

GUJARAT TECHNOLOGICAL UNIVERSITY

COMPUTER ENGINEERING CLOUD INFRASTRUCTURE AND SERVICES SUBJECT CODE: 2180712 B.E. 8th SEMESTER

Type of course: Bachelor of Engineering

Prerequisite: Nil

Rationale: The course presents a top-down view of cloud computing, from applications and administration to programming, infrastructure, billing and security. The topics include: overview of cloud computing, cloud systems, Load balancing in AWS, distributed storage systems, virtualization, security in AWS, and management services and Billing. Students will study state-of-the-art solutions for cloud computing developed by Amazon. Students will also apply what they learn in one programming assignments and one project executed over Amazon Web Services.

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)		
				PA	ALA	ESE	OEP			
3	0	2	5	70	20	10	20	10	20	150

Content:

Sr. No.	Content	Total Hrs	% Weightage
1	Introduction to Cloud Technologies Introduction to the Cloud Computing, History of cloud computing, Cloud service options, Cloud Deployment models, Business concerns in the cloud.	03	10
2	Virtualization and Cloud Platforms Exploring virtualization, Load balancing, Hypervisors, Machine imaging, Cloud marketplace overview, Comparison of Cloud providers.	05	10
3	Introduction to AWS AWS history, AWS Infrastructure, AWS services, AWS ecosystem.	03	10
4	Programming, management console and storage on AWS Basic Understanding APIs - AWS programming interfaces, Web services, AWS URL naming, Matching interfaces and services, Elastic block store - Simple storage service, Glacier - Content delivery platforms.	06	15
5	AWS identity services, security and compliance Users, groups, and roles - Understanding credentials, Security policies, IAM abilities and limitations, AWS physical security - AWS compliance initiatives, Understanding public/private keys, Other AWS security capabilities.	04	10
6	AWS computing and marketplace Elastic cloud compute - Introduction to servers, Imaging computers,	04	10

	Auto scaling, Elastic load balancing, Cataloging the marketplace, AMIs, Selling on the marketplace.		
7	AWS networking and databases Virtual private clouds, Cloud models, Private DNS servers (Route 53), Relational database service – DynamoDB, ElastiCache, Redshift.	05	10
8	Other AWS services and management services Analytics services, Application services, Cloud security, CloudWatch, CloudFormation, CloudTrail, OpsWorks.	05	15
9	AWS billing and Dealing with disaster Managing costs, Utilization and tracking, Bottom line impact, Geographic and other concerns, Failure plans, Examining logs.	05	10

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks				
R Level	U Level	A Level	N Level	E Level
10	18	18	18	06

Legends: R : Remembrance ; U = Understanding; A = Application; N = Analyze; E = Evaluation and above Levels (Revised Bloom’s Taxonomy)

Reference Books:

- Cloud Computing Bible. Barrie Sosinsky. John Wiley & Sons. ISBN-13: 978-0470903568.
- Amazon Web Services For Dummies. Bernard Golden. For Dummies. ISBN-13: 978- 1118571835
- Rajkumar Buyya, Cloud Computing: Principles and Paradigms, John Wiley & Sons, First Edition
- Amazon Security overview whitepaper- <https://aws.amazon.com/whitepapers>
- IAM Getting started Guide <http://docs.aws.amazon.com/IAM/latest/UserGuide/getting-started.html>
- Amazon.com Mashups by Francis Shanahan, Wrox, Wiley Publishing Inc., ISBN-13: 978-0470097779, ISBN-10: 0470097779
- Amazon Web Services in Action by Michael Wittig and Andreas Wittig, Dreamtech Press, ISBN: 9789351198758
- Building Applications in the Cloud: Concepts, Patterns and Projects by Christopher M. Moyer, Pearson Addison-Wesley Professional, ISBN-10: 0321720202, ISBN-13: 978-0321720207
- Cloud Computing Design Patterns by Thomas Erl, Prentice Hall, ISBN-10: 0133858561, ISBN-13: 978-0133858563

Course Outcome:

After learning the course, the student will be able:

1. To explain the core concepts of the cloud computing paradigm: how and why this paradigm shift came about, the characteristics, advantages and challenges brought about by the various models and services in cloud computing.
2. To apply the fundamental concepts in datacenters to understand the tradeoffs in power, efficiency and cost by Load balancing approach.
3. To discuss system virtualization and outline its role in enabling the cloud computing system model.
4. To illustrate the fundamental concepts of cloud storage and demonstrate their use in storage systems such as Amazon S3 and HDFS.
5. To analyze various cloud programming models and apply them to solve problems on the cloud.
6. To understand various management and other distinguish services of AWS.
7. To analyze the billing of resources and other paradigm: how to deal with disasters.
8. To understand security and compliances for AWS.

9. To deploy applications over commercial cloud computing infrastructures such as Amazon

List of Assignments / Experiments:

1. Write pros and cons of Cloud Computing.
2. Summarize Cloud service models with real time examples.
3. Define Virtualization. Also list and explain different Hypervisors.
4. Discuss performance evaluation of service over cloud.
5. Software study on Hadoop, MapReduce and HDFS.
6. Create an AMI for Hadoop and implementing short [Hadoop](#) programs on the Amazon Web Services platform.
7. Create a scenario that use Amazon S3 as storage on cloud.

Design based Problems (DP)/Open Ended Problem:

1. Students will choose their project topic and work in teams of three or four to design, implement, and evaluate cloud applications using Hadoop on the Amazon Web Services platform.
2. Students will present, in groups of three or two, one research paper during the semester. These papers cover very recent developments in cloud computing. The presentations (using power point slides) will take place in class, and evaluation will be done based on active participation in discussions.

Major Equipment:

Computer system with latest hardware, High speed internet access, Java Environment with IDE (Eclipse or NetBeans), AWS Subscription

List of Open Source Software/learning website:

- CloudSim 3.0.3
- <http://www.cloudbus.org/>
- <https://aws.amazon.com/>
- <http://aws.amazon.com/documentation/>
- <http://docs.aws.amazon.com/IAM/latest/UserGuide/getting-started.html>

ACTIVE LEARNING ASSIGNMENTS: Preparation of power-point slides: which include videos, animations, pictures, graphics for better understanding theory and practical work. The faculty will allocate chapters/ parts of chapters to groups of students so that the entire syllabus can be covered. The power-point slides should be put up on the web-site of the College/ Institute, along with the names of the students of the group, the name of the faculty, Department and College on the first slide. The best three works should submit to GTU.