Agentic AI with Python

(Industry-Oriented Program – 140 Hours)

Course Overview

This course is designed to train technical freshers and software developers to build **AI-powered, autonomous agents** using **Python** and modern AI frameworks. The program focuses on **practical application development**, enabling learners to design, develop, and deploy AI agents within real-world software systems.

Students will gain hands-on experience in integrating Large Language Models (LLMs), designing agent workflows, and embedding AI agents into web applications to meet current and future industry demands.

Module 1: Python Programming for AI Applications

- Python syntax and programming fundamentals
- Variables, data types, and control structures
- Functions and modular programming
- Data structures: lists, tuples, dictionaries, sets
- File handling and exception management
- Writing clean and maintainable Python code

Module 2: Python for Backend & API Development

- Object-Oriented Programming in Python
- Working with JSON and configuration files
- Consuming and exposing APIs using Python
- Virtual environments and package management
- Introduction to asynchronous programming concepts

Module 3: AI & Large Language Model Fundamentals

- Introduction to Artificial Intelligence and Generative AI
- Understanding Large Language Models (LLMs)
- Tokens, context windows, and cost considerations
- Interacting with LLMs using Python
- Handling and validating AI-generated outputs

Module 4: Prompt Engineering for Developers

- Principles of effective prompt design
- System, user, and assistant prompts
- Dynamic prompt creation using Python
- Structured outputs (JSON-based responses)
- Prompt optimization and error handling

Module 5: Agentic AI Concepts and Architecture

- Introduction to Agentic AI systems
- Difference between chatbots and AI agents
- Agent lifecycle: planning, execution, observation, decision-making
- Tools, memory, and reasoning mechanisms
- Single-agent and multi-agent architectures

Module 6: Building AI Agents Using Python

- Designing task-oriented AI agents
- Tool calling and function execution
- Integrating APIs and databases with agents
- Managing agent context and memory
- Developing custom agent logic

Module 7: RAG (Retrieval Augmented Generation)

- Introduction to RAG architecture
- Vector databases and embeddings (Pinecone, Chroma, FAISS)
- Building knowledge bases for agents
- Document retrieval and context injection
- Combining RAG with agentic workflows
- Optimizing retrieval quality and relevance

Module 8: Agent Frameworks (Python-Based)

- Overview of Python agent frameworks
- Building agents using LangChain
- Multi-agent systems using CrewAI
- Framework selection and architectural considerations
- Best practices for scalable agent development

Module 9: AI Agents with Backend Frameworks

- Developing AI agent services using FastAPI / Django
- Designing REST APIs for AI-powered applications
- Authentication and user-specific agent behavior
- Background processing and task orchestration
- Managing long-running AI workflows

Module 10: Frontend Integration & Application Embedding

- Exposing AI agents through APIs
- Integrating agents into web applications
- Handling asynchronous responses
- Webhooks and agent triggers
- UI considerations for AI-driven features

Module 11: Cost Optimization & Efficiency

- Token optimization strategies
- Caching mechanisms for AI responses
- Model selection based on task complexity
- Streaming responses for better user experience
- Batch processing and request optimization
- Cost monitoring and budget management

Module 12: Production Deployment & DevOps

- Containerization with Docker for AI applications
- Cloud deployment strategies (AWS, Azure, GCP)
- Scaling AI agent systems
- CI/CD pipelines for AI applications
- Environment management and configuration
- Production monitoring and alerting

Module 13: Real-World Integration Patterns

- Email automation agents
- Slack/Teams bot integration
- Database query and analysis agents
- MCP server
- Web scraping and data extraction agents
- Scheduling and cron-based automation
- CRM and business tool integrations

Projects (Industry-Focused)

Students will develop **end-to-end AI agent applications**, or agents within existing applications to automate particular workflows.