GUJARAT TECHNOLOGICAL UNIVERSITY

Program Name: Bachelor of Computer Applications /
Bachelor of Computer Applications (Honours/Honours with Research) /
Master of Computer Applications (Integrated)
Level: Under Graduate
Course / Subject Code: BC05001031
Course / Subject Name: Software Development and IT Operations

w. e. f. Academic Year:	2026-2027
Semester:	5
Category of the Course:	Discipline-Specific Elective-1

Prerequisite:	Basic knowledge of Operating Systems, Computer Networks, Software Engineering, Database Management Systems, and Programming Fundamentals.
Rationale:	Modern software development demands rapid delivery, continuous integration, automation, scalability, and collaboration between development and operations teams. DevOps has emerged as a critical methodology for achieving faster software releases, improved software quality, and efficient infrastructure management. This course introduces students to DevOps principles, software development lifecycle automation, version control systems, continuous integration and continuous deployment (CI/CD), containerization, cloud platforms, infrastructure automation, monitoring, and security practices. Students will gain practical exposure to industry-standard DevOps tools and workflows widely used in software organizations.

Course Outcome:

After Completion of the Course, Student will able to:

CO No	Course Outcome	RBT Level
CO1	Understand DevOps concepts, principles, culture, and lifecycle.	Understand
CO2	Apply version control and collaborative software development practices using Git.	Apply
CO3	Implement Continuous Integration and Continuous Deployment pipelines.	Apply
CO4	Use containerization and cloud technologies for application deployment.	Apply
CO5	Analyze monitoring, logging, and security practices in DevOps environments.	Analyze
CO6	Design and deploy end-to-end DevOps workflows for software applications.	Apply

**Revised Bloom's Taxonomy (RBT)*

Teaching and Examination Scheme:

Teaching Scheme (in Hours)			Total Credits L+T+ (PR/2)	Assessment Pattern and Marks				Total Marks
				Theory		Tutorial / Practical		
L	T	PR	C	ESE (E)	PA / CA (M)	PA/CA (I)	ESE (V)	
4	0	2	5	70	30	20	30	150

Course Content:

Unit No.	Content	No. of Hours	% of Weightage
1.	Introduction to DevOps: Software Development Life Cycle (SDLC), Traditional Software Development Models, Introduction to DevOps, DevOps Principles, Benefits of DevOps, DevOps Lifecycle, Agile and Scrum Fundamentals, DevOps Culture, Collaboration between Development and Operations Teams, DevOps Tools Overview.	12	20
2.	Version Control and Continuous Integration: Version Control Concepts, Centralized and Distributed Version Control Systems, Git Fundamentals, Repository Management, Branching and Merging, Pull Requests, GitHub/GitLab, Continuous Integration Concepts, Build Automation, Jenkins Fundamentals, Automated Testing, CI Pipeline Design.	14	20
3.	Continuous Deployment and Containerization: Continuous Delivery and Continuous Deployment, Deployment Strategies, Infrastructure as Code (IaC), Introduction to Containers, Docker Architecture, Docker Images and Containers, Dockerfile, Docker Compose, Container Registry, Kubernetes Fundamentals, Container Orchestration Concepts.	14	20
4.	Cloud Computing and DevOps Automation: Cloud Computing Concepts, Public, Private and Hybrid Cloud, Cloud Service Models (IaaS, PaaS, SaaS), AWS Overview, Microsoft Azure Overview, Infrastructure Automation, Configuration Management, Ansible Fundamentals, Terraform Basics, Cloud Deployment Pipelines.	10	20
5.	Monitoring, Security and DevOps Best Practices: Monitoring and Logging Concepts, DevOps Monitoring Tools, Prometheus and Grafana Overview, ELK Stack Basics, DevSecOps Fundamentals, Security in CI/CD Pipelines, Vulnerability Management, Incident Management, Reliability Engineering, DevOps Best Practices, Future Trends in DevOps and Cloud Native Computing.	10	20
	Total	**60**	**100**

Suggested Specification Table with Marks (Theory):

Distribution of Theory Marks (in %)					
R Level	**U Level**	**A Level**	**N Level**	**E Level**	**C Level**
10	**50**	**30**	**10**	**0**	**0**

Where R: Remember; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create (as per Revised Bloom's Taxonomy)

References/Suggested Learning Resources:

(a) Books:

1. Gene Kim, Jez Humble, Patrick Debois, John Willis – The DevOps Handbook.
2. Joakim Verona – Practical DevOps.
3. Len Bass, Ingo Weber, Liming Zhu – DevOps: A Software Architect's Perspective.

(b) Open source software and website:

1. Git
2. GitHub
3. GitLab
4. Jenkins
5. Docker
6. Kubernetes (Minikube)
7. Ansible
8. Terraform
9. Prometheus
10. Grafana

Suggested Course Practical List:

Exp. No.	Title of Experiment / Activity	Objective / Learning Outcome	Tools / Platforms (Open Source / Free)
1.	Installation of Git and Repository Creation	Understand version control basics	Git
2.	Git Branching and Merging	Learn collaborative development workflow	Git, GitHub
3.	Create and Manage GitHub Repository	Manage remote repositories	GitHub
4.	Build Automation using Jenkins	Automate software builds	Jenkins
5.	Create CI Pipeline	Understand Continuous Integration	Jenkins, GitHub
6.	Create Docker Images	Learn containerization concepts	Docker
7.	Deploy Application using Docker Containers	Container deployment	Docker
8.	Docker Compose Configuration	Multi-container application deployment	Docker Compose
9.	Kubernetes Deployment	Container orchestration basics	Kubernetes
10.	Cloud VM Deployment	Deploy applications on cloud platform	AWS/Azure
11.	Infrastructure Automation using Ansible	Automate server configuration	Ansible
12.	Infrastructure Provisioning using Terraform	Infrastructure as Code implementation	Terraform
13.	Monitoring with Prometheus	System monitoring	Prometheus
14.	Dashboard Creation using Grafana	Visualization and monitoring	Grafana
15.	DevOps Mini Project	End-to-end DevOps workflow implementation	Integrated Tools

Suggested Project List:

1. Automated Web Application Deployment Pipeline.
2. Dockerized E-Commerce Application.
3. CI/CD Pipeline using Jenkins and GitHub.
4. Kubernetes-based Application Deployment.
5. Cloud-hosted Inventory Management System.
6. Automated Infrastructure Provisioning using Terraform.
7. Monitoring Dashboard using Prometheus and Grafana.
8. DevSecOps Pipeline Implementation.
9. Microservices Deployment using Docker and Kubernetes.
10. End-to-End DevOps Automation Project.

Suggested Activities for Students:

1. ICT Enabled Classroom Teaching
2. Case Study Analysis
3. Industry Tool Demonstrations
4. Hands-on Lab Sessions
5. Team-Based DevOps Projects
6. Continuous Assessment Assignments

CO- PO Mapping:

Sem. 5	**Course Name : Software Development and IT Operations POs**											
Course Outcomes	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	2	1	-	1	-	-	-	-	-	-	-
CO2	3	3	2	1	2	-	-	-	1	-	-	-
CO3	3	3	3	2	3	-	-	-	1	-	-	1
CO4	2	3	3	2	3	1	-	-	2	-	-	1
CO5	2	2	3	3	3	1	1	-	2	1	-	2
CO6	1	2	3	3	3	1	1	1	2	2	1	

*Legend: '**3**' for high, '**2**' for medium, '**1**' for low and '**-**' for no correlation of each CO with PO.*

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