Cloud Computing

Government of Karnataka

DEPARTMENT OF COLLEGIATE and TECHNICAL EDUCATION

Program	**Computer Science & Engineering**	**Semester**	**5**
Course Code	**20CS53I**	**Type of Course**	**L:T:P (104:52:312)**
Course Name	**Cloud Computing**	**Credits**	**24**
CIE Marks	**240**	**SEE Marks**	**160**

Introduction:

With technological advances, the future is set to be highly competitive and agility is the need of the hour. With cloud computing, organizations can save money on storage, servers and management services, as these services can be moved to the cloud with minimum cost, making the operations more efficient. The cloud offers businesses more flexibility overall versus hosting on a local server. And, for need of extra bandwidth, a cloud-based service can meet that demand instantly, rather than undergoing a complex (and expensive) update to the existing IT infrastructure.

This specialisation course is taught in Bootcamp mode. Bootcamps are 13 weeks, intense learning sessions designed to prepare you for the practical world – ready for either industry or becoming an entrepreneur. You will be assisted through the course, with development-based assessments to enable progressive learning.

This course will teach you Fundamentals of cloud computing Architecture, Compute instances, High Availability and Scalability in Cloud, Databases, Cloud Storage Service, DNS Services and Content Delivery, Serverless Computing, Container Services, Monitoring & Auditing and Cloud Security. Details of the curriculum is presented in the sections below.

Note: Faculty and students are required to use Amazon Web Service (AWS) cloud platform to practice the lab exercises in week 1 to week 9 and similarly use Microsoft Azure cloud platform for week 10 to week 12 of the curriculum.

Pre-requisite

Before the start of this specialisation course, you would have completed the following courses;

In the 1st year of study, you would have studied Engineering Mathematics, Communication Skills, Computer Aided Engineering Graphics, Statistics & Analysis, Basic IT Skills, Fundamentals of Computer, Fundamentals of Electrical Electronics Engineering, Project Management skills and Multimedia & Animation.

In the 2nd year of study, you would have studied Python Programming, Computer Hardware, Maintenance and Administration, Computer Networks, Database System Concepts and PL/SQL, Data Structures with Python, Operating System and Administration, Object oriented programming and Design with Java, Software Engineering principles and practices.

In this year of study, you shall be applying your previous years learning along with specialised field of study into projects and real-world applications.

Course Cohort Owner

A Course Cohort Owner is a faculty from the core discipline, who is fully responsible for one specialised field of study and the cohort of students who have chosen to study that specialised field of study.

Guidelines for Cohort Owner

1. Each Specialized field of study is restricted to a Cohort of 20 students which could include students from other relevant programs.
2. One faculty from the Core Discipline shall be the Cohort Owner, who for teaching and learning in allied disciplines can work with faculty from other disciplines or industry experts.
3. The course shall be delivered in boot camp mode spanning over 12 weeks of study, weekly developmental assessments and culminating in a mini capstone.
4. The industry session shall be addressed by industry subject experts (in contact mode/online / recorded video mode) in the discipline only.
5. The cohort owner shall be responsible to identify experts from the relevant field and organize industry session as per schedule.
6. Cohort owner shall plan and accompany the cohort for any industrial visits.
7. Cohort owner shall maintain and document industrial assignments, weekly assessments, practices and mini project.
8. The cohort owner shall coordinate with faculties across programs needed for their course to ensure seamless delivery as per time table

9. The cohort owner along with classroom sessions can augment or use supplementally teaching and learning opportunities including good quality online courses available on platforms like Karnataka LMS, Infosys Springboard, NPTEL, Unacademy, SWAYAM , etc.

Course outcome: A student should be able to

CO1	**Work in cloud environment to demonstrate various aspects of Cloud computing and leverage them for project needs**
CO2	**Demonstrate the Public cloud services like compute, storage, networking, IAM, databases and configure them for given specification**
CO3	**Design, build and deploy a cloud native application using public cloud services**
CO4	**Adopt Cloud security policies, Monitor and troubleshoot basic issues in Cloud services**
CO5	**Administer cost, privileges and manage an existing deployed network**

Detailed course plan

Week	CO	PO	Days	1st session (9am to 1 pm)	L	T	P	2ND session (1.30pm to 4.30pm)	L	T	P
1	1	1	1	**Building blocks of cloud computing** - Introduction - Basic Architecture of Computer - Servers vs Desktop and laptops - Client-Server Computing - Hard Drives - HDDs and SDDs - Storage - block vs file vs object - Distributed Networking	3		1	- IP addressing - Networking - Routers and Switches - Networking - Firewalls - Databases - Server virtualization - Docker Containers - Application Programming Interfaces (API)	2		1
	1	1	2	**Introduction to cloud computing** - Introduction - From Mainframes to Clouds Evolution – How to host an application in traditional IT Infra - What is Cloud Computing - Example Cloud Application deployment	2		2	Cloud Computing Service Models - Software as a Service (SaaS) - Platform as a Service (PaaS) - Infrastructure as a Service (IaaS) Cloud Deployment Models – - Public - Private - Hybrid - Community List out the examples for each cloud models Benefits of Cloud	2		1
	1	4	3	**Cloud Architecture** - Introduction	3		1	- Monolithic and Microservices Architectures	2		1

				- Stateful vs Stateless Service - Scaling up vs Scaling out - Load Balancing - Fault Tolerance - Loose coupling				- Event-driven Architecture - List out the Popular Cloud service providers along with their features (AWS, Azure, GCP) - Open-Source cloud computing platforms			
	1	4	4	**AWS Cloud Overview** - Amazon Web Service (AWS) - Regions and AZ - Creating an AWS Account - Shared Responsibility Model and AWS Acceptable Policy	1		3	- Tour of AWS Console and Services in AWS hands-on			3
			5	**Developmental Assessment**				Assessment Review and corrective action			3
	1	**1,5**	6	**Industry Class: Build blocks of Cloud Computing**	2			Weekly Assignment(1PM-2PM)			
2	1	**1**	1	Peer Review		4		**AWS Identity and Access Management (IAM) Services** - What is IAM ? - What is IAM used for ? - Principle of least privilege - IAM Introduction: Users, Groups, Policies - IAM Users & Groups Hands on	1		2

								- IAM Policies - IAM Policies Hands On			
	2	1,4	2	- AWS IAM Multi-factor authentication (MFA) Overview - IAM MFA Hands On - AWS Access Keys, CLI & SDK - AWS CLI Setup - AWS CLI Hands On - AWS Cloud Shell	1		3	- IAM Roles for AWS Services - IAM Roles Hands On - IAM Security Tools - IAM Security Tools Hands On - IAM Best Practices **Cloud Computing instances in AWS** - Virtualization in Cloud Computing - What is Virtualization? - Virtualization as a Concept of Cloud Computing - Architecture of Virtualization - Types of Virtualizations	1		2
	1,2	**4**	3	**Amazon Elastic Compute Cloud (Amazon EC2) Instance** - EC2 Basics - Create a EC2 instance with EC2 user data - EC2 instance types basics - Security groups and classic ports	1		3	- Lab - Security Groups - How to SSH to EC2 Instance - EC2 Instance Connect - EC2 Instance Roles Demo - Private vs Public vs Elastic IP - Lab - Private vs Public vs Elastic IP - EC2 Placement groups - Lab - EC2 Placement groups	1		2

								-			
	1	1,3,	4	- Elastic Network Interface (ENI) Overview - Lab - ENI - EC2 Hibernate - Lab - EC2 Hibernate - EC2 Advance concepts (Nitro, vCPU, Capacity Reservations) - Amazon Elastic Block Store EBS Overview - Lab - EBS - EBS Snapshots - Lab - EBS Snapshots	2		2	- Amazon Machine Image (AMI) Overview - Lab - AMI - EC2 Instance Store - EBS Volume Types - EBS Multi-Attach - EBS Encryption - EFS - Lab - EFS - EFS vs EBS	1		2
			5	**Developmental Assessment**				Assessment Review and corrective action			3
	1,5	**2,3 ,4**	6	**Industry Class: Amazon EC2 Instance and IAM**	2		3	Weekly Assignment			
3	**1,5**	**2,3 ,4**	1	Peer Review **Mini Project/ Activity – Status review**		4		**Cloud Networking** - Introduction - CIDR, Private vs Public IP - Subnet Overview - Networking - VPC - Default VPC Overview - VPC Overview	2		1

								-			
	1,3 ,5	**2,3 ,4**	2	- Lab - VPC - Lab - Subnet - Internet Gateways & Route Tables - Lab - Internet Gateways & Route Tables - Bastion Hosts - Lab - Bastion Hosts - NAT Instances - Lab - NAT Instances -	1		3	- NAT Gateways - Lab - NAT Gateways - NACL & Security Groups - Lab - NACL & Security Groups	1		2
	2,5	**2,3 ,4**	3	- VPC Reachability Analyzer - Lab - VPC Reachability Analyzer - VPC Peering - Lab - VPC Peering - VPC Endpoints - Lab - VPC Endpoints	1		3	- VPC Flow Logs - Lab - VPC Flow Logs - Site to Site VPN, Virtual Private Gateway & Customer Gateway - Lab - Site to Site VPN, Virtual Private Gateway & Customer Gateway	1		2
	2,5	2,3, 4	4	- Direct Connect & Direct Connect Gateway - AWS PrivateLink - VPC Endpoint Services - AWS ClassicLink - Transit Gateway - VPC Traffic Mirroring	1		3	- IPv6 for VPC - Lab - IPv6 for VPC - Egress Only Internet Gateway - Lab - Egress Only Internet Gateway - Networking Costs in AWS	1		2

			5	**CIE 1 – Written and Practice Test**				Assessment Review and corrective action			3
	1,2, 4	4	6	**Industry Class: Cloud Networking**	2		3	Weekly Assignment			
4	1,2	**2,3 ,4**	1	Peer Review **Mini Project/ Activity – Status review**		4		**High Availability and Scalability in Cloud** - High Availability and Scalability - Elastic Load Balancer (ELB) and Auto Scaling Groups (ASG) - Classic Load Balancer (CLB) - Lab - CLB - Application Load Balancer (ALB) - Lab - ALB	2		1
	1,2	1,3	2	- Network Load Balancer (NLB) - Lab - NLB - Gateway Load Balancer (GWLB) - Elastic Load Balancer - Sticky Sessions - Elastic Load Balancer - Cross Zone Load Balancing -	1		3	- Elastic Load Balancer - SSL Certificates - Elastic Load Balancer - Connection Draining - Auto Scaling Groups (ASG) Overview - Lab - ASG	1		2
	1,2, 4	**2,3 ,4**	3	- Auto Scaling Groups - Scaling Policies - Lab - Auto Scaling Groups - Scaling Policies	1		3	- Amazon RDS Overview - RDS Read Replicas vs Multi AZ - Lab - Amazon RDS	1		2

				Databases in Cloud - Introduction - Amazon RDS, Aurora, ElasticCache				- RDS Encryption + Security			
	1,2,4	**2,3,4**	4	- Amazon Aurora - Lab - Amazon Aurora - Aurora - Advanced Concepts	1		3	- ElasticCache Overview - Lab - ElasticCache	1		2
			5	**Developmental Assessment**				Assessment Review and corrective action			3
	1,2,4	**2,3,4**	6	**Industry Class: Databases in AWS**	2		3	Weekly assignment			
5	1,2,5	**2,3,4**	1	Peer Review **Mini Project/ Activity – Status review**		4		**Cloud Storage Service** - AWS Storage Services - Amazon S3 - Section Introduction - S3 Buckets and Objects - Lab - S3 Buckets and Objects - S3 Versioning - Lab - S3 Versioning - S3 Encryption - Lab- S3 Encryption	1		2
	1,2,5	**2,3,4**	2	- S3 Security & Bucket Policies - Lab - S3 Security & Bucket Policies	1		3	- S3 Consistency Model - S3 MFA Delete	1		2

				- S3 Websites - S3 CORS - Lab - S3 CORS				- Lab - S3 MFA Delete - S3 Default Encryption - S3 Access Logs - Lab - S3 Access Logs - S3 Replication (Cross Region and Same Region)			
	1,2, 5	**2,3 ,4**	3	- Lab - S3 Replication - S3 Pre-signed URLs - Lab - S3 Pre-signed URLs - S3 Storage Classes + Glacier - Lab - S3 Storage Classes + Glacier	1		3	- S3 Lifecycle Rules - Lab - S3 Lifecycle Rules - S3 Analytics - S3 Performance - S3 Event Notifications	1		2
	1,2, 5	**2,3 ,4**	4	- Athena Overview - Lab - Athena - AWS Snow Family Overview - Lab - AWS Snow Family - Amazon FSx - Lab - Amazon FSx	1		3	- Storage Gateway Overview - Lab - Storage Gateway - AWS Transfer Family - Compare AWS Storage options	1		2
			5	**CIE 2 – Written and Practice Test**				Assessment Review and corrective action			3
	1,2, 5	**2,3 ,4**	6	**Industry Class: Cloud Storage Service**	2		3	Weekly Assignment			

6	2,3,5	2,3,4	1	Peer Review **Mini Project/ Activity – Status review**		4		**DNS Services and Content Delivery** - What is DNS? - AWS Route 53 Overview - Route 53 - Registering a domain - Route 53 - Creating our first records - Route 53 - EC2 Setup - Route 53 - TTL	1		2
	1,2,3,5	2,3,4	2	- Route 53 CNAME vs Alias - Routing Policy - Simple, Weighted - Routing Policy - Latency - Route 53 - Health Checks - Lab - Route 53 - Health Checks - Routing Policy - Failover, GeoLocation, Geoproximity	1		3	- Lab - Routing Policy - Traffic Flow & Geoproximity Hands On - Routing Policy - Multi Value - 3rd Party Domains & Route 53 - What is CDN ? - Advantages of CDN - CloudFront & AWS Global Accelerator -	1		2
	1,2,3,5	2,3,4	3	- CloudFront Overview - Lab - CloudFront with S3 - CloudFront Signed URL / Cookies - CloudFront Advanced Concepts - AWS Global Accelerator – Overview - Lab - AWS Global Accelerator	1		3	**Serverless Computing in Cloud** - What is Serverless computing ? - Benefits of serverless computing - Serverless application patterns - Serverless computing in AWS	1		2

	1,2,3,5	**2,3,4**	4	- AWS Lambda Overview - Lab - Lambda - Lambda Limits - Lambda@Edge - Amazon DynamoDB - Lab - Amazon DynamoDB	1		3	- API Gateway Overview - Lab - API Gateway Overview - API Gateway Security - AWS Cognito Overview - Serverless Application Model (SAM) Overview - Serverless Solutions Architecture	1		2
			5	**Developmental Assessment**				Assessment Review and corrective action			3
	2,3,5	**2,3,4**	6	**Industry Class: DNS & Serverless**	2		3	- Weekly Assignment			
7	**2,3,5**	**2,3,4**	1	Peer Review **Mini Project/ Activity – Status review**		4		**Container Services** - The need for containers - Introduction to Docker - Lab - Deploying Docker on a virtual machine	1		2
	1,2,3,5	**2,3,4**	2	- Lab - Running the nginx container on the Linux VM - Lab - Practice Docker commands - The need for an image registry	1		3	**Amazon ECR** - Lab - Amazon ECR - Publishing to Amazon ECR	1		2
	2,3,5	**2,3,4**	3	**Amazon ECS** - Lab - Creating ECS Cluster	1		3	**Kubernetes** - What is Kubernetes ?	1		2

				- Lab - Creating ECS Service - Amazon ECS - Auto Scaling, Rolling Updated and Solutions Architectures				- Kubernetes components - Learn Kubernetes Basics			
	1,2,3,5	**2,3,4**	4	- Create a Cluster in Kubernetes - Deploy an App ('Hello World' webpage) - Explore your App	1		3	- Expose your App Publicly - Scaling your App Amazon EKS Overview	1		2
			5	**CIE 3 – Written and Practice Test**				Assessment Review and corrective action			3
	2,3,5	**2,3,4**	6	**Industry Class: Container Services and Kubernetes**	2		3	Weekly Assignment			
8	**2,3,5**	**2,3,4**	1	Peer review **Mini Project/ Activity – Status review**		4		**Disaster Recovery and Migrations** - Disaster Recovery in AWS - Database migration service (DMS) - Lab - DMS - Datasync Overview - AWS Backup - Lab - AWS Backup - Transferring large datasets into AWS	1		2
	2,3,5	**2,3,4**	2	**AWS Elastic Beanstalk** - Introduction - Elastic Beanstalk Overview - Creating Beanstalk Environment	1		3	- Beanstalk CLI and Deployment Process - Beanstalk lifecycle policy overview and hands-on - Beanstalk Extensions	1		2

				- Beanstalk Deployment modes - Lab – Beanstalk Deployment Modes				- Beanstalk and Cloudformation - Beanstalk with Docker - Beanstalk Cleanup			
	2,3 ,5	**2,3 ,4**	3	**AWS CI/CD** - Introduction to CI/CD in AWS - CodeCommit overview - Lab- CodeCommit - CodePipeline Overview - Lab – CodePipeline - CodeBuild Overview - Lab – CodeBuild	1		3	- CodeDeploy Overview - Lab – CodeDeploy - CodeStar Overview - Lab – CodeStar - CodeArtifact Overview			3
	2,3 ,5	**2,3 ,4**	4	**AWS CloudFormation** - CloudFormation Overview - Lab – CloudFormation Create Stack - Lab – CloudFormation Update and delete Stack - YAML crash course - CloudFormation Resources - CloudFormation Parameters	1		3	- CloudFormation Mappings - CloudFormation Outputs - CloudFormation Conditions - CloudFormation Intrinsic Functions - CloudFormation RollBacks - CloudFormation Changesets, Nested Stacks and StackSet - CloudFormation Drift			3
			5	**Developmental Assessment**				Assessment Review and corrective action			3

	2,3,5	**2,3,4**	6	**Industry Class: Disaster Recovery and Migrations**	2		3	Weekly Assignment			
9	3	2,3	1	Peer review **Mini Project Activity – Status review**		4		**Monitoring and Auditing** - AWS Monitoring - CloudWatch Metrics - CloudWatch Custom Metrics and Dashboards - CloudWatch Logs - Lab - CloudWatch Logs -	2		1
	2,3,5	**2,3,4**	2	- CloudWatch Agent & CloudWatch Logs Agent - CloudWatch Alarms - Lab - CloudWatch Alarms - AWS CloudWatch Events - Amazon EventBridge	1		3	- AWS CloudWatch Events - Amazon EventBridge - CloudTrail Overview - Lab - CloudTrail			3
	2,3,5	**2,3,4**	3	- AWS Config - Overview - Lab - AWS Config - CloudTrail vs CloudWatch vs Config - AWS Cost Explorer	1		3	**Cloud Security** - Introduction - Defense in depth in security - AWS Security & Encryption - KMS Overview			3

								- Lab - KMS with CLI			
	5	3,4	4	- KMS Key Rotation - SSM Parameter Store Overview - Lab - SSM Parameter Store (CLI) - Lab - SSM Parameter Store (AWS Lambda) - AWS Secrets Manager - Overview - Lab - AWS Secrets Manager	1		3	- CloudHSM - Shield - DDoS Protection - Web Application Firewall (WAF) - Lab - WAF & Shield - Amazon GuardDuty - Amazon Inspector - Macie - AWS Well Architected Framework with more focus on Security			3
			5	**CIE 4 – Written and Practice Test**				Assessment Review and corrective action			3
	4	2,3	6	**Industry Class: Cloud Monitoring and Security**	2		3	Weekly Assignment			
10	1	3,4	1	Peer Review **Mini Project/ Activity – Status review**		4		**Microsoft Azure Cloud Overview** - Regions, Region Pairs, Sovereign Regions - Availability Zones and Data Centers - Resources, Resource Groups, Subscriptions, Management Groups - Overview of Azure Services - VM and App Services - Azure Storage and Data Services - Azure Networking Services and Microservices	1		2

								- Tour of the Azure Portal - Azure Free Account - Creating an Azure Free Account			
	1,2, 3	3,4	2	**Azure Active Directory** - Introduction to Azure Active Directory - Azure Active Directory Features - Azure Subscriptions - Creating an Azure subscription - Trust between Azure Subscription and Azure AD - Creating a user in Azure AD			4	- MFA or 2FA in azure - Lab - MFA on per user basis - Conditional Access Policies - Lab - Conditional Access Policies - Azure Powershell and Azure CLI - Azure CLI Hands on - What is Powershell - Installing Powershell in Azure - Quick look at a couple of commands - Installing Azure CLI	1		2
	1,3	2,3, 4	3	**Cloud Compute Services in Azure** - Azure Virtual Machines - The Virtual Machine Service - Deploying a Virtual Machine - Lab - Building a Windows Virtual Machine - Connecting to the Virtual Machine - Lab - Installing IIS	1		3	- State of the Virtual Machine - Lab - State of the Virtual Machine - Lab - Building a Linux Virtual Machine - Lab - Deploying a web server on the Linux virtual machine	1		2

	1,3	3,4	4	**Cloud Networking Services in Azure** - Virtual Networks - Introduction - The network interface - Lab - Working with Azure virtual networks - Lab - Deploying a machine to the virtual network - Attaching a secondary network interface - Lab - Adding a secondary network interface	1		3	- Network Security Groups - Lab - Network Security Groups (Working with rules, Priority setting, Subnets) - Virtual Network Peering - Lab - Virtual Network Peering - Setup and Implementation - Virtual private network			3
			5	**Developmental Assessment**				Assessment Review and corrective action			3
	2,3	3,4	6	**Industry Class: Networking Services in Azure**	2		3	Weekly Assignment			
11	1,5	2,3, 4	1	Peer Review **Mini Project /Activity – Status review**		4		**High Availability and Scalability in Azure Cloud** - Explore Availability and Scalability in Azure - Availability Sets - Lab - Availability Sets	1		2

								- Use case scenario - Availability sets - Availability Zones - Lab - Availability Zones - Azure virtual machine scale sets			
	2,3	2,3, 4	2	**Database Services in Azure** - Azure Database Service - Major Database Features - Database on VM - Azure SQL - Which Azure SQL to Choose? - Creating and Connecting to Azure SQL - Connecting the Catalog to the Database - Securing the Database Connection	1		3	**Cloud Storage Service in Azure** - Azure Storage Data Services - Introduction - Benefits of Azure Storage - What are storage accounts - Different types of storage accounts - Lab - Creating an Azure storage account - Azure Blob service - Lab - Blob service - Uploading a blob, Accessing the blob	1		2
	2,3	3	3	**DNS Services and Content Delivery in Azure** - Azure Private DNS - Lab- Azure Private DNS - Azure Public DNS - Azure CDN - Azure CDN Features	1		3	- How to use Azure CDN ? - Lab - Create Azure CDN - Create a storage account - Enabling CDN for storage account			3

	2,3	2.3, 4	4	**Serverless Computing in Azure** - Azure Serverless - How Azure Does Serverless - Overview of Azure Functions	1		3	- Lab - Creating and Testing a Azure Function - Logic Apps - Lab - Creating an Testing a Logic App			3
			5	**CIE 5 – Written and Practice Test**				Assessment Review and corrective action			3
	3	2,3	6	**Industry Class: Cloud Databases**	2		3	Weekly Assignment			
12	1	2,3, 4	1	Peer Review **Mini Project /Activity – Status review**				**Container Services in Azure** - Azure Container Registry - Lab - Azure Container Registry - Publishing to the Azure Container Registry - Publishing to the Azure Container Registry - Resources	2		1
	1,2, 3	2,3, 4	2	**Azure Container Instances** - Lab - Azure Container Instances and Azure Container Groups	2		2	**Kubernetes in Azure** - Azure Kubernetes Services (AKS) Overview - Lab - Deploying an Azure Kubernetes cluster - Lab - Deploying our application	1		2

	1,2, 3,4, 5	2,3, 4,6	3	**Azure Cloud Monitoring** - Azure Monitor Service - Quick look at Azure Monitor - Lab - Azure Monitor - Alerts	2		2	- What is a Log Analytics Workspace - Lab - Creating a Log Analytics workspace			3
	2,3	3,4	4	**Azure Cloud Security** - VM Security Best Practices - Networking Security Best Practices			4	- Database Security Best Practices - Zero Trust security - Azure Key Vault			3
			5	**Developmental Assessment**				Assessment Review and corrective action			3
	1,3	5	6	**Industry Class: Kubernetes in Azure**	2		3	Weekly Assignment			
13	1 to 4	2,3, 4,6		**Internship** **a) Secondary research on various industries and their operations to identify at least 3 companies along with the areas of work interest and develop an internship plan that clearly highlights expectations from the industry during the internship.** **b) Design and develop a cover letter for an internship request to all 3 identified companies and the resume to be submitted to potential companies.** **c) Prepare for an internship interview to highlight your interests, areas of study, career aspirations and personnel competence – including the areas of**	2	4	19	**Project** **a) Identification of the problem statement (from at least 3 known problems) the students would like to work as part of the project – either as provided by faculty or as identified by the student. Document the impact the project will have from a technical, social and business perspective.** **b) Design and develop the project solution or methodology to be used to solve at least one of the problems identified.**		4	11

				learning you expect to learn during internship.				**c) Prepare a project plan that will include a schedule, WBS, Budget and known risks along with strategies to mitigate them to ensure the project achieves the desired outcome.**				

****Note:** Saturday session from 9 AM -2 PM

References

Sl. No	Description
1	AWS Certified Cloud Practitioner Study Guide: CLF-C01 Exam by David Clinton (Author)
2	AWS Certified Solutions Architect Study Guide: Associate SAA-C02 Exam (Aws Certified Solutions Architect Official: Associate Exam) By Ben Piper and David Clinton
3	https://aws.amazon.com/training/awsacademy/
4	AWS Certified Cloud Practitioner : Study Guide with Practice Questions and Labs - Third Edition
5	https://docs.microsoft.com/en-us/learn/certifications/exams/az-900
6	Microsoft Azure AI: A Beginner's Guide Rekha Kodali
7	Learn Microsoft Azure Step by Step in 7 days for .NET Developers (English, Paperback, Pawar Saillesh)
8	https://zoomgroup.com/training/india/free-ebooks/aws-lab-manual-view/html5forwebkit.html?page=0
9	https://docs.aws.amazon.com/general/latest/gr/aws-general.pdf
10	https://www.skylinesacademy.com/az900-azure-fundamentals-ultimate-study-guide

CIE and SEE Assessment Methodologies

CIE Assessment	Assessment Mode	Duration In hours	Max Marks
Week 3	CIE 1– Written and practice test	4	30
Week 5	CIE 2– Written and practice test	4	30
Week 7	CIE 3– Written and practice test	4	30
Week 9	CIE 4– Written and practice test	4	30
Week 11	CIE 5– Written and practice test	4	30
	On line Course work (Minimum 10 hours online course with certification from (SWAYAM/NPTEL/Infosys Springboard)		40
	Profile building for Internship / Submission of Synopsys for project work		20
Portfolio evaluation (Based on industrial assignments and weekly developmental assessment) *			30
TOTAL CIE MARKS (A)			**240**
SEE 1 - Theory exam (QP from BTE) Conducted for 100 marks 3 hrs duration reduced to 60 marks		**3**	**60**
SEE 2 – Practical		**3**	**100**
TOTAL SEE MARKS (B)			**160**
TOTAL MARKS (A+B)			**400**

* The industrial assignment shall be based on peer-to-peer assessment for a total of 10 marks (on a scale of 1 to 10) and in the event of a group assignment the marks awarded will be the same for the entire group, the developmental assessment will be for a total of 20 marks and based on MCQ/case study/demonstration and such other assignment methods

Assessment framework for CIE (1)

Note: Theory to be conducted for 1 hour and practice for 3 hours, total duration of exam – 4 hours

Programme	**Computer Science Engineering**	**Semester**	**V**
Course	**Cloud Computing**	**Max Marks**	**30**
Course Code	**20CS53I**	**Duration**	**4 hours**
Name of the course coordinator		**CIE**	**1(3RD WEEK)**

Note: Answer one full question from each section.

Qn.No	**Question**	**CL L3/L4**	**CO**	**PO**	**Marks**
	Section-1 (Theory) – 10 marks				
1.a)	What are the steps involved in creating the VPC in AWS.	L4	1,2		5
b)	Suppose you are hosting a e-commerce application on cloud. Illustrate with example how do the following factors affect the cloud infrastructure. 1. Scaling up vs Scaling out 2. Load Balancing 3. Fault Tolerance 4. Loose coupling 5. Stateful vs Stateless Service	L3	1,2		5
2.a)	What is AWS IAM? Illustrate the need of AWS IAM Multi-factor authentication (MFA) with example.	L4	1,2		5
b)	How do you control traffic in and out of AWS EC2 instance.	L3	1,2		5

<table>
<tr><th colspan="6">Section-2 (Practical) - 20 marks</th></tr>
<tr><td>3)</td><td>. Create a Custom Amazon VPC by demonstrating the following
1. Sign in to the AWS Management Console as an administrator or power user.
. 2. Select the Amazon VPC icon to launch the Amazon VPC Dashboard.
3. Create an Amazon VPC with a CIDR block equal to 192.168.0.0/16, a name tag of My First VPC, and default tenancy.

Scheme of evaluation:
<table><tr><th>Sl.</th><th>Description</th><th>Marks</th></tr><tr><td>1</td><td>Sign into AWS Management Console</td><td>5</td></tr><tr><td>2</td><td>Launch of Amazon VPC</td><td>5</td></tr><tr><td>3</td><td>Creation of VPC</td><td>10</td></tr></table></td><td>L3</td><td>1,2</td><td></td><td>20</td></tr>
<tr><td>4)</td><td>Create an Amazon Elastic Compute Cloud (Amazon EC2) instance.
<table><tr><th>Sl.</th><th>Description</th><th>Marks</th></tr><tr><td>1</td><td>Launch of EC2 instance</td><td>5</td></tr><tr><td>2</td><td>Configuration of EC2 instance</td><td>5</td></tr><tr><td>3</td><td>Termination of instance</td><td>10</td></tr></table></td><td>L3</td><td>1,2</td><td></td><td>20</td></tr>
</table>

Note : Theory questions shall be aligned to practical questions

Assessment framework for SEE 1 (Theory) – 100 Marks / 3 hours (Reduced to 60 marks)

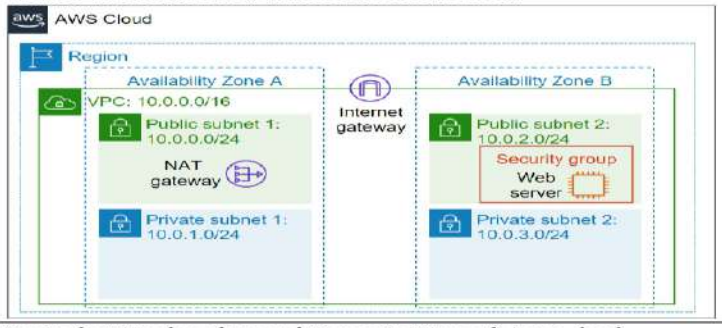
Program : Computer Science Engineering	**Semester: Vth**
Course : CLOUD COMPUTING	**Max Marks: 100**
Course Code : 20CS53I	**Duration :3 Hrs**

Instruction to the Candidate: Answer one full question from each section.

Q. No	Question	CL	CO	Marks
	Section-1			
1.a)	Why is AWS more economical than traditional data center for applications with varying compute workloads? Illustrate with the example.	3	1,2	10
b)	How does AWS IAM improves the security of the applications? Illustrate the Multi-factor authentication (MFA) with example.	4		10
2.a)	Illustrate the following AWS Cloud services a. EC2 Instances b. S3 Storage c. AWS Shield d. WAF Firewall e. NACL	4		10
b)	Illustrate the steps involved in creating an AWS EC2 Instance.	3		10
	Section-2			
3.a)	Differentiate between Security Group and NAC in AWS	3	1,2	10
b)	Explain the steps involved in Securing a new AWS account from Account root user.	4		10
4.a)	How is Elastic Load Balancer (ELB) and Auto Scaling Groups (ASG) are used?	4		10
b)	Write a note on the following a. VPC b. Subnets c. Security groups d. Route Table	4		10

	Section- 3			
5.a)	How to configure an Amazon S3 bucket for static website hosting.	3	1,3	10
b)	Create a Amazon S3 bucket for pre-signed URLs.	3		10
6.a)	Explain different Amazon S3 object-level storage classes available with use cases.	3		10
b)	Explain the Amazon EFS features and illustrate the steps in Amazon EFS implementation.	3		10
	Section-4			
7.a)	A company wants to store data that is not frequently accessed. What is the best and cost-effective solution that should be considered? Compare the same with traditional methods.	4	1,4	10
b)	What are the Amazon Managed services responsibilities?	4		10
8.a)	What is the AWS Well-Architected Framework? Explain the pillars of Well-Architected Framework	3		10
b)	Highlight the benefits of Container services and steps involved in Kubernetes service in AWS	4		10
	Section-5			
9.a)	Illustrate the following in Microsoft Azure. 1. Regions, Region Pairs, Sovereign Regions 2. Availability Zones and Data Centers, Resources, Resource Groups	3,4	1,5	10
b)	Different types of storage account in MS Azure Cloud.	3,4		10
10.a)	What are Virtual Networks in MS Azure Cloud. Explain with example.	3		10
b)	Write a note on Virtual Machine Security Best Practices in Azure Cloud.	4		10

Scheme of Evaluation for SEE 2 (Practical)

Sl. No	Description	Marks
Problem Statement:	Suppose client wants to migrate web application that is on-prem into cloud. How to create an EC2 Instance, deploy the application and create the AWS S3 storage.	
1	Deploy a simple application in AWS Cloud by creating the instances.	25
2	Create a S3 storage in AWS	20
3	Create a VPC for the below architecture in AWS Cloud. 	20
4	Create the Virtual machine and Storage in Microsoft Azure cloud.	25
5	Viva voce/Result	10
Total		**100**

Equipment/software list with Specification for a batch of 20 students

Sl. No.	Particulars	Specification	Quantity
9.	Computers	Intel i5, 4GB RAM, 500GB SSD	**20**
10.	AWS and AZURE Cloud account – Students subscription	Atleast $100 for each account	**20 AWS account** **20 Azure account**
11.	Broadband connection	Atleast 250MBPS	**1**