DEVOPS

Course Learning Objectives	- Introduce students to DevOps terminology, definitions and concepts. - Familiarize students with different version control tools like Git, GitHub. - Develop an understanding the continuous integration/continuous testing/continuous Deployment. - Explore the tools such as Jenkins for automating these processes. - Utilizing Maven for compiling and building applications. - Explore the concepts of configuration management using ansible - Cover Ansible basics, including Installation, YAML modules, Playbooks, inventory and roles. - Enable students to identify and evaluate real-world use cases of DevOps. - Enhance practical skills in cloud-based DevOps tools, Focusing on AWS DevOps - Integration Siemens PLM Software's Polarion ALM using Devops
Course Outcomes	- Comprehend different actions performed through version control tools like Git. - Implement Continuous Integration and Continuous Testing and Continuous Deployment using Jenkins by building and automating test cases using Maven. - Perform Automated Continuous Deployment - Configure management using ansible

	● Leverage Cloud based DevOps tools specifically AWS DevOps

UNIT I INTRODUCTION TO DEVOPS

Devops Essentials - Introduction To Polarion ALM,DevOps lifecycle and Key Concepts, GCP, Azure Version control systems: Git and GitHub.

UNIT II COMPILE and BUILD Using Maven

Introduction, Installation of Maven, POM files, Maven Build lifecycle, Build phases(compile build, test, package) Maven Profiles, Maven repositories(local, central, global),Maven plugins, Maven create and build Artificats, Dependency management

UNIT III Continuous Integration Using Jenkins

Install & Configure Jenkins, Jenkins Architecture Overview, Creating a Jenkins Job, Configuring a Jenkins job, Introduction to Plugins, Adding Plugins to Jenkins, Commonly used plugins (Git Plugin, Parameter Plugin, HTML Publisher, Copy Artifact and Extended choice parameters). Configuring Jenkins to work with java, Git and Maven, Creating a Jenkins Build and Jenkins workspace

UNIT IV Configuration management using Ansible Configuration management

Ansible Introduction, Installation, Ansible master/slave configuration, YAML basics, Ansible modules, Ansible Inventory files, Ansible playbooks, Ansible Roles, adhoc commands in ansible.

UNIT V Building DevOps Pipeline using GitHub actions and deployment in AWS

Create Github Account, Create Repository, Create AWS Organization, Create a new pipeline, Build a sample code, Deploy applications.

Course Duration: 45 Hours

Test Projects:
Use Cases:

1. Application of DevOps in Industry: Examine how DevOps methodologies have been implemented in large-scale industrial settings. Assess the challenges faced during the adoption of DevOps in industries and propose solutions. Analyze the before-and-after scenarios of implementing DevOps in an industrial environment.

Task 1: Implement Automated Build and Deployment Pipelines Task

2: Conduct DevOps Training Programs

Task 3: Establish Cross-Functional DevOps Teams

Task 4: Implement Infrastructure as Code (IaC)

2. Real-world DevOps Scenarios: Explore and present real-world examples where DevOps methodologies have led to significant improvements in operational processes. Evaluate the scalability and adaptability of DevOps practices in diverse industrial sectors

Task 1: Evaluate and Enhance Scalability

Task 2: Implement Automated Testing Frameworks

Task 3: Explore Containerization for Portability Task

4: Conduct DevOps Maturity Assessments

3. Security Considerations: Investigate the role of DevSecOps in addressing security concerns. Analyze the implementation of security measures in a DevOps pipeline within an industrial context

Task 1: Conduct Security Audits of DevOps Pipelines

Task 2: Implement Automated Security Testing

Task 3: Establish Role-Based Access Controls (RBAC)

Task 4: Implement Continuous Security Monitoring

4. Optimizing Resource Utilization: Assess how DevOps practices contribute to optimal resource utilization in manufacturing and production environments. Explore case studies where resource efficiency was improved through the implementation of DevOps.

Task 1: Implement Resource Scaling Strategies

Task 2: Conduct Resource Usage Analytics

Task 3: Explore Serverless Computing for Resource Efficiency

Task 4: Establish Resource Utilization KPIs

5. Continuous Improvement: Examine how the principles of continuous integration and continuous deployment are applied for continuous improvement in industrial processes. Evaluate the impact of continuous testing on product quality in an industrial setting.

Task 1: Implement DevOps Feedback Loops

Task 2: Conduct Root Cause Analysis (RCA) Workshops

Task 3: Integrate Automated Code Quality Checks

Task 4: Implement Lean and Agile Principles

Task 5: Establish Continuous Improvement Metrics

6. Collaboration and Communication: Analyze the role of collaboration tools in improving communication and coordination among cross-functional teams in an industrial setup. Investigate case studies showcasing successful collaboration between development and operations teams.

Task 1: Implement Collaborative Tools Integration
Task 2: Conduct Cross-Functional Training Sessions

Task 3: Establish a Centralized Knowledge Repository

Task 4: Implement Regular Collaboration Meetings

Task 5: Foster a Culture of Open Communication

7. Monitoring and Feedback: Evaluate the implementation of monitoring tools and feedback loops in industrial DevOps pipelines. Examine how real-time feedback mechanisms contribute to proactive issue resolution in industrial systems.

Task 1: Implement Real-time Monitoring Solutions

Task 2: Establish Continuous Feedback Loops

Task 3: Conduct Post-Deployment Reviews

Task 4: Enhance Incident Response Procedures

Task 5: Implement User Feedback Mechanisms

8. Scalability Challenges: Investigate challenges related to scalability when implementing DevOps in large-scale industrial systems. Propose strategies and solutions to address scalability concerns in diverse industrial scenarios.

Task 1: Conduct Scalability Assessment

Task 2: Implement Auto-scaling Solutions

Task 3: Optimize Database Scalability

Task 4: Load Testing for Scalability

Task 5: Continuous Scalability Monitoring

9. Regulatory Compliance: Explore case studies highlighting the adherence to regulatory standards and compliance requirements through DevOps practices. Analyze the role of DevOps in ensuring traceability and auditability for regulatory purposes.

Task 1: Regulatory Framework Analysis

Task 2: DevOps Pipeline Compliance Integration

Task 3: Auditing and Traceability Implementation

Task 4: Automated Compliance Reporting

Task 5: Continuous Compliance Monitoring

10. Cross-industry Comparisons: Compare the implementation of DevOps in different industrial sectors (e.g., manufacturing, healthcare, energy) and identify commonalities and differences. Evaluate the transferability of DevOps practices across diverse industrial domains.

Task 1: Industry Benchmarking Analysis

Task 2: Identification of Commonalities and Differences

Task 3: Transferability Evaluation

Task 4: Case Study Synthesis

Task 5: Recommendations for Cross-industry Implementation

11. Adoption Challenges: Investigate common challenges faced by industries during the initial adoption of DevOps methodologies. Propose strategies to overcome resistance and facilitate a smooth transition to a DevOps-oriented culture.

Task 1: Stakeholder Analysis
Task 2: Cultural Assessment
Task 3: Develop a Training Program
Task 4: Change Management Plan
Task 5: Metrics for Success

12. Impact on Time-to-Market: Analyze how DevOps accelerates the time-

to-market for industrial products and services. Evaluate case studies demonstrating reduced development and deployment timelines through DevOps practices.

Task 1: Time-to-Market Analysis

Task 2: Identify Bottlenecks

Task 3: Customer Feedback Integration

Task 4: Agile Methodologies

Task 5: Future Enhancements

13. **Devops Backbone:** In order to support MixOps, development and operations must share a common toolset, here termed DevOps backbone.

Task 1: Toolset Identification

Task 2: Tool Integration Analysis

Task 3: Governance and Security Measures

Task 4: Continuous Integration/Delivery Pipeline

Task 5: Scalability Assessment

14. **Telecommunications Network Optimization:** Verizon implemented DevOps to optimize its telecommunications network, leading to faster rollout of new services, improved network reliability, and enhanced customer experience. Implemented DevOps to optimize its telecommunications network, leading to faster rollout of new services, improved network reliability, and enhanced customer experience.

Task 1: Network Performance Analysis

Task 2: Implementation of DevOps Practices

Task 3: Redundancy and Fault Tolerance

Task 4: Collaboration with Network Teams

Task 5: Case Study Comparisons

15. **Digital Media Streaming:** Netflix adopted DevOps practices to enable

rapid and reliable content delivery, resulting in improved streaming quality, reduced downtime, and quicker response to user demands.

Task 1: Streaming Quality Metrics

Task 2: DevOps in Content Delivery

Task 3: Downtime Reduction Analysis

Task 4: User Demand Response

16. E-commerce Order Fulfillment: Shopify utilized DevOps to enhance its e-commerce platform, resulting in faster order processing, reduced system errors, and improved overall platform performance.

Task 1: Order Processing Efficiency

Task 2: Reduction in System Errors

Task 3: Integration with Inventory Management

Task 4: Customer Satisfaction Metrics

Task 5: Continuous Improvement Strategies

17. Automated Financial Services: JPMorgan Chase implemented DevOps in its financial services, leading to quicker software development cycles, enhanced security measures, and improved customer-facing application

Task 1: Software Development Cycle

Task 2: Security Measures in Financial Applications

Task 3: Customer-Facing Application Enhancements

Task 4: Compliance with Financial Regulations

Task 5: Lessons Learned and Best Practices

18. Government Digital Services: Digital Service applied DevOps principles to streamline digital services, resulting in faster delivery of citizen-centric services and improved government IT efficiency.

Task 1: Faster Delivery of Citizen-Centric Services

Task 2: Improved Government IT Efficiency

Task 3: Collaboration Across Government Agencies

Task 4: User Feedback Integration

Task 5: Compliance with Regulatory Standards

19. **Cloud Infrastructure Management:** Utilized DevOps for managing its cloud infrastructure, resulting in improved scalability, quicker deployment of updates, and enhanced reliability for its creative software services.

Task 1: Improved Scalability

Task 2: Quicker Deployment of Updates

Task 3: Reliability Enhancements

Task 4: Creative Software Service Reliability

Task 5: Cost Optimization Strategies

20. **Smart Manufacturing in Electronics:** Applied DevOps in its electronics manufacturing processes, leading to more agile production cycles, improved collaboration between design and manufacturing teams, and faster time-to-market for electronic products.

Task 1: Agile Production Cycles

Task 2: Collaboration Between Design and Manufacturing

Task 3: Faster Time-to-Market for Electronic Products

Task 4: Quality Control Enhancements

Task 5: Lessons for Other Manufacturing Sectors