

## SEMESTER S6

### CLOUD COMPUTING

(Common to CS/CA/CM/AM)

<b>Course Code</b>	<b>PECST635</b>	<b>CIE Marks</b>	40
<b>Teaching Hours/Week (L: T:P: R)</b>	3:0:0:0	<b>ESE Marks</b>	60
<b>Credits</b>	5/3	<b>Exam Hours</b>	2 Hrs. 30 Min.
<b>Prerequisites (if any)</b>	None	<b>Course Type</b>	Theory

#### Course Objectives:

1. To learn fundamentals of cloud and configure cloud environments, deploy virtual machines, and work with containerization tools, gaining practical skills.
2. To learn to identify and address common security threats in cloud environments, implementing best practices to ensure the safety and compliance of applications.

### SYLLABUS

<b>Module No.</b>	<b>Syllabus Description</b>	<b>Contact Hours</b>
<b>1</b>	Introduction - Limitations of Traditional Computing & solution, Three Layers of Computing, Factors behind Cloud Service Adoption; Evolution and Enabling Technologies of Cloud; Benefits and Challenges; [Text 2] Fundamental Concepts and Models - Roles and Boundaries, Cloud Characteristics, Cloud Delivery Models, Cloud Deployment Models; [Text 1] Introduction to Cloud Providers (AWS, Azure, Google Cloud). <b>Handson</b> - Cloud Account Setup and Virtual Machine Deployment - Create accounts on a cloud provider and deploy virtual machine instances, and document the process and inferences.	<b>8</b>
<b>2</b>	Cloud-Enabling Technology - Networks and Internet Architecture, Cloud Data Center Technology, Modern Virtualization, Multitenant Technology, Service Technology and Service APIs; Understanding Containerization - Influencers, Fundamental Virtualization and Containerization, Understanding Containers, Understanding Container Images, Multi-Container Types.[Text 1]	<b>10</b>

	<b>Handson</b> - Hypervisor and Containers installation - Install hypervisors and deploy VMs on local machines. Install any container platform and deploy applications.	
<b>3</b>	Resource Management - Resource Pooling, Sharing, Provisioning; Scaling in Cloud and the Strategies; Capacity Planning in Cloud Computing; Storage and File System - Challenges; Cloud Native File System, Deployment models, Storage Types, Popular Cloud Storages. High performance Computing Models.[Text 2] <b>Handson</b> - Use Map-reduce to implement basic big data applications such as word count.	<b>9</b>
<b>4</b>	Understanding Cloud Security - Basic Security Terminology, Basic Threat Terminology, Threat Agents, Common Threats; Other Considerations - Flawed Implementations, Security Policy Disparity, Contracts, Risk Management.[Text 1] <b>Handson</b> : Identify possible attacks of any selected cloud applications and suggest/implement solutions/policies for mitigation.	<b>7</b>

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

**Continuous Internal Evaluation Marks (CIE):**

<i>Attendance</i>	<i>Internal Ex</i>	<i>Evaluate</i>	<i>Analyse</i>	<i>Total</i>
<b>5</b>	<b>15</b>	<b>10</b>	<b>10</b>	<b>40</b>

**Criteria for Evaluation(Evaluate and Analyse): 20 marks**

**Ways of assessing at**

1. Analyze level - Analyze performance of traditional models (Hardware, Application, Computing / security models) against that in the cloud.
2. Evaluate level - Derive conclusions on the cloud programming / computing / security models based on standard performance evaluation criteria.

**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*

<b>Part A</b>	<b>Part B</b>	<b>Total</b>
<ul style="list-style-type: none"> <li>• 2 Questions from each module.</li> <li>• Total of 8 Questions, each carrying 3 marks <b>(8x3 =24 marks)</b></li> </ul>	2 questions will be given from each module, out of which 1 question should be answered. Each question can have a maximum of 3 subdivisions. Each question carries 9 marks. <b>(4x9 = 36 marks)</b>	<b>60</b>

### Course Outcomes (COs)

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

<b>Course Outcome</b>		<b>Bloom's Knowledge Level (KL)</b>
<b>CO1</b>	Evaluate the limitations of traditional computing models and recognize the factors driving cloud service adoption and compare between various cloud delivery and deployment models.	<b>K5</b>
<b>CO2</b>	Demonstrate proficiency in cloud-enabling technologies, including modern virtualization and containerization	<b>K3</b>
<b>CO3</b>	Examine the resource management within the cloud, including resource pooling, scaling strategies, and storage management and utilize tools like MapReduce for processing big data applications.	<b>K4</b>
<b>CO4</b>	Identify potential security threats in cloud environments and apply appropriate security measures to mitigate these risks.	<b>K3</b>

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

### CO-PO Mapping Table (Mapping of Course Outcomes to Program Outcomes)

	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>
<b>CO1</b>	3	3	3	3	3							3
<b>CO2</b>	3	3	3	3	2							3
<b>CO3</b>	3	3	3	3	3							3
<b>CO4</b>	3	3	3	3								3

Note: 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), -: No Correlation

<b>Text Books</b>				
<b>Sl. No</b>	<b>Title of the Book</b>	<b>Name of the Author/s</b>	<b>Name of the Publisher</b>	<b>Edition and Year</b>
1	Cloud Computing : Concepts, Technology, Security, and Architecture	Thomas Erl	Pearson	2/e, 2023
2	Cloud Computing	Sandeep Bhowmik	Cambridge University Press	1/e, 2017

<b>Reference Books</b>				
<b>Sl. No</b>	<b>Title of the Book</b>	<b>Name of the Author/s</b>	<b>Name of the Publisher</b>	<b>Edition and Year</b>
1	Cloud Computing : Theory and Practice	Dan C. Marinescu	Morgan Kaufman	3/e, 2023
2	Cloud Computing: A Hands-On Approach	Arshdeep Bahga and Vijay Madisetti	Universities Press	1/e, 2014
3	Mastering Cloud Computing	Rajkumar Buyya, Christian Vecchiola S.Thamarai Selvi	Morgan Kaufman	1/e, 2013
4	Cloud Computing : A Practical Approach	Anthony T. Velte, Toby J. Velte, Robert Elsenpeter	McGraw Hill	1/e, 2010

<b>Video Links (NPTEL, SWAYAM...)</b>	
<b>No.</b>	<b>Link ID</b>
<b>1</b>	<a href="https://archive.nptel.ac.in/courses/106/105/106105167/">https://archive.nptel.ac.in/courses/106/105/106105167/</a>