

Branch Name:	Artificial Intelligence & Data Science
Program Code:	108
Subject Title:	Cloud and FOG Computing
Subject Code:	1ET1080606
Pre-requisite:	Fundamentals of Distributed Computing

Course Objective:

1. To understand the principles and paradigm of Cloud Computing
2. To understand the Service Model with reference to Cloud Computing
3. To appreciate the role of Virtualization Technologies
4. Ability to design and deploy Cloud Infrastructure
5. Understand cloud security issues and solutions
6. To Understand the Function of FOG Computing

Teaching and Examination Scheme:

Teaching Scheme (Hours per week)				Evaluation Scheme (Marks)				
Lecture (L)	Tutorial (T)	Practical (P)	Credit	Theory (Marks)		Practical (Marks)		Total (Marks)
				University Assessment	Continuous Assessment	University Assessment	Continuous Assessment	
03	-	02	04	70	30	30	20	150

Subject Content:

Sr. No.	Topic	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 Provider, Platform as a Service Provider, Public, Private and Hybrid Cloud, Challenges and Risks	8	20
2	Resource Management and SLA Management: Virtualization, Hypervisors, Load balancing, Introduction of SLA Management, Types & Life Cycle of SLA	7	20
3	Cloud Security: Cloud Security: Cloud Security Overview, Issues / Challenges, Data security, Identity & Access Management, Distributed intrusion and anomaly detection.	5	20
4	Introduction to FOG computing: Introduction to FOG computing, Applications, Advantages and Disadvantages of FOG computing, FOG computing vs cloud computing, How and why FOG computing is used	4	25

5	FOG Architecture: Types of FOG Computing, Components of FOG Computing, FOG Computing Architecture, Optimization Problems in Fog, Data Management in Fog Computing, Applications and Issues.	4	15
---	---	---	----

Text Book:

1. Barrie Sosinsky, "Cloud Computing Bible", Wiley-India, 2010
2. Cloud Computing: Concepts, Technology & Architecture, Ricardo Puttini, Thomas Erl, and Zaigham
3. Fog and Edge Computing: Principles and Paradigms by Rajkumar Buyya, Satish Narayana Srirama.

List of Reference Books:

1. Rajkumar Buyya et. al., 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

e-Resources (If any):

1. <http://www.cloudbus.org/>
2. <https://www.tutorialspoint.com/what-is-fog-computing>
3. <https://www.javatpoint.com/fog-computing-vs-cloud-computing>
4. <https://www.techtarget.com/iotagenda/definition/fog-computing-fogging#:~:text=Fog%20computing%20is%20a%20computing,receive%2C%20with%20millisecond%20response%20time.>
5. <https://www.eccouncil.org/cybersecurity-exchange/ethical-hacking/fog-computing-everything-to-know/#:~:text=Components%20of%20Fog%20Computing&text=Data%20processing%3A%20Data%20processing%20is,a%20central%20location%20for%20storage.>
6. <https://www.educba.com/fog-computing-architecture/>

List of Experiments:

1. Explain Cloud Service Models With real time Examples
2. Explain various Deployment Models with real scenarios.
3. Explore various open-source Cloud computing architecture (at least two), install them and compare various features available in them.
4. Installation of Simulation tool (E.g. CloudSim, AWS) and show how to create a datacenter with multiple hosts and run cloudlets on it.
5. Write a code to create datacenter, Host and VM in CloudSim simulator
6. Write and explain various methods available for Load balancing in Cloud.
7. Create a scenario that uses Amazon S3 as storage on the Cloud.
8. Study and analyze scheduling algorithms (Cloudsim).
9. Sketch the architecture and have hands-on experience on one or more of the following:
 - a. Eucalyptus
 - b. Microsoft Azure
 - c. AWSCreate
10. To study about FOG Architecture
11. To study about various applications and design issues of Fog Computing.

Course Learning Outcomes (CLO): On completion of this course, the students will be able to:

CLO	Description	Bloom's Taxonomy Level
CLO1	Compare the strengths and limitations of cloud computing	4 Analyze 2 Understanding
CLO2	Identify the architecture, infrastructure and delivery models of cloud computing	2 Understanding
CLO3	Choose the appropriate cloud player , Programming Models and approach.	4 Analyze
CLO4	Address the core issues of cloud computing such as security, privacy and interoperability	2 Understanding
CLO5	.Design Cloud Services and Set a private cloud	2 Understanding 3 Applying

Mapping of CLOs with POs & PSOs

Course Learning Outcomes	Program Outcomes (POs)												Program Specific Outcomes(PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CLO1	H	L	L	M	L	M			L				L	L		
CLO2		L	M	H	L	L					L	L	M	L		
CLO3	L	M	M	M	M	H		M		L			M	L		
CLO4	M	L	M	L	M	H		M	L				M	L		
CLO5	L	L	L	L	M	H		M		L			H	L		

H: High, M: Medium, L: Low