# CSG302:SITE RELIABILITY ENGINEERING AND DEVOPS

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

**Course Outcomes:** Through this course students should be able to

CO1 :: define core SRE principles and their importance in building and maintaining reliable systems.

CO2 :: explain the concepts of SLOs, error budgets, and their role in SRE practices.

CO3 :: demonstrate and manage Kubernetes clusters on Google Kubernetes Engine (GKE) to deploy and scale containerized applications.

CO4 :: demonstrate complex system problems into smaller, manageable components.

CO5 :: investigate system performance data and identify potential bottlenecks using Google Cloud monitoring tools.

CO6 :: appraise and implement a scalable and reliable microservices architecture on Google Cloud Platform.

**Unit I**

**Foundational Concepts of SRE** : Welcome to Developing a Google SRE Culture., Devops, SRE why they exist, SLOs with Consequences., Make Tomorrow Better than Today Regulate Workload., Apply SRE in Your Organization

**Unit II**

**Designing Google Cloud Infrastructure** : Defining Services ,Microservice Design and Architecture., DevOps Automation., Choosing Storage and Data Solutions Google Cloud and Hybrid Network Architecture., Deploying Applications to Google Cloud., Designing Reliable Systems Security.

**Unit III**

**Mastering Google Kubernetes Engine (GKE)** : Introduction to Containers and Kubernetes , Kubernetes Architecture., Kubernetes Operations , Deployments and Jobs., Google Kubernetes Engine (GKE) Networking , Persistent Data and Storage., Access Control and Security in Kubernetes and GKE., GKE Logging and Monitoring, Using GCP Managed Storage Services with GKE.

**Unit IV**

**Observability and Monitoring in Google Cloud** : Introduction to Google Cloud Operations Suite., Monitoring Critical Systems , Alerting Policies., Advanced Logging and Analysis., Working with Cloud Audit Logs., Configuring Google , Cloud Services for Observability., Monitoring Google Cloud Network., Investigating Application Performance Issues .

**Unit V**

**Infrastructure as Code with Terraform** : Introduction to Terraform for Google Cloud Terms and Concepts., Writing Infrastructure Code for Google Cloud., Organizing and Reusing Configuration with Terraform Modules., Introduction to the Terraform State.

**Unit VI**

**Advanced SRE Practices** : Site Reliability Engineering Tooling (e.g., Prometheus, Grafana)., Advanced Kubernetes concepts (e.g., Service Meshes, Operators)., Security best practices in Google Cloud., Disaster Recovery and Business Continuity Planning., Automation and Orchestration best practices.

**List of Practicals / Experiments:**

**List of Practicals**

- Develop and deploy a simple web application on Google Compute Engine.
- Create and manage a Kubernetes cluster on Google Kubernetes Engine (GKE)
- Deploy a containerized application to GKE using Docker and Kubernetes manifests.
- Implement a basic load balancing solution for an application running on GKE.
- Configure monitoring and alerting for a GKE application using Cloud Monitoring and Cloud Logging.
- Create and manage persistent volumes for applications running on GKE.
- Write and deploy infrastructure-as-code using Terraform to provision Google Cloud resources.

- Implement basic security measures for a GKE cluster, including network policies and authentication.
- Analyze system logs and identify potential issues using Google Cloud Logging and Log Explorer.
- Conduct a simple chaos engineering experiment to test the resilience of an application.

**References:**

1. HTTPS://CLOUD.GOOGLE.COM/DOCS by GOOGLE, N A