

GUJARAT TECHNOLOGICAL UNIVERSITY

COMPUTER ENGINEERING (SOFTWARE ENGINEERING) (02)

CLOUD COMPUTING

SUBJECT CODE: 2730208

M.E. SEM-III

Type of course: Cloud Computing

Prerequisite: Fundamentals of Distributed Computing

Rationale:

The student will be able to:

- To understand the principles and paradigm of Cloud Computing
- To understand the Service Model with reference to Cloud Computing
- To appreciate the role of Virtualization Technologies
- Ability to design and deploy Cloud Infrastructure
- Understand cloud security issues and solutions

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks						Total Marks
L	T	P		Theory Marks		Practical Marks				
			ESE (E)	PA (M)	ESE (V)		PA (I)			
					ESE	OEP	PA	RP		
3	2#	2	5	70	30	20	10	10	10	150

Content:

Sr. No.	Content	Total Hrs	% Weightage
1	Introduction to Cloud Computing Overview, Roots of Cloud Computing, Layers and Types of Cloud, Desired Features of a Cloud, Benefits and Disadvantages of Cloud Computing, Cloud Infrastructure Management, Infrastructure as a Service Providers, Platform as a Service Providers, Challenges and Risks	06	
2	Cloud Architecture, Services and Applications Exploring the Cloud Computing Stack, Connecting to the Cloud, Infrastructure as a Service, Platform as a Service, SaaS Vs. PaaS, Using PaaS Application Frameworks, Software as a Service Cloud Deployment Models, Public vs Private Cloud, Cloud Solutions, Cloud ecosystem, Service management, Computing on demand, Identity as a Service, Compliance as a Service	08	
3	Abstraction and Virtualization Introduction to Virtualization Technologies, Load Balancing and Virtualization, Understanding Hypervisors, Understanding Machine Imaging, Porting Applications, Virtual Machines Provisioning and Manageability Virtual Machine Migration Services, Virtual Machine Provisioning and Migration in Action, Provisioning in the Cloud Context,	08	

	Virtualization of CPU, Memory , I/O Devices, Virtual Clusters and Resource management, Virtualization for Data Center Automation		
4	Cloud Infrastructure and Cloud Resource Management Architectural Design of Compute and Storage Clouds, Layered Cloud Architecture Development, Design Challenges, Inter Cloud Resource Management, Resource Provisioning and Platform Deployment, Global Exchange of Cloud Resources. Administrating the Clouds, Cloud Management Products, Emerging Cloud Management Standards,	06	
5	Cloud Security Security Overview, Cloud Security Challenges and Risks, Software-as-a-Service Security, Cloud computing security architecture: Architectural Considerations, General Issues Securing the Cloud, Securing Data, Data Security, Application Security, Virtual Machine Security, Identity and Presence, Identity Management and Access Control, Autonomic Security Establishing Trusted Cloud computing, Secure Execution Environments and Communications, , Identity Management and Access control Identity management, Access control, Autonomic Security Storage Area Networks, Disaster Recovery in Clouds	08	
6	Cloud Based Case-Studies Overview of Cloud services, Designing Solutions for the Cloud, Implement & Integrate Solutions, Emerging Markets and the Cloud, Tools for Building Private Cloud: IaaS using Eucalyptus, PaaS on IaaS - AppScale	04	

Reference Books:

1. Rajkumar Buyya et. el., Cloud Computing: Principles and Paradigms, Wiley India Edition
2. Sosinsky B., “Cloud Computing Bible”, Wiley India
3. Mastering Cloud Computing by Rajkumar Buyya, C. Vecchiola & S. Thamarai SelviMcGRAW Hill Publication
4. Miller Michael, “Cloud Computing: Web Based Applications that Change the Way You Work and Collaborate Online”, Pearson Education India
5. Velte T., Velte A., Elsenpeter R., “Cloud Computing – A practical Approach”, Tata McGrawHill

Course Outcome:

After learning the course the students should be able to:

1. Compare the strengths and limitations of cloud computing
2. Identify the architecture, infrastructure and delivery models of cloud computing
3. Apply suitable virtualization concept.
4. Choose the appropriate cloud player , Programming Models and approach.
5. Address the core issues of cloud computing such as security, privacy and interoperability
6. Design Cloud Services and Set a private cloud

List of Experiments:

(Pl. Note: List of Experiments should be as per theory covered in the class based on Cloud Environments. Following list can be used as a reference.)

1. Sketch out and analyze architecture of Aneka / Eucalyptus / KVM identify different entities to understand the structure of it.
2. Create a scenario in Aneka / Eucalyptus to create a datacenter and host. Also create virtual machines with static configuration to run cloudlets on them.
3. Make and perform scenario to pause and resume the simulation in Aneka / Eucalyptus entity, and create simulation entities dynamically.
4. Organize a case in Aneka / Eucalyptus for simulation entities in run-time using a its toolkit support and manage virtual cloud.
5. Sketch out and analyze architecture of Microsoft Azure.
6. Sketch out and analyze architecture of Amazon Web Service (AWS).
7. Categorize Microsoft Azure Services and discuss on each.
8. Categorize Amazon Web Service (AWS) and implement its various cloud entities using its Cloud Toolbox support.
9. Implement and use sample cloud services with the help of Microsoft Azure.
10. Create a sample mobile application using Microsoft Azure account as a cloud service. Also provide database connectivity with implemented mobile application.
11. Create a sample mobile application using Amazon Web Service (AWS) account as a cloud service. Also provide database connectivity with implemented mobile application.

Design based Problems (DP)/Open Ended Problem:

(Pl. Note: Following is a sample list of Open ended problem set. List of OEP should be as per theory covered in the class based.)

1. Consider you are going to start a business in various cities. You are worried about of your IT infrastructure. You are doing surveys of various options available with you for setting IT infrastructure. One of the options is to use Cloud Services. Write cost benefit analysis of traditional infrastructure vs. Cloud infrastructure after your survey. Justify each points of your analysis.
2. How exactly are you leveraging or planning to leverage the cloud?

Hint: Asking customers questions such as, “How exactly are you leveraging or planning to leverage the cloud?” is a non-threatening way to engage them and confirm whether they’ve been cloud washed or not. If they have, the only known “cure” is education about the benefits of the “real cloud” such as scalability and elasticity.

3. How the prospect’s “cloud” environment is the best way to uncover the truth?

Hint: Asking questions about how the prospect’s “cloud” environment is the best way to uncover the truth. Touching upon cloud’s “pay as you grow” (aka elasticity) model, which enables users to pay for only the compute power and storage capacity needed at any given time can be an effective way to open prospects’ minds to discovering the benefits of true cloud computing.

Major Equipment:

Cloud Environments like Aneka, Eucalyptus, AWS etc.

List of Open Source Software/learning website:

- technolamp.blogspot.com
- www.intelligentedu.com/
- NITTR Instructional Resources Videos.

Review Presentation (RP): The concerned faculty member shall provide the list of peer reviewed Journals and Tier-I and Tier-II Conferences relating to the subject (or relating to the area of thesis for seminar) to the students in the beginning of the semester. The same list will be uploaded on GTU website during the first two weeks of the start of the semester. Every student or a group of students shall critically study 2 papers, integrate the details and make presentation in the last two weeks of the semester. The GTU marks entry portal will allow entry of marks only after uploading of the best 3 presentations. A unique id number will be generated only after uploading the presentations. Thereafter the entry of marks will be allowed. The best 3 presentations of each college will be uploaded on GTU website.