



# SWARNANDHRA

## COLLEGE OF ENGINEERING & TECHNOLOGY

(AUTONOMOUS)

Accredited by National Board of Accreditation, AICTE, New Delhi, Accredited by NAAC with "A" Grade – 3.32 CGPA, Recognized under 2(f) & 12(B) of UGC Act 1956, Approved by AICTE, New Delhi, Permanent Affiliation to JNTUK, Kakinada Seetharampuram, W.G.DT., Narsapur-534280, (Andhra Pradesh)

### DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

Course Code	Course Title	Semester/Regulation	Branch	Contact Periods /Week	Academic Year	Date of commencement of Semester
20AD7J01	DEVOPS AND MLOPS	VII	AI-DS	5	2025-26	09-06-2025

#### COURSE OUTCOMES

#### KNOWLEDGE LEVELS

1	Understand the basics of DevOps and version control systems.	K2
2	Learn how to implement CI/CD pipelines for software automation and deployment.	K3
3	Learn how to use Docker for containerization and Kubernetes for orchestration.	K3
4	Understand MLOps concepts, and manage model and data versioning.	K2
5	Automate ML pipelines using CI/CD and learn model deployment.	K3

#### UNIT-I: INTRODUCTION TO DEVOPS AND VERSION CONTROL

UNIT	Out Comes / Bloom's Level	Topics No.	Topics/Activity	Text Book/ Reference	Contact Hour	Delivery Method
I	CO1: Understand the basics of DevOps and version control systems.	1.1	What is DevOps?	T1	1	Chalk & Board PPT
		1.2	Key principles and Benefits	T1	1	
		1.3	DevOps lifecycle: Plan, Develop, Build, Test, Deploy, Operate, Monitor	T1	2	
		1.4	Version Control Systems	R3	1	
		1.5	Introduction to Git	R3	2	
		1.6	Key Git operations: Clone, Commit, Branch, Merge, Push	R3	1	
		1.7	Introduction to GitHub, GitLab	R3	2	
	Content beyond syllabus	1.8	GitOps: Managing infrastructure using Git workflows	T	1	
		Revision of UNIT-I			1	
Total					12	

#### UNIT-II: CONTINUOUS INTEGRATION & CONTINUOUS DEPLOYMENT (CI/CD)

II	CO2: Learn how to implement CI/CD pipelines for software	2.1	Continuous Integration (CI): Introduction and benefits	T2	1	Chalk & Board
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automation and deployment.	2.2	Automating builds and tests	T2	1	PPT
	2.3	Automated Testing: Unit tests in CI/CD	T2	1	
	2.4	Automated Testing: Integration tests in CI/CD	T2	1	
	2.5	Continuous Deployment (CD):	T2	1	
	2.6	Automating deployment pipelines	T2	1	
	2.7	Automating deployment of applications using Jenkins or GitLab	T2	2	
Content beyond syllabus	2.8	CI/CD as Code (e.g., Jenkinsfile, .gitlab-ci.yml)	T	1	
	Revision of UNIT-II			1	
Total				10	

### UNIT-III: CONTAINERIZATION AND ORCHESTRATION

III	CO3:	3.1	Introduction to Docker	T3	1	Chalk & Board PPT
		3.2	Introduction to containers	T3	1	
		3.3	Introduction to images	T3	1	
		3.4	Managing Docker containers: Build, Run, Push,	T3	1	
		3.5	Docker Compose: Handling multi-container applications	T3	1	
		3.6	Introduction to Kubernetes	R1	1	
		3.7	Kubernetes architecture and concepts	R1	2	
	Content beyond syllabus	3.8	Deploying containers with Kubernetes	R1	2	
		3.9	Scaling containers with Kubernetes	R1	2	
		3.10	Managing containers with Kubernetes	R1	2	
		3.11	Docker Networking & Volume Management	T3	1	
Revision of UNIT-III					1	
Total					12	

### UNIT-IV: INTRODUCTION TO MLOPS AND MODEL VERSIONING

IV	CO4:	4.1	Introduction to MLOps	R2	1	Chalk & Board PPT
		4.2	Key differences between DevOps and MLOps	R2	1	
		4.3	MLOps and its lifecycle	R2	1	
		4.4	MLOps lifecycle: Data collection, Development, Deployment, Monitoring	R2	1	



		4.5	Introduction to version control for ML models	R2	1
		4.6	Introduction to version control for datasets (Git, DVC)	R2	2
		4.7	ML workflows	R2	1
		4.8	Experiment tracking in ML workflows	R2	1
		4.9	Reproducibility in ML workflows	R2	1
	Content beyond syllabus	4.10	Automated ML (AutoML)	R2	1
		Revision of UNIT-IV			1
Total					13

#### UNIT-V: CI/CD FOR MACHINE LEARNING, MODEL DEPLOYMENT, MODEL MONITORING AND SECURITY

V	CO5:	5.1	CI/CD for Machine Learning	R2	1	Chalk & Board PPT
		5.2	Automating ML pipelines (data preprocessing, model training, testing)	R2	2	
		5.3	Tools for MLOps CI/CD: Jenkins, GitLab CI, CircleCI	R2	1	
		5.4	ML Model Deployment: Deploying models as APIs using Flask/FastAPI	R2	1	
		5.5	ML Model Monitoring: Tools like Prometheus and Grafana for monitoring model performance	R2	1	
		5.6	Retraining models: When and how to retrain models based on performance	R2	1	
		5.7	Securing data in MLOps	R2	1	
		5.8	Securing models in MLOps	R2	1	
		5.9	Securing API endpoints in MLOps	R2	1	
	Content beyond syllabus	5.10	Model Serving with TensorFlow Serving/TorchServe	R2	1	
		Revision of UNIT-V			1	
Total					13	

#### CUMULATIVE PROPOSED PERIODS

60

Text Books:


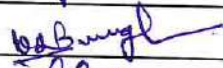


S. No.	AUTHORS, BOOK TITLE, EDITION, PUBLISHER, YEAR OF PUBLICATION
T1	Gene Kim, Jez Humble, Patrick Debois, John Willis, Nicole Forsgren, The DevOps Handbook: How to Create World-Class Agility, Reliability, & Security in Technology Organizations, Second Edition, Shroff Publishers & Distributors, 2024
T2	Jez Humble, David Farley, Continuous Delivery, First Edition, Addison-Wesley Professional, 2010

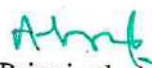
## Reference Books:

S. No.	AUTHORS, BOOK TITLE, EDITION, PUBLISHER, YEAR OF PUBLICATION
R1	Kelsey Hightower, Brendan Burns, Joe Beda, Kubernetes Up & Running: Dive into The Future of Infrastructure, First Edition, O'Reilly, 2017
R2	Andriy Burkov, Machine Learning Engineering, First Edition, True Positive Inc, 2020
R3	Jon Loeliger, Version Control with Git, Second Edition, O'Reilly Media, 2012

## Web Details:

1	<a href="https://www.atlassian.com/devops">https://www.atlassian.com/devops</a>
2	<a href="https://www.geeksforgeeks.org/git-and-github/">https://www.geeksforgeeks.org/git-and-github/</a>
3	<a href="https://www.jenkins.io/solutions/ci-cd/">https://www.jenkins.io/solutions/ci-cd/</a>
4	<a href="https://www.docker.com/resources/what-container">https://www.docker.com/resources/what-container</a>
5	<a href="https://www.coursera.org/articles/what-is-mlops-and-why-is-it-important">https://www.coursera.org/articles/what-is-mlops-and-why-is-it-important</a>
6	<a href="https://www.databricks.com/solutions/mlops">https://www.databricks.com/solutions/mlops</a>

		Name	Signature with Date
i	Faculty	M. N. V. Viswanadh	
ii	Course Coordinator	V. Durga Rao	
iii	Module Coordinator	Dr. G. Sudhakar	
iv	Program Coordinator	Dr. B. Rama Krishna	

  
Principal