

ABOUT THE COURSE: GOOGEL CLOUD COMPUTING FUNDAMENTALS

TABLE 1	
<p>OVERALL COURSE OBJECTIVE:</p>	<ul style="list-style-type: none"> • cloud computing, including its advantages, service models, and deployment models. • create and manage virtual machines (VMs) • using Google Compute Engine (GCE) in the Google Cloud Platform environment. • Deploy and manage applications using Kubernetes, including GKE Autopilot clusters, for efficient and scalable containerized applications. • Utilize Google Cloud Storage (GCS) for storing and managing objects, and understand storage classes and disk management using Google Persistent Disk. • Configure and manage networking components in Google Cloud Platform, including virtual private clouds (VPCs) and cloud load balancing, for efficient and secure communication between services and users.
<p>LEARNING OUTCOME:</p>	<p>Utilise cloud computing, including key</p> <ul style="list-style-type: none"> • concepts, service models (IaaS, PaaS, SaaS), deployment models (public, private, hybrid clouds) and Create, configure, and manage virtual machines (VMs) using Google Compute Engine (GCE), • Deploy and manage applications using Google Kubernetes Engine (GKE) for efficient container orchestration. and become well versed in using Google Cloud Storage (GCS) for storing and managing objects, understanding storage classes, and creating and attaching disks to VMs using Google Persistent Disk. • Master the configuration and management of networking components such as Virtual Private Clouds (VPCs) and the implementation of cloud load balancing. You'll also excel in managing access to

	<p>resources in Google Cloud Platform (GCP) through Identity and Access Management (IAM), ensuring secure and efficient communication and resource access control in your cloud environment</p>
	<ul style="list-style-type: none">• Master Google Cloud services such as BigQuery for querying and analyzing data, leveraging machine learning options including Vertex AI for model development and deployment, managing data storage and access with Cloud Storage and IAM, monitoring and deploying applications with Cloud Console and Functions, and integrating Pub/Sub with Python for scalable data processing.• set up a robust application development environment on Google Cloud, including utilizing Cloud Storage, Cloud Console, Cloud IAM, Cloud Monitoring, Cloud Functions, and Pub/Sub with Python for efficient development and deployment of cloud-based applications.

TABLE 2: MODULE WISE COURSE CONTENT AND OUTCOME

SL.NO	MODULE NAME	MODULE CONTENT	MODULE LEARNING OUTCOME	DURATION (HRS)
1	Introduction to cloud computing and computing services	Introduction to Cloud computing- Cloud vs traditional architecture-Iaas, Paas, and Saas- Creating a GCP account-Google Compute Engine (GCE) -Creating virtual machines (VMs) -Managing VM instances	Acquire a comprehensive Knowledge of cloud computing, including key concepts, service models (IaaS, PaaS, SaaS), deployment models (public, private, hybrid clouds), Create, configure, and manage virtual machines (VMs) using Google Compute Engine (GCE)	6
2	Google Kubernetes Engine (GKE) and storage services	Introduction to Kubernetes- Google Kubernetes Engine- Kubernetes Components- Deploying GKE Autopilot Clusters- Google Cloud Storage (GCS)-Overview of Storage Classes-Uploading and managing Objects-Google Persistent Disk -	Deploy and manage applications using Google Kubernetes Engine (GKE) for efficient container orchestration. and become well versed in using Google Cloud Storage (GCS) for storing and managing objects, storage classes, and	6

		Creating and attaching disks to VMs	creating and attaching disks to VMs using Google Persistent Disk.	
3	Networking in GCP and IAM	Virtual Private Cloud (VPC) -Creating and Configuring a VPC Network-Cloud Load Balancing- Introduction to load balancing- Configuring HTTP (S) load balancers- Overview of IAM- Managing permissions and roles- Service accounts and key managements- Key Elements of Cloud IAM	Master the configuration and management of networking components such as Virtual Private Clouds (VPCs) and the implementation of cloud load balancing. You'll also excel in managing access to resources in the Google Cloud Platform (GCP) through Identity and Access Management (IAM), ensuring secure and efficient communication and resource access control in your cloud environment.	6
4	Machine Learning with Vertex AI and Setting Up App Development Environment on Google Cloud	Introduction to Big Query-Querying and Analyzing the Data- Machine Learning options with Google Cloud-The machine learning workflow with vertex AI-Cloud	Master Google Cloud services such as BigQuery for querying and analyzing data, leveraging machine learning options	10

		Storage-Cloud Console-Cloud Storage CLI/SDK- Cloud IAM-Cloud Monitoring-Cloud Functions-Pub/Sub - Python	including Vertex AI for model development and deployment, managing data storage and access with Cloud Storage and IAM, monitoring and deploying applications with Cloud Console and Functions, and integrating Pub/Sub with Python for scalable data processing.	
5	Preparedatafor ML APIs on Google Cloud	Dataprep-Dataflow- TemplatesDataflow - Python-Dataproc console-Dataproc - command line - Cloud Natural Language API-Google Cloud Speech-to-Text API-Video Intelligence	Get skilled in preparing and processing data using Dataprep, Dataflow (both templates and Python), and Dataproc (console and command line). You'll also be proficient in utilizing Google Cloud's AI APIs such as Cloud Natural Language, Speech-to- Text, and Video Intelligence for various text, speech, and video	12

			processing tasks.	
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TABLE 3: OVERALL COURSE LEARNING OUTCOME ASSESSMENT CRITERIA AND USECASES

LEARNING OUTCOME	ASSESSMENT CRITERIA	USECASES
<ul style="list-style-type: none"> Acquire a comprehensive Knowledge of cloud computing, including key concepts, service models (IaaS, PaaS, SaaS), deployment models (public, private, hybrid clouds), Create, configure, and manage virtual machines (VMs) using Google Compute Engine (GCE) 	<ul style="list-style-type: none"> To assess cloud computing concepts, including the differences between IaaS, PaaS, and SaaS, as well as the advantages and disadvantages of public, private, and hybrid cloud deployment models. Evaluate the learner's ability to create, configure, and manage virtual machines (VMs) using Google Compute Engine, including tasks such as selecting machine types, configuring networking, and managing storage. 	<p>Lab 1: Start with a Google Cloud platform</p> <p>Objective: Analysing Google Cloud platform features and functionalities. Through practical exercises and theoretical knowledge, participants will learn to navigate the Cloud console, identify key components of a lab environment, access compute services, and utilize essential tools like gcloud commands and the API library. Additionally, the lab aims to clarify misconceptions about Google Cloud projects and basic roles while empowering users to inspect actions available to specific users through the Cloud IAM service. By the end of the lab, participants should feel</p>

		<p>confident in their ability to effectively utilize Google Cloud services for various applications.</p> <p>Lab 2: Use Google Cloud to build your apps</p> <p>Objective: This lab aims to equip participants with practical skills for deploying and managing applications on the Google Cloud platform. Throughout the labs, participants will learn how to create virtual machines, deploy web servers, work with Python applications, create and deploy cloud functions, view logs.</p>
<p>Deploy and</p> <ul style="list-style-type: none"> manage applications using Google Kubernetes Engine (GKE) for efficient container orchestration. and become well versed in using Google Cloud Storage (GCS) for storing and managing objects, understanding 	<ul style="list-style-type: none"> Evaluate the learner's ability to deploy and manage applications using Google Kubernetes Engine (GKE), including tasks such as creating clusters, deploying containers, and scaling applications. <p>Assess the learner's proficiency in using Google Cloud Storage (GCS) for storing and managing objects, including tasks such</p>	<p>Lab 1: Working with Cloud Build</p> <p>Objective: In this lab we will build a Docker container image from provided code and a Dockerfile using Cloud Build. You will then upload the container to the Artifact Registry.</p> <p>Lab 2: Deploying GKE Autopilot</p>

<p>storage classes, and creating and attaching disks to VMs using Google Persistent Disk.</p>	<p>as uploading and downloading objects, setting access controls, and managing storage classes and buckets.</p>	<p>Clusters</p> <p>Objective: In this lab, we use the Google Cloud Console to build GKE Autopilot clusters and deploy a sample Pod.</p> <p>Lab 3: Deploying GKE Autopilot Clusters from Cloud Shell</p> <p>Objective: In this lab, we use the command line to build GKE clusters. You inspect the kubeconfig file, and you use kubectl to manipulate the cluster.</p> <p>Lab 4: Cloud Storage: Qwik Start - CLI/SDK</p> <p>Objective: In this hands-on lab we will learn how to use the Google Cloud command line to: Create a storage bucket Upload objects to the bucket Create folders and subfolders in the bucket. Make objects in a storage bucket publicly accessible.</p> <p>Lab 5: Cloud SQL</p>
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		<p>for MySQL: Qwik Start Objective: In this lab we will learn how to create and connect to a Google Cloud SQL MySQL instance and perform basic SQL operations using the Cloud Console and the mysql client</p>
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<p>Master the</p> <ul style="list-style-type: none"> • configuration and management of networking components such as Virtual Private Clouds (VPCs) and the implementation of cloud load balancing. You'll also excel in managing access to resources in Google Cloud Platform (GCP) through Identity and Access Management (IAM), ensuring secure and efficient communication and resource access control in your cloud environment. 	<ul style="list-style-type: none"> • Assess the learner's ability to configure and manage networking components such as virtual private clouds (VPCs) in Google Cloud Platform (GCP), including tasks such as creating VPC networks, configuring subnets, and setting up firewall rules. • Assess the learner's ability to configure and manage networking components such as Virtual Private Clouds (VPCs) in Google Cloud Platform (GCP), including tasks such as creating VPC networks, configuring subnets, and setting up firewall rules. 	<p>Lab 1: Multiple VPC Networks</p> <p>Objective: In this lab, we will learn how to perform the following tasks:</p> <ul style="list-style-type: none"> Create custom mode VPC networks with firewall rules Create VM instances using Compute Engine. Explore the connectivity for VM instances across VPC networks Create a VM instance with multiple network interfaces. <p>Lab 2: VPC Networks Controlling Access</p> <p>Objective: In this lab, we will learn how to</p>
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		<p>perform the following tasks: Create an nginx web server on a VPC network. Create tagged firewall rules. Create a service account with IAM roles. Explore permissions for the Network Admin and Security Admin roles.</p> <p>Lab 3: Set Up Network and HTTP Load Balancers</p> <p>Objective: In this lab, we will learn how to:</p> <ol style="list-style-type: none">1. Set up a network load balancer.2. Set up an HTTP load balancer.3. Get hands-on experience learning the differences between network load balancers and HTTP load balancers. <p>Lab 4: Cloud IAM</p> <p>Objective: Google Cloud's Identity and Access Management (IAM) service lets you create and manage permissions for</p>
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		<p>Google Cloud resources. Cloud IAM unifies access control for Google Cloud services into a single system and provides a consistent set of operations.</p> <p>In this lab, you'll sign in with 2 different sets of credentials to experience how granting and revoking permissions works from Google Cloud Project Owner and Viewer roles.</p>
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<p>Master Google</p> <ul style="list-style-type: none"> • Cloud services such as BigQuery for querying and analyzing data, leveraging machine learning options including Vertex AI for model development and deployment, managing data storage and access with Cloud Storage and IAM, monitoring and deploying applications with Cloud Console and Functions, and integrating Pub/Sub with Python for scalable data processing. 	<p>Delve into a diverse</p> <ul style="list-style-type: none"> • array of machine learning algorithms encompassing Random Forest Classification, Linear Regression and Decision Tree Regression. • Gain hands-on experience in implementing and fine-tuning these algorithms to address various • prediction and classification tasks. Acquire a deep understanding of the theoretical foundations, strengths, and limitations of each algorithm to make informed modeling decisions. 	<p>Lab 1: Vertex AI</p> <p>Objective: In this lab, you will:</p> <ol style="list-style-type: none"> 1. Train a TensorFlow model locally in a hosted Vertex Notebook. 2. Create a managed Tabular dataset artifact for experiment tracking. 3. Containerize your training code with Cloud Build and push it to Google Cloud Artifact Registry. 4. Run a Vertex AI custom training job with your custom model container. 5. Use Vertex TensorBoard to visualize model performance. 6. Deploy your trained model to a Vertex Online Prediction Endpoint for serving predictions. 7. Request an online prediction and explanation and see the response. <p>Lab 2: Cloud Monitoring: Qwik Start</p> <p>Objective: In this lab, you learn how</p>
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		<p>to:</p> <ol style="list-style-type: none">1. Monitor a Compute Engine virtual machine (VM) instance with Cloud Monitoring2. Install monitoring and logging agents for your VM" <p>Lab 3: Cloud Functions Console</p> <p>Objective: In this lab, you learn how to:</p> <ol style="list-style-type: none">1. Create a cloud function2. Deploy and test the function3. View logs
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<p>Get skilled in</p> <ul style="list-style-type: none"> • preparing and processing data using Dataprep, Dataflow (both templates and Python), and Dataproc (console and command line). You'll also be proficient in utilizing Google Cloud's AI APIs such as Cloud Natural Language, Speech-to-Text, and Video Intelligence for various text, speech, and video processing tasks. 	<p>Acquire a</p> <ul style="list-style-type: none"> • comprehensive knowledge of the diverse features offered by the Auto AI service within Watson Studio. • Demonstrate the capability to construct a cohesive narrative flow within reports, effectively conveying insights derived from • Auto AI analyses. Showcase proficiency in leveraging visuals, annotations, and storytelling techniques to enhance the clarity • and impact of Auto AI findings. Exhibit competence in applying advanced design principles to create visually engaging and informative reports showcasing Auto AI-generated insights. 	<p>Lab 1:Data Proc</p> <p>Objective: In this lab, you learn how to:</p> <ol style="list-style-type: none"> 1. Create a Dataproc cluster using the command line 2. Run a simple Apache Spark job 3. Modify the number of workers in cluster 4. Create a Dataproc cluster using the command line 5 Run a simple Apache Spark job 6. Modify the number of workers in the cluster. <p>Lab 2:Dataflow</p> <p>Objective: In this lab, you learn how to:</p> <ol style="list-style-type: none"> 1. Create a BigQuery dataset and table. 2. Create a Cloud Storage Bucket. 3. Create a streaming pipeline using the Pub/Sub to BigQuery Dataflow template. 4. Create a Cloud Storage bucket to store the results of a Dataflow pipeline 5. Install the Apache Beam SDK for Python 6. Run a Dataflow pipeline
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		<p>remotely.</p> <p>Lab 3: Cloud Natural Language API</p> <p>Objective: In this lab, you learn how to:</p> <ol style="list-style-type: none"> 1. Create an API key. 2. Use the Cloud Natural Language API to extract "entities" (e.g. people, places, and events) from a snippet of text. <p>Lab 4: Google Cloud Speech-to-Text API</p> <p>Objective: In this lab, you learn how to:</p> <ol style="list-style-type: none"> 1. Create an API key 2. Create a Speech-to-Text API request 3. Call the Speech-to-Text API
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TABLE 4: TEST PROJECTS	
SL.NO	FINAL PROJECT (In this course students have to complete all the labs)
1	Start with a Google Cloud platform
2	Use Google Cloud to build your apps
3	Deploying GKE Autopilot Clusters
4	Cloud Storage: Qwik Start - CLI/SDK
5	Multiple VPC Networks
6	Set Up Network and HTTP Load Balancers

7	Vertex AI
8	Cloud Functions Console
9	Cloud Natural Language API
10	Google Cloud Speech-to-Text API