

PLURAL LABS

Data Science, Machine Learning, AI & Generative AI Master Course

Mode: Live instructor-led course

Level: Beginner to job-ready

Target Students: Freshers, working professionals, software developers, data analyst aspirants, and AI/ML career switchers.

About the course : This live course takes students from Python fundamentals to real-world Data Science, Machine Learning, Deep Learning basics, and Generative AI applications. Students will learn Python, SQL, statistics, data analysis, machine learning, model deployment, LLMs, prompt engineering, embeddings, vector databases, and RAG. By the end of the course, students will build practical projects including ML prediction systems, AI document chatbots, and deployed AI applications.

Course Duration

3 Months

Goal

By the end of this course, students will be able to:

Understand Python programming, work with real datasets, write SQL queries, perform **data analysis**, create visualizations, **build machine learning models**, **understand deep learning** basics, **build GenAI applications** using LLMs, **create RAG-based document chatbots**, **deploy ML/AI models**, and **prepare for Data Analyst, Data Scientist, ML Engineer, and GenAI Developer roles**.

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Complete Course Breakdown

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Module 1: Python Programming for Data Science | Week 1

This module starts from the basics and prepares students to write Python code confidently for data analysis and machine learning.

Topics Covered

Introduction to Python, Variables and data types, Operators, Conditional statements, Loops, Functions, Data structures, String handling, File handling, Exception handling, Modules and packages, Object-oriented programming, Python coding practice

Mini Assignment

Build a small **Student Performance Tracker** or **Basic Quick commerce** using Python.

Job Roles Students Can Start Exploring

Python Engineer
Python Developer

Module 2: SQL for Data Analytics and Data Science | Week 2

SQL is one of the most important skills for Data Analysts, Data Scientists, and ML professionals. In this module, students will learn how to work with structured data, write practical queries, analyze business data, and prepare datasets for analytics and machine learning.

Topics Covered

- SQL fundamentals and database basics
- Tables, rows, columns, keys, and constraints
- Data filtering, sorting, and aggregation
- Joins and relationships between tables
- String, date, and conditional functions
- Subqueries, CTEs, and views
- Window functions for analytics
- Data import and export
- SQL with Python connectivity
- Business analysis using SQL

- SQL interview practice

Job Roles Students Can Start Exploring

Data Analyst

SQL Analyst

Reporting Analyst

Business Analyst with SQL

Module 3: Data Analytics with Python | Week 3

In this module we will discuss how to use Python libraries to clean, analyze, and prepare real-world data for analytics and machine learning. Students will work with datasets, handle missing values, transform data, and create useful features for analysis.

Topics Covered

- NumPy fundamentals for numerical operations
- pandas for data analysis
- Reading data from CSV, JSON, and SQL sources
- Data inspection and understanding datasets
- Data cleaning: missing values, duplicates, and data types
- Outlier detection and treatment
- Data transformation and feature creation
- Combining and merging datasets
- Encoding and scaling data for ML
- Preparing datasets for machine learning

Mini Project

Developer Trends and AI Adoption Analysis.

Students will analyze a real-world dataset, clean the data, find useful patterns, and present insights using Python.

Module 4: Exploratory Data Analysis and Visualization | Week 4

The purpose of **Module 4: Exploratory Data Analysis and Visualization** is to help students understand datasets, identify patterns, detect issues, and generate meaningful insights before building models. It teaches students how to use charts, statistics, and visual storytelling to explain data clearly for business and Machine Learning decisions.

Topics Covered

- Introduction to Exploratory Data Analysis
- Understanding data patterns and relationships
- Missing value and outlier analysis
- Correlation and group-based analysis
- Business insight generation from data
- Data visualization using Matplotlib and Seaborn
- Interactive visualization using Plotly
- Dashboard-style reporting and storytelling

Job Roles Students Can Start Exploring after Module 3 and 4

Data Analyst, Business Analyst

Module 5: Business Statistics, Probability and ML Mathematics | Week 5

This module helps students build the essential mathematical and statistical foundation needed for Data Analytics, Machine Learning, and business decision-making.

Topics Covered

- Types of data, descriptive statistics, inferential statistics
- Sampling techniques and population vs sample
- Mean, median, mode, variance, standard deviation, IQR
- Probability, conditional probability, Bayes theorem
- Distributions: uniform, binomial, poisson, normal
- Z-score, skewness, kurtosis
- Covariance and correlation
- Hypothesis testing, p-value, t-test, z-test, chi-square, ANOVA
- Linear algebra and gradient descent intuition
- Practical statistics using Python

Module 6: Machine Learning Fundamentals | Week 6-7

This module introduces students to the core concepts of Machine Learning and teaches them how to build predictive models from data. Students will understand the difference between AI, ML, Deep Learning, and GenAI, learn supervised and unsupervised learning, explore the complete ML workflow, and build models using algorithms such as Linear Regression, Logistic Regression, KNN, Decision Tree, Random Forest, Naive Bayes, SVM, K-Means, and PCA. The module also covers model evaluation using regression and classification metrics, cross-validation, and key concepts like bias, variance, underfitting, and overfitting.

Topics Covered

Machine Learning Foundations

Students will learn what Machine Learning is, how it differs from AI, Deep Learning, and Generative AI, and how ML systems are trained using data.

Types of Machine Learning

The module covers supervised learning for prediction tasks and unsupervised learning for discovering hidden patterns in data.

ML Workflow

Students will understand the complete ML process, including data preparation, training, testing, evaluation, and model improvement.

Core Machine Learning Algorithms

Students will learn practical ML algorithms such as Linear Regression, Logistic Regression, KNN, Decision Tree, Random Forest, Naive Bayes, Support Vector Machine, K-Means Clustering, and PCA.

Model Performance and Evaluation

Students will learn how to evaluate models using accuracy, precision, recall, F1-score, confusion matrix, ROC-AUC, MAE, MSE, RMSE, R^2 , and cross-validation.

Model Improvement Concepts

Students will understand bias, variance, underfitting, overfitting, and how to make models more reliable.

Practical Learning

Students will build machine learning models on real datasets, compare multiple algorithms, evaluate model performance, and understand which model works best for different business problems.

Job Roles After This Module

Data Scientist, Machine Learning Engineer, Data Analyst with ML skills.

Module 7: Advanced Machine Learning and Model Optimization | Week 8

This module helps students move beyond basic machine learning and understand how real-world ML models are improved, optimized, and compared. Students will learn advanced algorithms, model tuning techniques, feature selection, handling imbalanced data, and explainability concepts used in practical ML projects.

Topics Covered

Advanced ML Algorithms

Students will learn ensemble learning techniques such as bagging, boosting, Gradient Boosting, XGBoost, LightGBM, and CatBoost.

Model Optimization

Students will understand how to improve model performance using hyperparameter tuning techniques like GridSearchCV and RandomizedSearchCV.

Production-Style ML Workflow

Students will learn how ML pipelines help organize preprocessing, training, testing, and model evaluation in a clean and reusable way.

Handling Real-World Data Challenges

The module covers imbalanced data handling, feature selection, error analysis, and model comparison.

Model Explainability

Students will get an introduction to explainability tools such as SHAP and LIME to understand why a model makes certain predictions.

Practical Learning

Students will compare multiple ML models, tune model performance, handle real-world dataset challenges, and select the best model based on business and technical requirements.

Job Roles After This Module

Data Scientist, Machine Learning Engineer, AI/ML Intern, Risk Analytics Trainee, Fraud Analyst.

Module 8: Time Series Forecasting | Week 9

This module introduces students to forecasting techniques used in sales, finance, demand planning, operations, and business analytics. Students will learn how to analyze date-based data, identify trends and patterns, build forecasting models, and explain forecast results in a business-friendly way.

Topics Covered

Time Series Fundamentals

Students will understand what time series data is and how it is different from regular datasets.

Patterns in Time Series Data

The module covers trend, seasonality, noise, and moving averages to understand how data changes over time.

Forecasting Techniques

Students will learn the intuition behind ARIMA, Prophet, and machine learning-based forecasting methods.

Forecast Evaluation

Students will learn how to evaluate forecasting models using metrics such as MAPE and RMSE.

Business Interpretation

Students will learn how to explain forecast results clearly for business decisions such as sales planning, demand prediction, and financial forecasting.

Practical Learning

Students will work with real date-based datasets, identify patterns, build forecasting models, evaluate predictions, and explain the results from a business perspective.

Job Roles After This Module

Forecasting Analyst, Business Analyst, Data Scientist, Supply Chain Analytics Trainee.

Module 9: Deep Learning Fundamentals | Week 10

The purpose of **Module 9: Deep Learning Fundamentals** is to help students understand how neural networks learn patterns from data and why deep learning is important in modern AI systems.

It gives students a strong foundation in neurons, activation functions, backpropagation, optimizers, and model training before moving into Generative AI and LLMs.

Topics Covered

Deep Learning Basics

Students will learn what Deep Learning is, how it is related to Machine Learning, and why neural networks are important in AI.

Neural Network Foundations

The module covers artificial neurons, perceptrons, activation functions, forward propagation, loss functions, and the basic training process.

Learning and Optimization

Students will understand how neural networks improve using backpropagation, optimizers such as SGD and Adam, epochs, and batches.

Model Training Challenges

Students will learn about overfitting in neural networks and techniques such as dropout and early stopping to improve model performance.

Deep Learning Tools

Students will get practical exposure to TensorFlow/Keras and an introductory understanding of PyTorch.

Neural Network Project

Students will build a basic neural network project for prediction or classification using a tabular dataset.

Practical Learning

Students will build and train a simple neural network, evaluate its performance, understand training behavior, and learn how Deep Learning models are applied in real-world AI problems.

Job Roles After This Module

AI Engineer, Deep Learning Intern, Machine Learning Engineer, Data Scientist with Deep Learning basics.

Module 10: Generative AI, LLMs, Prompt Engineering, and RAG | Week 11

The purpose of **Module 10: Generative AI, LLMs, Prompt Engineering, and RAG** is to help students understand how modern AI applications like chatbots, document assistants, and AI copilots are built using LLMs.

It teaches prompt engineering, embeddings, vector databases, and RAG so students can build practical GenAI applications that use real business or document data.

Topics Covered

Generative AI Foundations

Students will learn what Generative AI is and how it is used to generate text, images, code, audio, and intelligent responses.

Large Language Models

The module covers LLM basics, tokens, tokenization, context window, temperature, and model parameters.

Prompt Engineering

Students will learn how to write effective prompts using zero-shot prompting, few-shot prompting, role-based prompting, and structured prompting.

Embeddings and Semantic Search

Students will understand how text is converted into vectors and how semantic similarity is used to find meaning-based matches.

Vector Databases and RAG

The module covers vector databases such as Chroma, FAISS, and Pinecone, along with chunking, retrieval, and RAG architecture.

Building AI Applications

Students will learn how to build PDF/document chatbots using private documents and integrate LLM APIs such as OpenAI, Gemini, or Claude-style APIs.

LangChain, LlamaIndex, and Tool Calling

Students will get practical exposure to LangChain basics, LlamaIndex basics, and tool/function calling for connecting LLMs with external APIs.

AI Agents and Responsible AI

The module introduces AI agents, hallucination, guardrails, responsible AI, and GenAI evaluation methods.

Practical Learning

Students will build practical GenAI applications such as document chatbots, RAG-based assistants, and LLM-powered tools using real-world documents and APIs.

Job Roles After This Module

GenAI Developer, AI Engineer, LLM Application Developer, RAG Developer, Prompt Engineer, Data Scientist with GenAI skills.

Module 11: ML Project Deployment with Flask, AWS & MLOps Basics | Week 12

This module teaches students how to move from notebook-based machine learning to a real deployable application. Students will build a Breast Cancer Prediction model, create a Flask web application, connect the trained model with the app, and deploy it on AWS.

Topics Covered

Deployment Basics
Introduction to Flask
Flask Basic App
Model Building (Breast Cancer Prediction)
Flask App (Breast Cancer Prediction)
AWS
AWS Deployment

Module 12: Deep Learning Project - (Solar Panel Defect Classification)

This module helps students convert learning into job preparation.

Introduction to the Project, Data Understanding, Architecture Diagram, Running the base CNN2d model

Base CNN2d model — 10 epochs,

Base CNN2d model — 20 epochs,

Hit & Trial #1, Hit & Trial #2, Hit & Trial #3,

Transfer Learning — MobileNetV2,

Transfer Learning — MobileNetV2 — 20 epochs,

Transfer Learning — MobileNetV2 — 20 epochs output,

Transfer Learning — EfficientNetB0,

Transfer Learning — EfficientNetB0 — Hyperparameter Optimization,

Transfer Learning — EfficientNetB0 — HPO Results,

Convert to Streamlit App,

Streamlit Code Walkthrough,

Deployment on AWS EC2

Module 13: Generative AI Projects

Project 1: Chat Scholar — EdTech AI Assistant

Project 2: Resume AI Nova — AI Resume Analyzer and Career Assistant

Project 3: PDF RAG Chatbot using Web Scraped Data

Project 4: Text-to-SQL Chatbot

Module 14 : Interview Prep

ML Interview Prep

DL Interview Prep

Gen AI Interview Prep

Job Roles Students Can Apply For After Course

Job Role	Skills From Course
Data Analyst	Python, SQL, EDA, visualization
Business Analyst	SQL, statistics, visualization
Data Scientist	Python, statistics, ML
Machine Learning Intern	ML models, evaluation, tuning
ML Engineer	ML, APIs, deployment
AI Engineer	ML, DL basics, GenAI
GenAI Developer	LLMs, prompts, embeddings, RAG
RAG Developer	vector DB, chunking, retrieval, LLM integration
Prompt Engineer	prompt design, structured output, evaluation
Data Scientist with GenAI Skills	ML + GenAI + analytics

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