

# Kubernetes for Administrator and Developer (CKA + CKAD)

**Course Duration: 56 Hours (7 Days)**

## Overview

The Kubernetes for Administrator and Developer (CKA + CKAD) course is a comprehensive program designed to equip learners with the skills needed to manage Kubernetes clusters and Containerized applications effectively. It covers a wide range of topics from core concepts, Installation, Configuration, and Validation to more advanced topics such as Scheduling, Security, and Troubleshooting. For administrators, the course dives into the nitty-gritty of Kubernetes for administrators, including Cluster maintenance, Security policies, and Networking, ensuring that they can maintain and scale Kubernetes infrastructure efficiently. Developers, on the other hand, will benefit from modules focused on Application lifecycle management, multi-container pod design, and Building Docker images, which are critical for the Kubernetes application developer certification cost-effectiveness and practical utility. By completing this course, learners will gain the knowledge and hands-on experience needed to design, deploy, and manage applications on Kubernetes, as well as maintain the underlying infrastructure, thus equipping them with the skills required for both the Certified Kubernetes Administrator (CKA) and Certified Kubernetes Application Developer (CKAD) certifications.

## Audience Profile

Koenig Solutions' Kubernetes course prepares IT professionals for CKA and CKAD certifications, focusing on administration and development.

- System Administrators
- DevOps Engineers
- Cloud Engineers
- Software Developers
- Deployment Managers
- Site Reliability Engineers (SREs)
- Technical Leads
- IT Project Managers
- Application Developers
- IT graduates seeking Kubernetes expertise
- Professionals looking to transition into cloud roles
- Technical Architects designing cloud-native applications

## Course Syllabus

### Module 1 – Core Concepts

- Overview of Container Orchestra on
- Introduction on to Kubernetes
- Understanding Kubernetes Architecture

## **Module 2 – Installation on, Configuration & Validation**

- Design a Kubernetes Cluster
- Lab: Installation of Kubernetes 1-Master and 2-Nodes Cluster
- Lab: Choose a Network Solution and Configure
- Lab: Verify Installation with Kubectl command

## **Module 3 – Managing Resources**

- Understanding Pods, Labels & Selectors
- Lab: Deploying Applications as a Pod
- Lab: Managing Labels & Selector
- Understanding Replica Controller & Replica Set
- Lab: Deploying Replica Controller & Replica Set
- Understanding Services – ClusterIP, NodePort & LoadBalancer
- Lab: Creating & Managing Service
- Understanding Daemon Sets
- Lab: Deploying Applications as Daemon Sets

## **Module 4 - Scheduling**

- Manual Scheduling of Pods
- Taint and Tolerations
- Lab: Using Manual Scheduling or Taints and Tolerations

## **Module 5 - Application Lifecycle Management**

- Overview of Deployment
- Deployment Strategies – Blue/Green & Canary
- Lab: Deploying Applications as Deployment
- Lab: Implement Deployment Strategies on Deployments

## **Module 6 - Environment Variable**

- Plain Key
- Config Map
- Secret
- Lab: Using Plain Keys, Config Map & Generic Secret as Environment Variables

- Lab: Mount Environment Variable as Volumes

## **Module 7 – Storage**

- Understanding Volume Management in K8s
- Types of Volumes Provisioning
- Persistent Volumes
- Persistent Volume Claim
- Lab: Using PV & PVC to attach Persistent Volume to a Pod as HostPath
- Understanding Storage Class

## **Module 8 – Stateful Set**

- Introduction to StatefulSet
- Use cases of StatefulSet
- Manage StatefulSet
- Storage in StatefulSet
- Lab: Deploying and Managing Stateful Sets
- Lab: Creating Persistent Storage in Stateful Sets
- Headless Service

## **Module 9 – Security**

- Understanding Kubernetes Authentication
- Lab: Creating and Managing Users in Kubernetes
- Lab: Creating Service Accounts
- Understanding Role, Cluster Role, RoleBinding & ClusterRoleBinding
- Lab: Managing Roles and Role Binding
- Lab: Managing Cluster Role and Cluster Role Binding
- Understanding Security Context
- Lab: Adding Security Context to Pod to enable ping

## **Module 10 – Cluster Maintenance**

- Understanding OS Upgrade
- Lab: Upgrade a Kubernetes Cluster Version
- Static Pod
- Lab: Deploying Pods as Static Pod
- Lab: ETCD Backup
- Cronjob
- Lab: Deploying Pod as CronJob

## **Module 11 – Logging and Monitoring**

- Understand how to Monitor Application and Cluster Components
- Lab: Understand how to Read Application & Cluster Component Logs
- Lab: Deploying Prometheus & Grafana to Monitor K8s Cluster

## **Module 12 – Networking in Kubernetes**

- Understand Basics of Kubernetes Networking
- Understand CNI overview
- Understand Pod Networking Concepts
- CoreDNS overview of K8s
- Understanding Ingress
- Lab: Configure and Manage Ingress Rule Understanding Namespace & Use-Cases
- Lab: Creating Namespace & Deploying K8s resources in Different Namespace
- Metal Load Balancer
- Lab: Deploying Metal Load Balancer

## **Module 13 – Multi-Container Pod Design**

- Understanding Multi-Container Pods
- Creating Multi-Container Pods
- Lab: Sidecar Pattern
- Lab: Deploying Init Container
- Lab: Ambassador Pattern
- Lab: Adapter Pattern

## **Module 14 – Helm Package Manager**

- Introduction to Helm
- Work with Helm Charts
- Create Helm Charts
- Lab: Installing Helm Package Manager
- Upgrade and Downgrade Helm Charts
- Lab: Deploying Kubernetes Resources using Helm Package Manager

## **Module 15 – Building Docker Images**

- Introduction to Dockerfile
- Dockerfile Instructions
- Lab: Building Container images using Dockerfile

- Build Image Push Image to Centralized Registry
- Lab: Pushing Container Image to a Public & Private Registry

## **Module 16 – Readiness and Liveness Probe**

- Introduction to Readiness and Liveness Probe
- Implement Readiness and Liveness in Pod
- Lab: Creating Liveness and Readiness Probe for Pod

## **Module 17 – Troubleshooting**

- Ways to Troubleshoot ETCD Failure
- Ways to Troubleshoot Kubelet Failure
- Ways to Troubleshoot Container Runtime Failure
- Ways to Troubleshoot Scheduler Failure