


**Government of Karnataka**  
**Department of Technical Education**  
**Bengaluru**

	<b>Course Title: CLOUD COMPUTING</b>		
	Scheme (L:T:P) : <b>4:0:0</b>	Total Contact Hours: <b>52</b>	Course Code: <b>15CS63B</b>
	Type of Course: <b>Lectures, Self Study &amp; Student Activity.</b>	Credit : <b>04</b>	Core/ Elective: <b>Elective</b>
CIE- 25 Marks		SEE- 100 Marks	

### Prerequisites

Knowledge of Computer Networks

### Course Objectives

To understand cloud computing, the different models and architectures and study about the services offered by cloud, software plus services, understand about virtualization of cloud and various examples of cloud computing.

### Course Outcome

*On successful completion of the course, the students will be able to attain below Course Outcome (CO):*

Course outcome		CL	Linked PO	Teaching Hours
CO1	Understand need of cloud computing, cloud essentials, benefits, challenges, limitations, usage and applications, business models	<i>R,U,A</i>	1,2,3,4,6,7,8,9,10	<b>07</b>
CO2	Discuss the meaning of cloud computing, understand cloud models, cloud application architecture, cloud computing architecture and various infrastructure models	<i>U,A</i>	1,2,3,4,6,7,8,9,10	<b>10</b>
CO3	Understand the various cloud services	<i>U,A</i>	1,2,3,4,6,7,8,9,10	<b>10</b>
CO4	Determine the various software plus services possible for the users to place the very sensitive data housed on-site	<i>U,A</i>	1,2,3,4,6,7,8,9,10	<b>08</b>
CO5	Get knowledge of virtualization to know about virtual machines, virtual cluster, types of virtualization	<i>R,U,A</i>	1,2,3,4,6,7,8,9,10	<b>10</b>
CO6	Illustrate the different approaches to cloud computing, examples like Aneka, Autonomic computing engine	<i>U,A</i>	1,2,3,4,6,7,8,9,10	<b>07</b>
<b>Total</b>				<b>52</b>

**Legends:** R = Remember U= Understand; A= Apply and above levels (Bloom's revised taxonomy)

### Course Content and Blue Print of Marks for SEE

Unit No	Unit Name	Hour	Questions to be set for SEE			Marks Weightage	Marks Weightage (%)
			R	U	A	A	
I	Introduction to cloud computing	06	05	10	05	20	13.79
II	Cloud models	10	-	15	10	25	19.31
III	Cloud services	10		15	10	25	19.31
IV	Software plus services	10	-	15	10	25	15.17
V	Virtualization for cloud	08	-	15	10	25	19.31
VI	Examples of cloud computing	08	-	10	10	25	13.10
<b>Total</b>		<b>52</b>	<b>05</b>	<b>82</b>	<b>58</b>	<b>145</b>	<b>100</b>

### Course-PO Attainment Matrix

Course	Programme Outcomes									
	1	2	3	4	5	6	7	8	9	10
<b>Cloud Computing</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>-</b>	<b>-</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>3</b>

**Level 3- Highly Addressed, Level 2-Moderately Addressed, Level 1-Low Addressed.**

Method is to relate the level of PO with the number of hours devoted to the COs which address the given PO.

If  $\geq 40\%$  of classroom sessions addressing a particular PO, it is considered that PO is addressed at Level 3

If 25 to 40% of classroom sessions addressing a particular PO, it is considered that PO is addressed at Level 2

If 5 to 25% of classroom sessions addressing a particular PO, it is considered that PO is addressed at Level 1

If  $< 5\%$  of classroom sessions addressing a particular PO, it is considered that PO is considered not-addressed.

#### UNIT I: Introduction to Cloud computing

**06 Hrs**

Evolution of cloud, Essentials, Cloud Computing definition, Benefits and Challenges, Limitations, Usage and Applications, Business Models around Cloud Computing, Characteristics, Cloud Adoption

#### UNIT II: Cloud models

**10 Hrs**

Introduction, Collaboration to cloud, Cloud Models, Cloud Applications and Architecture, Cloud Computing Architecture, Cloud Infrastructure Models, Cloud Infrastructure Self Service, Scaling a cloud infrastructure

#### UNIT III: Cloud services

**10 Hrs**

Introduction to Services, Storage as a Service, Database as a Service, Information as Service, Process as a Service, Application as a Service, Management/Governance as Service, Platform as a Service, Security as a Service, Testing as Service, Integration as Service, Infrastructure as Service

**UNIT IV: Software plus Services****10 Hrs**

Introduction, Mobile Device Integration, Providers, Microsoft Online Intuit Quick base, Cast Iron Cloud, Bungee Connect, Introduction to Map Reduce, Goggle File System, Hadoop framework, Hadoop Distributed File System

**UNIT V: Virtualization for cloud****08 Hrs**

Introduction, Pros and Cons of Virtualization, Virtualization Architecture, Virtualization Machine, Virtualization in Clusters/Grid Context, Virtual Network, Types of Virtualization, Virtual Machine Monitor, Virtual Desktop Infrastructure

**UNIT VI: Examples of Cloud Computing****08 Hrs**

Introduction, Types of clouds, Cloud Comparing Approaches, Aneka Integration of private and public cloud, Aneka Cloud Platform, Introduction,, Resource Provisioning Service, Aneka Hybrid Cloud Implementation, Comet Cloud Architecture, Autonomic Behaviour, Comet Cloud, Overview of Comet Cloud Based Applications, Implementation

** Text books**

Cloud Computing, M.N RAO, PHI Learning Private Limited, ISBN: 978-81-203-5073-1

**References**

1. Cloud Computing – A practical approach for learning and implementation Pearson A.Srinivasan J.Suresh
2. Cloud Computing A hands-on-Approach, universities Press Arshdeep Bahga and Vijay Madiseti
3. Cloud Computing – Concepts, Technology and Architecture Pearson Thomas Erl

**Web Sources**

1. [http://www.tutorialspoint.com/cloud\\_computing/cloud\\_computing\\_tutorial.pdf](http://www.tutorialspoint.com/cloud_computing/cloud_computing_tutorial.pdf)
2. <http://www.thbs.com/downloads/Cloud-Computing-Overview.pdf>
3. [https://www.priv.gc.ca/resource/fs-fi/02\\_05\\_d\\_51\\_cc\\_e.pdf](https://www.priv.gc.ca/resource/fs-fi/02_05_d_51_cc_e.pdf)
4. Lewis, Grace. Basics About Cloud Computing.  
<http://www.sei.cmu.edu/library/abstracts/whitepapers/cloudcomputingbasics.cfm> (2010).
5. <http://www.intel.in/content/dam/www/public/us/en/documents/guides/cloud-computing-virtualization-building-private-iaas-guide.pdf>
6. [http://manjrasoft.com/aneka\\_architecture.html](http://manjrasoft.com/aneka_architecture.html)

## Suggested list of student activities

*Note: The following activities or similar activities for assessing CIE (IA) for 5 marks (Any one)*  
Student activity like mini-project, surveys, quizzes, etc. should be done in group of 3-5 students.

## Course Delivery

The course will be delivered through lectures and Power point presentations/ Video

## Course Assessment and Evaluation Scheme

Method	What		To whom	When/Where (Frequency in the course)	Max Marks	Evidence collected	Course outcomes
Direct Assessment	CIE	IA	Students	Three IA tests (Average of three tests will be computed)	20	Blue books	1 to 6
				Student activities	05	Activity Reports	1 to 6
				<b>Total</b>	<b>25</b>		
	SEE	End Exam		<b>End of the course</b>	<b>100</b>	Answer scripts at BTE	1 to 6
Indirect Assessment	Student Feedback on course		Students	Middle of the course		Feedback forms	1 to 3 Delivery of course
	End of Course Survey			End of the course		Questionnaires	1 to 6 Effectiveness of Delivery of instructions & Assessment Methods

**Note:** I.A. test shall be conducted for 20 marks. Average marks of three tests shall be rounded off to the next higher digit.

**Questions for CIE and SEE will be designed to evaluate the various educational components (Bloom's taxonomy) such as:**

Sl. No	Bloom's Category	%
1	Remembrance	4
2	Understanding	57
3	Application	39

**Note to IA verifier: The following documents to be verified by CIE verifier at the end of semester**

1. Blue books (20 marks)
2. Student suggested activities report for 5 marks
3. Student feedback on course regarding Effectiveness of Delivery of instructions & Assessment Methods.

**FORMAT OF IA TEST QUESTION PAPER (CIE)**

Test/Date and Time	Semester/year	Course/Course Code	Max Marks			
Ex: I test/6 <sup>th</sup> week of sem 10-11 AM	VI SEM		20			
	Year: 2017-18					
Name of Course coordinator : Units: __ CO's: ____						
Question no	Question		MARKS	CL	CO	PO
1						
2						
3						
4						

**Note: Internal choice may be given in each CO at the same cognitive level (CL).**

**MODEL QUESTION PAPER (CIE)**

Test/Date and Time	Semester/year	Course/Course Code	Max Marks			
Ex: I test/6 <sup>th</sup> week of sem 10-11 AM	VI SEM	Cloud computing	20			
	Year: 2017-18	Course code: <b>15CS63B</b>				
Name of Course coordinator : Units:1,2 Co: 1,2						
<b>Note: Answer all questions</b>						
Question no	Question		CL	CO	PO	
1	Explain the need of cloud computing		(5)	U	1	1,2
2	Illustrate the development of cloud to an organization.		(5)	A	1	1,2
3	Explain and illustrate cloud computing		(5)	U	2	1,2
4	Explain in detail about cloud application architecture		(5)	U	2	1,2

**Note: Internal choice may be given in each CO at the same cognitive level (CL).**

## Format for Student Activity Assessment

DIMENSION	Unsatisfactory 1	Developing 2	Satisfactory 3	Good 4	Exemplary 5	Score
<b>Collection of data</b>	Does not collect any information relating to the topic	Collects very limited information; some relate to the topic	Collects some basic information; refer to the topic	Collects relevant information; concerned to the topic	Collects a great deal of information; all refer to the topic	3
<b>Fulfill team's roles &amp; duties</b>	Does not perform any duties assigned to the team role	Performs very little duties	Performs nearly all duties	Performs all duties	Performs all duties of assigned team roles with presentation	4
<b>Shares work equally</b>	Always relies on others to do the work	Rarely does the assigned work; often needs reminding	Usually does the assigned work; rarely needs reminding	Does the assigned job without having to be reminded.	Always does the assigned work without having to be reminded and on given time frame	3
<b>Listen to other Team mates</b>	Is always talking; never allows anyone else to speak	Usually does most of the talking; rarely allows others to speak	Listens, but sometimes talk too much	Listens and contributes to the relevant topic	Listens and contributes precisely to the relevant topic and exhibit leadership qualities	3
<b>TOTAL</b>						<b>13/4=3.25=4</b>

**Note: This is only an example. Appropriate rubrics/criteria may be devised by the concerned Course Coordinator for assessing the given activity**

**Diploma in Computer Science & Engineering  
VI- Semester****Course Title : Cloud Computing****Time: 3 Hours****Max Marks: 100****PART-A****Answer any SIX questions. Each carries 5 marks.****5X6=30 Marks**

1. Explain the business models around the cloud
2. Explain the characteristics of cloud computing
3. Compare public cloud versus private cloud
4. Explain in detail about cloud application architecture
5. Define Cloud Service. List the main features of cloud services.
6. List the examples of SaaS, PaaS and IaaS.
7. Discuss about Software plus services in brief.
8. Describe Google Map Reduce.
9. Describe the types of server virtualization

**PART-B****Answer any SEVEN full questions each carries 10 marks.****10X7=70 Marks**

1. List and explain the usage scenarios and applications of cloud.
2. Write advantages and disadvantages of cloud computing
3. Explain the two main sections of cloud computing architecture
4. Explain briefly the cloud infrastructure self service.
5. Discuss about the security aspects of cloud computing
6. Summarize the different forms of testing related to cloud.
7. Write a short note on GFS and HDFS.
8. Explain the Hadoop architecture with the help of a diagram.
9. Compare server virtualization and storage virtualization and network virtualization
10. Explain Aneka hybrid cloud implementation



## MODEL QUESTION BANK

### Diploma in Computer Science & Engineering VI Semester Course Title: Cloud computing

CO	Question	CL	Marks	
I	Explain the evolution of cloud computing	R	05	
	Why cloud computing?	U		
	Describe the essentials of cloud computing	U		
	Illustrate the development of cloud to an organization	A		
	Explain the benefits and strategies of cloud	U		
	Discuss the limitations of cloud computing	U	10	
	Explain the business models around the cloud	U/A		
	Explain the characteristics of cloud computing	A		
	Explain the business and its perspectives of cloud	U		
	Describe in detail cloud computing	U		
II	List and explain the usage scenarios and applications of cloud	A	10	
	Write advantages and disadvantages of cloud computing	U		
	Illustrate the cloud adoption	U		
	II	Explain and illustrate cloud computing	U	05
		Discuss about various cloud models	U	
		Write the advantages of cloud computing architecture	U	
		Discuss the value of cloud computing	U	
		Explain cloud infrastructure models	U	
		Compare public cloud versus private cloud	U	10
		Explain in detail about cloud application architecture	U	
Discuss about various cloud models		U		
Explain the two main sections of cloud computing architecture		A		
Describe cloud infrastructure. Explain about each component clearly		A		
III	Discuss how do you scale a cloud infrastructure	A	10	
	Explain regarding different categories of scalability	U		
	Explain briefly the cloud infrastructure self service.	U		
	Define Cloud Service. List the main features of cloud services.	R		05
	List the advantages of cloud services.	U		
	Describe various modes of software as a service.	U		
	Identify the applications of software as a service.	A		
	Describe briefly the integration platform as a service.	U		
	III	List the examples of SaaS, PaaS and IaaS.	A	10
		Describe the importance of platform as a service.	U	
Describe the three main services provided by cloud computing.		A		
Explain management as a service.		A		
Compare the advantages of SaaS, PaaS, IaaS.		U		
IV		Explain database as a service with a neat diagram.	U	05
		Summarize the different forms of testing related to cloud.	A	
		Discuss about the security aspects of cloud computing	U	
		Discuss about Software plus services in brief.	U	
		Explain mobile device integration.	R	
IV	List the services provided by Microsoft.	U	05	
	Explain about cast iron cloud.	U		



	Explain Bungee Connect.	U	10
	Describe Google Map Reduce.	U	
	Differentiate between google map reduce and hadoop map reduce.	U	
	List the main functions in map reduce. Explain with diagram.	U	
	Write a short note on GFS and HDFS.	U	
	Explain the Hadoop architecture with the help of a diagram.	A	
	Describe the Hadoop Map Reduce framework.	U	
V	Define virtualization. Illustrate the pros and cons of virtualization,	R	05
	Explain virtual machines.	U	
	Define virtualization in cluster.	U	
	Explain Virtual machine monitor.	U	
	Describe the properties of virtual machine.	U	
	Distinguish between desktop virtualization and desktop infrastructure virtualization.	U	10
	Describe briefly the types of virtual machines.	U	
	Describe the types of server virtualization	A	
	Identify the need of storage virtualization. list the advantages and disadvantages	A	
	Define virtual desktop infrastructure. Discuss its advantages and disadvantages.	U	
List the different types of server virtualization. Explain them briefly.	U		
Compare server virtualization and storage virtualization and network virtualization.	U		
VI	List and explain various types of clouds.	U	05
	Compare and contrast different types of cloud approaches.	U	
	Explain Aneka Integration of private and public cloud.	U	
	Demonstrate Aneka cloud platform.	U	
	Explain the overview of comet cloud based applications.	A	
	Explain the fundamental cloud functions.	A	
	Demonstrate the overlay joins overheads.	U	
	Compare and contrast the execution time and utilized funds with or without a scheduling agent	A	10
	Explain Aneka hybrid cloud implementation	A	
	Draw and explain comet cloud architecture.	A	
	Explain Autonomic cloud bursting and autonomic cloud bridging.	A	
	Explain the autonomic cloud behaviours	A	

