Lesson Plan

Branch: Computer Engineering Semester: VI Year: 2022-23

Course Title: Cloud Computing (CSL605)	SEE: 3 Hours – Lab			
Total Contact Hours: 8 Hours/Week	Duration of SEE: 3 Hrs			
SEE Marks: 80 (Theory) + 20 (IA)				
Lesson Plan Author: Prof. Monica Khanore,	Date: 18-03-2023			
Prof. Roshni Padate, Prof. Jagruti				
Nagaonkar, Prof. Supriya Kamoji				
Checked By:	Date:			

Prerequisites: Computer Networks

Syllabus:

Module	Content	Hour	LO
1	Title: Introduction and overview of cloud computing. Objective: To understand the origin of cloud computing, cloud cube model, NIST	2	2
	model, characteristics of cloud, different deployment models, service models, advantages and		
2	Title: To study and implement Hosted Virtualization using VirtualBox& KVM. Objective: To know the concept of Virtualization along with their types, structures and mechanisms. This experiment should have demonstration of creating and running Virtual machines inside hosted hypervisors like VirtualBox and KVM with their comparison based on various virtualization parameters. 2 1	2	1
3	Title: To study and Implement Bare-metal Virtualization using Xen, HyperV or VMware Esxi. Objective: To understand the functionality of Bare-metal hypervisors and their relevance in cloud computing platforms. This experiment should have demonstration of install, configure and manage Bare Metal hypervisor along with instructions to create and run virtual machines inside it. It should also emphasize on accessing VMs in different environments along with additional services provided by them like Load balancing, Auto-Scaling, Security etc.	4	1
4	Title: To study and Implement Infrastructure as a Service using AWS/Microsoft Azure. Objective: To demonstrate the steps to create and run virtual machines inside Public cloud platform. This experiment should emphasize on creating and running Linux/Windows Virtual machine inside Amazon EC2 or Microsoft Azure Compute and accessing them using RDP or VNC tools.	4	2
5	Title: To study and Implement Platform as a Service using AWS Elastic Beanstalk/ Microsoft Azure App Service. Objective: To demonstrate the steps to deploy Web applications or Web services written in different languages on AWS Elastic Beanstalk/ Microsoft Azure App Service.	4	2
6	Title: To study and Implement Storage as a Service using Own Cloud/ AWS S3, Glaciers/ Azure Storage. Objective: To understand the concept of Cloud storage and to demonstrate the different types of storages like object storage, block level storages etc. supported by Cloud Platforms like Own Cloud/ AWS S3, Glaciers/ Azure Storage.	4	2

Title: To study and Implement Database as a Service on SQL/NOSQL	2	
1	4	2
databases like AWS RDS, AZURE SQL/ MongoDB Lab/ Firebase.		
Objective: To know the concept of Database as a Service running on		
cloud and to demonstrate the CRUD operations on different SQL and		
NOSQL databases running on cloud like AWS RDS, AZURE SQL/		
Mongo Lab/ Firebase.		
Title: To study and Implement Security as a Service on AWS/Azure	3	4
Objective: To understand the Security practices available in public		
cloud platforms and to demonstrate various Threat detection, Data		
protection and Infrastructure protection services in AWS and Azure.		
Title: To study and implement Identity and Access Management	2	2
(IAM) practices on AWS/Azure cloud. Objective: To understand the		
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Title: To study and Implement Containerization using Docker	4	6
Objective: To know the basic differences between Virtual machine		
and Container. It involves demonstration of creating, finding,		
building, installing, and running Linux/Windows application		
containers inside local machine or cloud platform.		
Title: To study and implement container orchestration using	4	6
Kubernetes Objective: To understand the steps to deploy Kubernetes		
Cluster on local systems, deploy applications on Kubernetes, creating		
=		
Mini-project: Design a Web Application hosted on public cloud	4	3,5
as a Service, Security as a Service etc.]		1
	Objective: To know the concept of Database as a Service running on cloud and to demonstrate the CRUD operations on different SQL and NOSQL databases running on cloud like AWS RDS, AZURE SQL/Mongo Lab/ Firebase. Title: To study and Implement Security as a Service on AWS/Azure Objective: To understand the Security practices available in public cloud platforms and to demonstrate various Threat detection, Data protection and Infrastructure protection services in AWS and Azure. Title: To study and implement Identity and Access Management (IAM) practices on AWS/Azure cloud. Objective: To understand the working of Identity and Access Management IAM in cloud computing and to demonstrate the case study based on Identity and Access Management (IAM) on AWS/Azure cloud platform. Title: To study and Implement Containerization using Docker Objective: To know the basic differences between Virtual machine and Container. It involves demonstration of creating, finding, building, installing, and running Linux/Windows application containers inside local machine or cloud platform. Title: To study and implement container orchestration using Kubernetes Objective: To understand the steps to deploy Kubernetes Cluster on local systems, deploy applications on Kubernetes, creating a Service in Kubernetes, develop Kubernetes configuration files in YAML and creating a deployment in Kubernetes using YAML,	Objective: To know the concept of Database as a Service running on cloud and to demonstrate the CRUD operations on different SQL and NOSQL databases running on cloud like AWS RDS, AZURE SQL/Mongo Lab/Firebase. Title: To study and Implement Security as a Service on AWS/Azure Objective: To understand the Security practices available in public cloud platforms and to demonstrate various Threat detection, Data protection and Infrastructure protection services in AWS and Azure. Title: To study and implement Identity and Access Management (IAM) practices on AWS/Azure cloud. Objective: To understand the working of Identity and Access Management IAM in cloud computing and to demonstrate the case study based on Identity and Access Management (IAM) on AWS/Azure cloud platform. Title: To study and Implement Containerization using Docker Objective: To know the basic differences between Virtual machine and Container. It involves demonstration of creating, finding, building, installing, and running Linux/Windows application containers inside local machine or cloud platform. Title: To study and implement container orchestration using Kubernetes Objective: To understand the steps to deploy Kubernetes Cluster on local systems, deploy applications on Kubernetes, creating a Service in Kubernetes, develop Kubernetes configuration files in YAML and creating a deployment in Kubernetes using YAML, Mini-project: Design a Web Application hosted on public cloud

Lab Plan

Lab	List of Experiments	Lab session						
Outcome	Outcome							
	Week1							
02	Title: Introduction and overview of cloud computing.	Session1						
	Objective: To understand the origin of cloud computing,	Session2						
	cloud cube model, NIST model, characteristics of cloud,							
	different deployment models, service models, advantages							
	and disadvantages.							
	Week2							
01	Title: To study and implement Hosted Virtualization	Session1						
	using VirtualBox& KVM.							
	Objective: To know the concept of Virtualization along							
	with their types, structures and mechanisms. This							
	experiment should have demonstration of creating and							
	running Virtual machines inside hosted hypervisors like							

	VietvolDov and VVM with their communican based on	
	VirtualBox and KVM with their comparison based on	
01	various virtualization parameters. Title: To study and Implement Bare-metal	Session2
UI	Virtualization using Xen, HyperV.	Sessionz
	Objective: To understand the functionality of Bare-metal	
	hypervisors and their relevance in cloud computing	
	platforms. This experiment should have demonstration of	
	install, configure and manage Bare Metal hypervisor	
	along with instructions to create and run virtual machines	
	inside it.	
	Week3	
02	Introduction to AWS and account creation and	Session1
02	Budget seeting	Session
02	Title: To study and Implement Infrastructure as a	Session 2
02	Service using AWS	Session 2
	Objective: To demonstrate the steps to create and run	
	virtual machines inside public cloud platform. This	
	experiment should emphasize on creating and running	
	Linux/Windows Virtual machine inside Amazon EC2 or	
	Microsoft Azure Compute and accessing them using RDP	
	or VNC tools.	
	Week4	
02	Explore various commercially available cloud services.	Session 1
	Introduction Google cloud and comparison with AWS	
02	Title: To study and Implement Platform as a	Session 2
	Service using AWS Elastic Beanstalk/ Microsoft	
	Azure App Service.	
	Objective: To demonstrate the steps to deploy Web	
	applications or Web services written in different	
	languages on AWS Elastic Beanstalk/ Microsoft Azure	
	App Service.	
	Week5	
02	Title: To study and Implement Storage as a Service using	Session1
	Own Cloud/ AWS S3, Glaciers/ Azure Storage.	
	Objective: To understand the concept of Cloud storage and	
	to demonstrate the different types of storages like object	
	storage, block level storages etc. supported by Cloud	
	Platforms like Own Cloud/ AWS S3, Glaciers/ Azure	
0.4	Storage.	G • A
04	Title: To study and Implement Security as a Service on	Session 2
	AWS/Azure	
	Objective: To understand the Security practices available	
	in public cloud platforms and to demonstrate various Threat	
	detection, Data protection and Infrastructure protection services in AWS and Azure.	
	Week 6	
04	Title: To study and implement Identity and Access	Session 1
V-7	Management (IAM) practices on AWS/Azure cloud.	Dession 1
	Objective: To understand the working of Identity and	
	Access Management IAM in cloud computing and to	
	1 management in the court companing and to	<u> </u>

	demonstrate the case study based on Identity and Access	
	Management (IAM) on AWS/Azure cloud platform.	
05	Interaction with industry expert	Session 2
	Week 7	
06	Title: To study and Implement Docker Objective: To understand the working of Docker PLAYHUB as a native registry for storing both public and private repositories.	Session 1
06	Title: To study and Implement Containerization using Docker Objective: To know the basic differences between Virtual machine and Container. It involves demonstration of creating, finding, building, installing, and running Linux/Windows application containers inside local machine or cloud platform.	Session 1
	Week 8	
02,05	Explore salesforce as a SAAS Objective: To know SaaS or Software as a Service, which means there is no need to install the software or server to work on. Users can simply sign-up in Salesforce.com and can start running the business instantly.	Session 1 & 2
3,5	Mini-project: Design a Web Application hosted on public cloud platform [It should cover the concept of IaaS, PaaS, DBaaS, Storage as a Service, Security as a Service etc.]	Session 1 & 2

Lab Outcomes (LO):

On successful completion of course learner will be able to:

- **CSL605.1.** Implement different types of virtualization techniques.
- **CSL605.2**. Analyze various cloud computing service models and implement them to solve the given problems.
- **CSL605.**3. Design and develop real world web applications and deploy them on commercial cloud(s).
- **CSL605.4**. Explain major security issues in the cloud and mechanisms to address them.
- **CSL605.5**. Explore various commercially available cloud services and recommend the appropriate one for the given application.
- **CSL605.**6. Implement the concept of containerization

CO-PO Mapping: (BL – Blooms Taxonomy, C – Competency, PI – Performance Indicator)

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modern solve engineering problems engineering tools, techniques	concept of contamerization		_		1	
engineering tools, techniques			•	_		
tools, techniques				solve engineering problems		
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and resources			tools, techniques			
			and resources			

	PO	PO1	PO1	PO1								
	1	2	3	4	5	6	7	8	9	0	1	2
CSL605.	3	2	2	2	2							1
CSL605.	3	2	2	2	2							1
CSL605.	3	2	2	2	2							1
CSL605.	3	2	2	2	2							1
CSL605. 5	3	2	2	2	2							1
CSL605.	3	2	2	2	2							1

CO-PSO Mapping:

CO	BL	С	PI	PO	Mapping
CSC602.4.	2	2.2	2.2.2	PSO1	3
		2.3	2.3.1		
		2.4	2.4.1		

	PSO	PSO
	1	2
CSL605.1.	3	
CSL605.2.	3	
CSL605.3.	3	
CSL605.4.	3	
CSL605.5.	3	
CSL605.6.	3	

CO Measurement Weightages for Tools:

Course Outcomes			Indirect Method (20%)						
Outcomes	Lab	Ass	signmen	nts	Mini Project			Oral Exam	Course exit survey
	1	1	2	3		1	2		
CSL605.1	10%	10%			10%	10%		60%	100%
CSL605.2	10%	10%			10%		10%	60%	100%
CSL605.3	10%		10%		20%			60%	100%
CSL605.4	10%		10%		20%			60%	100%
CSL605.5	20%				20%			60%	100%

CSL605.6	20%				20%			60%	100%
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Attainment:

LO CSL605.1:

Direct Method

$$A_{CSL605.1D} = 0.1 * Lab + 0.1 * Assignment + 0.1 * Quizzes + 0.1 * MiniProject + 0.6 * SEE Lab$$

Final Attainment:

$$A_{CSL605,1} = 0.8 * A_{CSL605,1D} + 0.2 * A_{CSL605,1I}$$

LO CSL605.2:

Direct Method

$$A_{CSL605.2D} = 0.1*Lab + 0.1*Assignment + 0.1*Quizzes + 0.1*MiniProject + 0.6*SEE_Lab$$

Final Attainment:

$$A_{CSL605.2} = 0.8 * A_{CSL605.2D} + 0.2 * A_{CSL605.2I}$$

LO CSL605.3:

Direct Method

 $A_{CSL605.3D} = 0.1*Lab + 0.1*Assignment + 0.2*MiniProject + 0.6*SEE_Lab$ Final Attainment:

$$A_{CSL605.3} = 0.8 * A_{CSCSL605.3D} + 0.2 * A_{CSL605.3I}$$

LO CSL605.4:

Direct Method

 $A_{CSL605.4D} = 0.1*Lab + 0.1*Assignment + 0.2*MiniProject + 0.6*SEE_Lab$ Final Attainment:

$$A_{CSL605.4} = 0.8 * A_{CSL605.4D} + 0.2 * A_{CSL605.4I}$$

LO CSL605.5:

Direct Method

$$A_{CSL605.5D} = 0.2 * Lab + 0.2 * MiniProject + 0.6 * SEE_Lab$$

Final Attainment:

$$A_{CSL605.5} = 0.8 * A_{CSL605.5D} + 0.2 * A_{CSL605.5I}$$

LO CSL605.6

Direct Method

$$A_{CSL605,6D} = 0.2 * Lab + 0.2 * MiniProject + 0.6 * SEE_Lab$$

Final Attainment:

$$A_{CSL605.6} = 0.8 * A_{CSL605.6D} + 0.2 * A_{CSL605.6I}$$

Course Level Gap (if any): Nil

Content beyond Syllabus: Nil

Practical Session Plan Comps B

D 4 7	Practic		
Batch	Dates Planned Actual		Remarks
		Actual	
Experiment			
	tion and overview of cloud compa		model, NIST model, characteristics
-	_	service models, advantages a	
A	23/01/2023, 26/01/2023	23/01/2023, 26/01/2023	26/01/2023(Thursday) Holiday
В	23/01/2023, 26/01/2023	23/01/2023, 26/01/2023	26/01/2023(Thursday) Holiday
С	23/01/2023, 25/01/2023	23/01/2023, 25/01/2023	
D	23/01/2023, 24/01/2023	23/01/2023, 24/01/2023	
Objective: This experin	dy and implement Hosted Volume to know the concept of Virtuent should have demonstrate	tion of creating and running	ox& KVM. Tpes, structures and mechanisms. Virtual machines inside hosted on various virtualization parameters
A	30/01/2023, 02/02/2023	30/01/2023, 02/02/2023	paramotors
В	30/01/2023, 02/02/2023	30/01/2023, 02/02/2023	
С	30/01/2023, 01/02/2023	30/01/2023, 01/02/2023	
D	30/01/2023, 31/01/2023	30/01/2023, 31/01/2023	
Objective: T computing p	o understand the functionali latforms. This experiment sl		s and their relevance in cloud install, configure and manage Bare
A	06/02/2023, 09/02/2023	06/02/2023, 09/02/2023	
В	06/02/2023, 09/02/2023	06/02/2023, 09/02/2023	
С	06/02/2023, 08/02/2023	06/02/2023, 08/02/2023	
D	06/02/2023, 07/02/2023	06/02/2023, 07/02/2023	
	No. 4 to AWS and account creation ly and Implement Infrastructu		
A	13/02/2023, 16/02/2023	13/02/2023, 16/02/2023	
В	13/02/2023, 16/02/2023	13/02/2023, 16/02/2023	
С	13/02/2023, 15/02/2023	13/02/2023, 1502/2023	
D	13/02/2023,14/02/2023	13/02/2023,14/02/2023	
Experiment To study and		vice using AWS Elastic Bean	stalk/ Microsoft Azure App Service.

B C			
С	20/02/2023, 23/02/2023	20/02/2023, 23/02/2023	
	20/02/2023, 22/02/2023	20/02/2023, 22/02/2023	
D	20/02/2023, 21/02/2023	20/02/2023, 21/02/2023	
Experiment	No. 6		
		as a Service using Own Clou	d/ AWS S3, Glaciers/ Azure
A	27/02/2023, 02/03/2023	27/02/2023, 02/03/2023	UT 1
В	27/02/2023, 02/03/2023	27/02/2023, 02/03/2023	UT 1
C	27/02/2023, 29/03/2023	27/02/2023, 29/03/2023	UT 1
D	27/02/2023, 28/03/2023	27/02/2023, 28/03/2023	UT 1
	ŕ	21102/2023, 20/03/2023	
Experiment Title: To s		and Access Management (I	AM) practices on AWS/Azure
	eraction with industry expert		(1447) practices on 71 445/71Zure
	• •		nstrate the different types of storages
like object s	torage, block level storages		forms like Own Cloud/ AWS S3,
Glaciers/ Az	zure Storage.		
A	06/03/2023, 09/03/2023	13/03/2023, 16/03/2023	Sports Day / Holi
В	06/03/2023, 09/03/2023	13/03/2023, 16/03/2023	Sports Day / Holi
С	06/03/2023, 08/03/2023	13/03/2023, 15/03/2023	Sports Day / Holi
D	06/03/2023, 07/03/2023	13/03/2023, 14/03/2023	Sports Day / Holi
Experiment	No. 8		
	dy and Implement Security as		
•	· 1	_	ad platforms and to demonstrate
A Various Thre	eat detection, Data protection a 13/03/2023, 16/03/2023	13/03/2023, 16/03/2023	ervices in AwS and Azure.
B	,	13/03/2023, 16/03/2023	
	· ·	· 	
C	13/03/2023, 15/03/2023	13/03/2023, 15/03/2023	
D	13/03/2023, 14/03/2023	13/03/2023, 14/03/2023	
Experiment			
Title: To stu	udy and Implement Docker		
	20/03/2023, 21/03/2023	20/03/2023, 21/03/2023	
A	20/03/2023, 21/03/2023	20/03/2023, 21/03/2023	
B	20/03/2023, 21/03/2023	-01001-0-0, -11001-0-0	
	20/03/2023, 21/03/2023	20/03/2023, 22/03/2023	
В	· ·	·	
B C D	20/03/2023, 22/03/2023 20/03/2023, 21/03/2023	20/03/2023, 22/03/2023	
B C D	20/03/2023, 22/03/2023 20/03/2023, 21/03/2023	20/03/2023, 22/03/2023 20/03/2023, 21/03/2023	
B C D	20/03/2023, 22/03/2023 20/03/2023, 21/03/2023 4 No. 10	20/03/2023, 22/03/2023 20/03/2023, 21/03/2023	

В	27/03/2023, 30/03/2023	27/03/2023, 30/03/2023	
С	27/03/2023, 29/03/2023	27/03/2023, 29/03/2023	
D	27/03/2023, 28/03/2023	27/03/2023, 28/03/2023	

Text books:

- 1. Bernard Golden, "Amazon Web Services for Dummies", John Wiley & Sons, Inc.
- 2. Michael Collier, Robin Shahan, "Fundamentals of Azure, Microsoft Azure Essentials", Microsoft Press.
- 3. RajkumarBuyya, Christian Vecchiola, S ThamaraiSelvi, "Mastering Cloud Computing", Tata McGraw-Hill Education
- 4. Barrie Sosinsky, "Cloud Computing Bible", Wiley publishing.
- 5. John Paul Mueller, "AWS for Admins for Developers", John Wiley & Sons, Inc.
- 6. Ken Cochrane, Jeeva S. Chelladhurai, NeependraKhare, "Docker Cookbook Second Edition", Packt publication.
- 7. Jonathan Baier, "Getting Started with Kubernetes-Second Edition", Packt Publication.

Term Work:

- 1. Term work should consist of 10 experiments and a mini project.
- 2. Journal must include at least 2 assignments.
- 3. The final certification and acceptance of term work ensures that satisfactory performance of laboratory work and minimum passing marks in term work.
- 4. Total 50 Marks (Experiments: 15-marks, Mini project (Implementation) 15 marks, Mini Project Presentation & Report [for deployment, utilization, monitoring and billing] 10 Marks, Attendance 05-marks, Assignments: 05-marks)

Oral examination will be based on Laboratory work, mini project and above syllabus

Web References:

Sr.	Topic	Link
no.		
1	Introduction and overview of cloud computing	https://www.nist.gov/system/files/documents/itl/cloud/NIST_SP-500-291_Version2_2013_June18_FINAL.pdf
2	Hosted Virtualization using KVM	https://phoenixnap.com/kb/ubuntu- installkvm\ 3 Baremetal Virtualization using Xen
3	Baremetal Virtualization using Xen	https://docs.citrix.com/en-us/xenserver/7- 1/install.html
4	IaaS, PaaS, STaaS, DbaaS, IAM and Security as a Service on AWS and Azure	AWS https://docs.aws.amazon.com/ Azure https://docs.microsoft.com/en- us/azure
5	Docker	https://docs.docker.com/get-started/
6	Kubernetes	https://kubernetes.io/docs/home/

Verified by:

Programme Coordinator

Subject Expert

Meloway

Janhi 1

Jagruti 1