DevOps Multi-Cloud

Complete Course Content & Training Curriculum

AWS • Microsoft Azure • Google Cloud Platform (GCP)

COURSE OVERVIEW	Details
Duration	6 Months | 24 Weeks
Level	Beginner to Advanced
Mode	Theory + Hands-On Labs + Real Projects
Cloud Platforms	AWS + Microsoft Azure + Google Cloud (GCP)
Certifications	AWS DevOps Pro | AZ-400 | GCP DevOps Engineer | CKA/CKAD
Prerequisites	Basic computer knowledge; Python/scripting basics preferred

PHASE 1 | FOUNDATIONS

Weeks 1 – 4

Module 1: Introduction to DevOps

- What is DevOps? History & Evolution
- DevOps vs Traditional IT (Waterfall vs Agile vs DevOps)
- DevOps Lifecycle: Plan > Code > Build > Test > Release > Deploy > Operate > Monitor
- DevOps Culture, Principles & Best Practices
- Introduction to Agile & Scrum Methodology
- DevOps Roles & Responsibilities

Module 2: Introduction to Cloud Computing

- What is Cloud Computing?
- Types: Public, Private, Hybrid, Multi-Cloud
- Cloud Service Models: IaaS, PaaS, SaaS
- Introduction to AWS, Azure & GCP
- Cloud Pricing & Cost Management Basics
- Shared Responsibility Model

Module 3: Linux & Scripting Fundamentals

- Linux OS Basics & Command Line
- File System, Permissions, Users & Groups
- Shell Scripting (Bash) for Automation
- Python Scripting for DevOps Tasks
- Regular Expressions & Text Processing
- Cron Jobs & Task Scheduling

Module 4: Networking Basics for DevOps

- TCP/IP, DNS, HTTP/HTTPS Fundamentals
- Virtual Private Cloud (VPC) Concepts
- Subnets, Firewalls & Load Balancers
- CDN (Content Delivery Network) Basics
- API Concepts: REST, JSON, Webhooks

PHASE 2 | VERSION CONTROL & AGILE

Weeks 5 – 6

Module 5: Git & Version Control

- Git Basics: init, clone, commit, push, pull
- Branching Strategies: GitFlow, Trunk-Based Development
- Merge, Rebase & Conflict Resolution
- GitHub / GitLab / Bitbucket
- Pull Requests & Code Reviews
- Git Hooks & Automation

Module 6: Agile & Project Management Tools

- Agile Methodology & Scrum Framework
- Sprints, Backlog & User Stories
- Jira for Project Tracking
- Confluence for Documentation
- Kanban Boards

PHASE 3 | CI/CD PIPELINES

Weeks 7 – 10

Module 7: Continuous Integration (CI)

- What is CI and Why It Matters
- Setting Up Jenkins (Installation, Plugins, Jobs)
- GitHub Actions – Workflows & Actions
- GitLab CI/CD – Pipelines & Runners
- Azure DevOps Pipelines
- AWS CodePipeline & CodeBuild
- Google Cloud Build
- Automated Testing in CI Pipelines

Module 8: Continuous Delivery & Deployment (CD)

- CI vs CD vs Continuous Deployment
- Deployment Strategies:
  - Blue/Green Deployment
  - Canary Deployment
  - Rolling Updates
  - Feature Flags
- Release Management & Approvals
- Rollback Strategies

Module 9: Artifact Management

- What are Build Artifacts?
- JFrog Artifactory & Nexus Repository
- AWS CodeArtifact | Azure Artifacts | GCP Artifact Registry
- Container Image Registries: Docker Hub, ECR, ACR, GCR

Module 10: Testing in DevOps

- Types of Testing: Unit, Integration, End-to-End, Performance
- Test Automation Frameworks: Selenium, JUnit, PyTest
- Shift-Left Testing Approach
- SonarQube – Code Quality & Static Analysis
- OWASP – Security Testing in Pipelines

PHASE 4 | CONTAINERS & ORCHESTRATION

Weeks 11 – 14

Module 11: Docker & Containerization

- What are Containers? Docker vs VMs
- Docker Architecture: Images, Containers, Volumes, Networks
- Writing Dockerfiles
- Docker Compose for Multi-Container Apps
- Docker Hub & Private Registries
- Container Best Practices & Security
- Hands-On Lab: Containerize a Real Application

Module 12: Kubernetes (K8s) – Core

- What is Kubernetes and Why Use It?
- K8s Architecture: Control Plane, Worker Nodes
- Core Objects: Pods, Deployments, Services, ConfigMaps, Secrets
- Namespaces & Resource Management
- Scaling: Horizontal Pod Autoscaler (HPA)
- Rolling Updates & Rollbacks
- Kubernetes Networking & Ingress

Module 13: Kubernetes – Advanced & Multi-Cloud

- Managed Kubernetes Services:
  - AWS EKS – Elastic Kubernetes Service
  - Azure AKS – Azure Kubernetes Service
  - GCP GKE – Google Kubernetes Engine
- Multi-Cluster Management
- Helm – Kubernetes Package Manager
- Kubernetes RBAC & Security
- Istio – Service Mesh Basics
- Hands-On Lab: Deploy App Across EKS + AKS + GKE

Module 14: Serverless Computing

- What is Serverless?
- AWS Lambda | Azure Functions | Google Cloud Functions
- Event-Driven Architecture
- Serverless CI/CD Pipelines
- Comparing Serverless Across Clouds

PHASE 5 | INFRASTRUCTURE AS CODE (IaC)

Weeks 15 – 17

Module 15: Terraform – Multi-Cloud IaC

- What is Infrastructure as Code (IaC)?
- Terraform Fundamentals: Providers, Resources, State
- Writing Terraform Configurations (HCL)
- Terraform Modules & Reusability
- Multi-Cloud with Terraform:
  - Provisioning on AWS
  - Provisioning on Azure
  - Provisioning on GCP
- Terraform Cloud & Remote State
- Terragrunt for Large-Scale IaC
- Hands-On Lab: Deploy Same Infrastructure on 3 Clouds Using Terraform

Module 16: Configuration Management

- Ansible – Playbooks, Roles, Inventories
- Ansible for Multi-Cloud Configuration
- Chef & Puppet (Overview)
- AWS Systems Manager | Azure Automation | GCP Config Connector
- Immutable Infrastructure Concepts

Module 17: Cloud-Native IaC Tools

- AWS CloudFormation & CDK
- Azure Bicep & ARM Templates
- Google Cloud Deployment Manager
- Pulumi – IaC with Programming Languages
- Crossplane – Kubernetes-Based IaC

PHASE 6 | MULTI-CLOUD PLATFORMS – DEEP DIVE

Weeks 18 – 20

Module 18: Amazon Web Services (AWS) – Deep Dive

- AWS Core Services: EC2, S3, RDS, VPC, IAM
- AWS DevOps Tools: CodeCommit, CodeBuild, CodeDeploy, CodePipeline
- AWS ECS & EKS for Containers
- AWS CloudWatch for Monitoring
- AWS Security: IAM, KMS, Security Hub, GuardDuty
- AWS Cost Management & Billing

Module 19: Microsoft Azure – Deep Dive

- Azure Core Services: VMs, Blob Storage, SQL, VNet, Entra ID
- Azure DevOps: Boards, Repos, Pipelines, Test Plans, Artifacts
- Azure Kubernetes Service (AKS)
- Azure Monitor & Application Insights
- Azure Security Center & Defender for Cloud
- Azure Cost Management

Module 20: Google Cloud Platform (GCP) – Deep Dive

- GCP Core Services: Compute Engine, Cloud Storage, BigQuery, VPC, IAM
- GCP DevOps: Cloud Build, Cloud Deploy, Artifact Registry
- Google Kubernetes Engine (GKE)
- Cloud Operations Suite: Logging, Monitoring, Trace
- GCP Security: IAM, Cloud Armor, Security Command Center
- GCP Billing & Cost Control

PHASE 7 | MONITORING, LOGGING & OBSERVABILITY

Weeks 21 – 22

Module 21: Monitoring & Alerting

- The 3 Pillars of Observability: Metrics, Logs, Traces
- Prometheus – Metrics Collection & Alerting
- Grafana – Dashboards & Visualization
- Datadog – Full-Stack Observability
- Dynatrace – AI-Powered Monitoring
- AWS CloudWatch | Azure Monitor | GCP Operations Suite
- SLI, SLO, SLA Concepts
- Alerting & Incident Management

Module 22: Logging & Distributed Tracing

- Centralized Logging Concepts
- ELK Stack – Elasticsearch, Logstash, Kibana
- Fluentd & Fluent Bit for Log Collection
- Jaeger & Zipkin – Distributed Tracing
- AWS CloudTrail & CloudWatch Logs
- Azure Log Analytics | GCP Cloud Logging
- Multi-Cloud Log Aggregation Strategies

PHASE 8 | SECURITY – DevSecOps

Week 23

Module 23: DevSecOps – Security in DevOps

- What is DevSecOps? Shift-Left Security
- SAST – Static Application Security Testing
- DAST – Dynamic Application Security Testing
- Container Security: Image Scanning (Trivy, Snyk, Aqua)
- Secrets Management:
  - HashiCorp Vault
  - AWS Secrets Manager
  - Azure Key Vault
  - GCP Secret Manager
- IAM Best Practices Across Clouds
- Cloud Security Benchmarks (CIS, NIST)
- Compliance as Code
- OWASP Top 10 – Web App Security
- Zero Trust Architecture
- Multi-Cloud Security Policies: Prisma Cloud, Wiz

PHASE 9 | ADVANCED MULTI-CLOUD, SRE & CAPSTONE

Week 24

Module 24: Multi-Cloud Architecture & Strategy

- Multi-Cloud Design Patterns
- Cloud-Agnostic Architecture Principles
- Service Mesh Across Clouds: Istio, Linkerd
- Multi-Cloud Networking: VPN, Direct Connect, ExpressRoute
- Data Sovereignty & Compliance Across Regions
- Multi-Cloud Cost Optimization Strategies
- FinOps Principles & Tooling
- Disaster Recovery & Business Continuity
- Multi-Cloud Governance with Terraform & Policy-as-Code (OPA)

Module 25: Site Reliability Engineering (SRE)

- SRE vs DevOps – What's the Difference?
- Error Budgets, SLIs, SLOs, SLAs
- Incident Management & Post-Mortems
- Chaos Engineering: Chaos Monkey, LitmusChaos
- Toil Reduction & Automation
- Capacity Planning

CAPSTONE PROJECT | Module 26 Full End-to-End Multi-Cloud DevOps Pipeline Develop a microservices app • Containerize with Docker • Deploy to EKS + AKS + GKE CI/CD via GitHub Actions & Jenkins • IaC with Terraform across 3 clouds Monitoring with Prometheus + Grafana • Centralized Logging with ELK Security Scanning in Pipeline • Cost Optimization Report

Tools & Technologies Covered

Category	Tools
Version Control	Git, GitHub, GitLab, Bitbucket
CI/CD	Jenkins, GitHub Actions, GitLab CI, Azure DevOps, AWS CodePipeline, GCP Cloud Build
Containers	Docker, Docker Compose
Orchestration	Kubernetes, Helm, Istio, EKS, AKS, GKE
IaC	Terraform, Ansible, Pulumi, CloudFormation, Azure Bicep
Monitoring	Prometheus, Grafana, Datadog, CloudWatch, Azure Monitor, GCP Ops
Logging & Tracing	ELK Stack, Fluentd, Jaeger, Zipkin
Security	HashiCorp Vault, Trivy, Snyk, Prisma Cloud, Wiz, OWASP
Cloud Providers	Amazon Web Services (AWS), Microsoft Azure, Google Cloud (GCP)

Scripting	Bash, Python, YAML, HCL (Terraform)

Certifications You Can Pursue

AWS	AWS Certified DevOps Engineer – Professional
Microsoft Azure	Azure DevOps Engineer Expert (AZ-400)
Google Cloud	Google Professional DevOps Engineer
Kubernetes	Certified Kubernetes Administrator (CKA)
Kubernetes	Certified Kubernetes Application Developer (CKAD)
Security	Certified DevSecOps Professional (CDP)
Terraform	HashiCorp Certified: Terraform Associate

This curriculum covers AWS, Azure, and GCP DevOps practices from beginner to advanced level. Includes hands-on labs and real-world capstone projects. Content reflects current cloud-native tools and industry standards. | ByteLearned