



Mainstream Institute

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Mainstream
Learning

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Generative AI & Agentic AI with Python

MODULE 1: PYTHON PROGRAMMING

Course Introduction

- Introduction to the Course
- Understanding AI, Generative AI & Agentic AI
- Career Opportunities in AI

Introduction to Python

- Getting Started with Python
- Python Syntax
- Variables and Data Types
- Operators in Python

Python Control Flow

- Conditional Statements
- If, Else, Elif
- Loops and Iterations

Data Structures

- Lists and List Comprehension
- Tuples
- Dictionaries
- Sets

Functions in Python

- User Defined Functions
- Lambda Functions
- Map Function
- Filter Function

Modules & Packages

- Importing Modules
- Creating Modules
- Standard Libraries

File Handling

- Reading Files
- Writing Files
- Working with File Paths

Exception Handling

- Try, Except
- Else and Finally Blocks

Object Oriented Programming

- Classes & Objects
- Inheritance
- Polymorphism
- Encapsulation
- Abstraction



MODULE 2: NATURAL LANGUAGE PROCESSING (NLP)

Text Processing

- Tokenization
- Text Preprocessing
- Stemming
- Lemmatization
- Stopwords Removal

Text Vectorization

- Bag of Words
- N-Grams
- TF-IDF

Word Embeddings

- Word2Vec
- CBOW
- Skip Gram
- GloVe

NLP Applications

- POS Tagging
- Named Entity Recognition
- Text Classification



MODULE 3: DEEP LEARNING

Introduction to Deep Learning

- Deep Learning Concepts
- Applications of Deep Learning
- Neural Network Fundamentals

Artificial Neural Networks

- What is a Neuron
- Activation Functions
- Sigmoid Function
- ReLU Function
- Tanh Function
- Gradient Descent
- Backpropagation

Recurrent Neural Networks

- RNN Architecture
- Forward Propagation
- Backward Propagation
- RNN Projects

Long Short-Term Memory (LSTM)

- LSTM Architecture
- Forget Gate
- Input Gate
- Output Gate
- GRU Networks
- LSTM Projects

Bidirectional RNN

- Concept and Architecture
 - Advantages
 - Applications
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MODULE 4: TRANSFORMERS & LARGE LANGUAGE MODELS

Encoder Architecture

- Introduction to Encoders
- BERT Architecture
- BERT Fine Tuning
- RoBERTa
- DistilBERT
- ALBERT

Decoder Architecture

- Introduction to Decoders
- GPT Architecture
- GPT Training
- Masked Multi Head Attention

Sequence to Sequence Architecture

- Encoder & Decoder Models
- Seq2Seq Networks
- Attention Mechanism

Transformers

- Self Attention
 - Multi Head Attention
 - Positional Encoding
 - Layer Normalization
 - Encoder Transformer
 - Decoder Transformer
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MODULE 5: GENERATIVE AI FUNDAMENTALS

Introduction to Generative AI

- What is Generative AI
- AI vs ML vs DL vs Gen AI
- Evolution of LLM Models
- Understanding ChatGPT & Llama Models

Data Preprocessing & Embeddings

- Data Cleaning
- Embeddings
- Generative AI Pipeline

Large Language Models

- Introduction to LLMs
- Transformer Architecture
- Training of ChatGPT
- LLM Ecosystem

Prompt Engineering

- Prompt Design
- Role Prompting
- Few Shot Prompting
- Chain of Thought Prompting

MODULE 6: VECTOR DATABASES

Vector Database Fundamentals

- Introduction to Vector Databases
- Vector Indexing
- Similarity Search

Practical Vector Databases

- ChromaDB
- Pinecone
- FAISS

- Vector Search Applications
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MODULE 7: OPENAI DEVELOPMENT

OpenAI Fundamentals

- Introduction to OpenAI
- API Setup
- API Key Generation
- Local Environment Setup

OpenAI API Development

- Chat Completion API
- Completion API
- Function Calling
- Structured Outputs

OpenAI Projects

- Text Classification
- Audio Transcription using Whisper
- Image Generation using DALL·E
- AI Content Generator

MODULE 8: LANGCHAIN

LangChain Introduction

- LangChain Ecosystem
- Virtual Environment Setup
- OpenAI Integration

LangChain Core Components

- Prompt Templates
- Chains
- Memory
- Tools
- Agents

Documents & Text Processing

- Document Loaders
- Text Splitters
- Recursive Text Splitter
- JSON Splitter
- HTML Splitter

Embeddings in LangChain

- OpenAI Embeddings
- Hugging Face Embeddings
- Ollama Embeddings

LangChain Projects

- AI Interview Question Generator
- Website Chatbot
- PDF Chatbot
- Knowledge Assistant

MODULE 9: RETRIEVAL AUGMENTED GENERATION (RAG)



RAG Fundamentals

- Introduction to RAG
- Importance of RAG
- RAG Architecture

RAG Development

- Retrieval Process
- Context Injection
- Query Optimization
- Hybrid Search

RAG Projects

- Q&A Application
 - Document Search Assistant
 - Enterprise Knowledge Chatbot
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MODULE 10: LlamaIndex

LlamaIndex Fundamentals

- Introduction to LlamaIndex
- Data Connectors
- Index Creation

LlamaIndex Projects

- Financial Data Analysis
- Research Assistant
- Document Intelligence System

MODULE 11: FINE TUNING LARGE LANGUAGE MODELS

Fine Tuning Concepts

- What is Fine Tuning
- Parameter Efficient Fine Tuning

LoRA Techniques

- LoRA
- QLoRA
- Fine Tuning Llama Models

Custom Model Training

- Dataset Preparation
- Model Evaluation
- Practical Fine Tuning



MODULE 12: LLM APPLICATION DEPLOYMENT

Application Deployment

- Flask
- Streamlit
- FastAPI

Cloud Deployment

- AWS Basics
- Hosting AI Applications

Production Deployment

- Monitoring
 - Security
 - Scaling AI Applications
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MODULE 13: AGENTIC AI

Introduction to Agentic AI

- What is Agentic AI
- AI Agents vs Agentic AI
- Agent Architecture
- Agent Memory
- Planning Systems
- Types of Agents
- Multi-Agent Systems

Agent Development

- Autonomous Workflows
 - Agent Communication
 - Task Execution Models
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MODULE 14: LANGGRAPH

LangGraph Fundamentals

- Introduction to LangGraph
- Components of LangGraph
- Workflow Design

LangGraph Development

- Graph-Based Agents
- State Management
- Multi-Agent Workflows

LangGraph Project

- End-to-End Agentic AI Application
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MODULE 15: MODEL CONTEXT PROTOCOL (MCP)

MCP Fundamentals

- Introduction to MCP
- MCP Architecture
- MCP Components

MCP Development

- MCP Clients
- MCP Servers
- Tool Integration

MCP Project

- Building MCP Server from Scratch
- Enterprise AI Tool Integration

MODULE 16: AI AUTOMATION USING N8N

n8n Fundamentals

- Introduction to n8n
- Workflow Automation
- Triggers & Actions

n8n Nodes

- Trigger Nodes
- Action Nodes
- Data Transformation Nodes
- Switch Nodes
- Filter Nodes

Agentic AI Workflows

- AI Agent Automation
- Prompt-Based Workflows
- Credential Setup & Testing

Automation Projects

- AI Lead Generation System
- AI Customer Support Agent
- AI Content Automation Workflow

COURSE HIGHLIGHTS

- ✓ 100% Practical Training
- ✓ Generative AI + Agentic AI + Python
- ✓ OpenAI, ChatGPT, Gemini & Llama Models
- ✓ LangChain, LangGraph & MCP
- ✓ Vector Database & RAG Development
- ✓ AI Automation with n8n
- ✓ Real-Time Projects & Case Studies
- ✓ Portfolio Development
- ✓ Resume & Interview Preparation
- ✓ Microsoft AI Certification Preparation
- ✓ Internship & Placement Assistance



Thank You

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