Course Syllabus: AI Automation Engineer

Course Title: AI Automation Engineering: Designing and Deploying Intelligent Workflows

Target Audience: This course is for software engineers, automation specialists, and IT professionals who want to leverage AI to automate complex tasks. A strong foundation in Python and a working knowledge of APIs are essential.

Course Level: Advanced Intermediate to Expert.

Duration: 10 Weeks

Course Description: This curriculum provides a hands-on, project-based approach to becoming an AI Automation Engineer. You will learn how to go beyond simple scripts and build intelligent, multi-step workflows that can reason, interact with various systems, and self-correct. The course covers the entire lifecycle of an AI-powered automation, from identifying business problems to deploying and monitoring a production-ready solution using leading frameworks and tools.

Learning Objectives

Upon successful completion of this course, students will be able to:

- Understand the core principles of AI-driven automation and its benefits over traditional automation.
- Design and implement AI-powered workflows that can reason and perform complex, multi-step tasks.
- Master the use of AI orchestration frameworks and no-code/low-code automation platforms.
- Integrate AI models with existing business software and APIs.
- Apply MLOps principles to deploy, monitor, and manage automated AI workflows.
- Optimize AI automations for performance, cost-efficiency, and reliability.
- Develop a portfolio of real-world projects demonstrating proficiency in AI automation.

Course Structure: A Step-by-Step Learning Path

Part 1: Foundations of Automation & AI (Weeks 1-3)

This section bridges the gap between traditional automation and AI-powered systems, establishing the core technical skills.

Week 1: Introduction to AI Automation

- The shift from traditional automation (RPA, scripts) to intelligent, AI-driven automation.
- Identifying high-impact automation opportunities within business processes.
- The role of LLMs and other AI models in decision-making and task execution.
- The components of an AI automation: triggers, actions, and decision-making logic.
- **Hands-on Lab:** Analyze a business process and map out a potential AI automation workflow.

Week 2: Python for Automation & API Integration

- Advanced Python for automation: libraries for web scraping, file manipulation, and data processing.
- Using APIs to interact with business software (e.g., Salesforce, Google Workspace).
- Error handling and robust scripting practices.
- **Hands-on Project:** Write a Python script to automate a data entry task by interacting with a web form and an API.

Week 3: The AI as a "Brain"

- Integrating AI via APIs: sending data to an LLM and parsing its response.
- Advanced prompt engineering for automation: providing clear instructions, context, and expected output formats (e.g., JSON).
- Using AI for specific automation tasks: text summarization, data classification, and sentiment analysis.
- **Hands-on Lab:** Use an LLM API to automatically classify incoming emails based on their content.

Part 2: Building and Orchestrating AI Workflows (Weeks 4-7)

This section focuses on using specialized frameworks and platforms to build and manage complex, multi-step automation.

Week 4: Agentic AI for Automation

- The concept of an **AI agent** that can plan, reason, and use tools.
- Building a basic agent using frameworks like **LangChain** or **LlamaIndex**.
- Equipping agents with tools to interact with the external world (e.g., search, calendars).
- **Hands-on Project:** Create an AI agent that can plan and execute a multi-step task, such as researching a topic and generating a report.

Week 5: No-Code/Low-Code Automation Platforms

- Introduction to platforms like **Zapier**, **Make.com**, and **n8n**.
- Using AI modules within these platforms to build automations without code.
- Connecting different apps and services in a visual workflow builder.
- **Hands-on Project:** Recreate the AI-powered email classification from Week 3 using a no-code platform.

Week 6: Advanced Workflow Design & Multi-Agent Systems

- Designing complex workflows with conditional logic, loops, and parallel processing.
- Orchestrating multiple agents to collaborate on a single, larger goal.
- Using frameworks like **CrewAI** to define agent roles and a collaborative process.
- **Hands-on Project:** Build a multi-agent system where one agent gathers data and another summarizes it, working together to complete a single task.

Week 7: Data Integration for Automation

- The role of **Retrieval-Augmented Generation (RAG)** in automation.
- Using vector databases to provide LLMs with specific, grounded data from your business.
- Building an automation that can access internal documents to provide accurate answers.
- **Hands-on Project:** Create an AI automation that answers questions based on a private PDF document using RAG.

Part 3: Deployment, Maintenance, and Expert Practice (Weeks 8-10)

This final section covers the essential engineering skills for deploying and maintaining AI automations in a professional environment.

Week 8: MLOps for Automation

- The MLOps lifecycle for automated workflows.
- **Containerization with Docker** for consistent and reproducible deployments.
- Version control for both code and prompts.
- **Hands-on Lab:** Dockerize your AI automation and set up a CI/CD pipeline.

Week 9: Deployment & Monitoring

- Deploying your automation to a cloud platform (e.g., AWS, GCP, Azure).
- Monitoring tools for tracking workflow performance, success rates, and costs.
- Setting up alerts for automation failures and unexpected behavior.
- **Hands-on Project:** Deploy your containerized automation and set up a monitoring dashboard.

Week 10: Final Project & Career Skills

- **Capstone Project:** Design, build, and deploy a complete AI automation that solves a real-world business problem of your choice.
- Building a professional portfolio and resume tailored for AI Automation Engineer roles.
- Interview preparation and understanding the industry landscape.