Paperlive Learning | Microsoft

DevOps & Azure with GenAI Master program in collaboration with Microsoft

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Course Content

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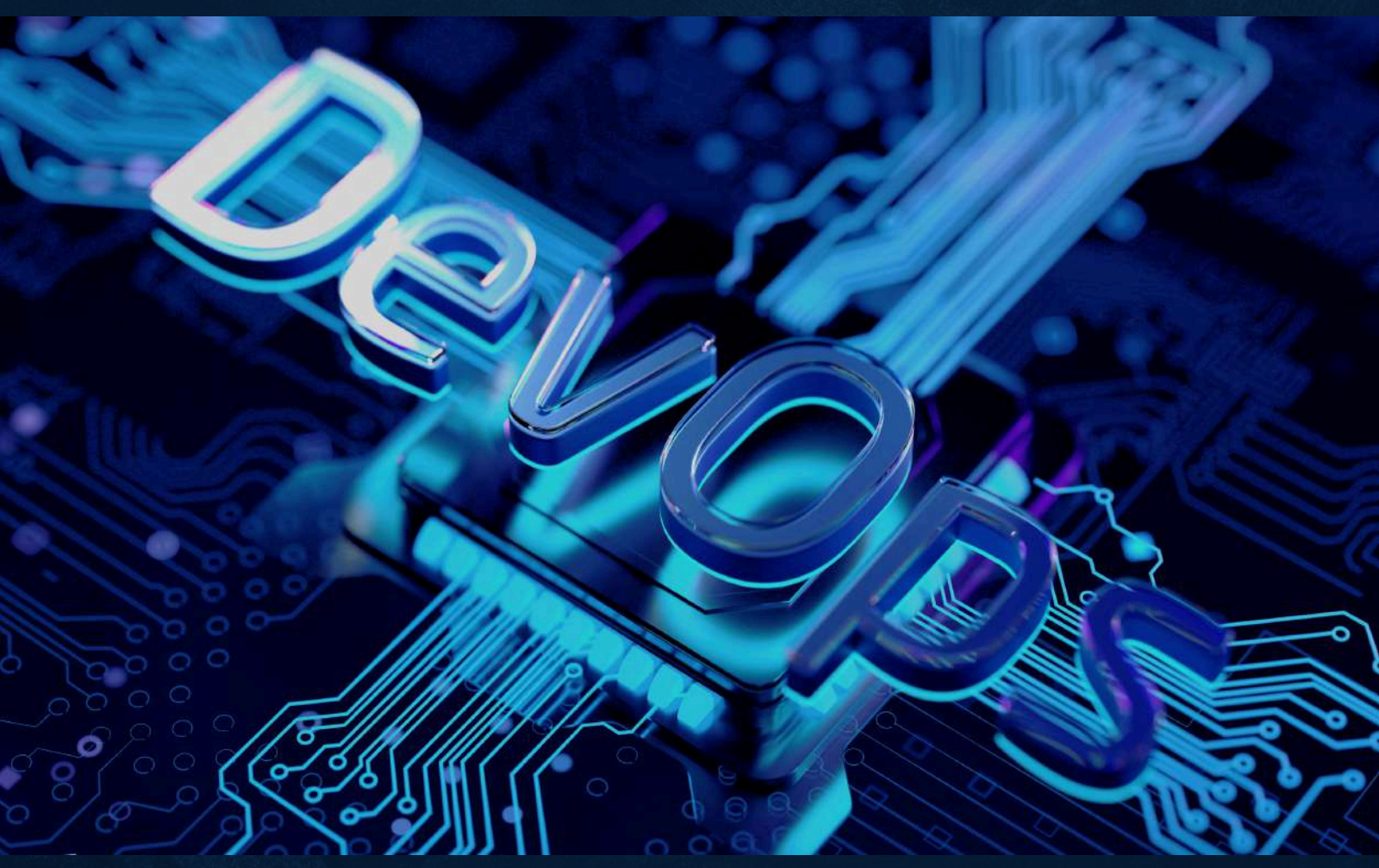
Topics

- Generic DevOps
- Azure Associate
- GenAI Integration with DevOps

Course Name	DevOps and Azure with GenAI
Level	Beginner to Expert
Duration	110 hrs



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Module 1 : DevOps Overview:

- Content : Evolution of Waterfall, Agile and DevOps, DevOps Benefits, Stages, Lifecycle, CI/CD, Automation in DevOps

Module 2: Fundamentals of Linux Operating System

1- Overview of Linux, Linux Architecture, Linux Distributions, Basic Linux Commands

2- File Permission Management, User creation, SSH, Vi utility

3- Shell Scripting

Module 3: Fundamentals of Python scripting

1- Overview,Features, Benefits, Uses of Python,Installation and Setup of Python Environment, Various Types of Sequences in Python

2- Loops and Control flow,File Operations,Python Functions,

3- OOPs Concepts,Modules,Errors and Exception Handling

Module 4: Version Control System using - Git and GitHub

1- Overview of Version Control System,Central vs Distributed Version Control System, Installation of Git, Git File workflow,Important Git Commands, Creating and Managing git Repositories, GIT-IGNORE

2- GIT Misc Commands,Reverting and Resetting ,GIT Stash,GIT Branching Strategies, working with Git Branching, Merging, Rebase and Squash, Introduction to GitHub, Managing Remote Repositories,Handling Github repositories using Visual Studio Code

Module 5: Maven Build Tool

1- Overview of Various Build Tools,Maven Architecture, Maven Plugins,Maven commands

2- Building of web applications, standalone applications, enterprise applications using Maven

Module 6: Continuous Integration Using Jenkins

1- Difference between Continuous vs Traditional Integration, Overview of Jenkins, Jenkins Installation and Configuration, Jenkins Plugins, Jenkins Freestyle and Pipeline Jobs

2- Scripted and Declarative Pipelines,Jenkins Master-Slave Architecture, Configuring Slave Node to Jenkins

3- Configure Tomcat Server,Integrate and Deploy to Tomcat Server using Jenkins, Jenkins Build Triggers, Enable Email Notifications, Jenkins Management

Module 7: Containerization, Docker, and Docker Hub

1- Introduction to Virtualization and Containerization, Docker Architecture, Overview of Docker Hub, Docker Installation, Docker Commands, Container Modes,Port Binding

2- Docker Volume, Docker Networking

3- Docker file, Customized Docker Images, Running and Managing Containers,Docker Compose, Overview of Docker Swarm Orchestration tool with all commands, Jenkins Integration with Docker

Module 8: Container Orchestration Tool – Kubernetes

1- Overview of Container Orchestration, Difference between Docker swarm and Kubernetes Cluster, Kubernetes Architecture, Installation of Kubernetes – Minikube, Kops script, Managed AKS/EKS/GKE Cluster [anyone], Namespaces

2- Kubernetes Nodes, Kubernetes Pods,Kubernetes Deployments, Rolling updates and rollbacks, Scaling up and down of the application

3- Services in Kubernetes, Kubernetes Volume -empty dir, HostPath,Persistent Volume, Persistent Volume Claim, Dynamic Provisioning, Storage Classes,Stateful application deployment, Pod Scheduling, Node Scheduling

Module 9: Infrastructure as Code (IaC) using Terraform

1- Introduction to Terraform, Terraform Vs Ansible, Terraform Architecture, Terraform Configuration HCL files

2- Terraform Commands, Managing Terraform Resources on AWS like ec-2 instance along with VPC, Subnet, Key-pair value, Security Group, Internet Gateway,EBS, Input, Output variables, Dynamically fetch AMI, Primitive and Complex Data types, Terraform functions.

3- Local Values, Data Sources, Remote State using AWS S3 Bucket, Local, Remote exec Provisioners, Terraform Modules

Module 10: Configuration Automation using Ansible

1- Overview of Configuration Automation, Introduction to Ansible, Ansible Architecture, Components of Ansible, Installation and Configuration of Ansible, Ansible ad-hoc commands

2- Ansible Master and Slave Set-up, Ansible Playbooks

3- Ansible Variables, Ansible Handlers, Ansible Role using Ansible Galaxy

Module 11: Continuous Monitoring using Prometheus and Grafana

1- Overview of continuous monitoring, Continuous monitoring tools in DevOps, Installation and Configuration of Prometheus and Grafana, Prometheus Architecture, Monitoring using Prometheus, Dashboard visualization using Grafana

Microsoft Azure Cloud – Associate

Module 1: Getting Started with Microsoft Azure

Overview of cloud computing, Explore Microsoft Azure,IaaS and PaaS Services provided by Microsoft Azure, Demonstrating the working of the Azure Portal, Usage and understanding of Azure Command Line Interface (CLI), Working with the Azure PowerShell

Module 2: Exploring the Microsoft Entra ID

Introduction to Microsoft Entra IID, Compare the difference between Windows AD and Azure AD, Identity and access management in Azure, Users,Group creation, Azure AD domains, Microsoft Entra tenant, Authentication options, Azure AD Connect, Self-service password reset (SSPR), Microsoft Entra Multi-factor authentication (MFA),Different Multi-factor Authentication verification methods, Azure Resources, Subscription, Management Group, Conditional Policies

Module 3: Navigate the Compute Services on the Microsoft Azure Platform

Navigating to the Azure virtual machines, Data disks in Azure, Azure VMs and Interfaces, Examine the ways to create a virtual hard disk template, Creating and launching the Custom images of Azure VM, Virtual machine scale sets, Availability sets, Availability zones, Resource Locks, Resource Tags, IIS role, NSG,RBAC Roles, Azure Policies

Module 4: Azure Networking Services

1- Overview of Azure virtual networks, Azure VNet component, Public and Private IPs, Azure VNet subnets, Manage the Azure network interface cards (NIC), Network Security Group (NSG),Routing, Managing Route tables, Service tags, Azure DNS, Manage and resolve the Private DNS

2- Hub and Spoke Topology, Vnet Peering, VPN- Site-to-Site, Point-to-Site, Express Route, Azure Bastion, Azure load balancers,Azure Firewall Configuration

3- Application gateway configuration,Application Security Groups, Azure front door service, Azure traffic manager ,Network watcher

Module 5: Getting Started with the Azure Storage Services

Azure Storage Account, Azure Blob Storage, Replication Strategies, Azure table storage, Azure queue storage,Azure file storage, Azure File Sync,Azure storage explorer, Azure shared access signature (SAS), Azure Databox and its use cases, Azure Import/Export service, Azure Content Delivery Network Profile with Endpoints, ARM Templates

Module 6: PaaS Container Services on Microsoft Azure

Containerized web apps on Windows and Linux, App service plan, Networking for an app service and its deployment types, Deployment slots by using the Azure Portal, Azure Container Instance, Building and pushing the container images to the Azure container registry, Azure Kubernetes service, Azure Function App, Azure Logic App

Module 7: Working with the Azure Data Platform

Overview of the SQL Databases, Azure SQL, Elastic Pools, Configuration,Achieve elastic scale in Azure SQL Database Cosmos DB, Multiple APIs and data models, Request units, Request Unit calculator, Partition key, Cross-partition queries, Replication and consistency levels in Microsoft Azure, Triggers, User-Defined Functions

Module 8: Application Management and Security

Azure key vault, Automated Azure AD managed identities in Microsoft Entra ID, Azure AD application management

Module 9: Backup and Monitoring

Recovery Services vault,Backup of Azure virtual machines, VM backup policies, Restore Azure virtual machines, Azure Monitor, Azure metric, Log Analytics workspace, Creating alerts and actions, Application Insights using the Azure Monitor

Module 10: Azure DevOps

Understanding Azure DevOps concepts, Azure Boards, Azure repos, Azure pipelines, Deploying web applications using Azure pipelines.

GenAI with DevOps

Module 1: Introduction to AI/ML

Overview of AI, ML, ML Algorithms- Supervised, Unsupervised , Reinforcement Learning, Deep Learning, Neural Networks

Module 2: Introduction to Generative AI

1- Overview of Large Language Models (LLMs) (GPT, Claude, Gemini, BERT,Llama), RAG, Prompt Engineering

2- Diffusion Models (Stable Diffusion, DALL·E, GitHub Copilot), Use Cases in DevOps (Code Generation, Log Analysis, Incident Response, Bias, hallucinations, IP, explainability, Prompt Engineering

Module 3: Why Combine Gen-AI with DevOps?

AI-Powered Automation, Self-Healing Systems, Predictive Analytics in Operations, AI-Assisted Debugging & Troubleshooting, Common Use Cases- Intelligent CI/CD assistants, Generative documentation, Code review and security scanning, AI-assisted observability (log and anomaly analysis)

Module 4: Gen-AI Tools & Frameworks for DevOps

1- AI-Powered Code Generation & Assistance- GitHub Copilot, Amazon CodeWhisperer, AI-assisted scripting (Bash, Python, Terraform), AI for Infrastructure as Code (IaC)- Generating Terraform/Ansible scripts using AI, AI-based IaC validation & optimization with Tools- ChatGPT, Claude, Mistral for IaC, Deploy an LLM on Kubernetes (e.g., Llama 2)

2- AI for Log Analysis & Anomaly Detection- Anomaly Detection in Logs using GenAI (e.g., Prometheus + LLMs), Splunk AI & LogGPT, OpenTelemetry with AI-driven insights

3- AI in CI/CD Pipelines- Automated Test Case Generation, AI-based Security Scanning (e.g., Snyk, DeepCode), Self-Optimizing Pipelines, Using LLMs to generate/test pipeline scripts (YAML, Bash, Dockerfiles), Automating pull request reviews using AI

Module 5: MLOps with Generative AI

1- Evolution from DevOps to MLOps,MLOps Lifecycle, Role of DevOps Engineer in MLOps and Machine Learning Pipelines

2- MLOps on different Cloud Platforms- AWS, Azure,GCP, Building end-to-end Machine Learning , Train your ML model in Google Colab, Managing ML Artifacts, Types of Model Artifacts in MLOps World, ML Model Metrics

3- Deploying with Fast API Model, ML Flow Deployment with Kubernetes,ML Flow Setup for Model Experiments, Model Monitoring, Drift of Models, Collaboration between Data Scientists and DevOps Engineers in ML Projects.

Module 6: Building AI Assistants for Cloud Operations

1- Creating ChatOps Assistants Using GenAI and Slack/Teams Integrations and Prompts, Fine-tuning LLMs for Infrastructure Support

2- Use Cases- Automating Troubleshooting with Prompt-Driven Agents, Different Prompts - Automating Troubleshooting with Prompt-Driven Agents, Integrating LLMs with CI/CD Tools (Jenkins, GitLab CI)

3- Build a GenAI-powered ChatOps Bot

Projects

Create a high availability architecture. Deploying a webserver with a Dynamic Website. We will be deploying our database on Relational Database Service. After attaching the database to the webserver, the client will be able to write the content on the database from the provided website.

1. Deploy Web Applications on Azure:
This is to create a secured application deployment on Azure Cloud Platform using containers, push it to Azure Container Registry, and deploy it as a container to Azure App Service.

2. E-Commerce Application Azure:
The Project aims to create a highly scalable E-Commerce Application and deployed on Azure Cloud Platform. This involves Containerized microservice based applications deployed using AKS.

3. Dynamic Infra-Structure Management:
Learners can able to use Terraform and Ansible on Azure to create highly reliable dynamic infrastructure

4. Setup dedicated VPCs: Insurance
Deployment of Web Applications in a Dedicated VPCs on AWS/Azure/GCP. With this project, Learners can able to master in using IAC Tools like Terraform and Ansible

5. Deployment web application using Azure serverless architecture using Azure functions.
Creation of a serverless web application using Azure serverless architecture using Azure functions.

6. Automated Continuous Monitoring:
The project aims to create a highly available production environments using Azure Monitoring services with proactive alert management and automated webhooks.

7. Applications Deployments in scalable cloud environment:
In this Project, Learners can able to understand the concepts of high availability and auto-scaling in a dynamic cloud environment with zero downtime.

CASE STUDY

1. Continuous Integration/Continuous Delivery (CI/CD) Pipeline for a Web Application

- **Objective:** Set up a fully automated CI/CD pipeline for a web application.
- **Case Study:** A software development team wants to reduce the time taken to release new features. As a DevOps engineer, your task is to automate the testing, building, and deployment of the application using tools like Jenkins, Docker, and Kubernetes.
- **Key Tools:** Jenkins, GitHub, Docker, Kubernetes, Terraform.
- **Outcome:** Faster and more reliable deployment process with minimal manual intervention.

2. Migrating to Azure

- **Objective:** Migrate an on-premise application to Azure with minimal downtime.
- **Case Study:** A company running a large e-commerce platform on physical servers wants to migrate to Azure for scalability and reliability. As part of the DevOps team, your task is to plan and execute this migration.
- **Outcome:** Efficient cloud migration with automated infrastructure management.

3. Infrastructure as Code (IaC) Implementation

- **Objective:** Implement Infrastructure as Code (IaC) to manage cloud infrastructure.
- **Case Study:** A startup needs scalable infrastructure for its expanding user base. The company wants to use IaC for infrastructure management to automate provisioning and deployment processes. You'll use tools like Terraform and Ansible to manage infrastructure on Azure.
- **Key Tools:** Terraform, Ansible, Azure.
- **Outcome:** Fully automated infrastructure setup, resulting in reduced configuration errors and faster provisioning.

4. Monitoring and Alerting for a Microservices Architecture

- **Objective:** Set up monitoring and alerting systems for a microservices-based architecture.
- **Case Study:** A company running microservices-based applications wants to monitor their health and performance. Your role is to implement monitoring solutions using Prometheus, Grafana, and ELK stack, and set up alerts for service downtimes or performance issues.
- **Key Tools:** Prometheus, Grafana, Helm charts.
- **Outcome:** Real-time monitoring and alerting system that ensures high availability and performance of services.

5. Dockerizing an Application and Orchestrating with Kubernetes

- **Objective:** Containerize a legacy application and deploy it using Kubernetes.
- **Case Study:** An enterprise wants to containerize its legacy application to make it more portable and scalable. Your task is to create Docker images for the application and orchestrate them using Kubernetes, implementing auto-scaling, and load balancing.
- **Key Tools:** Docker, Kubernetes, Helm.
- **Outcome:** Seamless application deployment with scalable infrastructure and reduced deployment complexities.

6. DevSecOps: Automating Security in the DevOps Pipeline

- **Objective:** Integrate security checks into the DevOps pipeline (DevSecOps).
- **Case Study:** A financial services company needs to ensure its application remains secure while adopting DevOps practices. You will automate security testing and vulnerability scans using tools like OWASP ZAP, Snyk, and SonarQube.
- **Key Tools:** OWASP ZAP, Snyk, SonarQube, Jenkins.
- **Outcome:** A secure CI/CD pipeline that automatically identifies and fixes security vulnerabilities during the build process.

7. Automating Blue-Green Deployment for a Web Application

- **Objective:** Automate a blue-green deployment strategy to minimize downtime during updates.
- **Case Study:** A company wants to ensure zero downtime during application updates. You will implement an automated blue-green deployment strategy using CI/CD tools.
- **Key Tools:** Azure DevOps, Azure app services.
- **Outcome:** Zero-downtime deployment process ensuring smooth application rollouts.