CVM UNIVERSITY
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FACULTY OF ENGINEERING & TECHNOLOGY

First Year Master of Engineering

Semester I/II

Course Code: 102341201

Course Title: Cloud Computing

Type of Course: Program Elective I/II/ Core Course IV

Course Objectives: Organizations look for cloud solutions rather than investing and maintaining infrastructure on their part. Since the Cloud infrastructure is complex, investigations are necessary from security perspective. This course will help in implementing cloud architecture, analysing the security issues, writing incidence report and deploying the security architecture for cloud platform.

Teaching & Examination Scheme:

Contact hours per week			Course Credits	Examination Marks (Maximum / Passing)				
				Internal		External		Total
Lecture	Tutorial	Practical		Theory	J/V/P*	Theory	J/V/P*	
3	0	2	4	30/15	20/10	70/35	30/15	150/75

* **J**: Jury; **V**: Viva; **P**: Practical

Detailed Syllabus:

Sr.	Contents	Hours
1	Unit 1: Overview of Computing Paradigm Recent trends in Computing Grid Computing, Cluster Computing, Distributed Computing, Utility Computing, Cloud Computing	2
2	Unit 2: Introduction to Grid Computing Data and Computational Grids, Grid Architectures and its relations to various Distributed Technologies- Challenges and applications.	2
3	Unit 3: Cloud Computing Overview Cloud Computing definition and characteristics (elasticity, multi-tenant, on-demand, ubiquitous access, usage metering, self-service, sla-monitoring, etc.). Cloud Computing and SOA, Enterprise Cloud drivers and adoption trends, Typical Cloud Enterprise workloads, Cloud service models/types (public, private, hybrid, and community clouds), Cloud ROI models, Cloud reference architectures, Cloud standards (OSDIAPIs, etc.), Technology providers vs. Cloud providers vs. Cloud vendors , Planning Cloud transformations	5

4	Unit 4: Services Models Infrastructure as a Service (IaaS) : IaaS definition, Introduction to virtualization, Different approaches to virtualization, Hypervisors, Machine Image, Virtual Machine(VM), Resource Virtualization-(Server, Storage, Network), Iaas vendor solutions : Amazon EC2, HP, Microsoft, Savvis, Terremark, Right Scale, Rackspace cloud, IBM, Oracle, Verizon, IaaS mainstream offerings (assessment offerings, design offerings, build offerings, integrated operations and management offerings, governance offerings) Platform as a Service(PaaS) : Introduction to PaaS and What is PaaS?, Service Oriented Architecture (SOA) Cloud Platform and Management-(Computation, Storage) Software as a Service(PaaS) : Introduction to SaaS, Web services, Web 2.0, Web OS, Case Study on SaaS	**12**
5	Unit 5: Cloud Security & Management Infrastructure Security- (Network level security, Host level security, Application level security) Data security and Storage – (Data privacy and security Issues, Jurisdictional issues raised by Data location) Identity & Access Management, Access Control Trust, Reputation, Risk Authentication in cloud computing, Client access in cloud, Cloud contracting Model, Commercial and business considerations, Security Management Standards	**12**
6	Unit 6: Service Management in Cloud Computing Service Level Agreements (SLAs), Billing & Accounting, Comparing Scaling Hardware: Traditional vs. Cloud, Economics of scaling: Benefitting enormously	**4**
7	Unit 7: Amazon web services Elastic compute cloud, Simple storage server, Identity Access Management, Route 53, Elastic block store	**3**

Suggested Specification table with Marks (Theory) (Revised Bloom's Taxonomy):

Distribution of Theory Marks						**R**: Remembering; **U**: Understanding; **A**: Application, **N**: Analyze; **E**: Evaluate; **C**: Create
R	**U**	**A**	**N**	**E**	**C**	
10%	30%	30%	10%	10%	10%	

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Reference Books:

1	Cloud Computing Bible, Barrie Sosinsky, Wiley-India, 2010
2	Cloud Computing: Principles and Paradigms, Editors: Rajkumar Buyya, James Broberg , Andrzej M. Goscinski , Wile, 2011
3	Cloud Computing Explained: Implementation Handbook for Enterprises, John Rhoton, Publication Date: November 2, 2009

4	Cloud Security and Privacy: An Enterprise Perspective on Risks and Compliance (Theory in Practice), Tim Mather, ISBN-10: 0596802765,O'Reilly Media, September 2009
5	Cloud Security: A Comprehensive Guide to Secure Cloud Computing, Ronald L. Krutz, Russell Dean Vines, Wiley-India, 2010
6	Joshy Joseph & Craig Fellenstein, "Grid Computing", Pearson Education 2004
7	Maozhen Li, Mark Baker, The Grid Core Technologies, John Wiley & Sons ,2005
8	Ravi Shankar, Navin Sabharwa "Cloud Computing First Steps: Cloud Computing for Beginners" CreateSpace Independent Publishing Platform
9	Miller Michael, "Cloud Computing: Web Based Applications that Change the Way You Work and Collaborate Online", Pearson Education India.

Course Outcomes (CO):

Sr.	Course Outcome Statements	%weightage
CO-1	To understand the genesis of grid computing.	**5**
CO-2	Strengths of cloud computing and virtualization.	**5**
CO-3	Analyze the trade-offs between deploying applications in the cloud and over the local infrastructure.	**10**
CO-4	Understand cloud models and identify cloud architecture to evaluate real world applications.	**10**
CO-5	Analyze the performance, scalability, and availability of the underlying cloud technologies and software.	**15**
CO-6	Deploy applications over commercial cloud computing infrastructures such as Amazon Web Services, Windows Azure, and Google App Engine.	**25**
CO-7	Identify security aspects of each cloud model.	**20**
CO-8	Apply trust-based security models to different layers.	**10**

List of Practicals / Tutorials:

1	Study of Grid toolkit alchemi.net.
2	Service Grid: Create a calculator web service using WSRF.Net framework for Grid Applications.
3	Study of Cloud Toolkit and Middleware.
4	Introduction and Installation of CloudSim, Cloud analyst tool (either on Eclipse or NetBeans), Aneka / Eucalyptus.
5	Study and implementation of Storage as a Service.
6	To deploy a multi container application to the AWS cloud using Elastic Beanstalk and its extensions.
7	Installation and Configuration of virtualization using KVM.
8	Use an open source tool to evaluate performance of cloud platforms.
9	Prepare a case study of security policy or service level agreement signed by a cloud service provider.
10	Implement identity management mechanisms in the cloud.

Supplementary learning Material:	
1	https://nptel.ac.in/courses/106/105/106105167/

Curriculum Revision:	
Version:	**1**
Drafted on (Month-Year):	Apr-20
Last Reviewed on (Month-Year):	Jul-20
Next Review on (Month-Year):	Apr-22