

# Cloud Computing

<b>Code</b> CS- 833	<b>Credit Hours</b> 3-0
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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 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), datacentres, virtualization, containerization, Kubernetes, microservices, serverless computing, cloud computing mechanisms and architectures, cloud storage, and cloud security.

## Text Book:

1. Cloud Computing Concepts, Technology & Architecture by Thomas Erl, Zaigham Mahmood, and Ricardo Puttini, Prentice Hall Publisher, Second Edition, 2023
2. Cloud Computing, Theory and Practice by Dan C. Marinescu, THIRD EDITION, Morgan Kaufmann Publishers, 2022

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## Reference Sources:

1. Google Cloud Platform
2. Microsoft Azure
3. Amazon Web Services

## Prerequisites

### ASSESSMENT SYSTEM FOR THEORY

Quizzes	10%
Assignments	10%
Mid Terms	30%
ESE	40%
Project	10%

## Teaching Plan

Week No	Topics	Learning Outcomes
1-3	Understanding Cloud Computing: Origins and influences, basic concepts and terminologies, benefits Fundamental Concepts and Models Cloud characteristics, cloud delivery models (IaaS, PaaS) Fundamental Concepts and Models Cloud delivery models (SaaS), Cloud deployment models (public, private, multi-cloud, hybrid)	Understanding the cloud environment
4-6	Cloud Enabling Technologies <ul style="list-style-type: none"> <li>• Broadband networks &amp; internet architecture</li> <li>• Data center technology: Basics, Design, topologies</li> <li>• Virtualization technology</li> <li>• </li> </ul> Cloud Enabling Technologies <ul style="list-style-type: none"> <li>• Web technology and web services</li> <li>• Containerization</li> <li>• Dockers, Kubernetes, Docker swarm</li> </ul> Micro-services Micro-services in clouds <ul style="list-style-type: none"> <li>• Monolithic vs micro-services</li> <li>• Development lifecycle of micro-services</li> </ul> Developing a micro-service	Understanding the cloud environment  Understand and apply the concepts of containerization, microservices and serverless computing
7-8	Cloud Mechanisms <ul style="list-style-type: none"> <li>• Cloud storage</li> <li>• Cloud usage monitoring</li> <li>• Resource replication</li> <li>• Ready-made environments</li> </ul> Cloud Mechanisms <ul style="list-style-type: none"> <li>• Automated scaling listener</li> <li>• Load balancing</li> <li>• Failover system</li> <li>• Resource cluster</li> <li>• State management</li> </ul>	Understand different cloud mechanism to develop SaaS application using PaaS
<b>9</b>	<b>MSE</b>	
10-13	Cloud Architectures <ul style="list-style-type: none"> <li>• Dynamic Scalability Architecture</li> <li>• Elastic resource capacity</li> <li>• Service load balancing</li> <li>• Cloud bursting</li> </ul> Elastic Disk Provisioning Architecture Cloud Architectures <ul style="list-style-type: none"> <li>• Redundant storage</li> <li>• Hypervisor clustering</li> <li>• Load balanced virtual server</li> </ul> Non-disruptive service relocation Cloud Advanced Architectures <ul style="list-style-type: none"> <li>• Zero downtime</li> <li>• Cloud balancing</li> <li>• Resource reservation</li> </ul> Dynamic failure detection and recovery Cloud Advanced Architectures <ul style="list-style-type: none"> <li>• Distributed Data Sovereignty Architecture</li> <li>• Virtual Private Cloud Architecture</li> </ul> Cloud Security – Access-oriented Mechanisms Encryption, hashing, digital signatures, public key infrastructure, hardened virtual server image, biometric scanner, multi-factor authentication, single sign-on, identity access and management, federated identity	Explore different cloud architectures to develop and deploy SaaS application using PaaS

14	Cloud Security - Data-Oriented Mechanisms <ul style="list-style-type: none"><li>• Digital Virus Scanning and Decryption System</li><li>• Malicious Code Analysis System</li><li>• Data Loss Prevention (DLP) System</li><li>• Activity Log Monitor</li><li>• Traffic Monitor</li></ul>	Understand cloud-centric security measures
15	Clouds and AI	
16	Advanced topics in Cloud Computing	
17	Project Week	
18	<b>End Semester Exam</b>	