

CSE 816: Software Production Engineering Course

Final Project Guidelines and Evaluation Criteria

Total Marks: 30

❖ **Project Expectations:**

The final project requires students to design and implement a complete **DevOps framework** to automate the Software Development Life Cycle (SDLC) using appropriate DevOps tools. The implementation is expected to include:

- **Version Control:** Git and GitHub
- **CI/CD Automation:** Jenkins, GitHub Hook Trigger for GITScm Polling, and Jenkins pipelines
- **Containerization:** Docker and Docker Compose
- **Configuration Management:** Ansible Playbooks
- **Orchestration and Scaling:** Kubernetes (K8s)
- **Monitoring and Logging:** ELK Stack (Elasticsearch, Logstash, and Kibana)

Alternatively, students may choose equivalent tools to achieve the same objectives if justified appropriately.

❖ **Evaluation Expectations:**

Your project will be evaluated based on its ability to simulate real-world DevOps workflows, showcasing automation, modular design, and scalability. The following functionalities are mandatory:

1. Incremental updates to the Git repository should trigger automated processes, including:
 - Jenkins fetching and building the updated code.
 - **Running automated tests.**
 - Pushing the generated Docker images to Docker Hub.
 - Deploying the Docker images to a target deployment system.
2. **Upon refreshing the application, the new changes should be visible seamlessly.**

3. Application logs must feed into the ELK Stack, and the **Kibana dashboard** should visualize these logs, providing insights into application activities.

❖ **Security and Advanced Features Encouraged:**

We strongly encourage incorporating security practices and advanced features such as:

- **Secure Storage:** Use tools like Vault to **securely store** sensitive credentials (e.g., usernames and passwords).
- **Modular Design:** Implement modular code, such as roles in Ansible Playbooks.
- **High Availability and Scalability:** Use Horizontal Pod Autoscaling (HPA) in Kubernetes for dynamic scalability.
- **Live Patching:** Implement live patching to update the application without downtime.

❖ **Marks Distribution:**

1. **Working Project** (20 Marks):

- Fully functional and deployable project: **20 Marks**
- Partially functional due to last-minute issues (project demonstrates substantial completion): **15 Marks**

2. **Advanced Features** (3 Marks):

- Usage of Vault, Roles in Ansible, and Kubernetes HPA: **3 Marks**

3. **Innovation** (2 Marks):

- **Creative or innovative solutions** implemented in the project: **2 Marks**

4. **Domain-Specific Projects** (5 Marks):

- Instead of a generic full-stack application or some web applications, projects targeting specific domains such as **MLOps, AIOps, DevSecOps, Networking (e.g., NFV implementation), Big Data, Healthcare, or Finance** will earn additional marks: **5 Marks**

By following these guidelines, students are expected to demonstrate their understanding of DevOps methodologies and their practical application in automating complex SDLC workflows.