

Mastering Multi-Cloud DevOps Engineering

AWS • Azure • GCP • Kubernetes • Terraform • CI/CD • GitOps • DevSecOps • Observability

Technologies: Docker • Kubernetes • EKS • AKS • GKE • Terraform • Ansible • GitHub Actions • GitLab CI • Azure DevOps • AWS CodePipeline • Cloud Build • ArgoCD • Flux • Prometheus • Grafana • Loki • OpenTelemetry • Istio • Helm • Trivy • SonarQube • Falco • Karpenter • KEDA • cert-manager

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COURSE OVERVIEW

This 130-hour, industry-grade programme takes you from DevOps fundamentals to building secure, observable, production-grade multi-cloud pipelines. You will master containerisation (Docker), orchestration (Kubernetes on EKS, AKS & GKE), Infrastructure as Code (Terraform & Ansible), CI/CD (GitHub Actions, GitLab CI, Azure DevOps, AWS & GCP native tools), GitOps (ArgoCD & Flux), DevSecOps security gates, full observability (Prometheus + Grafana + Loki + OpenTelemetry), multi-cloud networking, FinOps, and five end-to-end enterprise projects.

Who Should Attend? DevOps Engineers, Cloud Engineers, Platform Engineers, SREs, and developers wanting cloud-native skills.

Prerequisites: Basic Linux & Python/Bash. Awareness of one cloud platform.

Format: Instructor-led • 40+ hands-on labs • 5 enterprise projects • mock certifications • interview prep.

Module 1: DevOps Fundamentals & Culture | Duration: 3 Hours | Level: Beginner

What is DevOps & Why It Matters

DevOps vs Traditional IT — Key Differences

DevOps Lifecycle — Plan → Code → Build → Test → Release → Deploy → Operate → Monitor

DevOps Principles

- Continuous Integration (CI) & Continuous Delivery / Deployment (CD)
- Infrastructure as Code (IaC), Shift Left — Test Early, Everything as Code

DevOps Culture — Collaboration & Shared Ownership

Site Reliability Engineering (SRE) Overview

Platform Engineering — Modern DevOps

DevOps Tools Landscape — Complete Overview (2025)

Multi-Cloud DevOps — Why Companies Use Multiple Clouds

DevOps Career Roadmap — Roles & Salaries 2025

Lab: DevOps Toolchain Setup — Local Environment

Module 2: Linux & Shell Scripting for DevOps | Duration: 4 Hours | Level: Beginner

Linux Fundamentals — File system, permissions, users & groups

Essential commands — ls, cd, cp, mv, grep, find

Process management — ps, kill, top, htop

System monitoring — df, du, free, netstat

Shell Scripting — Bash

- Variables, data types, arrays
- Conditionals (if/elif/else), Loops (for, while, until)
- Functions, Arguments & input handling
- Error handling — exit codes, Cron jobs — schedule scripts

File Operations & Text Processing — sed, awk, cut, sort, uniq, grep & regex, pipes

Network Commands — curl, wget, ssh, scp, rsync, ping, traceroute, dig

Package Management — apt, yum, dnf | Systemd — Manage Services

Labs: Shell Scripts for DevOps Automation, Cron Job Daily Backup Script

Quiz: Linux & Shell — 15 Questions

Module 3: Git & Version Control | Duration: 3 Hours | Level: Beginner-Intermediate

What is Git & Why Version Control Matters

Git Architecture — Working Tree, Index, Repository

Git Commands — Complete Guide

- init, clone, add, commit, push, pull
- branch, checkout, merge, rebase, stash, cherry-pick, reset, revert
- log, diff, blame, bisect, tag — Version releases

Git Branching Strategies

- GitFlow — feature, develop, release, hotfix branches
- Trunk-Based Development, GitHub Flow — PR-based workflow

Pull Requests & Code Review Best Practices

Git Hooks — Pre-commit, Pre-push automation

Monorepo vs Polyrepo — When to Use What

Semantic Versioning — MAJOR.MINOR.PATCH

Git Submodules & Subtrees | .gitignore & .gitattributes Best Practices

Labs: GitFlow Workflow Feature → Production, Git Hooks Pre-commit Linting

Quiz: Git — 15 Questions

Module 4: Docker — Containerization | Duration: 5 Hours | Level: Intermediate

What is Docker & Why Containerisation | Docker vs VMs — Key Differences

Docker Architecture — Engine (daemon & CLI), Images (Layers & Union FS), Containers, Registry

Docker Commands — run, build, push, pull, stop, rm, ps, images, logs, exec, inspect, network, volume, stats

Dockerfile — Build Custom Images

- FROM, RUN, COPY, ADD, ENV, ARG, WORKDIR, EXPOSE, CMD, ENTRYPOINT

- Multi-stage builds — Smaller, leaner images | Layer caching best practices

Docker Compose — Multi-Container Apps

- docker-compose.yml: services, networks, volumes, .env variables

- docker compose up, down, logs, scale

Docker Networking — Bridge, Host, None, Overlay | Container-to-container communication

Docker Volumes — Named volumes, Bind mounts, tmpfs mounts

Docker Registry — Docker Hub, AWS ECR, Azure ACR, GCP Artifact Registry

Docker Security — Non-root user, Read-only FS, Trivy/Snyk scanning, Secrets management

Best Practices — Alpine/Distroless base images, layer optimisation, health checks

Labs: Dockerize Python & Node.js Apps, Multi-Stage Build, Docker Compose Full Stack

Quiz: Docker — 20 Questions

Module 5: Kubernetes — Container Orchestration | Duration: 8 Hours | Level: Intermediate-Advanced

SECTION A — Fundamentals & Architecture

- Control Plane: API Server, etcd, Scheduler, Controller Manager, Cloud Controller Manager
- Worker Nodes: kubelet, kube-proxy, Container Runtime
- kubectl: get, describe, create, apply, delete, logs, exec, port-forward, rollout, scale, autoscale

SECTION B — Core Objects

- Pods (single/multi-container, init containers, sidecar pattern)
- ReplicaSets, Deployments (rolling update, recreate, rollback)
- StatefulSets, DaemonSets, Jobs & CronJobs, Namespaces

SECTION C — Networking

- Services: ClusterIP, NodePort, LoadBalancer, ExternalName
- Ingress — NGINX/Traefik, path/host routing, TLS termination
- Network Policies, CoreDNS, Istio Service Mesh Overview

SECTION D — Storage

- PV & PVC, Storage Classes (Dynamic Provisioning)
- ConfigMaps, Secrets (Opaque, TLS, Docker), External Secrets (AWS/Azure/GCP)

SECTION E — Scheduling & Resource Management

- Resource Requests & Limits, LimitRange, ResourceQuota
- Node/Pod Affinity & Anti-Affinity, Taints & Tolerations, Priority Classes

SECTION F — Scaling & Auto-Healing

- HPA (CPU/Memory/Custom metrics), VPA, Cluster Autoscaler, KEDA

SECTION G — Security

- RBAC: Roles, ClusterRoles, Bindings, Service Accounts
- Pod Security Standards, OPA Gatekeeper, Falco Runtime Security

SECTION H — Helm

- Charts, Releases, Repositories | helm install/upgrade/rollback/uninstall
- Writing Custom Helm Charts — Chart.yaml, values.yaml, Go templates, helpers
- values-dev.yaml, values-prod.yaml | Helmfile | ArtifactHub

Labs: Deploy Microservices, HPA Auto-Scale, Helm Chart, RBAC, Network Policies

Quiz: Kubernetes — 25 Questions

Module 6: Kubernetes on AWS — EKS | Duration: 5 Hours | Level: Advanced

What is Amazon EKS — Managed Kubernetes on AWS

EKS Architecture — Control Plane & Node Groups

Creating EKS Cluster — eksctl, AWS Console, Terraform

EKS Node Groups — Managed, Self-Managed, AWS Fargate (Serverless pods)

EKS Networking — VPC CNI Plugin, ALB Ingress Controller, ExternalDNS (Route53)

EKS Storage — EBS CSI Driver, EFS CSI Driver, S3 CSI Driver

EKS IAM Integration — IRSA, Pod Identity, AWS Secrets Manager

EKS Cluster Autoscaler & Karpenter — Node templates, Spot-aware provisioning

EKS Monitoring — CloudWatch Container Insights, Prometheus + Grafana, ADOT

EKS Cost Optimization — Spot instances, Karpenter with Spot, right-sizing

EKS Security — RBAC with IAM, GuardDuty for EKS, Audit logs

EKS Upgrades — Zero-Downtime Strategy

Labs: Create EKS Cluster (eksctl), ALB Ingress + Route53, IRSA S3 Access, Karpenter

Quiz: EKS — 15 Questions

Module 7: Kubernetes on Azure — AKS | Duration: 4 Hours | Level: Advanced

What is Azure Kubernetes Service (AKS) | AKS Architecture & Components

Creating AKS Cluster — Azure CLI, Azure Portal, Terraform

AKS Node Pools — System vs User, Spot node pools, Windows node pools

AKS Networking — Kubenet vs Azure CNI, AGIC, Azure Load Balancer, Private AKS cluster

AKS Storage — Azure Disk CSI, Azure Files CSI, Azure Blob Storage CSI

AKS Identity & Security

- Workload Identity, Azure Key Vault integration, Azure AD RBAC, Defender for Containers

AKS Auto-Scaling — Cluster Autoscaler, KEDA, Virtual Nodes (ACI burst)

AKS Monitoring — Azure Monitor Container Insights, Prometheus + Grafana, Managed Grafana

AKS Cost Management — Stop/Start cluster, Spot pools, right-sizing

AKS GitOps — Flux CD Integration

Labs: AKS Cluster (Terraform), Workload Identity + Key Vault, KEDA on Service Bus

Quiz: AKS — 15 Questions

Module 8: Kubernetes on GCP — GKE | Duration: 4 Hours | Level: Advanced

What is Google Kubernetes Engine (GKE)

GKE Architecture — Standard vs Autopilot

- GKE Standard — Manual node management | GKE Autopilot — Fully managed nodes

Creating GKE Cluster — gcloud CLI, Console, Terraform

GKE Node Pools — Spot VMs, Preemptible VMs, GPU pools for ML workloads

GKE Networking — VPC-Native (Alias IP), GKE Ingress, Multi-cluster Ingress, Private GKE

GKE Storage — Persistent Disk CSI, Filestore CSI (NFS), GCS FUSE (mount buckets)

GKE Identity & Security

- Workload Identity Federation, Binary Authorization, Shielded Nodes, Security Posture Dashboard

GKE Scaling — Cluster Autoscaler, Node Auto-Provisioning, VPA, KEDA

GKE Monitoring — Cloud Monitoring, Cloud Logging, Managed Prometheus

GKE Cost Optimization — Spot VMs, Autopilot efficiency, Usage metering

GKE GitOps — Config Sync (Anthos)

Labs: GKE Autopilot Cluster, Workload Identity GCS Access, Multi-Path Ingress

Quiz: GKE — 15 Questions

Module 9: Infrastructure as Code — Terraform | Duration: 6 Hours | Level: Intermediate-Advanced

What is IaC & Why Terraform | Terraform vs Ansible vs Pulumi vs CloudFormation

Terraform Architecture — Providers, Resources, Data Sources, State, Modules, Workspaces

Terraform Commands

- init, plan, apply, destroy, validate, fmt, show

- state list/show/mv/rm, import, output

Terraform Language — HCL

- Variables (input, local, output), Data types, Expressions, Functions

- Dynamic blocks, for_each & count — Multiple resources

Terraform State Management — Local, Remote (S3/Azure Blob/GCS), State Locking

Terraform Modules — Write, publish, version, public registry

Terraform on AWS — VPC, EC2, RDS, S3, EKS, IAM

Terraform on Azure — Resource Groups, VNet, AKS, ACR, Key Vault

Terraform on GCP — VPC, GKE, Cloud SQL, GCS, IAM

Best Practices — DRY, separate state per env, module versioning, naming conventions

Terragrunt — DRY Terraform Configurations

Terraform Cloud & Enterprise — Remote runs, Sentinel Policy as Code

Terraform Testing — Terratest & Checkov

Labs: VPC + EKS (AWS), AKS + ACR (Azure), GKE + GCS (GCP), Reusable EKS Module

Quiz: Terraform — 20 Questions

Module 10: Ansible — Configuration Management | Duration: 4 Hours | Level: Intermediate

What is Ansible & Configuration Management | Ansible vs Chef vs Puppet vs SaltStack

Ansible Architecture — Agentless, SSH-based, Control Node, Managed Nodes, Inventory

Ansible Inventory — Static hosts file, AWS/Azure/GCP dynamic inventory, group_vars, host_vars

Ansible Ad-Hoc Commands — ping, command, shell, copy

Ansible Playbooks

- Plays, Tasks, Handlers | Variables, Conditionals (when), Loops (loop/with_items)

- Tags, Include & Import — Reuse tasks

Ansible Modules — file, copy, template, service, package, user, cron, git, docker

Ansible Roles — Structured reusable code | Ansible Galaxy — Download roles

Ansible Vault — Encrypt Sensitive Data

Ansible with AWS — Provision & Configure EC2

Ansible with Azure — Configure VMs | Ansible with GCP — Configure Instances

Ansible Tower / AWX — Enterprise Ansible

Labs: NGINX Playbook, Web Server Role, Ansible + AWS EC2

Quiz: Ansible — 15 Questions

Module 11: GitHub Actions — CI/CD | Duration: 6 Hours | Level: Intermediate-Advanced

GitHub Actions Architecture — Workflows, Jobs, Steps, Runners (hosted & self-hosted), Events

Workflow File — .github/workflows/ | Triggers: push, pull_request, workflow_dispatch, schedule, release

Jobs & Steps — runs-on, needs, strategy.matrix, if, timeout-minutes

GitHub Actions Core Features

- Secrets, Environment variables, Outputs, Artifacts, Cache

- Environments (dev/staging/prod gates), Concurrency control

GitHub Marketplace Actions

- actions/checkout, setup-python/node/java, docker/build-push-action

- aws-actions/configure-aws-credentials, azure/login, google-github-actions/auth

Writing Custom Actions — Composite, Docker container, JavaScript

Reusable Workflows — DRY CI/CD across repos

GitHub Actions for Docker — Build & push to ECR/ACR/Artifact Registry, Multi-platform builds

GitHub Actions for Kubernetes — Deploy to EKS/AKS/GKE, kubectl, Helm

GitHub Actions for AWS — OIDC keyless auth, Lambda, ECS, EKS, S3 sync, CloudFormation

GitHub Actions for Azure — OIDC, AKS, App Service, Functions, Terraform Plan/Apply

GitHub Actions for GCP — Workload Identity Federation, GKE, Cloud Run, Functions

GitHub Actions for Terraform — Plan on PR, Apply on merge, Infracost cost estimate

Security — OIDC, Secret scanning, Dependabot, CodeQL

Best Practices — Pin action versions (SHA), minimal permissions, matrix parallel testing

Labs: CI Build+Test+Scan, CD to EKS (Helm), OIDC Keyless AWS, Matrix Strategy, Reusable Workflow

Quiz: GitHub Actions — 20 Questions

Module 12: GitLab CI/CD | Duration: 6 Hours | Level: Intermediate-Advanced

GitLab CI/CD & DevOps Platform | GitLab vs GitHub — Feature Comparison

.gitlab-ci.yml — Pipeline Configuration (stages, jobs, scripts)

Pipeline Triggers — Push, MR pipeline, Schedule, API, Upstream/Downstream

Stages & Jobs — before_script, after_script, artifacts, cache, dependencies

GitLab Runners — Shell, Docker, Kubernetes executors | Tags, Self-hosted setup

GitLab Variables — Predefined (CI_COMMIT_SHA), Custom, Protected/Masked, Env-specific

GitLab Environments & Deployments

- Protected environments with approval gates | Review apps — Dynamic envs per MR

GitLab Includes & Templates — include, extends, !reference, Built-in CI templates

GitLab Rules & Workflow — rules, workflow rules, changes-based triggers

GitLab Needs — DAG Pipelines (skip stage ordering for faster pipelines)

GitLab CI/CD for Docker — Build to GitLab Registry, Kaniko vs DinD

GitLab CI/CD for Kubernetes — GitLab Kubernetes Agent (GitOps), EKS/AKS/GKE, Helm

GitLab CI/CD for AWS/Azure/GCP — OIDC keyless auth, Terraform pipelines

GitLab Security — DevSecOps

- SAST, DAST, Dependency scanning, Container scanning, Secret detection, License compliance

GitLab Auto DevOps — One-Click Pipeline

Labs: Multi-Stage Pipeline, MR Pipeline, Deploy to EKS, SAST + Container Scan, K8s Agent GitOps

Quiz: GitLab CI/CD — 20 Questions

Module 13: AWS DevOps Services | Duration: 6 Hours | Level: Intermediate-Advanced

AWS Developer Tools

- CodeCommit — Managed Git (repos, branches, triggers)
- CodeBuild — buildspec.yml, build phases, artifacts, Docker builds, S3/layer caching
- CodeDeploy — EC2/Lambda/ECS, In-place, Blue/Green, Canary, AppSpec, lifecycle hooks, rollback
- CodePipeline — Source → Build → Test → Deploy, Manual approvals, cross-account
- CodeArtifact — Maven, npm, PyPI, NuGet package registry

AWS Container Services

- ECR — Push/pull, lifecycle policies, image scanning, cross-account sharing, ECR Public
- ECS — Clusters, Services, Task Definitions, EC2 vs Fargate, ALB integration, CI/CD
- AWS Fargate — Serverless containers, Fargate Spot for cost optimisation

AWS Infrastructure & Config

- CloudFormation — Templates, Stacks, StackSets, Change sets
- AWS CDK — IaC in Python/TypeScript/Java
- AWS Systems Manager — Parameter Store, Session Manager, Run Command, Patch Manager
- AWS Config — Compliance & Drift Detection

AWS Monitoring & Observability

- CloudWatch — Metrics, Logs, Log Insights, Alarms, Dashboards, EventBridge
- AWS X-Ray — Distributed Tracing, Service map, Sampling rules
- CloudTrail — API audit logging, S3 + CloudWatch, Compliance
- Amazon Managed Grafana & Prometheus

Full Pipeline: GitHub → CodeBuild → ECR → CodeDeploy → ECS/EKS

Labs: CodePipeline → ECS Fargate, Blue/Green (CodeDeploy), CloudFormation VPC+EKS, CloudWatch Alarms

Quiz: AWS DevOps — 20 Questions

Module 14: Azure DevOps Services | Duration: 6 Hours | Level: Intermediate-Advanced

Azure DevOps Platform

- Azure Boards (Agile), Repos (Git), Pipelines (CI/CD), Artifacts, Test Plans

Azure Repos

- Branch policies, protection, PR workflow, Code review (comments & approvals)

Azure Pipelines — YAML

- Structure: trigger, stages, jobs, steps | Triggers: push, PR, schedule, manual
- Tasks: Docker build/push, kubectl, Helm, Terraform, AzureCLI, Web App Deploy
- Agents: Microsoft-hosted (Ubuntu/Windows/macOS), Self-hosted, Container jobs
- Variables, Variable groups, Key Vault integration, Secret masking
- Environments — Kubernetes, VM, Approval gates
- Deployment strategies: RunOnce, Rolling, Canary, Blue/Green
- Pipeline Templates — Step, Job, Stage templates (DRY)

Azure Container Registry (ACR)

- Push/pull, Geo-replication, ACR Tasks, Defender scanning, Webhooks

Azure Infrastructure

- ARM Templates — Parameters, variables, resources, outputs, Linked templates
- Bicep — Simplified ARM, Bicep vs Terraform, Bicep modules & CI/CD
- Azure Policy, Azure Blueprints, Management Groups

Azure Monitoring

- Azure Monitor, Log Analytics (KQL, Workbooks), Application Insights (APM)
- Azure Managed Grafana, Network Watcher

Full Pipeline: Azure Repos → Azure Pipelines → ACR → AKS

Labs: Full CI/CD to AKS (Helm), Blue/Green on AKS, Bicep IaC Pipeline, Key Vault Secrets

Quiz: Azure DevOps — 20 Questions

Module 15: GCP DevOps Services | Duration: 5 Hours | Level: Intermediate-Advanced

Cloud Build — Managed CI/CD

- cloudbuild.yaml, build steps, substitutions (variables)
- Triggers: Push, PR, tag, manual | Private pools, Cloud Build security (IAM & VPC)

Cloud Deploy — Managed CD

- Delivery pipelines, Targets (GKE, Cloud Run, Anthos)
- Rollouts, Approvals between stages, Rollback, Canary (traffic splitting)

Artifact Registry

- Docker, Maven, npm, PyPI, Go, Apt/Yum | Vulnerability scanning
- Remote & Virtual repositories

GCP Container & Serverless

- Cloud Run — Serverless containers, Zero-to-N auto-scaling, Traffic splitting
- Cloud Run Jobs — Batch workloads | VPC connector — Private access

GCP Infrastructure

- Deployment Manager — GCP native YAML IaC
- Config Connector — Kubernetes for GCP Resources
- Anthos Config Management — Config Sync (GitOps), Policy Controller (OPA)

GCP Security & Governance

- Cloud IAM, Binary Authorization, Cloud Armor (WAF & DDoS), Secret Manager

GCP Monitoring & Observability

- Cloud Monitoring — Metrics, uptime checks, alerting policies
- Cloud Logging — Log explorer, log-based metrics, BigQuery/GCS sinks
- Cloud Trace, Cloud Profiler, Error Reporting, Managed Prometheus & Grafana

Full Pipeline: GitHub → Cloud Build → Artifact Registry → Cloud Deploy → GKE

Labs: Cloud Build CI, Cloud Deploy to GKE, Cloud Run CI/CD, Managed Prometheus+Grafana

Quiz: GCP DevOps — 15 Questions

Module 16: GitOps — Git-Driven Deployments | Duration: 4 Hours | Level: Advanced

What is GitOps & Why It Is the Future of Deployments

GitOps Principles — Git as single source of truth, Declarative infra, Auto-reconciliation, Pull-based

GitOps vs Traditional CI/CD — Push vs Pull model

ArgoCD — Kubernetes GitOps

- ArgoCD Architecture & Installation on Kubernetes
- Applications — Sync Git to Cluster | ApplicationSets — Multi-cluster deploy
- Sync policies (Auto & Manual), Rollback (Git revert = cluster revert)
- ArgoCD with Helm & Kustomize | RBAC, Notifications (Slack/Email), Image Updater

Flux CD — Alternative GitOps Tool

- Flux vs ArgoCD — Comparison
- Flux controllers: Source, Kustomize, Helm | GitRepository, HelmRelease, Kustomization

Kustomize — Kubernetes Config Management

- Base & overlays, patches, namePrefix, commonLabels
- ConfigMap & Secret generators | Kustomize vs Helm — When to use each

GitOps with Multi-Cluster — ArgoCD ApplicationSets, Cluster generators

GitOps Security — Secrets in Git

- Sealed Secrets, External Secrets Operator, SOPS (Mozilla Secret Operations)

Labs: ArgoCD Deploy GitHub → EKS, ApplicationSets Multi-Cluster, Flux on GKE, Sealed Secrets

Quiz: GitOps — 15 Questions

Module 17: DevSecOps — Security in DevOps | Duration: 4 Hours | Level: Advanced

What is DevSecOps — Shift Security Left | Security in CI/CD Pipeline — Gates & quality enforcement

SAST — Static Application Security Testing

- SonarQube, Semgrep — Fast SAST, Bandit — Python, Checkov & tfsec — Terraform/IaC

DAST — Dynamic Application Security Testing — OWASP ZAP, Nikto

Dependency Scanning — Snyk, Dependabot, OWASP Dependency Check

Container Security

- Trivy & Grype — Container image scanning | Docker Bench Security
- Falco — Runtime threat detection

Secrets Scanning — GitLeaks, TruffleHog, GitHub Secret Scanning

Supply Chain Security

- SLSA — Supply chain Levels for Software Artifacts
- Sigstore & Cosign — Container signing
- SBOM (Software Bill of Materials), Syft — Generate SBOM

Infrastructure Security — Checkov, tfsec, Prowler (AWS), ScoutSuite (multi-cloud)

Kubernetes Security Tools

- kube-bench (CIS benchmark), kube-hunter (pen testing)
- Polaris (best practice), OPA Gatekeeper (policy enforcement)

Security Pipeline Integration — Quality gates, block on critical CVEs, vuln management workflow

Labs: Trivy + Snyk in GitHub Actions, SonarQube Code Gate, Checkov IaC Scan, Falco Runtime

Quiz: DevSecOps — 15 Questions

Module 18: Observability & Monitoring Stack | Duration: 5 Hours | Level: Advanced

Three Pillars of Observability — Metrics, Logs & Traces

Prometheus — Metrics Collection

- Architecture, PromQL, Exporters (node, blackbox, custom)

- ServiceMonitor & PodMonitor, Alertmanager, Recording & Alert rules
 - Prometheus Operator — Manage Prometheus on Kubernetes
- Grafana — Visualisation & Dashboards
- Data sources: Prometheus, Loki, Tempo, CloudWatch | Dashboard creation
 - Grafana Alerting, Grafana as Code (JSON), Grafana Cloud
- Loki — Log Aggregation
- Loki Architecture (Distributor, Ingestor, Querier) | LogQL — Query language
 - Promtail — Log collector | Loki with Kubernetes — Collect pod logs
- Tempo — Distributed Tracing
- OpenTelemetry — Industry standard | Grafana + Tempo trace visualisation
- ELK Stack — Elasticsearch, Logstash, Kibana
- Filebeat — Log shipper | ECK operator on Kubernetes
- OpenTelemetry — Unified Observability
- OTel SDK, OTel Collector, Auto-instrumentation
- Distributed Tracing — Spans, Traces, Context propagation, Jaeger
- SLI, SLO & SLA — Reliability Metrics
- Define SLIs, Set SLOs, Error budgets, Alert on SLO burn rate
- On-Call & Incident Management — PagerDuty, OpsGenie, Runbooks
- Labs:** Prometheus + Grafana on K8s, Loki Log Collection, OTel Python App, SLO Dashboard
- Quiz:** Observability — 20 Questions

Module 19: Multi-Cloud Networking & Security | Duration: 4 Hours | Level: Advanced

Multi-Cloud Networking Overview

AWS Networking for DevOps

- VPC: Subnets, Route Tables, IGW, NAT, Security Groups, NACLs
- VPC Peering & Transit Gateway, AWS PrivateLink
- Route 53 — DNS | CloudFront — CDN | AWS WAF & Shield

Azure Networking for DevOps

- VNet: Subnets, NSG, Route Tables | VNet Peering, Virtual WAN, Azure Private Link
- Azure DNS, Azure Front Door (Global CDN), Application Gateway (WAF)

GCP Networking for DevOps

- VPC: Subnets, Firewall Rules, VPC Peering, Shared VPC
- Cloud NAT & Cloud Armor | Cloud CDN & Load Balancing | Cloud DNS

Service Mesh — Advanced Networking

- Istio — VirtualService & DestinationRule, Traffic splitting (canary), mTLS, Kiali
- Linkerd — Lightweight service mesh alternative

Cert-Manager — TLS Certificate Automation

- Let's Encrypt, ClusterIssuer & Certificate objects on Kubernetes

External DNS — Auto-DNS for Kubernetes Services

Labs: AWS VPC + EKS Private Cluster, Istio Canary with Traffic Splitting, cert-manager Auto TLS

Module 20: Multi-Cloud Cost Optimization & FinOps | Duration: 3 Hours | Level: Advanced

What is FinOps — Cloud Cost Management Framework

AWS Cost Optimization

- Cost Explorer, Budgets, Reserved Instances vs Savings Plans
- Spot instances, Right-sizing, S3 Intelligent Tiering, Trusted Advisor

Azure Cost Optimization

- Azure Cost Management, Azure Advisor, Reserved VMs & Savings Plans
- Azure Spot VMs, Azure Hybrid Benefit

GCP Cost Optimization

- Cloud Billing (reports & budgets), Committed Use Discounts (CUD)
- Spot VMs (Preemptible), GCP Recommender, Budget alerts

Kubernetes Cost Optimization

- Kubecost — K8s cost visibility & chargeback
- Resource requests right-sizing | Spot/Preemptible node pools
- Cluster bin packing | Karpenter — Cost-aware provisioning

Infracost — Cost in CI/CD Pipeline

- Show cost estimate on Terraform PR | Block if cost exceeds threshold

Labs: Kubecost Kubernetes Cost Dashboard, Infracost in GitHub Actions

Module 21: End-to-End Multi-Cloud DevOps Projects | Duration: 10 Hours | Level: Advanced

Project 1 — AWS DevOps Pipeline

- App: Python microservices | CI: GitHub Actions (Docker build → Trivy scan → ECR push)
- IaC: Terraform — VPC + EKS + RDS
- CD: ArgoCD GitOps deploy to EKS | Ingress: ALB + Route53 + cert-manager
- Monitoring: Prometheus + Grafana + Loki | Security: Checkov + Snyk | Alerts: Slack + PagerDuty

Project 2 — Azure DevOps Pipeline

- App: Node.js microservices | Source: Azure Repos
- CI: Azure Pipelines (Build + container scanning → ACR push)
- IaC: Bicep — AKS + VNET + Key Vault
- CD: Azure Pipelines Blue/Green to AKS | Secrets: Key Vault + External Secrets Operator
- Monitoring: Azure Monitor + Managed Grafana | Security: Defender for Containers

Project 3 — GCP DevOps Pipeline

- App: Go microservices | CI: Cloud Build (Build + scan + Artifact Registry push)
- IaC: Terraform — GKE + VPC + Cloud SQL
- CD: Cloud Deploy progressive delivery | GitOps: Flux CD config management
- Monitoring: Managed Prometheus + Grafana | Security: Binary Authorization + Checkov

Project 4 — Multi-Cloud GitOps Platform

- Clusters: EKS + AKS + GKE — three-cloud deployment
- ArgoCD ApplicationSets — one config deploys to all 3 clusters with overrides
- CI: GitHub Actions unified pipeline | Registry: ECR + ACR + Artifact Registry
- IaC: Terraform all 3 clouds | Observability: OpenTelemetry → Grafana Cloud
- FinOps: Kubecost + Infracost in pipeline

Project 5 — Full DevSecOps Pipeline

- CI: GitHub Actions — SAST (SonarQube + Semgrep), Snyk, Trivy, Checkov, GitLeaks
- Supply chain: Cosign image signing | CD: ArgoCD + OPA Gatekeeper policies
- Runtime: Falco security monitoring | Reporting: Security dashboard in Grafana

BONUS TOPICS: Advanced DevOps Mastery

1. Platform Engineering

- Internal Developer Platform (IDP) concepts
- Backstage — Developer portal
- Self-service infrastructure for dev teams
- Golden paths — Standardised workflows

2. Service Mesh Deep Dive

- Istio traffic management at scale
- mTLS zero-trust networking
- Circuit breaking & retry policies
- Distributed tracing with Istio + Jaeger

3. Advanced Kubernetes Patterns

- Operator pattern — Extend Kubernetes API
- Custom Resource Definitions (CRDs)
- Controller-runtime — Build your own operator
- Kubebuilder & Operator SDK

4. Policy as Code

- Open Policy Agent (OPA) deep dive
- Rego language — Write policies
- OPA Gatekeeper on Kubernetes
- Kyverno — Kubernetes-native policies

5. MLOps & AI/ML Pipelines

- Kubeflow — ML pipelines on Kubernetes
- MLflow + Airflow integration
- GPU node pools on EKS/AKS/GKE
- Model serving — Triton, TorchServe

6. Chaos Engineering

- Principles of Chaos Engineering
- LitmusChaos — Kubernetes chaos
- Chaos Monkey — AWS failures
- Gremlin — Enterprise chaos platform

7. Progressive Delivery

- Canary deployments — Flagger
- Feature flags — LaunchDarkly, Flagsmith
- A/B testing in production
- Blue/Green at scale

8. Container Runtime & eBPF

- containerd vs CRI-O vs Docker runtime
- eBPF — Linux observability
- Cilium — eBPF-based networking
- Hubble — Network observability

9. Multi-Cloud Database DevOps

- Database migration automation
- Liquibase & Flyway — DB schema CI/CD
- AWS RDS, Azure SQL, Cloud SQL — IaC

- Database backup automation in Kubernetes

10. Edge & IoT DevOps

- K3s — Lightweight Kubernetes for edge
- KubeEdge — IoT edge computing
- Multi-arch Docker builds (AMD64 + ARM64)
- GitHub Actions multi-platform CI

DEVOPS INTERVIEW PREPARATION & CAREER GUIDE

1. Technical Interview Strategy

Know Kubernetes architecture cold — every component & its function

Explain design decisions with trade-offs (Helm vs Kustomize, ArgoCD vs Flux)

Show CI/CD pipeline design end-to-end

Demonstrate multi-cloud awareness — same problem, 3 cloud solutions

Discuss observability — how you diagnose a production issue

2. Top Interview Questions

'Design a zero-downtime blue/green deployment on Kubernetes'

'How do you manage secrets in a GitOps workflow?'

'What is the difference between HPA and KEDA?'

'How would you implement canary deployments on EKS?'

'Explain the difference between ArgoCD and Flux'

'How do you handle Terraform state in a team?'

'What is IRSA and why is it better than instance profiles?'

'How do you debug a CrashLoopBackOff pod?'

3. Resume Bullet Upgrades

■ Managed Kubernetes clusters

■ Managed 3 production EKS clusters (50+ microservices) with zero-downtime rolling deploys via ArgoCD GitOps

■ Set up CI/CD pipelines

■ Built GitHub Actions CI/CD with Trivy + Snyk security gates reducing CVE exposure by 70% across 20+ repos

■ Used Terraform

■ Authored 15 reusable Terraform modules (VPC, EKS, AKS, GKE) cutting infra provisioning from 3 days to 45 min

4. Certifications Roadmap

Month 1-2: Certified Kubernetes Administrator (CKA)

Month 3: Certified Kubernetes Application Developer (CKAD)

Month 4: Certified Kubernetes Security Specialist (CKS)

Month 5-6: AWS Solutions Architect Associate / Professional

Month 7-8: Azure Administrator AZ-104 / DevOps Engineer AZ-400

Month 9-10: GCP Professional Cloud DevOps Engineer

Month 11+: HashiCorp Certified: Terraform Associate

5. Salary Expectations (India)

Entry level (0-2 years): ■8-14 LPA

Mid-level (2-5 years): ■16-28 LPA

Senior (5+ years): ■28-45 LPA

Lead/Principal/Staff Engineer: ■45-70+ LPA

6. Salary Expectations (Global)

US: \$120K-180K (Senior DevOps), \$180K-220K+ (Staff/Principal)

Canada: CAD \$110K-155K

UK: £75K-120K

EU: €80K-130K

Remote (India-based): 1.5-2x Indian market

RESUME & CAREER SKILL UPGRADE GUIDE

MUST-HAVE TECHNICAL SKILLS

- Linux & Shell scripting
- Docker — build, optimise, push
- Kubernetes — production-grade workloads
- Terraform — modules, remote state, multi-cloud
- CI/CD — GitHub Actions or GitLab CI
- At least 2 major cloud platforms
- Git — branching strategy, PR workflow
- Helm — chart authoring, values management

DIFFERENTIATING SKILLS

- GitOps — ArgoCD or Flux
- Observability — Prometheus + Grafana + Loki
- DevSecOps — Trivy, SonarQube, OPA
- Service Mesh — Istio basics
- FinOps — Kubecost, Infracost
- Platform Engineering — Backstage, golden paths
- Chaos Engineering — LitmusChaos

SKILLS PROGRESSION PATH

Year 1: Linux + Docker + Kubernetes basics + Git

Year 2: Terraform + CI/CD + 1 cloud (EKS/AKS/GKE) + Helm

Year 3: GitOps + Observability + DevSecOps + multi-cloud

Year 4+: Platform Engineering + Architecture + SRE + Leadership

PROJECT PORTFOLIO CHECKLIST

- Dockerised multi-service app with multi-stage builds
- Kubernetes deployment with HPA & resource limits
- Helm chart for a real application
- Terraform modules for VPC + EKS (or AKS/GKE)
- CI/CD pipeline with security scanning
- ArgoCD GitOps deployment
- Prometheus + Grafana monitoring stack
- DevSecOps pipeline with quality gates
- Multi-cloud comparison project

TARGET JOB TITLES

DevOps Engineer (Junior / Senior)

Platform Engineer

Cloud Engineer (AWS / Azure / GCP)

Site Reliability Engineer (SRE)

Kubernetes Engineer

Infrastructure Engineer

MLOps Engineer

Cloud Architect (5+ years)

COURSE SUMMARY & OUTCOMES

WHAT YOU'LL MASTER

- ✓ Build and deploy containerised applications with Docker & Kubernetes
- ✓ Manage Kubernetes clusters on EKS, AKS, and GKE
- ✓ Provision multi-cloud infrastructure with Terraform (AWS + Azure + GCP)
- ✓ Build production-grade CI/CD pipelines (GitHub Actions + GitLab CI + Azure DevOps)
- ✓ Implement GitOps with ArgoCD and Flux CD
- ✓ Integrate DevSecOps security gates into every pipeline
- ✓ Build full observability stacks (Prometheus + Grafana + Loki + OpenTelemetry)
- ✓ Automate configuration with Ansible
- ✓ Optimise cloud costs with FinOps practices
- ✓ Deliver 5 enterprise-grade end-to-end multi-cloud projects
- ✓ Prepare for CKA, CKAD, AWS, Azure, and GCP certifications

COURSE STATISTICS

Total Duration: 130 hours (16-18 weeks)

21 Core Modules + 10 Bonus Topics

40+ Hands-On Labs

5 End-to-End Multi-Cloud Projects

300+ CLI commands, manifests & pipeline examples

Mock certification exams & interview Q&A sessions

Lifetime Access to Course Materials

Job Placement Assistance & LinkedIn Review

ENROLLMENT & CONTACT

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