



Course Syllabus
Gyanmanjari College of Computer Application
Semester-6 (BCA)

Subject: Cloud Architecture and Design-BCACT10335

Type of course: Major (Core)

Prerequisite: Basic knowledge of computer networks, operating systems, and fundamentals of distributed computing.

Rationale:

Cloud architecture and design form the backbone of modern computing, enabling organizations to build scalable, resilient, and secure systems on-demand. This course provides students with a structured understanding of cloud service models, virtualization, orchestration, design principles, and emerging trends. It equips learners with the ability to evaluate, architect, and optimize cloud-based solutions, preparing them for professional roles in cloud engineering, solution architecture, and enterprise system design.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks					Total Marks
CI	T	P	C	SEE		CEE			
				Theory	Practical	MSE	LWA	ALA	
3	0	2	4	75	25	30	20	50	200

Legends: CI-Class Room Instructions; T – Tutorial; P - Practical; C – Credit; SEE - Semester End Evaluation; MSE- Mid Semester Examination; LWA - Lab Work Assessment; V – Viva voce; CCE-Continuous and Comprehensive Evaluation; ALA- Active Learning Activities.

3 Credits * 25 Marks = 75 Marks (each credit carries 25 Marks) Theory

1 Credits * 25 Marks = 25 Marks (each credit carries 25 Marks) Practical

SEE 100 Marks will be converted in to 50 Marks

CCE 100 Marks will be converted in to 50 Marks

It is compulsory to pass in each individual component.

Course Content:

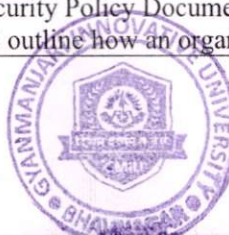
Sr. No	Course content	Hrs	% Weightage
1	Fundamentals of Cloud Architecture Introduction to Cloud Computing Evolution of cloud , Characteristics , Service Models (IaaS, PaaS, SaaS), Deployment Models (Public, Private, Hybrid, Community), Basic Cloud Architecture Components, Cloud Stack Layers: Infrastructure Layer, Platform Layer, Application Layer, Virtualization	10	20%



	Technologies: (Hypervisors (Type-1, Type-2),Containers (Docker basics) Kubernetes basics, Resource Pooling & Elastic Resource Allocation)		
2	Cloud Design Principles Cloud-Native Design, Twelve-Factor Application Principles, Micro services vs. Monolithic Architecture ,API Gateway Concepts, Service Mesh Concepts (Istio/Linkerd basics), Scalability & Elasticity, Auto-Scaling,Load Balancing, Fault Tolerance & High Availability, Redundancy, Failover, Multi-Cloud Strategies	10	20%
3	Advanced Cloud Architecture Kubernetes Deep Dive(Pods, Deployments, Services, Networking & Ingress, Serverless Computing (AWS Lambda, Azure Functions, Google Cloud Functions) Cloud Networking (VPC,VPN,SDN,Hub-and-Spoke Architecture) Cloud Storage (Object Storage: AWS S3 / Azure Blob / GCP Cloud Storage, Distributed File Systems: HDFS, Ceph, GlusterFS.	15	20%
4	Security, Optimization & Emerging Trends Cloud Security & Compliance (IAM, Encryption (At Rest, In Transit), Zero Trust Model, GDPR, HIPAA, ISO 27001, PCI-DSS) Cloud Monitoring & Performance Management (AWS CloudWatch , Google Stackdriver , Prometheus / Grafana) Emerging Cloud Technologies (Multi-Cloud & Hybrid Cloud, Edge Computing / Fog Computing , AI/ML in Cloud, Quantum Cloud Computing	10	20%
5	Advanced Cloud Architecture & Enterprise Design Advanced Architecture Patterns (Event-Driven Architecture, CQRS (Command Query Responsibility Segregation), Saga Pattern (Distributed Transactions), Sidecar / Ambassador / Adapter Patterns, API-First & Design-First Architecture) Infrastructure as Code (IaC) (Terraform Basics, Providers, State, Variables, Modules, CloudFormation / ARM Templates, Infrastructure Deployment Automation)	10	20%

Continuous Assessment:

Sr. No	Active Learning Activities	Marks
1	Cloud API Integration Task Students will implement a basic API call (using REST APIs from AWS, Azure, GCP, or Firebase) to fetch or update data. They will write simple code (Python/Java/Node.js), capture outputs, and upload code snippets and results on the GMIU Web Portal.	10
2	Cloud Storage Architecture Demo Students will configure and test a free cloud storage service (e.g., Google Drive API, Firebase Storage, AWS S3 Free Tier). They will upload and retrieve files programmatically or via console and submit a demonstration video/screenshots on the GMIU Web Portal .	10
3	Comparative Study of Multi-Cloud vs Hybrid Cloud Students will prepare a comparative study highlighting benefits, challenges, and real-world adoption of multi-cloud vs hybrid cloud. A PowerPoint or PDF presentation will be submitted on the GMIU Web Portal.	10
4	Cloud Case Study – Disaster Recovery & Business Continuity: Students will research a real-world disaster recovery case study (e.g., Netflix, Dropbox, or banking sector cloud adoption) and prepare a report analyzing recovery strategies, RTO (Recovery Time Objective), and RPO (Recovery Point Objective). The report will be uploaded to the GMIU Web Portal.	10
5	Cloud Security Policy Creation: Students will prepare a comprehensive Cloud Security Policy Document based on standard cloud security practices. The policy will outline how an organization	10



	should secure its cloud resources, users, data, and infrastructure. The assignment will strengthen understanding of IAM, encryption, access control, backup policies, and compliance considerations. Uploaded as PDF to the GMIU portal.	
Total		50

Suggested Specification table with Marks (Theory):75

Distribution of Theory Marks (Revised Bloom's Taxonomy)						
Level	Remembrance (R)	Understanding (U)	Application (A)	Analyze (N)	Evaluate (E)	Create (C)
Weightage	25%	45%	15%	15%	0	0

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Course Outcome:

After learning the course the students should be able to:	
CO1	Explain the fundamental concepts of cloud computing, including service models, deployment models, and core architectural components.
CO2	Apply cloud design principles to build scalable, elastic, and highly available cloud solutions.
CO3	Deploy and manage containerized applications using orchestration tools such as Docker and Kubernetes.
CO4	Implement cloud security practices including IAM, encryption, access controls, and compliance frameworks.
CO5	Evaluate enterprise cloud architecture frameworks such as AWS Well-Architected, Azure Cloud Adoption Framework, and Google Cloud Architecture Framework to design enterprise-grade cloud solutions.

List of Practical

Sr. No	Descriptions	Unit No	Hrs
1	Create a Database Instance : Launch a free-tier SQL/NoSQL database.	1	2
2	Create a simple microservice architecture with multiple functions.	1	2
3	Host a simple HTML/CSS website on cloud storage with public access.	1	2
4	Implement simple user login/signup using cloud authentication.	1	4
5	Create a GCP Cloud Storage bucket & upload/download files.	2	4
6	Implement HTTPS hosting on Firebase.	2	4
7	Write and deploy a simple "Hello World" serverless function.	3	2
8	Implement Serverless Computing with Firebase Cloud Functions.	4	2



9	Perform CRUD Operation : insert, update, read, and delete data from a cloud database.	5	4
10	Configure API Gateway on AWS.	5	4
		Total	30

Instructional Method:

The course delivery method will depend upon the requirement of content and need of students. The teacher in addition to conventional teaching method by black board, may also use any of tools such as demonstration, role play, Quiz, brainstorming, MOOCs etc.

From the content 10% topics are suggested for flipped mode instruction.

Students will use supplementary resources such as online videos, NPTEL/SWAYAM videos, e-courses, Virtual Laboratory

The internal evaluation will be done on the basis of Active Learning Assignment

Practical/Viva examination will be conducted at the end of semester for evaluation of performance of students in laboratory.

Reference Books:

- [1] "Cloud Computing: Concepts, Technology & Architecture": Ricardo Puttini, Thomas Erl, and Zaigham Mahmood
- [2] "Google Cloud Certified Associate Cloud Engineer Study Guide": Dan Sullivan
- [3] "Architecting the Cloud: Design Decisions for Cloud Computing Service Models"
- [4] "Cloud Engineering & Architecture Design Patterns"
- [5] "Cloud Computing: Cloud Computing Architecture Design & Implementation"