CSE476:AGENTIC AI AND INTELLIGENT AUTOMATION

L:3 T:0 P:1 Credits:4

Course Outcomes: Through this course students should be able to

CO1 :: build intelligent AI agents using Microsoft Azure AI Foundry and modern agent orchestration frameworks.

CO2 :: build autonomous and conversational AI systems capable of reasoning, memory management, planning, and tool usage.

CO3 :: build production-ready AI agents using Python, Semantic Kernel, AutoGen, and Azure AI services.

CO4 :: execute multi-agent collaborative systems for enterprise workflow automation and intelligent task execution.

CO5 :: apply prompt engineering, testing, observability, and deployment strategies for reliable AI agent operations.

CO6 :: practice responsible AI principles, enterprise security, governance, and scalable deployment practices for AI agent systems.

Unit I

Foundations of AI Agents and Azure AI Foundry : Introduction to AI agents, intelligent agent architectures, reactive and goal-based agents, perception and action models,, conversational AI fundamentals, planning and reasoning, introduction to Azure AI Foundry, AI agent lifecycle, prompt engineering basics, AI services in Azure, agent design principles, use cases of enterprise AI agents, overview of Microsoft AI ecosystem.

Unit II

Building Intelligent Agent Workflows : Agent workflows and orchestration, task automation, tool calling mechanisms, API integration, workflow chaining, event-driven AI systems, conversational workflows, service integration, autonomous execution pipelines, context-aware agents, workflow testing, deployment basics, AI-powered automation in enterprise environments

Unit III

Agent Development with Python and Frameworks : Python programming for AI agents, Semantic Kernel fundamentals, AutoGen framework, Bot Framework integration, asynchronous workflows, memory management, state handling, prompt templates,, retrieval-augmented generation (RAG), integration of external tools, building modular AI systems, framework-based enterprise agent development

Unit IV

Multi-Agent Systems and Collaboration : Introduction to multi-agent systems, planner-executor architectures, collaborative agents, inter-agent communication, task delegation, distributed problem solving, orchestration patterns,, agent coordination mechanisms, collaborative enterprise workflows, role-based agents, scalable AI collaboration strategies,, workflow optimization for multi-agent systems.

Unit V

Testing, Monitoring, and Deployment of AI Agents : Testing AI agent workflows, debugging techniques, observability and monitoring, telemetry collection,, hallucination detection, validation methods, deployment strategies, cloud deployment on Azure,, API deployment, CI/CD integration, scalability considerations, performance optimization, production-ready AI agent systems.

Unit VI

Responsible AI, Security, and Enterprise Governance : Responsible AI principles, ethical AI systems, enterprise governance, AI safety mechanisms, prompt injection prevention,, authentication and authorization, Azure security practices, compliance and auditing,, secure deployment architectures, risk mitigation, monitoring AI behavior,, , enterprise AI governance models, secure multi-agent systems.

List of Practicals / Experiments:

List of Practical's

- 1.To create and configure an AI agent development environment using Azure AI Foundry and VS Code.

- 2.To create a conversational hotel information agent using Azure AI Foundry and Prompt Engineering techniques.
- 3.To create an intelligent workflow automation agent using Python and Azure AI Services.
- 4.To create an AI agent capable of tool calling and API integration using Python and Semantic Kernel.
- 5.To create an agent with memory and context management capabilities using Python and Semantic Kernel.
- 6.To create a medical information AI agent with responsible AI safeguards using Python and AutoGen.
- 7.To create a multi-agent collaborative workflow system using Python and AutoGen.
- 8.To create and test retrieval-augmented generation (RAG) workflows using Python and Azure AI Services
- 9.To create monitoring and observability mechanisms for AI agent execution using Azure AI Foundry and Python.
- 10.To create secure deployment and governance workflows for enterprise AI agents using Azure AI Services and Python.

Text Books:

1. BUILDING AGENTIC AI SYSTEMS: CREATE INTELLIGENT, AUTONOMOUS AI AGENTS THAT CAN REASON, PLAN, AND ADAPT by ANJANAVA BISWAS, PACKT PUBLISHING

References:

1. AGENTIC AI UNLEASHED: A GUIDE TO DESIGNING, BUILDING, AND DEPLOYING AUTONOMOUS AI SYSTEMS (ENGLISH EDITION) by JAYARAM NANDURI AND ANAND OKA, BPB PUBLICATIONS