PYTHON SYLLABUS

Python Fundamentals (8 hours)

1. Introduction to Python (1 hour)
    - Basics of Python syntax
    - Variables and data types
    - Basic operations
2. Control Flow and Loops (1 hour)
    - Conditional statements (if, elif, else)
    - Loops (for, while)
    - Control flow structures
3. Functions and Modules (1 hour)
    - Defining functions
    - Passing arguments
    - Returning values
    - Importing modules
4. Data Structures (2 hours)
    - Lists, tuples, and sets
    - Dictionaries
    - List comprehensions
    - String manipulation
5. File Handling (1 hour)
    - Reading and writing files
    - File modes
    - CSV and JSON manipulation

6. Exception Handling (1 hour)
    - Handling errors with try-except blocks
    - Raising exceptions

Machine Learning Fundamentals (8 hours)

1. Introduction to Machine Learning (1 hour)
    - Definition and types of Machine Learning
    - Supervised, Unsupervised, and Reinforcement Learning
2. Regression (2 hours)
    - Linear regression
    - Polynomial regression
    - Regularization techniques (Ridge, Lasso)
3. Classification (2 hours)
    - Logistic regression
    - Decision trees
    - Support Vector Machines
4. Clustering (1 hour)
    - K-means clustering
    - Hierarchical clustering
5. Dimensionality Reduction (1 hour)
    - Principal Component Analysis (PCA)
    - t-Distributed Stochastic Neighbor Embedding (t-SNE)
6. Model Evaluation and Validation (1 hour)
    - Cross-validation
    - Evaluation metrics (accuracy, precision, recall, F1-score)
    - Overfitting and underfitting

Python Libraries for Data Science (8 hours)

1. Introduction to NumPy (2 hours)
    - Arrays and matrices
    - Array operations
    - Indexing and slicing
2. Introduction to Pandas (3 hours)
    - Series and DataFrames
    - Data manipulation and cleaning
    - Grouping and aggregating data
3. Data Visualization with Matplotlib and Seaborn (3 hours)
    - Basic plots (line, scatter, bar)
    - Customizing plots
    - Seaborn for statistical visualization

Statistics for Data Science (4 hours)

1. Descriptive Statistics (1 hour)
    - Measures of central tendency (mean, median, mode)
    - Measures of dispersion (range, variance, standard deviation)
    - Percentiles and quartiles
2. Probability Distributions (1 hour)
    - Discrete and continuous distributions
    - Normal distribution
    - Binomial and Poisson distributions
3. Inferential Statistics (1 hour)
    - Hypothesis testing
    - Confidence intervals

- p-values

4. Correlation and Regression (1 hour)
    - Correlation analysis
    - Simple and multiple regression
    - Assumptions of linear regression

Advanced Machine Learning (4 hours)

1. Ensemble Learning (1 hour)
    - Bagging and boosting
    - Random forests
    - Gradient boosting
2. Neural Networks (2 hours)
    - Introduction to artificial neural networks
    - Deep learning frameworks (TensorFlow, PyTorch)
    - Building and training neural networks
3. Hyperparameter Tuning (1 hour)
    - Grid search
    - Random search
    - Bayesian optimization