

Cloud Computing

Code SE- 315	Credit Hours 2-1
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Course Description

Cloud computing services are being widely adopted by a variety of organizations from different domains. Cloud computing is the delivery of computing as a service over a network (usually internet) where the distributed resources are rented, instead of owned, as a utility by the end user. This greatly reduces the capital required for initial infrastructure setup and provides several benefits. This course gives students an overview of the field of Cloud Computing. This includes thorough understanding of cloud enabling technologies, primary building blocks of cloud computing, and hands-on experience by utilizing public cloud infrastructures (e.g. Google Cloud Platform, Amazon AWS, Microsoft Azure etc.). The major topics covered in this course include fundamentals of cloud computing, cloud delivery models (IaaS, PaaS, SaaS), virtualization, containerization, Kubernetes, cloud computing mechanisms and architectures, storage, and cloud security.

Textbook:

1. Cloud Computing, Theory and Practice by Dan C. Marinescu, THIRD EDITION, Morgan Kaufmann Publishers, 2022
2. Cloud Computing Concepts, Technology & Architecture by Thomas Erl, Zaigham Mahmood, and Ricardo Puttini, Prentice Hall Publisher, 2013

Reference Sources:

1. Google Cloud Platform: <https://cloud.google.com/compute/>
2. Amazon Web Services: <https://aws.amazon.com/>

Prerequisites

CS212-Object Oriented Programming.

EE353-Computer Networks

ASSESSMENT SYSTEM FOR THEORY

Quizzes	10%
Assignments	10%
Mid Terms	35%
ESE	45%

ASSESSMENT SYSTEM FOR LAB

Lab Work and Report	70%
Lab ESE/Viva	30%

Teaching Plan

Week No	Topics	Learning Outcomes
1	Introduction to Cloud Computing Basic concepts	Understand the core concepts of the cloud computing paradigm
2	Fundamental Concepts and Models Cloud characteristics, cloud delivery models (IaaS)	
3	Fundamental Concepts and Models Cloud delivery models (IaaS, PaaS, SaaS), Cloud deployment models (public, private, hybrid, community)	
4	Cloud Enabling Technologies <ul style="list-style-type: none"> Broadband networks & internet architecture Data center technology, 	
5	Cloud Enabling Technologies <ul style="list-style-type: none"> Virtualization technology Containerization, Dockers, Kubernetes Micro-services 	
6	Micro-services in clouds Monolithic vs micro-services	Apply fundamental concepts in cloud infrastructures to understand the tradeoffs
7	Working with micro-services <ul style="list-style-type: none"> Development lifecycle of micro-services Developing a micro-service 	
8	Cloud Infrastructure Mechanisms <ul style="list-style-type: none"> Cloud storage Cloud usage monitoring Resource replication 	
9	MSE	
10	Cloud Infrastructure Mechanisms <ul style="list-style-type: none"> Automated scaling listener Load balancing Failover system	Apply fundamental concepts in cloud infrastructures to understand the tradeoffs
11	Cloud Architectures <ul style="list-style-type: none"> Elastic resource capacity Service load balancing Cloud bursting Redundant storage 	Distinguish the various characteristics of public, private and hybrid cloud delivery models
12	Cloud Advanced Architectures <ul style="list-style-type: none"> Hypervisor clustering Load balanced virtual server Non-disruptive service relocation	Display skills to effectively use cloud centric solutions such as serverless application development

13	Cloud Advanced Architectures <ul style="list-style-type: none"> • Zero downtime • Cloud balancing • Resource reservation • Dynamic failure detection and recovery 	
14	Cloud Security <ul style="list-style-type: none"> • Encryption, hashing, digital signatures, public key infrastructure, single sign-on, identity access and management, federated identity, security as a service 	Distinguish the various characteristics of public, private and hybrid cloud delivery models
15	Clouds and Machine Learning	
16	Advanced topics in Cloud Computing	
17	Project Week	
18	End Semester Exam	

Practical:

Experiment No	Description
1	Introduction to Cloud Environment
2	Compute Engine – Working with VMs
3	Cloud Shell and GCP essentials
4	Set Up Network and HTTP Load Balancers
5	Cloud Marketplace: Deploy LAMP stack. Working with VPC Networking and Google Compute Engine
6	Handling Storage: Cloud Storage and Cloud SQL
7	App Dev - Setting up a Development Environment: Python
8	App Dev - Storing Application Data in Cloud Datastore: Python
9	App Dev - Storing Image and Video Files in Cloud Storage
10	App Dev - Deploying the Application into Kubernetes Engine: Python
11	Serverless App Dev – Creating a Streaming Data Pipeline for a Real-Time Dashboard with Dataflow
12	<u>Open Ended Lab</u> - Serverless Cloud Run Development
13	Open Ended Lab
14	Open Ended Lab
15	Project Presentations/Demos
16	Project Presentations/Demos