

SEMESTER S8
CLOUD COMPUTING

Course Code	PEEVT 867	CIE Marks	60
Teaching Hours/Week (L: T:P: R)	3:0:0:0	ESE Marks	40
Credits	3	Exam Hours	2 Hrs. 30 Min.
Prerequisites (if any)	None	Course Type	Theory

Course Objectives:

1. Understand Cloud Computing Fundamentals.
2. Explore Cloud Technologies and Platforms.
3. Apply Cloud Solutions and Ensure Security.

SYLLABUS

Module No.	Syllabus Description	Contact Hours
1	Traditional computing- Limitations. Overview of Computing Paradigms- Grid Computing, Cluster Computing, Distributed Computing, Utility Computing, Cloud Computing. NIST reference Model-Basic terminology and concepts. Cloud characteristics, benefits and challenges, Roles and Boundaries. Cloud delivery (service) models-Infrastructure-as-a-Service (IaaS), Platform-as-a-Service (PaaS), Software-as-a-Service (SaaS), XaaS (Anything-as-a-service) - Cloud deployment models- Public cloud, Community cloud, Private cloud, Hybrid cloud.	8
2	Introduction to virtualization-Virtualizing physical computing resources, Virtual Machines (Machine virtualization), non-virtualized v/s virtualized machine environments. Types of VMs- process VM v/s system VM, Emulation, interpretation and binary translation. Hardware-level virtualization- Hypervisors/VMM. Types of Hypervisors. Full Virtualization, Para- Virtualization, Hardware-assisted virtualization, OS level virtualization. Basics of Network Virtualization, Storage Virtualization and Desktop Virtualization, Pros and cons of virtualization.	8

3	<p>Broadband networks and internet architecture- Internet Service Providers (ISPs), Data center technology, Web technology, Multitenant technology, Service technology. Resource provisioning techniques-static and dynamic provisioning.</p> <p>Open-source software platforms for private cloud-OpenStack, Cloud Stack, Basics of Eucalyptus, Open Nebula, Nimbus.</p> <p>Cloud Programming- Parallel Computing and Programming Paradigms. Map Reduce – Hadoop Library from Apache, HDFS, Pig Latin High Level Languages, Apache Spark.</p>	8
4	<p>Basic terms and concepts in security- Threat agents, Cloud security threats/risks, Trust. Operating system security-Virtual machine security-Security of virtualization- Security Risks Posed by Shared Images, Security Risks Posed by Management OS. Infrastructure security- Network Level Security, Host Level Security, Application level security, Security of the Physical Systems. Identity & Access Management- Access Control.</p> <p>Amazon Web Services (AWS):- AWS ecosystem- Computing services, Amazon machine images, Elastic Compute Cloud (EC2), Advanced compute services. Storage services-Simple Storage System (Amazon S3), Elastic Block Store (Amazon EBS).</p> <p>Google Cloud Platform:- IaaS Offerings: Compute Engine (GCE), Cloud Storage, PaaS Offerings: Google App Engine (GAE), Storage services, Application services, Compute services, Database Services, SaaS Offerings: Gmail, Docs, Google Drive.</p> <p>Microsoft Azure: Azure Platform Architecture, Hyper-V, Azure Virtual Machine, Compute services, Storage services.</p>	12

**Course Assessment Method
(CIE: 60 marks, ESE: 40 marks)**

Continuous Internal Evaluation Marks (CIE):

Attendance	Assignment/ Microproject	Internal Examination-1 (Written)	Internal Examination- 2 (Written)	Total
5	30	12.5	12.5	60

End Semester Examination Marks (ESE)

In Part A, all questions need to be answered and in Part B, each student can choose any one full question out of two questions

Part A	Part B	Total
<ul style="list-style-type: none"> 2 Questions from each module. Total of 8 Questions, each carrying 2 marks <p style="text-align: center;">(8x2 =16 marks)</p>	<ul style="list-style-type: none"> Each question carries 6 marks. Two questions will be given from each module, out of which 1 question should be answered. Each question can have a maximum of 3 sub divisions. <p style="text-align: center;">(4x6 = 24 marks)</p>	40

Course Outcomes (COs)

At the end of the course students should be able to:

Course Outcome		Bloom's Knowledge Level (KL)
CO1	Explain the various cloud computing models and services.	K2
CO2	Demonstrate the significance of implementing virtualization techniques.	K2
CO3	Explain different cloud enabling technologies and compare private cloud platforms	K2
CO4	Apply appropriate cloud programming methods to solve big data problems	K3
CO5	Describe the need for security mechanisms in cloud and compare the different popular cloud computing platforms	K2

Note: K1- Remember, K2- Understand, K3- Apply, K4- Analyse, K5- Evaluate, K6- Create

CO-PO Mapping Table:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3											3
CO2	2	2	3									3
CO3	3											3
CO4	2	2	3	3	2							3
CO5	3	3			3							3

Text Books				
Sl. No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
1	Cloud Computing Concepts, Technology & Architecture	Thomas, E., Zaigham M., Ricardo P	Prentice Hall	2013
2	Mastering cloud computing: foundations and applications programming	Buyya, R., Vecchiola, C., & Selvi, S. T.	Morgan Kaufmann	2017
3	Cloud computing	Bhowmik, S	Cambridge University Press	2017

Reference Books				
Sl. No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
1	Cloud computing: theory and practice	Marinescu, D. C	Morgan Kaufmann	2017
2	Cloud computing: Principles and paradigms	Buyya, R., Broberg, J., & Goscinski, A. M	John Wiley & Sons.	2011

Video Links (NPTEL, SWAYAM...)	
Module No.	Link ID
1	https://archive.nptel.ac.in/courses/106/105/106105167/
2	https://onlinecourses.nptel.ac.in/noc23_cs90/preview
3	https://onlinecourses.nptel.ac.in/noc22_cs18/preview
4	https://archive.nptel.ac.in/courses/106/105/106105167/