1. Python Basics

- **Python HOME**
- **Python Introduction**
- **Python Get Started**
- **Python Syntax**
- **Python Comments**
- **Python Variables**
- **Python Data Types**
- **Python Numbers**
- **Python Casting**
- **Python Strings**
- **Python Booleans**
- **Python Operators**

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2. Python Data Structures

- **Python Lists**
- **Python Tuples**
- **Python Sets**
- **Python Dictionaries**

- **Python Arrays**

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3. Python Control Flow

- **Python If...Else**
- **Python Match**
- **Python While Loops**
- **Python For Loops**

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4. Python Functions

- **Python Functions**
- **Python Lambda**
- **Python Scope**

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5. Object-Oriented Programming (OOP)

- **Python OOP**
- **Python Classes/Objects**
- **Python Inheritance**
- **Python Iterators**
- **Python Polymorphism**

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6. Modules & Package Management

- **Python Modules**
- **Python PIP**
- **Python VirtualEnv**

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7. Python Advanced Topics

- **Python Dates**
- **Python Math**
- **Python JSON**
- **Python RegEx**

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8. File Handling

- **File Handling (Overview)**
- **Python File Handling**
- **Python Read Files**
- **Python Write/Create Files**
- **Python Delete Files**

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9. Error & Exception Handling

- **Python Try...Except**

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10. String Operations & User Interaction

- **Python String Formatting**
- **Python User Input**

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11. Python Libraries & Frameworks

- **NumPy Tutorial**
- **Pandas Tutorial**

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12. Data Science & Machine Learning with Python

12.1 Introduction to Data Science

- What is Data Science?
- Applications of Data Science
- Data Science Workflow

12.2 Data Types and Data Structures

- Structured vs. Unstructured Data

- Numerical, Categorical, Text, Image, Time-series Data
- Arrays, DataFrames, and Matrices

12.3 Exploratory Data Analysis (EDA)

- Data Cleaning & Preprocessing
- Handling Missing Values
- Outlier Detection
- Data Summarization

12.4 Data Visualization

- Basic Plots (line, bar, histogram, scatter)
- Heatmaps, Pairplots, Boxplots
- Advanced Visualizations

12.5 Statistical Concepts and Summary Statistics

- Mean, Median, Mode
- Variance & Standard Deviation
- Probability Distributions
- Correlation & Covariance

12.6 Fundamentals of Machine Learning

- What is Machine Learning?

- Steps in ML Workflow

12.7 Supervised Learning

- Regression (Linear, Polynomial, Regularization)
- Classification (Logistic Regression, Decision Trees, SVM, k-NN)

12.8 Unsupervised Learning

- Clustering (k-means, Hierarchical, DBSCAN)
- Dimensionality Reduction (PCA, t-SNE)

12.9 Evaluation Metrics & Model Validation

- Confusion Matrix, Accuracy, Precision, Recall, F1-score
- ROC Curve, AUC
- Cross-validation techniques

12.10 Feature Engineering & Selection

- Feature Scaling (Normalization, Standardization)
- Encoding Categorical Variables
- Feature Importance & Dimensionality Reduction

12.11 Python Libraries for DS & ML

- **NumPy** – Numerical Computing
- **Pandas** – Data Manipulation & Analysis

- **Scikit-learn** – ML Algorithms & Model Building
- **Matplotlib & Seaborn** – Data Visualization

📌 Additional Resources for Learning Python

- roadmap.sh Python Developer Roadmap — A structured roadmap for modern Python developers.
- W3Schools Python Comments Tutorial — Useful for quickly learning about Python comments.
