AI 200- Develop AI Cloud Solutions on Microsoft Azure

Days: *5*

Audience: This course is designed for developers who build backend and AI-driven applications on Azure and need practical skills in containerized compute, data services for AI, event-driven workflows, and application security and monitoring.

Description: This course teaches developers how to create, monitor, and troubleshoot AI solutions on Microsoft Azure. Students will learn how to implement Azure compute and containerization patterns to host applications, build serverless APIs with Azure Functions, and integrate services using event-driven and message-based architectures such as Azure Service Bus and Event Grid. The course also covers working with Azure data services that support AI workloads, including designing and querying solutions with Cosmos DB for NoSQL, Azure Database for PostgreSQL with pgvector, and Azure Managed Redis for caching, streaming, and vector search. By the end of the course, developers will be able to connect services, orchestrate AI workflows, and build secure, scalable, and observable AI-driven applications on Azure.

OUTLINE:

LESSON 1 - STORE AND MANAGE CONTAINERS IN AZURE CONTAINER REGISTRY

- Registries, repositories, and artifacts
- Build and run images with ACR Tasks
- Tag and version images
- Module assessment

2 - DEPLOY CONTAINERS TO AZURE APP SERVICE

- Deploy containers to Azure App Service
- Configure container runtime behavior
- Configure application settings
- Observe and troubleshoot containerized apps
- Module assessment

3 - DEPLOY CONTAINERS TO AZURE CONTAINER APPS

- Explore Container Apps environments
- Deploy a container app using the Azure CLI and YAML
- Configure runtime settings with environment variables and secrets
- Configure image pull authentication for private registries
- Verify deployments with logs and status
- Module assessment

4 - MANAGE CONTAINERS IN AZURE CONTAINER APPS

- Update images and manage revisions safely
- Manage the container app lifecycle
- Monitor logs and troubleshoot issues
- Configure health probes and troubleshoot failures
- Optimize container resources and scaling
- Module assessment

5 - SCALE CONTAINERS IN AZURE CONTAINER APPS

- Configure scale rules
- Implement event-driven scaling with KEDA
- Apply KEDA scalers for custom workloads
- Select compute resources for performance and cost
- Choose and apply revision modes
- Module assessment

6 - DEPLOY APPLICATIONS TO AZURE KUBERNETES SERVICE

- Create Kubernetes deployment manifests
- Expose applications in Azure Kubernetes Services
- Deploy applications to Azure Kubernetes Services
- Module assessment

7 - CONFIGURE APPLICATIONS ON AZURE KUBERNETES SERVICE

- Define ConfigMaps for application settings
- Implement secrets for sensitive data
- Attach persistent storage to an app
- Module assessment

8 - MONITOR AND TROUBLESHOOT APPLICATIONS ON AZURE KUBERNETES SERVICE

AI 200- Develop AI Cloud Solutions on Microsoft Azure

- Monitor application logs and metrics
- Troubleshoot pods and services
- Verify service connectivity and endpoints
- Module assessment

9 - BUILD QUERIES FOR AZURE COSMOS DB FOR NOSQL

- Explore Azure Cosmos DB for NoSQL
- Implement the Azure Cosmos DB for NoSQL SDK
- Query Azure Cosmos DB for NoSQL
- Module assessment

10 - IMPLEMENT VECTOR SEARCH ON AZURE COSMOS DB FOR NOSQL

- Store and retrieve embeddings in Azure Cosmos DB
- Execute vector similarity queries for semantic search
- Combine vector similarity results with metadata filtering
- Use the change feed to trigger embedding refresh
- Module assessment

11 - OPTIMIZE QUERY PERFORMANCE FOR AZURE COSMOS DB FOR NOSQL

- Understand indexes in Azure Cosmos DB
- Configure range and composite indexes
- Tune vector indexes for embedding workloads
- Reduce RU costs with strategic indexing
- Choose consistency levels for optimal performance
- Module assessment

12 - BUILD AND QUERY WITH AZURE DATABASE FOR POSTGRESQL

- Explore Azure Database for PostgreSQL
- Connect to PostgreSQL
- Create and manage schemas
- Query data
- Integrate SDKs and applications
- Module assessment

13 - IMPLEMENT VECTOR SEARCH WITH AZURE DATABASE FOR POSTGRESQL

- Store and query embeddings with pgvector
- Perform fast vector similarity search
- Manage index lifecycle and embedding updates
- Run vector similarity search for semantic retrieval
- Implement retrieval patterns for RAG pipelines
- Module assessment

14 - OPTIMIZE VECTOR SEARCH IN AZURE DATABASE FOR POSTGRESQL

- Tune PostgreSQL for pgvector
- Choose and configure vector indexes
- Optimize data layout
- Scale for high-volume workloads
- Connection optimization
- Module assessment

15 - IMPLEMENT DATA OPERATIONS IN AZURE MANAGED REDIS

- Explore Azure Managed Redis
- Client libraries and development best practices
- Implement data operations
- Module assessment

16 - IMPLEMENT EVENT MESSAGING WITH AZURE MANAGED REDIS

- Publish and subscribe to events with Redis pub/sub
- Implement task queues with Redis Streams
- Choose between broadcast and coordinated distribution
- Module assessment

17 - IMPLEMENT VECTOR STORAGE IN AZURE MANAGED REDIS

- Index and query vector data
- Choose vector types and indexing strategies
- Optimize Redis data structures for vector storage
- Module assessment

18 - QUEUE AND PROCESS AI OPERATIONS WITH AZURE SERVICE BUS

- Explore Azure Service Bus concepts and messaging in AI architectures
- Choose between queues and topics with subscriptions
- Structure messages for AI workloads
- Process messages reliably
- Module assessment

19 - DEVELOP EVENT-DRIVEN AI WORKFLOWS WITH AZURE EVENT GRID

- Understand Azure Event Grid concepts and event-driven patterns for AI solutions

- Work with event schemas and properties
- Configure delivery and retry policies for reliable event processing
- Publish custom events from AI applications
- Module assessment

20 - BUILD SERVERLESS AI BACKENDS WITH AZURE FUNCTIONS

- Understand Azure Functions hosting and scaling for AI workloads
- Set up the local development environment for Functions
- Create triggers and bindings for AI integration patterns
- Manage secrets and configuration in Functions
- Configure identity and access for Functions
- Module assessment

21 - MANAGE APPLICATION SECRETS WITH AZURE KEY VAULT

- Store and organize secrets, keys, and certificates
- Retrieve secrets using Azure SDK client libraries
- Handle secret versioning and rotation
- Implement caching strategies to reduce Key Vault calls
- Module assessment

22 - MANAGE APPLICATION SETTINGS WITH AZURE APP CONFIGURATION

- Connect to App Configuration from application code
- Organize settings with labels and feature flags
- Reference Key Vault secrets from App Configuration
- Decide what to store in App Configuration vs Key Vault
- Module assessment

23 - INSTRUMENT AN APP WITH OPENTELEMETRY

- Explore OpenTelemetry and its role in observability
- Add the OpenTelemetry SDK to an application
- Configure spans and traces
- Export telemetry to Azure Monitor
- Debug distributed flows with trace data
- Module assessment

24 - ANALYZE APP TELEMETRY WITH LOGS AND METRICS

- Write basic KQL queries
- Explore logs for errors and performance
- Build dashboards for app telemetry
- Create workbooks for interactive analysis
- Set alerts for app failures and anomalies
- Module assessment