Course Name:
Python and Machine Learning – Intensive Bootcamp with Project Implementation
Duration: 9 Days (6 Hours/Day)

Tools Used
- Jupyter Notebook
- Pandas, NumPy, Matplotlib, Seaborn
- Scikit-learn
- Optional: PyCharm/VS Code, TensorFlow/Keras (for advanced image tasks)

Day I – Essential Python for Machine Learning
Topics:
- Introduction to Python
- Python Syntax and Structure
- Variables, Data Types, Type Conversion
- Arithmetic, Relational, Logical Operators
- Data Structures: Lists, Tuples, Dictionaries, Sets
- Loops and Conditional Statements
- Functions: Defining, Calling, Arguments, Return Values
- Introduction to Machine Learning & Real-world Applications

Hands-on:
- Write scripts to manipulate data using dictionaries and functions
- Practice loop-based filtering on sample lists
- Discuss common ML applications: recommendation systems, fraud detection, disease prediction
  [Python for ML](#)

Day II – Python Libraries for Data Handling & Visualization
Topics:
- **NumPy: Arrays, Indexing, Slicing, Basic Ops**
- **Pandas:** Series, DataFrames, CSV handling, GroupBy, Filtering
- **Matplotlib:** Line, Bar, Histogram, Pie
- **Seaborn:** Pairplot, Heatmap, Countplot, Boxplot

Hands-on:
- Visualize sales/COVID/startup data
- Perform group-based summarization using Pandas [Python Libraries for ML](#)

Day III – A: Data Preprocessing in Python
Topics:
- Importance of Preprocessing in ML Pipelines
- Handling Missing Data
- Encoding Categorical Variables (Label, One-hot)
- Importing and organizing NumPy, Pandas, Matplotlib for use in ML workflows

Hands-on:
- Preprocess dataset with missing entries and categorical columns [Data Preprocessing](#)

Day III – B: Simple Linear Regression
Topics:
- Building a Simple Linear Regression Model using Scikit-learn
- Using .fit()and .predict()methods
- Visualizing Regression Line
- Evaluating Model Performance: R^2, MSE

Hands-on:
- Predict salary or house prices using linear regression [Linear regression](#)

Day IV – Polynomial Regression
Topics:
- When and Why to Use Polynomial Regression
- Building Polynomial Features using PolynomialFeatures
- Model Training and Evaluation

Hands-on:
- Salary prediction using both Linear and Polynomial Regression
- Visualize model curves and compare performance

[Polynomial Regression](#)

Day V – A: Support Vector Regression (SVR)
Topics:
- Understanding SVR and Linear SVM Limitations
- Implementing SVR in Scikit-learn
- Choosing Kernel Functions
- Model Evaluation on Test Set

Hands-on:
- Use SVR for predicting salaries with non-linear trends [Support Vector Machine](#)
- Comparing Linear vs Polynomial Regression Performance

Days 6–9: Project-Based Learning (Capstone Focus)

Project 1 (Days 6–7): Indian Startup Funding Analysis
Goal: Analyze India's startup funding ecosystem and extract actionable business insights.
Dataset:

Tasks:
- Clean & preprocess funding data (dates, nulls, formats)
- Analyze:
    - Funding trends over time
    - Top sectors, cities, startups
    - Active investors
    - Investment type distributions
- Visualize using Seaborn & Matplotlib
- Write recommendations for investors/startup founders [Analysis Project](#)

Project 2 (Days 8–9): Plant Disease Detection Using Leaf Images
Goal: Build an ML model to classify plant leaf diseases.
- **Dataset: [PlantVillage Dataset – Kaggle](#)**

Tasks:
- Preprocess image data (resize, scale, label encode)
- Use traditional ML (color histograms + classifiers) or CNN (for advanced learners)
- Train model (Logistic Regression / SVM / CNN)
- Evaluate using Accuracy, Confusion Matrix
- Suggest use case for smart farming [Plant disease detection project](#)