**Machine Learning Course Contents**

**Beginner Level**

* Introduction to Machine Learning
* Definition and Concepts
* Types of Machine Learning: Supervised, Unsupervised, Reinforcement Learning
* Applications of Machine Learning
* Basic Terminologies

**Python for Machine Learning**

* Introduction to Python
* Essential Libraries: NumPy, Pandas, Matplotlib, Scikit-learn
* Data Types and Structures
* Basic Programming Concepts

**Data Preprocessing**

* Data Cleaning
* Handling Missing Values
* Removing Duplicates
* Outlier Detection / Removal
* Data Transformation
* Normalization and Standardization
* Encoding Categorical Variables
* Data Splitting
* Train/Test Split
* Cross-Validation

**Exploratory Data Analysis (EDA)**

* Data Visualization Techniques
* Histograms, Boxplots, Scatterplots
* Descriptive Statistics
* Mean, Median, Mode, Standard Deviation
* Correlation Analysis

**Supervised Learning Algorithms**

Regression Algorithms

* Linear Regression
* Polynomial Regression

Classification Algorithms

* Logistic Regression
* k-Nearest Neighbors (k-NN)
* Decision Trees
* Support Vector Machines (SVM)

**Model Evaluation**

Metrics for Regression

* Mean Absolute Error (MAE), Mean Squared Error (MSE), R-squared

Metrics for Classification

* Accuracy, Precision, Recall, F1 Score, ROC-AUC

**Model Validation Techniques**

* Cross-Validation
* Confusion Matrix

**Intermediate Level**

**Advanced Data Preprocessing and Feature Engineering**

Handling Imbalanced Datasets

* Oversampling and Undersampling
* SMOTE

Feature Selection Techniques

* Filter Methods: Chi-Square, ANOVA
* Wrapper Methods: Recursive Feature Elimination
* Embedded Methods: LASSO

Feature Extraction Techniques

* Principal Component Analysis (PCA)
* Linear Discriminant Analysis (LDA)

**Advanced Supervised Learning**

* Ensemble Methods
* Random Forest
* Gradient Boosting Machines (GBM)
* XGBoost, LightGBM, CatBoost
* Neural Networks Basics
* Perceptron and Multilayer Perceptrons
* Backpropagation Algorithm