

## CI/CD with Docker and Kubernetes

**Duration:** 9 Days

**Hands-On Format:** This hands-on class is approximately 80/20 lab to lecture ratio, combining engaging lecture, demos, group activities and discussions with comprehensive machine-based practical programming labs and project work.

**Lab:** Koenig DC

### Module 1 - Docker Administration

- Introduction to Containers
- Introduction to Docker
- Downloading and Installing Docker
- Docker Essential Commands
- Docker Engine
- Understanding Docker Images
- Building Docker Images
- Storing and Retrieving Docker Images from Docker Hub
- Private Registry
- Building Containers from Images
- Understand Storage Methods
- Networking Docker Containers
- Data Persistence with Volumes
- Linux Capabilities

### Module 2 – Core Concepts

- Overview of Container Orchestration
- Introduction to Kubernetes
- Kubernetes Architecture

### Module 3 – Installation, Configuration & Validation

- Design a Kubernetes Cluster
- Installation of Kubernetes Master and Nodes
- Choose a Network Solution
- Verify Installation

### Module 4 – Managing Resources

- Managing Pods
- Managing Labels & Selector
- Managing Replication Controller & Replica Set
- Managing Service
- Managing DaemonSets

### Module 5 – Scheduling

- Manual Scheduling
- Taint and Tolerations

## **Module 6 – Application Lifecycle Management**

Overview of Deployment  
Deployment Strategies  
Managing Deployment

## **Module 7 – Environment Variable**

Plain Key  
Config Map  
Secret  
Mount Variable as Volume

## **Module 8 – Storage**

Volumes  
Persistent Volumes  
Persistent Volume Claim

## **Module 9 – Security**

Kubernetes Authentication  
Managing Users in Kubernetes  
Service Account  
Managing Roles and Role Binding  
Managing Cluster Role and Cluster Role Binding  
Security Context

## **Module 10 – Cluster Maintenance**

OS Upgrade  
Upgrade Cluster Version  
Static Pod  
ETCD Backup  
Cron Job

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

Understand how to Monitor all Cluster Components  
Understand how to Monitor Applications  
Manage Cluster Components Logs  
Manage Application Logs  
Prometheus Tool

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

Kubernetes Networking  
Understand CNI  
Understand Pod Networking Concepts  
Configure DNS  
Configure and Manage Ingress Rule  
Namespace  
Metal Load Balancer

## **Module 13 – Troubleshooting**

Troubleshoot ETCD Failure  
Troubleshoot Kubelet Failure  
Troubleshoot Container Runtime Failure  
Troubleshoot Scheduler Failure

**Module 14 – Introduction to Jenkins**

Introduction to Jenkins  
Jenkins Installation

**Module 15 – Git**

Introduction to Version Control System  
History of Git  
Git Basics  
States in Git  
Installing Git  
Configuration of Git  
Working with Repositories  
Basics Git Commands  
Working with Remotes  
Tagging  
Git Branching

**Module 16 – Integrate Jenkins with Docker**

Connect Registry with Jenkins  
Automatically Build and Push Image to Docker Hub Whenever Developer Changes Application Code

**Module 17 – GitOps**

Install ArgoCD in Kubernetes  
Configure ArgoCD to Fetch Updates from GitHub and Deploy Application to Kubernetes

**Module 18 – Email Integration**

Install Mailer Plugin in Jenkins  
Integrate Gmail with Jenkins to Send Report Email

**Module 19 – Jenkins Logging and Monitoring**

Integrate EFK with Jenkins to Store Logs  
Integrate Prometheus and Grafana to Monitor Jenkins