# **Generative AI Course – 60 days**

**Topic’s covered:**

1. **Python programming**
2. **Machine Learning model development**
3. **Deep Learning model development**
4. **AutoML model development**
5. **Azure Data Analytics**
6. **Azure DevOps**
7. **Azure Data Engineering**
8. **Azure Data Science**
9. **Azure Generative AI Engineering**
10. **No code and Low Code platform for Gen-AI Development**

**Duration: 100 hours @ 1½ daily (6AM to 7:30AM - IST)**

**Fees: 1 lakh for entire course**

**Certification study material will be provided for seven Azure exams**

**Other charges: Azure subscription for two months, Visual Studio, Visual Studio Code, SQL Server, Data tools**

# **Day-wise Syllabus**

# **Days 1–10: Python programming**

**Day 1:** Introduction to Python

* **Topics**: Python setup, IDEs, syntax basics, variables, and data types.
* **Hands-On**: Install Python, set up Jupyter Notebook or VSCode, and write basic print and input commands.
* **Case Study**: Write a simple program for a restaurant that takes orders and prints out a receipt.

**Day 2:** Control Flow

* **Topics**: Conditional statements (if-else), loops (for, while), and logical operators.
* **Hands-On**: Write a guessing game using loops and conditions.
* **Case Study**: Create a simple calculator that performs basic arithmetic based on user input.

**Day 3:** Data Structures

* **Topics**: Lists, dictionaries, tuples, and sets.
* **Hands-On**: Create a contact book using dictionaries.
* **Case Study**: Build a to-do list application with list and dictionary functionalities.

**Day 4:** Functions and Modules

* **Topics**: Defining functions, lambda functions, import modules.
* **Hands-On**: Write functions for calculating statistics (mean, median).
* **Case Study**: Write a script that imports a module to analyze customer survey data.

**Day 5:** File Handling and Exception Management

* **Topics**: Reading and writing files, handling exceptions.
* **Hands-On**: Write code to read and write a CSV file.
* **Case Study**: Build a mini-database by storing and retrieving user information from files.

**Day 6:** Numpy Basics

* **Topics**: Arrays, basic operations, and array manipulation.
* **Hands-On**: Perform basic mathematical operations on Numpy arrays.
* **Case Study**: Use Numpy to handle datasets and calculate statistics.

**Day 7:** Pandas Basics

* **Topics**: DataFrames, data manipulation, and indexing.
* **Hands-On**: Load, filter, and analyze a sample dataset.
* **Case Study**: Analyze a simple dataset, such as customer sales data, to find trends.

**Day 8:** Data Visualization with Matplotlib

* **Topics**: Creating plots, customizing graphs, subplots.
* **Hands-On**: Generate bar and line charts.
* **Case Study**: Visualize customer purchase data to identify high sales products.

**Day 9:** Introduction to Object-Oriented Programming (OOP)

* **Topics**: Classes, objects, inheritance, and encapsulation.
* **Hands-On**: Create a class for a product catalog.
* **Case Study**: Implement an inventory management system using OOP concepts.

**Day 10:** Python Project Day

* **Hands-On**: Create a small end-to-end project integrating previous topics, such as a basic CRUD (Create, Read, Update, Delete) application.
* **Case Study**: Build a simple library management system that allows adding, searching, and borrowing books.

# **Days 11–20: Machine Learning Model development**

**Day 11:** Introduction to Machine Learning

* **Topics**: What is ML? Types of ML (Supervised, Unsupervised, Reinforcement).
* **Hands-On**: Build a simple linear regression model to predict house prices.
* **Case Study**: Predict the cost of used cars based on mileage and age.

**Day 12:** Data Preprocessing

* **Topics**: Handling missing data, feature scaling, and encoding categorical data.
* **Hands-On**: Preprocess a dataset with missing values and categorical variables.
* **Case Study**: Clean a customer dataset to prepare it for clustering.

**Day 13:** Supervised Learning - Classification

* **Topics**: Introduction to classification, Logistic Regression.
* **Hands-On**: Build a logistic regression model for binary classification.
* **Case Study**: Predict customer churn based on historical data.

**Day 14:** Supervised Learning - Decision Trees and Random Forests

* **Topics**: Decision Trees, ensemble methods, Random Forests.
* **Hands-On**: Build a decision tree and random forest model.
* **Case Study**: Classify credit card transactions as fraudulent or not.

**Day 15:** Supervised Learning - Evaluation Metrics

* **Topics**: Accuracy, precision, recall, F1-score, ROC, and AUC.
* **Hands-On**: Evaluate the performance of previous models.
* **Case Study**: Analyze the quality of a model predicting loan approval.

**Day 16:** Unsupervised Learning - Clustering

* **Topics**: K-means clustering, hierarchical clustering.
* **Hands-On**: Apply K-means on a customer segmentation dataset.
* **Case Study**: Cluster customers into groups based on purchasing behavior.

**Day 17:** Dimensionality Reduction

* **Topics**: PCA, t-SNE, and feature selection.
* **Hands-On**: Reduce dimensions of a dataset using PCA.
* **Case Study**: Use PCA to visualize high-dimensional customer data.

**Day 18:** Introduction to Neural Networks

* **Topics**: Neurons, activation functions, forward propagation.
* **Hands-On**: Build a simple neural network in Python.
* **Case Study**: Classify handwritten digits using a neural network.

**Day 19:** Neural Network Optimization Techniques

* **Topics**: Backpropagation, learning rate, and gradient descent.
* **Hands-On**: Optimize the neural network from Day 18.
* **Case Study**: Fine-tune a digit classification model.

**Day 20:** Project Day

* **Project**: End-to-end ML project, using everything learned in Days 11–19.
* **Case Study**: Create a model to predict house prices, from preprocessing to evaluation.

# **Days 21–30: Deep Learning Model development**

**Day 21:** Deep Learning Overview

* **Topics**: Overview of deep learning, introduction to TensorFlow and PyTorch.
* **Hands-On**: Set up and explore TensorFlow/Keras.
* **Case Study**: Train a basic neural network using TensorFlow.

**Day 22:** Convolutional Neural Networks (CNNs) Basics

* **Topics**: Convolution, pooling, CNN architectures.
* **Hands-On**: Build a CNN for image classification.
* **Case Study**: Classify clothing images from the Fashion MNIST dataset.

**Day 23:** Advanced CNN Techniques

* **Topics**: Data augmentation, transfer learning, fine-tuning.
* **Hands-On**: Use transfer learning with a pre-trained model.
* **Case Study**: Fine-tune a model for image classification of animals.

**Day 24:** Recurrent Neural Networks (RNNs) Basics

* **Topics**: Sequential data, RNN architectures, limitations.
* **Hands-On**: Build a simple RNN for sequence prediction.
* **Case Study**: Predict stock prices based on historical data.

**Day 25:** Long Short-Term Memory (LSTM) Networks

* **Topics**: LSTM networks and applications in time-series.
* **Hands-On**: Build an LSTM model for text generation.
* **Case Study**: Generate poetry based on historical data.

**Day 26:** Attention Mechanism

* **Topics**: Attention mechanism basics, context vectors.
* **Hands-On**: Implement attention in an NLP model.
* **Case Study**: Summarize text with attention-based model.

**Day 27:** Introduction to Transformers

* **Topics**: Transformer architecture, self-attention.
* **Hands-On**: Build a simple Transformer-based model.
* **Case Study**: Apply a Transformer model for language translation.

**Day 28:** Generative Adversarial Networks (GANs) Basics

* **Topics**: GAN architecture, generator, discriminator.
* **Hands-On**: Build a simple GAN for image generation.
* **Case Study**: Generate images of handwritten digits with GANs.

**Day 29:** Variational Autoencoders (VAEs)

* **Topics**: Variational Autoencoders, latent space.
* **Hands-On**: Build a VAE for image reconstruction.
* **Case Study**: Create new handwritten digits using a VAE.

**Day 30:** Project Day

* **Project**: Build a generative model (VAE or GAN) on image data.
* **Case Study**: Generate new fashion items based on Fashion MNIST.

# **Days 31–35: Azure DevOps and Data Engineering for Generative AI**

**Day 31: Introduction to Azure DevOps**

* **Topics**: Overview of Azure DevOps, project setup, repositories, and version control.
* **Hands-On**: Set up an Azure DevOps project, connect Git repositories, and push initial code.
* **Case Study**: Initiate a version control system for an NLP project, managing collaborative updates.

**Day 32: CI/CD Pipelines in Azure DevOps**

* **Topics**: Continuous Integration (CI) and Continuous Deployment (CD), pipeline setup, build and release pipelines.
* **Hands-On**: Implement a CI/CD pipeline to deploy a simple ML model to Azure.
* **Case Study**: Build a pipeline to automate model updates for a sentiment analysis project.

**Day 33: Azure Data Engineering Essentials**

* **Topics**: Azure Data Factory, data storage options (Azure Blob, Azure SQL Database), and data integration.
* **Hands-On**: Set up a data pipeline to process and store datasets for ML model training.
* **Case Study**: Design a pipeline to clean and load customer review data into Azure SQL for analysis.

**Day 34: Data Processing with Azure Databricks**

* **Topics**: Introduction to Azure Databricks, Spark basics for big data, and distributed data processing.
* **Hands-On**: Process a large dataset using Spark on Azure Databricks for feature engineering.
* **Case Study**: Extract, transform, and load (ETL) customer data for use in a recommendation system.

**Day 35: Monitoring and Logging in Azure DevOps**

* **Topics**: Monitoring tools, logging, and maintaining model versions.
* **Hands-On**: Implement Azure Monitor and Application Insights for an ML project.
* **Case Study**: Monitor the performance of a deployed language model and log user interactions for improvement.

# **Days 36–45: Generative AI Model development on Azure - AZ-102**

**Day 36:** Introduction to NLP and Text Generation

* **Topics**: NLP basics, text preprocessing.
* **Hands-On**: Preprocess text data, tokenization.
* **Case Study**: Clean and tokenize a corpus of product reviews.

**Day 37:** Word Embeddings

* **Topics**: Word2Vec, GloVe embeddings.
* **Hands-On**: Train word embeddings on a custom dataset.
* **Case Study**: Find similarities between product reviews.

**Day 38:** Sequence-to-Sequence Models for Text Generation

* **Topics**: Seq2Seq model basics, applications in translation.
* **Hands-On**: Build a Seq2Seq model for translation.
* **Case Study**: Translate English text to French.

**Day 39:** Language Models (LMs)

* **Topics**: Language models (LM), perplexity, N-grams.
* **Hands-On**: Train an LSTM-based language model.
* **Case Study**: Generate product descriptions based on example text.

**Days 40:** Transformer-Based Language Models

* **Topics**: BERT, GPT models, pre-training and fine-tuning.
* **Hands-On**: Fine-tune BERT on a custom dataset.
* **Case Study**: Fine-tune BERT for sentiment analysis.

**Days 41:** Advanced Text Generation with GPT

* **Topics**: GPT model for coherent text generation.
* **Hands-On**: Use OpenAI’s GPT for custom text generation tasks.
* **Case Study**: Generate customer service responses based on FAQ data.

**Days 42-43:** Image-to-Text Models

* **Topics**: Image captioning using CNNs and RNNs.
* **Hands-On**: Build a model that captions images.
* **Case Study**: Caption images from a stock photo dataset.

**Days 44–45:** Diffusion Models

* **Topics**: Introduction to diffusion models, their use in generative art.
* **Hands-On**: Implement a basic diffusion model.
* **Case Study**: Generate abstract artwork using a diffusion model.

# **Days 46–60: Generative AI development platforms (No Code-Low Code)**

**Days 46–48:** Langflow

* **Topics**: Text-to-image synthesis, CLIP models.
* **Hands-On**: Use CLIP to generate images from text prompts.
* **Case Study**: Generate product concepts from descriptive text prompts.

**Days 49–51:** Flowise

* **Topics**: Audio synthesis, WaveNet.
* **Hands-On**: Build a model for speech synthesis.
* **Case Study**: Generate audio samples from text.

**Days 52–54:** Bolt

* **Topics**: Reinforcement learning in generative models.
* **Hands-On**: Train a GAN with reinforcement learning.
* **Case Study**: Apply GANs to create unique game levels.

**Days 55–57:** N8N – Workflow automation

* **Topics**: Multimodal models for image, text, and audio.
* **Hands-On**: Implement multimodal generation (text + image).
* **Case Study**: Create text-based art with generated image-text pairs.

**Days 58–60:** Capstone Project on Azure Platform

* **Project**: Select a real-world application of generative AI (customer support chatbot) and build an end-to-end solution.