MIT Academy of Engineering (An Autonomous Institute Affiliated to SPPU)	COURSE SYLLABUS	
SCHOOL OF COMPUTER ENGINEERING AND TECHNOLOGY	W.E.F	2021 - 2022 (Rev.2019)
THIRD YEAR BACHELOR OF TECHNOLOGY COMPUTER ENGINEERING	COURSE NAME	Cloud Native Application Development
	COURSE CODE	CS356
	COURSE CREDITS	4
RELEASE DATE : 01/07/2021	REVISION NO	0.0

TEACHING SCHEME (HOURS/WEEK)		EXAMINATION SCHEME & MARKS						
		THEORY			PRACTICAL			TOTAL
LECTURE	PRACTICAL	MSE	ESE	IA	MSE	ESE	IA	
3	2	35	35	30	NIL	40	10	150

PRE-REQUISITE :

1: Data Structures
2: Database Management Systems
3: Cloud Computing Foundations

COURSE OBJECTIVES :

CS228.CEO.1: To study SDKs available for AWS based Application Development
CS228.CEO.2: To learn how to program various AWS services using SDK
CS228.CEO.3: To understand the function of various database services provided by AWS
CS228.CEO.4: To learn the concept of Ifrastructure as a Code
CS228.CEO.5: To develop the serverless applications

COURSE OUTCOMES:

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

CS228.CO.1: To configure the Software Development Kit for various AWS Services
CS228.CO.2: To develop various compute services in cloud
CS228.CO.3: To access various databases services through a web application
CS228.CO.4: To distinguish between protocols for developing own API
CS228.CO.5: To select an appropriate configuration for provisioning infrastructure as a code
CS228.CO.6: To develop a web application using various cloud services

THEORY COURSE CONTENT		
UNIT 1	**Programming AWS Compute Services**	**6 HOURS**
App/System/Case study: AWS EC2, AWS ImageBuilder, AWS ElasticBeanStalk **Contents:** Introduction to AWS SDK, Configuring AWS SDK for Java, Python and Node JS. Configuration of SDK for various IDEs like Eclipse, PyCharm, Visual Studio Code. Using the various AWS compute services like EC2, EC2 Image Builder and Elastic Beanstalk through programming **Self study:** SDK for Microsoft Azure **Further Reading:** AWS LaunchWizard		
UNIT 2	**Programming AWS Identity and Storage Services**	**6 HOURS**
App/System/Case study: AWS IAM, AWS S3, AWS EFS, AWS Glacier **Contents:** Programmatically accessing Identity and Access Management Services – create users, groups, security groups, roles, policies and permissions, permission boundaries, Access Analyzer Programmatically accessing AWS S3, S3 Glacier and EFS, Backing up data programmatically. **Self study:** AWS Cognito **Further Reading:** AWS Firewall Manager		
UNIT 3	**Programming AWS Database Services and API Gateway**	**6 HOURS**
App/System/Case study: AWS RDS, AWS DynamoDB, AWS Aurora, Amazon API Gateway **Contents:** Programming with AWS RDS, AWS DynamoDB, AWS Aurora – Interfaces, Low level API API Gateway – concepts, use cases. Choosing HTTP or REST API, Working with HTTP APIs, Working with REST APIs, Working with WebSockets APIs, API Gateway Security **Self Study:** AWS ElastiCache **Further Reading:** Amazon CloudFront		
UNIT 4	**Provosioning Infrastructure as Code**	**6 HOURS**
App/System/Case study: Amazon CloudFormation **Contents:** Cloud Formation concepts, How does Cloud Formation works, Setting up VPC End Points for Cloud Formation, Working with Stacks, Working with Templates, Working with StackSets, Using the Cloud Formation Registry, Security – Controlling access with IAM, Loggin API Calls, Infrastructure Security, Configuration and vulnerability analysis **Self Study:** AWS LakeFormation **Further Reading:** Terraform		
UNIT 5	**AWS Serverless**	**6 HOURS**
App/System/Case study: AWS Lambda, AWS Step Functions **Contents:** Need for Serverless architecture, How serverless architecture works Foundations of Lamdba Functions – concepts, features, programming model, architectures, function scaling, Lambda Permissions – Execution role, resource based policies, user policies, resources and conditions, permission boundaries, Configuration Functions, Managing Functions, Invoking Functions, lambda Functions AWS Step Functions **Self Study:** AWS LakeFormation **Further Reading:** Writing AWS Lambda Functions in JavaScript		

UNIT 6	AWS CI/CD	6 HOURS
App/System/Case study: Amazon CodeCommit, Amazon CodeBuild, AWS CodeDeploy, AWS CodePipeline **Contents:** What is CI/CD? CodePipeline concepts, How pipeline execution works, Integration with CodePipeline action types, working with pipelines, working with actions, working with stage transitions, monitoring pipelines, security in pipelines **Self Study:** ClouWatch Events for Pipelines **Further Reading:** Jenkins		

PRACTICAL:		
PRACTICAL NO.01	**First Virtual Machine on AWS using SDK**	**4 HOURS**
Launching the virtual machine on Amazon AWS and doing basic settings using AWS SDK		
PRACTICAL NO.02	**Storage Conftguration using SDK**	**4 HOURS**
Configuring various storages available on AWS and storing, retrieving, deleting the data from those storage applications using AWS SDK		
PRACTICAL NO.03	**Database Connectivity**	**4 HOURS**
Connecting to the database services like RDS, DynamoDB using AWS SDK and implementing CRUD Applications		
PRACTICAL NO.04	**Developing REST Based API**	**4 HOURS**
Developing REST based API using AWS API Gateway and invoking it through the web applications		
PRACTICAL NO.05	**Launching Infrastructure using CloudFormation**	**4 HOURS**
Launch a specific set of configurations using AWS CloudFormation		
PRACTICAL NO.06	**Developing a Serverless Application**	**4 HOURS**
Developing a Serverless Application using AWS Lambda		
PRACTICAL NO.06	**Developing Application using CI/CD**	**4 HOURS**
Developing an Application using AWS CI/CD services		
PRACTICAL NO.07	**Project**	**4 HOURS**
Implement a Web Application using all the services studied		

TEXT BOOKS

1. Wittig, Michael, Andreas Wittig, and Ben Whaley. Amazon web services in action. Manning,, 2018.
2. Murty, James. Programming amazon web services: S3, EC2, SQS, FPS, and SimpleDB. " O'Reilly Media, Inc.", 2008.
3. Tankariya, Vipul, and Bhavin Parmar. AWS Certified Developer-Associate Guide: Your one-stop solution to pass the AWS developer's certification. Packt Publishing Ltd, 2017.
4. Alteen, Nick, et al. AWS Certified Developer Official Study Guide: Associate (DVA-C01) Exam. John Wiley Sons, 2019..
5. van Vliet, Jurg, Flavia Paganelli, and Jasper Geurtsen. Resilience and Reliability on AWS: Engineering at Cloud Scale. " O'Reilly Media, Inc.", 2013.
6. Sarkar, Aurobindo, and Amit Shah. Learning AWS: Design, build, and deploy responsive applications using AWS Cloud components. Packt Publishing Ltd, 2018.

REFERENCE BOOKS

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.