

UNIVERSITY OF SARGODHA
Department of Computer Sciences and Information Technology

COURSE OUTLINE

Spring 2020

Course Title: Cloud Computing

Course Code: CS-4544

Credit Hours: 3(3,0)

Instructor: Iqra Khan

Email: iqra.khan@uos.edu.pk

DESCRIPTION AND OBJECTIVES

This course gives an introduction to cloud computing and related techniques, issues, ecosystem and case studies. Students will learn and understand about such fundamental distributed computing "concepts" for cloud computing, how these techniques work inside today's most widely-used cloud computing systems and various research papers will be studied and reviewed to get the idea of current areas of research and study in cloud computing as well as practical work of cloud based scheduling algorithms.

INTENDED LEARNING OUTCOMES

At the end of the course the students will be able to:

- Understand about fundamental concepts of distributed computing, how these techniques work inside today's most widely-used cloud computing systems
- Understand Techniques that are widely being used in cloud computing field.
- Understanding of Iaas, Paas, SaaS, CaaS etc.

COURSE CONTENTS

Following contents will be covered in this course:

- Introduction: to Cloud Computing and Distributed computing etc.
- Characteristics, Design goals and Types of distributed systems
- Service and deployment models of Cloud computing: Iaas, Paas and SaaS etc.
- Properties, Issues, characteristics and Implementation of service models.
- Amazon Web Services AWS, EC2 and S3 Platform Introduction.
- Virtualization, Virtualization vs Emulation, goals and types of Virtualization.
- Memory Virtualization; Virtualization Techniques.
- Virtualization Practicum: CloudSim Installation.
- Overview to CloudSim Platform and working and creation of Datacenters, Virtual Machines, Broker etc.
- Cloud Federation: Characterization and Conceptual Model.
- Presence in the Cloud and Presence Protocols Overview.
- Presence Protocols: XMPP, SIMPLE, SIP.
- Privacy and Privacy risks in Cloud Systems.

- End user access to Cloud Systems: Practical Demonstration (Amazon RD etc).
- Implementation of Virtual Machines and scheduling Algorithms in CloudSim.
- Openstack overview

READINGS

[TB] Cloud Computing Implementation, Management, and Security by John W. Rittinghouse and James F. Ransome, Taylor and Francis Group, LLC (2010). ISBN 978-1-4398-0680-7

Reference Material:

- Distributed Computing: Principles and Applications Book by Mei-Ling L. Liu. ISBN-13: 978-0201796445
- Cloud Computing Theory and Practice by Dan C. Marinescu (2013). ISBN: 978-0-12404-627-6.
- Internet of Things: Principles and Paradigms, book by rajkumar buyya and Amir vahid DastjerDi(Eds.), publisher: Morgan kaufmann, ISBN: 978-0-12-805395-9
- <https://arxiv.org/abs/1601.02752>
- <https://www.vmware.com/pdf/virtualization.pdf>
- https://www.vmware.com/pdf/virtualization_considerations.pdf
- https://www.researchgate.net/publication/270581440_Cloud_Federation_characterization_and_conceptual_model
- <https://xmpp.org/>
- Architecting the Cloud: Design Decision for Cloud Computing Service Models (SAAS, PAAS and IAAS) Publisher: Wiley India Private Limited; 2014 edition, ISBN-10: 8126550333

COURSE SCHEDULE

Week	Topics and Readings	Books with Page No.
1	What is Cloud Computing? Different perspectives, Properties and characteristics , Benefits	[TB1: Preface]
2	Distributed systems, Characteristics of DS , Design goals, Types of distributed systems, Overview to Datacenter, Networks, Scheduling	[TB2:1]
3	Perspectives, Service and deployment models of Cloud computing, Service models: IaaS, PaaS, SaaS	[TB1:2]
4	From IaaS to PaaS, PaaS and SaaS properties, Issues, characteristics and Implementation	[TB9]
5	Web Services Delivered from the Cloud, Communication-as-a-Service (CaaS), Advantages of CaaS, Fully Integrated, Enterprise-Class	[TB1: 2]

	Unified Communications, Monitoring-as-a-Service (MaaS), Protection Against Internal and External Threats, Delivering Business Value, Real-Time Log Monitoring, Enables Compliance	
6	Modern On-Demand Computing, Amazon's Elastic Cloud, Amazon Web Services, Characteristics, Amazon SimpleDB, Amazon Simple Queue Service (Amazon SQS), Amazon CloudFront, Amazon Elastic Block Store (EBS)	[TB1: 2]
7	Virtualization, From emulation to virtualization, Goals of virtualization, Types of Virtualization Hosted and Hypervisor, Server Virtualization, CPU Virtualization.	[TB1:4, 5]
8	Memory Virtualization: Background, Virtualization Techniques: Emulated TLB, Shadow Page Tables, Hardware supported Memory Virtualization, Nested Page Tables	[6]
9	Virtualization Practicum.: Installation of CloudSim 4.0 Overview to CloudSim Platform and working and creation of Datacenters, Virtual Machines, Broker etc.	[TB:Appendix A]
10	Cloud Federation: Characterization and Conceptual Model, Voluntary or independent model, Horizontal, Vertical, Hybrid model, Architectural models for cloud federation: Semantics based, Market-oriented, Reservoir, Market-oriented, Reservoir, Service oriented architecture, Conceptual Model, Segments in a Federation.	[TB1: 5, 7]
11	Presence in the Cloud, Presence Protocols, Leveraging Presence, Presence Enabled, The Future of Presence, The Interrelation of Identity, Presence, and Location in the Cloud, Federated Identity Management, Cloud and SaaS Identity Management, Federating Identity, Identity-as-a-Service (IaaS), Compliance-as-a-Service (CaaS), The Future of Identity in the Cloud	[TB1: 5]
12	Presence Protocols: XMPP, SIMPLE, SIP	[8]
13	Privacy and Its Relation to Cloud-Based Information Systems, Privacy Risks and the Cloud, Cloud Security Challenges, Security in an interconnected world, cloud security risks, Attacks in a cloud environment, top threats, Security, a major concern for cloud users, Privacy, Trust. Operating systems security,	[TB1:6]
14	Virtual machine security, Security of virtualization, Security risks posed by shared images, Security risks posed by a management OS, XOAR - breaking the monolithic design of TCB, Terra a trusted virtual machine monitor, Security services, IDS, IPS, Honeypots, Firewalls, Packet analysers.	[TB1:8]
15	Mobile Internet Device and the Cloud, Cloud, IOT.	[TB1: 9]
16	Final Terms	

Sessional Exam, Home Assignments, Quizzes, Presentations, Final Exam

ASSESSMENT CRITERIA

Sessional Marks: 20 Marks

Quiz	05
Assignment	05
Term Project\Presentations	10
Mid Semester Exam:	30
Final Semester Exam:	50