

III B.Tech I Semester

23 A39501 Applied

23A32501T	INTRODUCTION TO MACHINE LEARNING (Professional Core)	L	T	P	C
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COURSE OBJECTIVES:

- To introduce the fundamental concepts of machine learning algorithms and their practical relevance.
- To explore supervised, unsupervised, semi-supervised, and reinforcement learning techniques.
- To equip students with algorithmic and mathematical intuition behind ML models.
- To train students in using tools and frameworks for implementing ML models.
- To enable application of ML algorithms to solve real-world problems in various domains.

COURSE OUTCOMES:

After successful completion of the course, students will be able to:

1. Understand the concepts and types of machine learning algorithms.
2. Design and implement suitable machine learning algorithms for classification, regression, and clustering.
3. Evaluate model performance and perform model tuning.
4. Apply ML algorithms in real-life domains such as NLP, finance, and healthcare.
5. Utilize tools like Scikit-learn, TensorFlow, and PyTorch for practical ML solutions.

UNIT I: Fundamentals of Machine Learning

Introduction to Machine Learning: Definitions, Scope, and Applications, Types of Machine Learning: Supervised, Unsupervised, Semi-Supervised, Reinforcement, Key Concepts: Features, Labels, Training vs Testing Data, Data Splitting, Data Preprocessing: Cleaning, Feature Engineering, Feature Scaling, Over fitting, Under fitting, and Bias-Variance Trade-off, ML Pipeline & Cross-validation Techniques.

UNIT II: Supervised Learning Algorithms

Linear Regression and Ridge/Lasso Regularization, Logistic Regression and its Application in Classification, Decision Trees and Random Forests, Support Vector Machines (SVMs), k-Nearest Neighbors (k-NN), Model Evaluation: Confusion Matrix, Precision, Recall, F1, AUC.

UNIT III: Unsupervised and Ensemble Methods

Clustering Algorithms: k-Means, DBSCAN, Agglomerative, Dimensionality Reduction: PCA, t-SNE, Association Rule Mining: Apriori and FP-Growth, Ensemble Techniques: Bagging, Boosting, and Stacking, Gradient Boosting, AdaBoost, and XGBoost, Evaluation of Unsupervised Models and Visualization.

UNIT IV: Advanced Learning Paradigms

Reinforcement Learning: Markov Decision Process, Q-Learning, Semi-Supervised Learning Techniques, Introduction to Deep Learning: Perceptrons, MLP, Feature Selection & Feature Importance Methods, Model Tuning: Hyperparameter Optimization using Grid Search/Random Search, Explainable AI (XAI) and Model Interpretability Tools.

UNIT V: Applications of Machine Learning

Machine Learning in Healthcare and Diagnostics, Financial Modeling and Fraud Detection, NLP Applications: Text Classification and Sentiment Analysis, Recommender Systems: Collaborative & Content-Based Filtering, Image Classification using Pre-trained Models, Deployment of ML Models using Flask, Streamlit.

TEXTBOOKS:

1. Aurélien Géron, Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow, O'Reilly.
2. Ethem Alpaydin, Introduction to Machine Learning, MIT Press.
3. Tom Mitchell, Machine Learning, McGraw-Hill Education.

REFERENCE BOOKS:

1. Kevin Murphy, Machine Learning: A Probabilistic Perspective, MIT Press.
2. Trevor Hastie, Robert Tibshirani, Jerome Friedman, The Elements of Statistical Learning, Springer.
3. Peter Flach, Machine Learning: The Art and Science of Algorithms, Cambridge University Press.
4. François Chollet, Deep Learning with Python, Manning Publications.