ABOUT THE COURSE:

TOTAL DURATION:	45 HRS
MODE OF DELIVERY	Virtual Instructor-Led Training + Self-Paced Learning
TRAINER TO STUDENT RATIO:	1:50
TOTAL MARKS:	75
Virtual Instructor-Led Training Duration	30 HRS
Self-Paced Learning Duration	10 HRS
Project Development Duration	05 HRS
Total Duration	45 HRS

TABLE 1	
OVERALL COURSE OBJECTIVE:	● Gain foundational knowledge of cloud computing, including its advantages, service models, and deployment models. ● Learn to 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.

LEARNING OUTCOME:	● Acquire a comprehensive Knowledge of cloud computing, including key 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 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.
	● 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.
	● Gain Knowledge about how to 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)	**4**
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	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	**4**

		Persistent Disk - Creating and attaching disks to VMs	objects, understanding storage classes, and 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.	**4**

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 Storage-Cloud Console-Cloud Storage - CLI/SDK-Cloud IAM-Cloud Monitoring-Cloud Functions-Pub/Sub - Python	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.	**8**
5	**Prepare data for ML APIs on Google Cloud**	Dataprep-Dataflow-Templates-Dataflow - 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	**10**

		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.	

TABLE 3: OVERALL COURSE LEARNING OUTCOME ASSESSMENT CRITERIA AND USECASES		
LEARNING OUTCOME	**ASSESSMENT CRITERIA**	**USECASES**
● 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)	● To assess the learner's understanding of key 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	**Lab 1:** Start with a Google Cloud platform

Objective: Lab aims to provide participants with a comprehensive understanding of 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 |

	Compute Engine, including tasks such as selecting machine types, configuring networking, and managing storage.	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 confident in their ability to effectively utilize Google Cloud services for various applications. **Lab 2:** Use Google Cloud to build your apps **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.
● Deploy and	● Evaluate the learner's	**Lab 1:** Working with

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.	ability to deploy and manage applications using Google Kubernetes Engine (GKE), including tasks such as creating clusters, deploying containers, and scaling applications. ● Assess the learner's proficiency in using Google Cloud Storage (GCS) for storing and managing objects, including tasks such as uploading and downloading objects, setting access controls, and managing storage classes and buckets.	Cloud Build **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. **Lab 2:** Deploying GKE Autopilot Clusters **Objective:** In this lab, we use the Google Cloud Console to build GKE Autopilot clusters and deploy a sample, Pod. **Lab 3:** Deploying GKE Autopilot Clusters from Cloud Shell **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. **Lab 4:** Cloud Storage: Qwik Start - CLI/SDK **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. **Lab 5:** Cloud SQL 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
● 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 Google Cloud Platform (GCP) through Identity and Access Management (IAM), ensuring secure and	● 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	**Lab 1:** Multiple VPC Networks **Objective:** In this lab, we will learn how to perform the following tasks: 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.

efficient communication and resource access control in your cloud environment.	creating VPC networks, configuring subnets, and setting up firewall rules.	**Lab 2:** VPC Networks - Controlling Access **Objective:** In this lab, we will learn how to 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. **Lab 3:** Set Up Network and HTTP Load Balancers **Objective:** In this lab, we will learn how to: 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. **Lab 4: Cloud IAM Objective:** Google Cloud's Identity and Access Management (IAM) service lets you create and manage permissions

		for Google Cloud resources. Cloud IAM unifies access control for Google Cloud services into a single system and provides a consistent set of operations. 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.
● 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.	● Delve into a diverse 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 modelling decisions.	**Lab 1:** Vertex AI **Objective:** In this lab, you will: 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 Tensor Board 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. **Lab 2:** Cloud Monitoring: Qwik Start **Objective: I**n this lab, you learn how to: 1. Monitor a Compute Engine virtual machine (VM) instance with Cloud Monitoring 2. Install monitoring and logging agents for your VM" **Lab 3:** Cloud Functions Console Objective: In this lab, you learn how to: 1. Create a cloud function 2. Deploy and test the function 3. View logs
● 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,	● Acquire a 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	**Lab 1: Data Proc** **Objective:** In this lab, you learn how to: 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

and Video Intelligence for various text, speech, and video processing tasks.	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.	5 Run a simple Apache Spark job 6. Modify the number of workers in the cluster. **Lab 2: Dataflow** **Objective:** In this lab, you learn how to: 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 remotely. **Lab 3:Cloud Natural Language API** **Objective:** In this lab, you learn how to: 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. **Lab 4: Google**

		Cloud Speech-to-Text API **Objective:** In this lab, you learn how to: 1. Create an API key 2. Create a Speech-to-Text API request 3. Call the Speech-to-Text API

TABLE 4: LIST OF FINAL PROJECTS (10 PROJECTS THAT COMPREHENSIVELY COVER ALL THE LEARNING OUTCOME)	
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

TABLE 5: COURSE ASSESSMENT RUBRICS (TOTAL MARKS: 75)				
ASSESSMENT CRITERIA	**DESCRIBE THE CRITERIA OF THE BELOW CATEGORY PERFORMANCE**			**TOTAL MARKS**
	Fair	**GOOD**	**EXCELLENT**	
Problem Definition & Design Thinking	3	5	8	10

Innovation & Problem Solving	1	2	4	5
Implementation of Project	6	12	18	20
Performance of the Project	1	2	4	5
Project Demonstration & Documentation	3	5	8	10
MCQ-based assessment 25 Questions				25

Category	Assessment Criteria	Performance Levels	Weightage (Marks)
Practical Skills Proficiency	Demonstrates ability to perform job-specific tasks effectively, using relevant tools, techniques, or methodologies	Fair, Good, Excellent	20
Technical Knowledge Application	Applies theoretical concepts to practical scenarios with accuracy and relevance	Fair, Good, Excellent	15
Project Execution	Completes assigned projects or use cases demonstrating innovation, thoroughness, and skill application relevant to industry standards.	Fair, Good, Excellent	30
Communication and Reporting	Clearly presents findings, solutions, or project outcomes using professional communication	Fair, Good, Excellent	10

Category	Assessment Criteria	Performance Levels	Weightage (Marks)
	and documentation standards (e.g., reports, presentations).		