

FACULTY OF COMPUTER APPLICATIONS
BCA (H) – Cloud Computing

- **Sem.** : 7
- **Subject Code** : 05BH0706
- **Subject** : DevOps Methodology
- **Course Objectives:**

By the end of this course, students will be able to:

- **Remember** the fundamental concepts, terminology, and principles of DevOps
- **Understand** the DevOps lifecycle, culture, and its integration with agile methodologies
- **Apply** version control systems, continuous integration, and continuous deployment practices
- **Analyze** system requirements to implement appropriate containerization and orchestration strategies
- **Evaluate** the performance and reliability of DevOps pipelines
- **Create** end-to-end automated CI/CD pipelines with infrastructure as code and monitoring solutions

Prerequisites : Basic knowledge of programming, operating systems, and networking concepts

Theory Component (1 Credit - 15 Hours)

Unit No	Topics Covered	No of lectures required
1	<p>Introduction to DevOps</p> <ul style="list-style-type: none"> ● DevOps Definition and Principles ● Evolution of DevOps ● DevOps Culture and Mindset ● DevOps vs. Traditional Development Models ● Business Benefits of DevOps 	03
2	<p>Version Control and Collaboration</p> <ul style="list-style-type: none"> ● Distributed Version Control Systems ● Git Fundamentals 	03



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	<ul style="list-style-type: none">● Branching Strategies and Workflows● Code Review Practices● Collaboration Tools and Techniques	
3	Continuous Integration and Delivery <ul style="list-style-type: none">● CI/CD Principles and Practices● Automated Build Processes● Test Automation Strategies● Deployment Strategies (Blue-Green, Canary, Rolling)● Feature Flags and A/B Testing	03
4	Infrastructure as Code and Containerization <ul style="list-style-type: none">● Infrastructure as Code Principles● Configuration Management● Container Concepts and Benefits● Container Orchestration	03
5	Monitoring, Logging, and Security <ul style="list-style-type: none">● Monitoring Fundamentals● Log Management and Analysis● Performance Metrics● DevSecOps Principles● Compliance and Governance in DevOps	03

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Course Outcomes:

Upon successful completion of this course, students will be able to:

1. CO1: DevOps Fundamentals

Explain core DevOps concepts, principles, and methodologies and describe the relationship between DevOps culture, tools, and continuous delivery practices.

2. CO2: Version Control and Collaboration

Implement effective version control workflows and collaborative practices using Git and associated tools to enable continuous integration.

3. CO3: Containerization and Infrastructure

Analyze system requirements to implement appropriate containerization strategies and deploy infrastructure as code solutions for automated environment provisioning.

4. CO4: CI/CD Pipeline Implementation

Design and build comprehensive CI/CD pipelines integrating testing, deployment, and monitoring to enable continuous delivery of applications.

5. CO5: DevOps Assessment and Security

Evaluate the effectiveness of DevOps implementations and assess the security implications of various deployment methods while implementing appropriate monitoring and observability solutions.

CO-PO Mapping

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	H	L	-	H	L	M	L	H
CO2	M	M	M	L	H	M	M	H
CO3	M	H	H	L	M	H	H	M
CO4	L	H	H	L	H	H	M	H
CO5	M	H	M	M	H	H	M	M

CO-PSO Mapping

Course Outcomes	PSO1	PSO2	PSO3
CO1	M	L	H
CO2	H	H	M

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Course Outcomes	PSO1	PSO2	PSO3
CO3	H	M	H
CO4	H	H	H
CO5	H	M	H

Textbooks

1. Kim, G., Humble, J., Debois, P., & Willis, J. (2021). *The DevOps Handbook: How to Create World-Class Agility, Reliability, & Security in Technology Organizations* (2nd ed.). IT Revolution Press.
2. Forsgren, N., Humble, J., & Kim, G. (2018). *Accelerate: The Science of Lean Software and DevOps: Building and Scaling High Performing Technology Organizations*. IT Revolution Press.
3. Morris, K. (2021). *Infrastructure as Code: Managing Servers in the Cloud* (2nd ed.). O'Reilly Media.

Reference Books

1. Arundel, J., & Domingus, J. (2019). *Cloud Native DevOps with Kubernetes*. O'Reilly Media.
2. Vadapalli, S. (2018). *DevOps: Continuous Delivery, Integration, and Deployment with DevOps*. Packt Publishing.
3. Huettermann, M. (2012). *DevOps for Developers*. Apress.
4. Ferguson, J., & Smith, S. (2019). *Practical DevOps* (2nd ed.). Packt Publishing.

Online Resources

- [Docker Documentation](#)
- [Kubernetes Documentation](#)
- [Terraform Documentation](#)
- [Jenkins Documentation](#)
- [Ansible Documentation](#)
- [GitHub Actions Documentation](#)
- [AWS DevOps Documentation](#)
- [Google Cloud DevOps Documentation](#)
- [Microsoft Azure DevOps Documentation](#)



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PRACTICALS

Unit No	Topics Covered
1	Version Control with Git <ul style="list-style-type: none">● Setting up Git repositories● Implementing branching strategies● Managing merge conflicts● Using Git hooks for automation● Collaborative development with Pull/Merge Requests
2	Continuous Integration Setup <ul style="list-style-type: none">● Setting up a CI server (Jenkins/GitHub Actions/GitLab CI)● Creating and configuring build jobs● Implementing automated testing● Generating build reports● Configuring build notifications
3	Containerization with Docker <ul style="list-style-type: none">● Creating custom Docker images● Working with Dockerfiles● Managing containers● Using Docker Compose for multi-container applications● Implementing best practices for Docker security
4	Container Orchestration with Kubernetes <ul style="list-style-type: none">● Setting up a Kubernetes cluster● Deploying applications to Kubernetes● Managing Kubernetes resources● Implementing scaling and self-healing● Kubernetes networking and storage concepts
5	Infrastructure as Code with Terraform <ul style="list-style-type: none">● Writing Terraform configurations● Managing infrastructure state● Implementing infrastructure modules● Provisioning cloud resources● Implementing infrastructure testing
6	Configuration Management with Ansible <ul style="list-style-type: none">● Setting up Ansible control nodes



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	<ul style="list-style-type: none">● Writing Ansible playbooks● Working with inventories and roles● Implementing idempotent configurations● Ansible vault for secrets management
7	CI/CD Pipeline Implementation <ul style="list-style-type: none">● Building end-to-end CI/CD pipelines● Implementing pipeline as code● Managing environments in CI/CD● Implementing deployment approvals● Automated rollbacks
8	Monitoring and Observability <ul style="list-style-type: none">● Setting up monitoring tools (Prometheus/Grafana)● Implementing logging solutions (ELK stack)● Creating dashboards and alerts● Implementing distributed tracing● Performance monitoring and optimization
9	Cloud-Native DevOps <ul style="list-style-type: none">● Working with cloud provider DevOps tools● Implementing serverless applications● Cloud resource optimization● Multi-cloud strategies● Cloud security best practices
10	DevSecOps Implementation <ul style="list-style-type: none">● Implementing security scanning in pipelines● Container security scanning● Infrastructure security testing● Compliance as code● Security monitoring and response