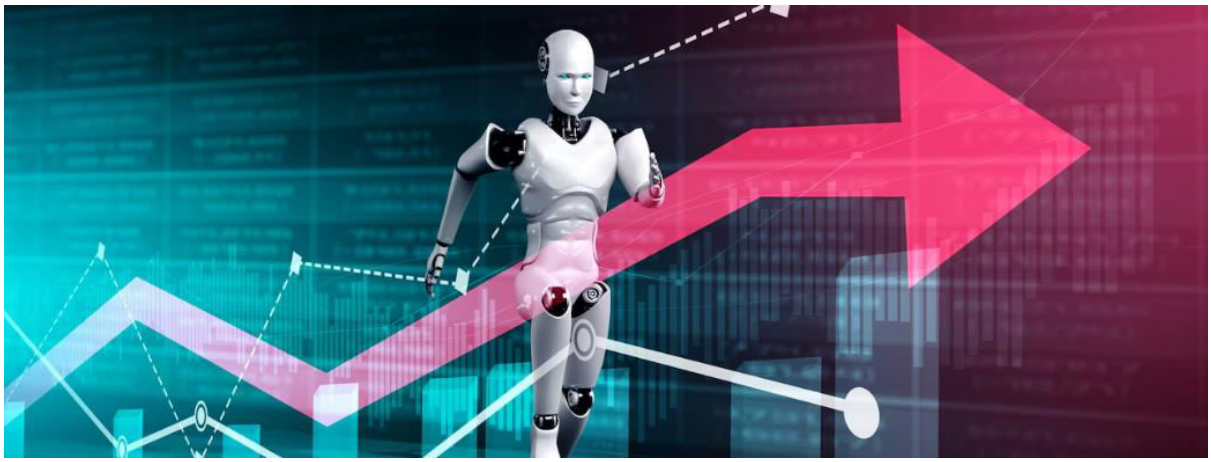

AGENTIC AI

(Building Autonomous, Goal-Driven AI Systems)

Certificate of Completion: Agentic AI

Course Code: IT_HM_I_009/25

Duration: 40 Hours

Delivery Format: Hybrid

Target Audience:

- Developers
- Data scientists
- AI enthusiasts with basic Python experience

Program Objectives:

- Understand foundational concepts of Agentic AI and autonomous systems.
- Learn how to design and simulate AI agents with planning and decision-making capabilities.
- Explore popular frameworks like LangChain, CrewAI, AutoGPT for building AI agents.
- Implement agents that use tools, memory, and planning strategies to complete tasks.
- Apply reinforcement learning and continual learning techniques to train adaptive agents.
- Address ethical and safety considerations in autonomous AI systems.
- Build and demonstrate a fully functional agentic system as a capstone project.

Detailed Syllabus

Module 1 (4 hours): Foundations of Agentic AI

Objective: Introduce core principles and real-world relevance of Agentic AI.

Topics:

- Definitions, key traits, and use-cases
- Evolution from traditional AI to autonomous agents
- Core Concepts – Agency, autonomy, proactivity, adaptability
- Comparing LLMs vs. Agentic Systems
- Real-World Examples – AutoGPT, BabyAGI, Devin

Activities:

- Mini-project: Analyze the design philosophy of an existing open-source Agentic AI system.

Module 2 (4 hours): Anatomy of an AI Agent

Objective: Explore the internal structure and operational loop of AI agents.

Topics:

- Perception-Planning-Action Loop
- Types of Agents – Reactive, deliberative, hybrid, learning agents
- State, Environment, and Goal modeling
- Interaction with APIs and tools
- Use of memory and context in decision-making

Activities:

- Project: Simulate a basic agent loop in Python that makes decisions based on user input.

Module 3 (4 hours): Goal Management and Planning

Objective: Learn goal setting and planning techniques in agent design.

Topics:

- Defining and prioritizing goals
- Hierarchical task decomposition (HTN)

- Planning algorithms – STRIPS, GOAP, A*
- Reasoning and Self-reflection mechanisms
- Integrating feedback loops

Activities:

- Mini Coding Task: Create a simple planner that breaks down a high-level goal into subtasks.

Module 4 (4 hours): Multi-Agent Systems and Coordination

Objective: Understand coordination strategies and communication in multi-agent systems.

Topics:

- Collaboration among agents
- Agent-to-agent communication protocols
- Conflict resolution and coordination
- Swarm intelligence and decentralized behavior

Activities:

- Project: Simulate a swarm of agents completing a multi-step task collaboratively.

Module 5 (4 hours): Agent Frameworks and Libraries

Objective: Explore tools and libraries to build agentic AI systems.

Topics:

- LangChain Agents, CrewAI, AutoGPT, BabyAGI
- Understanding Tools, Chains, and Executors
- Prompt engineering for task delegation
- Integrating vector stores (Pinecone, FAISS)

Activities:

- Hands-on Lab: Build a LangChain Agent that uses tools and memory to solve a user query.

Module 6 (4 hours): Memory, Tool Use and Environment Interaction

Objective: Implement memory and tool use in dynamic environments.

Topics:

- Types of memory – short-term, long-term, episodic
- Tool-augmented agents – search, calculator, APIs
- Managing dynamic tool sets
- Environment simulation for testing

Activities:

- Project: Create a tool-using agent that reads a document and answers questions with references.

Module 7 (4 hours): Reinforcement Learning for Agent Behaviour

Objective: Introduce reinforcement learning techniques for agentic behaviour.

Topics:

- Introduction to RL – states, actions, rewards
- Policy gradients, Q-learning
- Reward shaping for goal achievement
- Exploration vs. exploitation in agents

Activities:

- Mini-Project: Train a simple RL agent to navigate a maze to reach a goal.

Module 8 (4 hours): Continual and Self-Supervised Learning

Objective: Explore learning strategies that support long-term adaptability.

Topics

- Meta-learning and lifelong learning in agents
- Self-refinement using reflection loops
- Self-supervised learning for task adaptation
- Integrating learning modules in autonomous systems

Activities:

- Project: Implement a learning loop where the agent adapts to user feedback over time.

Module 9 (4 hours): Agent Alignment, Safety and Bias

Objective: Analyze ethical risks and safety measures in agentic systems.

Topics:

- Risks of autonomous systems
- Misalignment and hallucination
- Evaluation frameworks – HELM, ARC Eval
- Ethics of autonomy, transparency, and accountability
- Real-world failures and lessons

Activities:

- Project: Case study analysis of an Agentic AI failure and propose mitigation strategies.

Module 10 (4 hours): Capstone Project – Build Your Own Agent

Objective: Build and present a goal-oriented AI agent system.

Topics:

- Select a domain (e.g. task manager, research assistant, data analyzer)
- Architect an agent with memory, tools, goals, and autonomy
- Use LangChain/CrewAI + LLM + vector memory
- Present your project with a demo and technical breakdown