Clustering- Agglomerative and divisive clustering, Evaluation of clustering algorithms. Principal Component Analysis (Eigen values, Eigen Vectors, Orthogonality). Association Rules: Association Rule mining: Apriori Algorithm, Support and Confidence Parameters Lift and Leverage. Feature Reduction and Dimensionality Reduction.

Semi-Supervised Learning: Introduction, Assumptions, Working and Real-World Applications. Reinforcement Learning: Introduction, Applications and Examples, Challenges of applying reinforcement learning, reinforcement learning algorithm.

Dichotomy, Model Validation Approaches, Evaluation of the performance of an algorithm: Mean Squared Error, Root Mean Squared Error.

$$RMS = \sqrt{\frac{\Sigma(O_i - A_i)^2}{n}}$$

Unit 2   (15 hrs)

Supervised Learning with Regression and Classification techniques -2:
   Logistic Regression and Support Vector Machine (SVM), Naive Bayesian Classifier, K-Nearest Neighbor (KNN), Cross-Validation, Confusion Matrix. Evaluation of the performance of an algorithm: Accuracy, Error Rate, Precision, Recall, Specificity, F1 Score. Decision Tree: Picking the best splitting attribute: entropy and information gain, overfitting and underfitting, noisy data and pruning. Ensemble Methods: Random Forest,

Unit 3   (16 hrs)

Unsupervised Learning: Clustering, Partitioning Method - K-means, K-medoids, Hierarchical Clustering- Agglomerative and divisive clustering, Evaluation of clustering algorithms. Principal Component Analysis (Eigen values, Eigen Vectors, Orthogonality). Association
Rules: Association Rule mining: Apriori Algorithm, Support and Confidence Parameters Lift and Leverage. Feature Reduction and Dimensionality Reduction.

Semi-Supervised Learning: Introduction, Assumptions, Working and Real-World Applications. Reinforcement

Learning: Introduction, Applications and Examples, Challenges of applying reinforcement learning, reinforcement learning algorithm.