Professional AI–ML Engineering Program (6 Months / 26 Weeks)
Offered by: Alpha IT Managed Services
Plot 15C, IT Park, Sector 67, Mohali (Punjab)

Module 1: Python Foundations for AI–ML Engineering (Weeks 1–4)

Week 1: Python Basics & Environment Setup
- Role of Python in AI–ML Engineering
- Setting up Anaconda, virtual environments
- Data types, variables, operators
- Conditional logic & basic programming
- Intro tasks on ML-friendly CSV files

Week 2: Data Structures & Functions
- Lists, tuples, sets, dictionaries
- Loops & iterations for preprocessing
- Functions, lambda, map, filter
- Error & file handling
- Small cleaning tasks on AI datasets

Week 3: NumPy for Numerical Computing
- Ndarrays & indexing
- Vectorization & broadcasting
- Matrix operations for ML
- Data transformations
- Hands-on with ML datasets

Week 4: Pandas for ML Data Processing
- DataFrames, joins, merges
- Cleaning & preprocessing
- GroupBy, aggregations
- EDA foundations
- Mini ML preprocessing project

Module 2: SQL for ML Data Pipelines (Weeks 5–6)

Week 5: SQL Foundations
- MySQL installation & setup
- CRUD operations
- Filtering, ordering, limiting
- Joins for ML datasets
- Python–MySQL data pipeline

Week 6: Advanced SQL for ML
- Subqueries, views
- Stored routines
- Indexing basics
- Exporting query outputs
- Mini ETL pipeline project

Module 3: EDA for Machine Learning (Weeks 7–8)

Week 7: Exploratory Analysis for ML

- Summary statistics
- Outlier detection
- Missing value treatment
- Correlation & feature behavior
- EDA case study

Week 8: ML Visualization

- Matplotlib & Seaborn
- Visual insights for ML
- Categorical vs. numerical analysis
- Heatmaps for correlation
- EDA storytelling project

Module 4: Core Machine Learning Engineering (Weeks 9–14)

Week 9: ML Workflow & Preprocessing

- ML lifecycle (industry)
- Splits & validation strategies
- Scaling & encoding
- Imbalance handling (SMOTE)
- Preprocessing pipeline

Week 10: Regression Models

- Linear & polynomial regression
- Cost function & gradient descent
- Regularization (Ridge, Lasso)
- Performance metrics
- Regression project

Week 11: Classification Models

- Logistic regression
- KNN, Naive Bayes
- Decision Trees
- Metrics: F1, ROC-AUC
- Churn prediction project

Week 12: Ensemble Learning

- Bagging & boosting
- XGBoost & LightGBM
- CatBoost
- Hyperparameter tuning
- Model improvement case study

Week 13: Unsupervised Learning

- K-Means & Hierarchical clustering
- Dimensionality reduction (PCA)
- Anomaly detection

- Silhouette score
- Segmentation project

Week 14: Feature Engineering
- Encoding techniques
- Feature selection
- Pipeline automation
- Model interpretability (SHAP)
- Mini ML pipeline project

Module 5: Deep Learning Engineering (Weeks 15–20)

Week 15: Artificial Neural Networks (ANN)
- ANN architecture
- Activation functions
- Forward & backward propagation
- Optimizers & losses
- ANN classification project

Week 16: CNN for Computer Vision
- Convolution & filters
- Pooling & feature extraction
- CNN model building
- Transfer learning
- Image classification project

Week 17: LSTM for Sequence Modeling
- RNN foundations
- LSTM gates
- Text preprocessing
- Sequence modeling
- Sentiment analysis project

Week 18: Advanced NLP with Deep Learning
- Word embeddings
- BiLSTM models
- Attention mechanism
- Text classification
- Text generation project

Week 19: Transformers & Modern NLP
- Self-attention mechanism
- Transformer encoder–decoder
- BERT architecture
- Fine-tuning for NLP
- News classifier project

Week 20: Autoencoders & GANs
- Autoencoder architecture
- VAE concepts
- GAN generator & discriminator
- Image synthesis pipeline

- Mini GAN project

Module 6: Reinforcement Learning & MLOps (Weeks 21–23)

Week 21: Reinforcement Learning
- Agent–environment interaction
- States, actions, rewards
- Q-learning fundamentals
- Policies: ε-greedy strategy
- RL simulation project

Week 22: MLOps Foundations
- ML production lifecycle
- Model versioning (DVC/Git)
- CI/CD basics
- Monitoring ML models
- Model packaging (pickle, joblib)

Week 23: Deployment Engineering
- Streamlit application
- Flask REST API
- Cloud deployment (AWS/GCP)
- Docker container basics
- End-to-end deployment project

Module 7: Capstone Projects & AI Career Preparation (Weeks 24–26)

Week 24: ML Capstone Project
- Domain understanding
- EDA & feature design
- Model experimentation
- Business metric linkage
- Presentation drafting

Week 25: Deep Learning Capstone Project
- Choosing DL architecture
- Model training & tuning
- Explainability (Grad-CAM, SHAP)
- Deployment readiness
- Documentation

Week 26: Portfolio & Career Development
- Final capstone consolidation
- GitHub ML/DL project portfolio
- Resume for AI–ML roles
- Interview preparation
- Certification issuance