

DTA-AAI-101

Agentic AI with Python

Program Information



Nature of the Course
Lecture + Hands-on Labs



Total Hours per Day
60 hours



Course Duration
6 Weeks

Course Summary

This syllabus outlines the structure, content, and requirements of the Agentic AI and Autonomous Systems course. The design emphasizes conceptual clarity, hands-on implementation, and real-world agent development using modern AI frameworks within a hybrid learning environment.

Completion Criteria

After fulfilling all of the following criteria, the student will be deemed to have finished the module:

- Has attended 90% of all classes held.
- Has received an average of 80% on all assignments
- Has received an average of 60% in assessments.
- The tutor believes the student has grasped all of the concepts and is ready to go on to the second module.

Prerequisites

- Fundamental programming knowledge in Python, including experience from an AI bootcamp
- Basic understanding of data structures.

Course Details



Module 1: Introduction to Agentic AI (3 Hours)

- Definition of Agentic AI
 - Difference between AI, Generative AI, and Agentic AI
 - Why agents (beyond chatbots)
 - Real-world enterprise & startup use cases
 - Limits of autonomy
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Module 2: Foundations of AI & Machine Learning (4 Hours)

- Overview of Artificial Intelligence
 - Machine Learning types: Supervised, Unsupervised, Reinforcement
 - Basics of Neural Networks
 - Introduction to Deep Learning
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Module 3: Large Language Models (LLMs) (6 Hours)

- What are LLMs
 - Transformer architecture basics
 - Prompt engineering fundamentals – System prompts, ReAct, Plan–Execute, Reflection
 - Limitations and hallucinations in LLMs
 - Cost & latency awareness
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Module 4: Agent Architectures & Design Patterns (6 Hours)

- Reactive vs deliberative agents
 - Goal-based & utility-based agents
 - Agent lifecycle
 - Sense–Think–Act loop
 - Stateless vs stateful agents
 - Control loops & stopping conditions
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Module 5: Reasoning, Planning & Decision Making (6 Hours)

- Task planning and decomposition
 - Chain-of-thought reasoning
 - Decision-making under uncertainty
 - Autonomous action selection
 - Tree-of-thought & graph-based planning
 - Dynamic replanning
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Module 6: Memory, RAG & Knowledge Systems (5 Hours)

- Short-term vs long-term memory
 - Episodic vs semantic memory
 - Vector databases and embeddings
 - Retrieval-Augmented Generation (RAG)
 - Context management for agents
 - Memory summarization & forgetting
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Module 7: Tool Use & API Integration (5 Hours)

- Using tools with AI agents
 - API calling and function execution
 - Database and file system integration
 - Error handling and safety checks
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Module 8: Multi-Agent Systems (4 Hours)

- Introduction to multi-agent systems
 - Agent collaboration and communication
 - Hierarchical and swarm agents
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Module 9: Agent Frameworks (6 Hours)

- LangChain: AgentExecutor, Custom tools, Memory integrations, Callback system
 - LangGraph: State machines for agents, Long-running agents, Cycles & branching
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Module 10: Testing, Evaluation & Optimization (3 Hours)

- Agent behavior testing
 - Performance evaluation metrics
 - Debugging agent workflows
 - Improving reliability and accuracy
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Module 11: Deployment, Ethics & Security (3 Hours)

- Deploying agents (local, Docker, VM-ready patterns)
 - Monitoring and logging
 - Ethical considerations in Agentic AI
 - Security risks and mitigation
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Module 12: Fine tuning LLMs (5 Hours)

- Fine-Tuning Fundamentals
 - Hugging Face Trainer
 - PEFT / LORA
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Module 13: Capstone Project (4 Hours)

- Designing a real-world AI agent
 - Tool integration and memory usage
 - Project presentation and evaluation
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