

	Cloud Computing & Security		Semester	VI
	Course Code	BIS613D	CIE Marks	50
	Teaching Hours/Week (L: T:P: S)	3:0:0:0	SEE Marks	50
	Total Hours of Pedagogy	40	Total Marks	100
	Credits	03	Exam Hours	3
	Examination type (SEE)	Theory		
	Course objectives: <ul style="list-style-type: none">● Introduce the rationale behind the cloud computing revolution and the business drivers● Understand various models, types and challenges of cloud computing● Understand the design of cloud native applications, the necessary tools and the design tradeoffs.● Realize the importance of Cloud Virtualization, Abstraction`s, Enabling Technologies and cloud security			
	Teaching-Learning Process (General Instructions) <p>These are sample Strategies; which teachers can use to accelerate the attainment of the various course outcomes.</p> <ol style="list-style-type: none">1. Lecturer method (L) needs not to be only a traditional lecture method, but alternative effective teaching methods could be adopted to attain the outcomes.2. Use of Video/Animation to explain functioning of various concepts.3. Encourage collaborative (Group Learning) Learning in the class.4. Ask at least three HOT (Higher order Thinking) questions in the class, which promotes critical thinking.5. Discuss how every concept can be applied to the real world - and when that's possible, it helps improve the students' understanding.6. Use any of these methods: Chalk and board, Active Learning, Case Studies.			
	Module-1			
	Distributed System Models and Enabling Technologies: Scalable Computing Over the Internet, Technologies for Network Based Systems, System Models for Distributed and Cloud Computing, Software Environments for Distributed Systems and Clouds, Performance, Security and Energy Efficiency. Textbook 1: Chapter 1: 1.1 to 1.5			
	Module-2			
	Virtual Machines and Virtualization of Clusters and Data Centers: Implementation Levels of Virtualization, Virtualization Structure/Tools and Mechanisms, Virtualization of CPU/Memory and I/O devices, Virtual Clusters and Resource Management, Virtualization for Data Center Automation. Textbook 1: Chapter 3: 3.1 to 3.5			
	Module-3			
	Cloud Platform Architecture over Virtualized Datacenters: Cloud Computing and Service Models, Data Center Design and Interconnection Networks, Architectural Design of			

	<p>Compute and Storage Clouds, Public Cloud Platforms: GAE, AWS and Azure, Inter-Cloud Resource Management.</p> <p>Textbook 1: Chapter 4: 4.1 to 4.5</p>
	Module-4
	<p>Cloud Security: Top concern for cloud users, Risks, Privacy Impact Assessment, Cloud Data Encryption, Security of Database Services, OS security, VM Security, Security Risks Posed by Shared Images and Management OS, XOAR, A Trusted Hypervisor, Mobile Devices and Cloud Security.</p> <p>Cloud Security and Trust Management: Cloud Security Defense Strategies, Distributed Intrusion/Anomaly Detection, Data and Software Protection Techniques, Reputation-Guided Protection of Data Centers.</p> <p>Textbook 2: Chapter 11: 11.1 to 11.3, 11.5 to 11.8, 11.10 to 11.14</p> <p>Textbook 1: Chapter 4: 4.6</p>
	Module-5
	<p>Cloud Programming and Software Environments:</p> <p>Features of Cloud and Grid Platforms, Parallel and Distributed Computing Paradigms, Programming Support for Google App Engine, Programming on Amazon AWS and Microsoft, Emerging Cloud Software Environments.</p> <p>Textbook 1: Chapter 6: 6.1 to 6.5</p>
<p>Course outcome (Course Skill Set)</p> <p>At the end of the course, the student will be able to:</p> <ol style="list-style-type: none"> 1. Describe various cloud computing platforms and service providers. 2. Illustrate the significance of various types of virtualization. 3. Identify the architecture, delivery models and industrial platforms for cloud computing based applications. 4. Analyze the role of security aspects in cloud computing. 5. Demonstrate cloud applications in various fields using suitable cloud platforms. 	

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

- For the Assignment component of the CIE, there are 25 marks and for the Internal Assessment Test component, there are 25 marks.
- The first test will be administered after 40-50% of the syllabus has been covered, and the second test will be administered after 85-90% of the syllabus has been covered
- Any two assignment methods mentioned in the 22OB2.4, if an assignment is project-based then only one assignment for the course shall be planned. The teacher should not conduct two assignments at the end of the semester if two assignments are planned.
- For the course, CIE marks will be based on a scaled-down sum of two tests and other methods of assessment.

Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester-End Examination:

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (**duration 03 hours**).

1. The question paper will have ten questions. Each question is set for 20 marks.
2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
3. The students have to answer 5 full questions, selecting one full question from each module.
4. Marks scored shall be proportionally reduced to 50 marks

Suggested Learning Resources:

Text Books:

1. Kai Hwang, Geoffrey C Fox, and Jack J Dongarra, Distributed and Cloud Computing, Morgan Kaufmann, Elsevier 2012
2. Dan C. Marinescu, Cloud Computing Theory and Practice, Morgan Kaufmann, 2nd Edition, Elsevier 2018

Reference Books:

1. Rajkumar Buyya, Christian Vecchiola, and Thamrai Selvi, Mastering Cloud Computing McGrawHill Education, 1st Edition, 2017
2. Toby Velte, Anthony Velte, Cloud Computing: A Practical Approach, McGraw-Hill Education, 2017.
3. George Reese, Cloud Application Architectures: Building Applications and Infrastructure in the Cloud, O'Reilly Publication, 1st Edition, 2009
4. John Rhoton, Cloud Computing Explained: Implementation Handbook for Enterprises, Recursive Press, 2nd Edition, 2009.

Web links and Video Lectures (e-Resources):

- <https://freevideolectures.com/course/4639/npTEL-cloud-computing/1>.
- <https://www.youtube.com/playlist?list=PLShJJCRzJWxhz7SfG4hpaBD5bKOloWx9J>
- https://www.youtube.com/watch?v=EN4fEbcFZ_E
- <https://www.youtube.com/watch?v=RWgW-CgdIk0>
- <https://www.geeksforgeeks.org/virtualization-cloud-computing-types/>
- <https://www.javatpoint.com/cloud-service-provider-companies>

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

- Installation of virtualization software (Virtual box, Xen etc..) and run applications with different OS. - 10 Marks
- Implement cloud applications using GAE, AWS, Azure/simulate cloud applications using Cloudsim/ Greencloud/ Cloud Analyst etc... - 15 Marks