UIT UNIVERSITY

Faculty of Engineering Technology
SPRING-2025

Course Title: Software Operations & Maintenance

Assignment # 01

1- Objective:
To understand the concepts and practical applications of automating deployment pipelines, focusing on Continuous Deployment (CD), containerization with Docker, orchestration with Kubernetes, rollback strategies, and versioning.

Instructions:

- Answer all questions with relevant explanations and examples.
- Use diagrams where necessary to support your answers.
- Submit the assignment in a well-structured format.
- Include references for any external sources used.

Section 1: Continuous Deployment (CD) Overview

1. Define Continuous Deployment (CD) and explain how it differs from Continuous Integration (CI) and Continuous Delivery.
2. What are the key benefits of implementing CD in a software development lifecycle?
3. Describe the role of automation tools in CD (e.g., Jenkins, GitHub Actions, GitLab CI/CD).
4. Explain how CD helps in reducing deployment risks and increasing software reliability.

Section 2: Docker and Containerization

1. What is Docker, and how does it help in deployment automation?
2. Explain the differences between Virtual Machines (VMs) and Containers.
3. Describe the process of building and running a Docker container with an example.
4. How does Docker Compose help in managing multi-container applications?

Section 3: Kubernetes for Container Orchestration

1. What is Kubernetes, and why is it used for container orchestration?

2. Explain the key components of Kubernetes (e.g., Pods, Nodes, Deployments, Services).
3. Describe how Kubernetes helps in scaling applications automatically.
4. How does Kubernetes handle service discovery and load balancing?

Section 4: Rollback Strategies in CI/CD

1. What is a rollback, and why is it important in deployment pipelines?
2. Describe different rollback strategies used in CI/CD (e.g., Blue-Green Deployment, Canary Deployment, Revert Changes).
3. Explain the role of feature flags in rollback mechanisms.
4. How can automated testing help prevent the need for rollbacks?

Section 5: Versioning in Deployment Pipelines

1. What is versioning in software deployment, and why is it essential?
2. Explain Semantic Versioning (SemVer) with examples.
3. How does Git help in version control for deployment pipelines?
4. Describe best practices for maintaining different software versions in a CI/CD pipeline.

Submission Guidelines:

- Submit a well-formatted document (PDF or Word format).
- Ensure originality and avoid plagiarism.
- Provide references to any external sources used.
- Deadline: [13-04-2025]