

# Kubernetes Essentials Course Outline

**Duration:** 24–30 Hours

**Level:** Beginner to Intermediate

**Delivery Mode:** Online / Offline

**Target Audience:** Developers, DevOps Engineers, System Administrators, Cloud Engineers

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## Module 1: Introduction to Kubernetes

- What is Kubernetes?
  - Benefits of Kubernetes in DevOps and Cloud-Native Development
  - Key Concepts: Pods, Nodes, Clusters, and Services
  - Kubernetes vs. Docker
  - Kubernetes Architecture Overview
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## Module 2: Setting Up Kubernetes

- Installing Kubernetes with Minikube and kubeadm
  - Configuring kubectl (Command Line Tool)
  - Kubernetes Cluster Setup
  - Introduction to Kubernetes Cloud Providers (GKE, EKS, AKS)
  - Exploring the Kubernetes Dashboard
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## Module 3: Pods, Deployments, and Namespaces

- Understanding Pods and Pod Lifecycle
  - Creating and Managing Deployments
  - Rolling Updates and Rollbacks
  - Using Namespaces for Isolation
  - Labels, Selectors, and Annotations
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## Module 4: Kubernetes Services and Networking

- Introduction to Kubernetes Services
- Types of Services: ClusterIP, NodePort, LoadBalancer, and ExternalName

- Service Discovery and DNS in Kubernetes
  - Networking in Kubernetes: Ingress Controllers and Network Policies
  - Managing Pod-to-Pod Communication
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## **Module 5: Persistent Storage and Volumes**

- Kubernetes Volumes: Types and Use Cases
  - Configuring Persistent Volumes (PVs) and Persistent Volume Claims (PVCs)
  - StatefulSets for Stateful Applications
  - Storage Solutions: NFS, AWS EBS, GCE Persistent Disks
  - Using Kubernetes ConfigMaps and Secrets for Configuration Management
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## **Module 6: Scaling and Autoscaling**

- Horizontal Pod Autoscaling (HPA)
  - Vertical Pod Autoscaling (VPA)
  - Cluster Autoscaling
  - Resource Requests and Limits for Pods
  - Managing Load Balancers and Scaling Applications
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## **Module 7: Kubernetes Security**

- Securing Kubernetes Clusters and Access Control
  - Authentication and Authorization: RBAC, ABAC, and Service Accounts
  - Network Policies for Pod Security
  - Running Containers with Least Privilege
  - Using Kubernetes Secrets for Sensitive Data Management
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## **Module 8: Monitoring and Logging in Kubernetes**

- Introduction to Kubernetes Monitoring Tools (Prometheus, Grafana)
- Setting Up Logs with Fluentd and ELK Stack
- Metrics Server and Custom Metrics
- Application Monitoring and Alerts
- Troubleshooting Kubernetes Pods and Deployments

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## **Module 9: Managing Configurations and Secrets**

- Using ConfigMaps for External Configuration
- Storing Secrets Securely in Kubernetes
- Secrets Management Best Practices
- Configuring Helm for Package Management
- Helm Charts for Kubernetes Deployment

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## **Module 10: Hands-On Project and Case Studies**

- Build and Deploy a Multi-Tier Application on Kubernetes
- Managing a Kubernetes Cluster in the Cloud (GKE, EKS, AKS)
- Implement CI/CD Pipelines with Kubernetes and Docker
- Kubernetes Best Practices for Production Environments