



# GUJARAT TECHNOLOGICAL UNIVERSITY

Program Name: Master of Computer Applications

Level: Post Graduate

Course / Subject Code: MC03094071

Course / Subject Name: Containerization

w. e. f. Academic Year:	2025-26
Semester:	3
Category of the Course:	Elective Group-1

<b>Prerequisite:</b>	Basic knowledge of Linux commands, networking, and software development life cycle. Familiarity with virtualization concepts is helpful but not mandatory.
<b>Rationale:</b>	Containerization is a key technology in modern software engineering and DevOps. It allows applications to be packaged with their dependencies and run consistently across environments. This course introduces the foundational concepts and practical tools for working with containers and orchestration platforms like Docker and Kubernetes. Students will gain hands-on skills to build, deploy, and manage containerized applications, making them industry-ready for cloud-native development environments. <b>Course Pedagogy:</b> The course will follow a hands-on, application-driven pedagogy that blends theory with practical exposure. Each concept will be introduced through real-world problems, followed by live demonstrations using open-source tools like Docker and Kubernetes. Students will engage in interactive lab sessions to reinforce their understanding and build containerized applications. Assignments and mini-projects will foster collaboration and critical thinking. Online labs and simulation platforms will be used for experiential learning and to encourage self-paced exploration beyond the classroom.

## Course Outcome:

After Completion of the Course, students will be able to:

No	Course Outcomes	RBT Level
01	Understand containerization principles and architecture.	UN
02	Deploy and manage containers using Docker.	AP
03	Use Docker Compose to define and run multi-container applications.	AP
04	Explain and implement container orchestration using Kubernetes.	AN
05	Apply containerization to real-world software development and DevOps scenarios.	CR

\*Revised Bloom's Taxonomy (RBT)



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### Teaching and Examination Scheme:

Teaching Scheme (in Hours)			Total Credits L+T+ (PR/2)	Assessment Pattern and Marks				Total Marks
L	T	PR	C	Theory		Tutorial / Practical		
				ESE (E)	PA / CA (M)	PA/CA (I)	ESE (V)	
3	0	2	4	70	30	20	30	150

### Course Content:

Unit No.	Content	No. of Hours	% of Weightage
1.	Introduction to Containerization: Virtualization vs. Containerization, Container lifecycle, Benefits, Use cases	9	20
2.	Docker Basics: Docker architecture, Images, Containers, Volumes, Networks, Docker CLI	9	20
3.	Docker Compose: Writing docker-compose files, Linking services, Environment variables, Networking	9	20
4.	Container Orchestration: Kubernetes architecture, Pods, Services, Deployments, ConfigMaps, Helm	9	20
5.	CI/CD and DevOps Integration: Using containers in build pipelines, Security and best practices, Monitoring	9	20
<b>Total</b>		<b>45</b>	<b>100</b>

### Suggested Specification Table with Marks (Theory):

Distribution of Theory Marks (in %)					
R Level	U Level	A Level	N Level	E Level	C Level
10	20	40	10	10	10

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) Reference Books:

1. Nigel Poulton, *Docker Deep Dive*, Independently Published, 2023
2. Kelsey Hightower, Brendan Burns, Joe Beda, *Kubernetes: Up and Running*, O'Reilly Media
3. Pethuru Raj, Jeeva S. Chelladurai, Vinod Singh, *Docker in Practice*, Manning Publications
4. Elton Stoneman, *Learn Docker – Fundamentals of Docker 19.x*, Packt Publishing



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## (b) Online Learning Resources and Opensource software and website:

- Docker – <https://www.docker.com>
- Docker Compose – <https://docs.docker.com/compose/>
- Kubernetes – <https://kubernetes.io>
- Minikube – <https://minikube.sigs.k8s.io/docs/>

## Suggested List of Practical

1. Install and configure Docker on Linux/Windows.
2. Create, run, stop, and manage Docker containers using CLI.
3. Build Docker images from custom Dockerfiles.
4. Use Docker Volumes and Networks in applications.
5. Write Docker Compose files and deploy multi-container setups.
6. Setup Minikube for Kubernetes cluster simulation.
7. Deploy containers on Kubernetes using kubectl.
8. Create and manage Kubernetes Services and Deployments.
9. Integrate Docker containers in a simple CI/CD pipeline.
10. Monitor container resources and apply security best practices.

## CO- PO Mapping:

Semester 3	Course Name: Containerization							
	POs							
Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3	3	2	-	-	-	-	-
CO2	3	3	3	2	-	-	-	-
CO3	3	2	3	2	1	-	-	-
CO4	3	3	3	3	2	-	-	-
CO5	3	3	3	3	2	1	-	-

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

**Note: The CO-PO mapping is indicative; the institute/faculty member can change as required.**

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