MIT | Academy of Engineering (An autonomous Institute Affilated to SPPU)	**COURSE SYLLABUS**	
SCHOOL OF COMPUTER ENGINEERING AND TECHNOLOGY	**W.E.F**	2022 - 2023
FINAL YEAR BACHELOR OF TECHNOLOGY	**COURSE NAME**	Cloud Native DevOps
	COURSE CODE	CC07
	COURSE CREDITS	4
RELEASED DATE : 01/07/2022	**REVISION NO**	0.0

TEACHING SCHEME		**EXAMINATION SCHEME AND MARKS**					
(HOURS/WEEK)		THEORY			TUTORIAL/	PRESENTATION/	TOTAL
LECTURE	PRACTICAL	MSE	ESE	IA	PRACTICAL	DEMONSTRATION	
4	NIL	30	70	50	NIL	NIL	150

PRE-REQUISITE :

Knowledge of Cloud Computing Foundations & Cloud Native Application Development

COURSE OBJECTIVES :

CS463.CEO.1: To study SDLC Automation Process

CS463.CEO.2: To learn advanced facilities available for launching infrastructure with CloudFormation

CS463.CEO.3: To understand the container services available in AWS

CS463.CEO.4: To learn the policies and standards used in service automation of OS.

CS463.CEO.5: To develop the plan for High Availabilitya and Disaster Recovery

COURSE OUTCOMES :

The students after completion of the course will be able to,

CS341.CO.1: To develop the automated the SDLC Process

CS341.CO.2: To summerize the various advanced facilities available to launch infrastructure using CloudFormation

CS341.CO.3: To differenciate between AWS Elastic Container Service, AWS Fargate and AWS Elastic Kubernetes Service

CS341.CO.4: To implement the various policies and standards required for automation

CS341.CO.5: To design the systems with detailed plan for High Availability and Disaster Recovery

CS341.CO.6: To develop a infrastructure using Jenkins

THEORY COURSE CONTENT

UNIT 1	**SDLC Automation**	**8 HOURS**

App/System/Case study: Web Application Development using CICD Pipeline
Contents: CICD Overview, CodeCommit - Overview, options, securing repository and branches, Triggers and notifications.
CodeBuild - Overview, buildspec.yaml, Docker, ECR using buildspec.yaml, Environment varialbles and Parameter Store, Artifacts and S3, Events and Logging
CodeDeploy - Overview, Application Deployment Groups, Deployment configurations, Hooks and Environement Variables, Rollbacks, Deploy to AWS Lambda
CodePipeline - Overview, Adding CodeCommit, CodeDeploy and CodeBuild, Manual approval steps, Stage Actions, All Intergartions
Self -Study: Jenkins Architecture
Further Reading: AWS Plugins for Jenkins

UNIT 2	**Advanced Configuration Management**	**6 HOURS**

App/System/Case study: Launching infrastructure for executing a Web Application
Contents: Advanced CloudFormation - User Data, cfn-init, cfn-signal and wait conditions, Rollbacks, Nested Tasks, Change Sets, Deletion Policy, Deploying Lambda Functions, Drift Detection
Advanced Elastic Beanstalk - Saved configurations, .ebextensions for config and resources, Rolling updates strategies, Swap URL, Worker environements
Advanced Lambda - Security, Environment variables, KMS and SSM, Versions, Aliases and Canary routing, SAM Framework
Self-Study: EBS Multi Docker Deployment
Further Reading: Lambda CodeDeploy

UNIT 3	**Elastic Container and Elastic Kubernetes Services**	**6 HOURS**

App/System/Case study: Deploying a Web Application using Containers
Contents: What is Docker, ECS Clusters, ECS Task Definition, ECR, Fargate, Elastic Kubernetes - Overview, deployment
Self-study: ECS Autoscaling
Further Reading: ECS CloudWatch Integration

UNIT 4	**Policies and Standards Automation**	**6 HOURS**

App/System/Case study: Developing policies and standards for Monitoring and Logging of a Web Application
Contents: SSM - Overview, EC2 steup, On Premise Setup, Resource Groups, Run Command, Parameter Store, Patch Manager, Inventory, Automation Config - Rules, Automation, Multi Account Inspector - Setup and Automation Trusted Advisor, GuardDuty, Secrets Manager
Self- Study: AWS Maccie
Further Reading: EC2 Instance Compliance

UNIT 5	**High Availability, Fault Tolerance, Disaster Recovery**	**6 HOURS**

App/System/Case study: Developing High Availability, Fault Tolerance features for a Web Application

Contents: AutoScaling Groups - Scheduled Actions, Scaling Policies, ALB Integration, Lifecycle Hooks, Termination Policies, Integration with SQS, CodeDeploy Integration, Deployment Strategies Multi AZ and Multi Region - Overview, CloudFormation StackSets, CodePipeline Disaster Recovery - Overview, Strategies

Self- Study: AWS Organizations

Further Reading: HTTPS on ALB

UNIT 6	**Terraform**	**8 HOURS**

App/System/Case study: Launching the infrastructure to run a Web Application using Terraform

Contents:: Jenkins - Overview, Installation and basic configuration, creating and running first job, adding and managing slaves, Building triggers, Continuous Integration, Using AWS functionality

Self -Study: Difference between Terraform and AWS CloudFormation

Further reading: Using AWS Services through Terraform

TEXT BOOK

1. Wittig, Michael, Andreas Wittig, and Ben Whaley. Amazon web services in action. Manning,, 2018.
2. Raheja, Yogesh, Giuseppe Borgese, and Nathaniel Felsen. Effective DevOps with AWS: Implement continuous delivery and integration in the AWS environment. Packt Publishing Ltd, 2018.
3. Vehent, Julien. Securing DevOps: security in the cloud. Simon and Schuster, 2018.
4. Vehent, Julien. Securing DevOps: security in the cloud. Simon and Schuster, 2018.
5. Sarkar, Aurobindo, and Amit Shah. Learning AWS: Design, build, and deploy responsive applications using AWS Cloud components. Packt Publishing Ltd, 2018.

REFERENCE BOOK

1. Kavis, Michael J. Architecting the cloud: design decisions for cloud computing service models (SaaS, PaaS, and IaaS). John Wiley Sons, 2014.
2. Vacca, John R., ed. Cloud computing security: foundations and challenges. CRC Press, 2016.
3. Furht, Borivoje, and Armando Escalante. Handbook of cloud computing. Vol. 3. New York: springer, 2010.