CSG301:DEVELOPING APPLICATIONS WITH GCB

L:2 T:0 P:2 Credits:3

Course Outcomes: Through this course students should be able to

CO1 :: recall the architecture and services of Google Cloud Platform to identify suitable solutions for application development

CO2 :: recognize scalable and efficient cloud-based applications using GCP's compute, storage, and networking services.

CO3 :: indicate security best practices to protect applications and data on GCP, including IAM, VPC, and encryption techniques.

CO4 :: determine different GCP tools and services to optimize application performance and cost-effectiveness.

CO5 :: illustrate and deploy containerized applications using Google Kubernetes Engine (GKE) and other GCP DevOps services.

CO6 :: evaluate GCP's AI and machine learning services to enhance application functionalities and user experiences.

Unit I

Best Practices for Application Development : Code and environment management, Design and development of secure, scalable, reliable, loosely coupled application components and microservices, Continuous integration and delivery, Re-architecting applications for the cloud

Getting Started with Google Cloud Development : Overview of Google Cloud services for apps and scripts, Google Cloud APIs, Cloud SDK, Cloud Client Libraries, Cloud Shell, Cloud Code

Unit II

Overview of Data Storage Options : Overview of options to store application data, Use cases for Cloud Storage, Fire store, Cloud Bigtable, Cloud SQL and Cloud Spanner, Connecting Securely to a Cloud SQL Database

Best Practices for Using Datastore : Best practices related to using Fire store in Datastore mode for Queries, Built-in and composite indexes, Inserting and deleting data (batch operations), Transactions, Error handling, Explore Datastore, Use Dataflow to Bulk-load Data into Datastore, Storing Application Data in Datastore

Performing Operations on Buckets and Objects : Cloud Storage concepts, Consistency model, Request endpoints, Composite objects and parallel uploads, Truncated exponential backoff, Enable CORS Configuration in Cloud Storage

Unit III

Best Practices for Using Cloud Storage : Naming buckets for static websites and other uses, Naming objects (from an access distribution perspective), Performance considerations, Storing Image and Video Files in Cloud Storage

Handling Authentication and Authorization : Identity and Access Management (IAM) roles and service accounts, User authentication by using Firebase Authentication, User authentication and authorization by using Identity-Aware Proxy, Adding User Authentication to your Application

Using Pub/Sub to Integrate Components of Your Application : Topics, publishers, and subscribers, Pull and push subscriptions, Use cases for Pub/Sub, Developing a Backend Service

Unit IV

Adding Intelligence to Your Application : Overview of pre-trained machine learning APIs, Vision API, Cloud Natural Language Processing API

Using Cloud Functions for Event-Driven Processing : Key concepts such as triggers, background functions, HTTP functions, Use cases, Developing and deploying functions, Logging, error reporting, and monitoring, Invoke Cloud Functions Through Direct Request-response, Processing Pub/Sub Data using Cloud Functions

Unit V

Managing APIs with Cloud Endpoints : Open API deployment configuration, Deploying an API for the Quiz Application

Deploying Applications : Creating and storing container images, Repeatable deployments with deployment configuration and templates, Exploring Cloud Build and Cloud Container Registry, Deploying the Application into Kubernetes Engine

Unit VI

Compute Options for Your Application : Compute Engine, Google Kubernetes Engine (GKE), Cloud Run, Cloud Functions, Platform comparisons, Comparing App Engine and Cloud Run

Debugging, Monitoring, and Tuning Performance : Google Cloud's operations suite, Managing performance, Debugging Application Errors, Logging, Monitoring and tuning performance, Identifying and troubleshooting performance issues, Harnessing Cloud Trace and Cloud Monitoring

List of Practicals / Experiments:

List of Practicals

- Set up and use Cloud SDK for managing your Google Cloud resources.
- Design and develop secure, scalable, reliable, and loosely coupled application components and microservices.
- Work with Cloud Shell and Cloud Code for cloud-native development.
- Optimize queries with built-in and composite indexes.
- Use Dataflow to bulk-load data into Datastore.
- Perform various operations on buckets and objects. Enable CORS configuration in Cloud Storage.
- Develop and deploy Cloud Functions with triggers, background functions, and HTTP functions.
- Configure and deploy APIs using OpenAPI deployment configuration.
- Explore Cloud Build and Cloud Container Registry. Use deployment configurations and templates for repeatable deployments.
- Utilize Google Cloud's operations suite for performance management.

References:

1. GETTING STARTED WITH GOOGLE CLOUD by GOOGLE INC., UNKNOWN