Detailed Course Description - Course Plan Development and Updating Procedures/ Computer information systems Department	QF01/0408-3.0E

Faculty	Faculty of Science and Information Technology	Department	Computer Information Systems
Course Number	0113446	Course Title	**Cloud Computing**
Number of Credit Hours	3	Pre-Requisite/Co-Requisite	Data Mining

Brief course description

This course gives students an overview of the field of Cloud Computing, its enabling technologies, main building blocks, and hands-on experience through projects utilizing public cloud infrastructures (Amazon Web Services (AWS) and Microsoft Azure). Cloud computing services are being adopted widely across a variety of organizations and in many domains. Simply, cloud computing is the delivery of computing as a service over a network, whereby distributed resources are rented, rather than owned, by an end user as a utility.

The course will introduce this domain and cover the topics of cloud infrastructures, virtualization, software defined networks and storage, cloud storage, and programming models. As an introduction, we will discuss the motivating factors, benefits and challenges of the cloud, as well as service models, service level agreements (SLAs), security, example cloud service providers and use cases. Modern data centers enable many of the economic and technological benefits of the cloud paradigm; hence, we will describe several concepts behind data center design and management and software deployment. Next, we will focus on virtualization as a key cloud technique for offering software, computation and storage services. We will study how CPU, memory and I/O resources are virtualized, with examples from Xen and VMWare, and present real use cases such as Amazon EC2. Within the same theme of virtualization, students will also be introduced to Software Defined Networks and Storage (SDN and SDS). Subsequently, students will learn about different cloud storage concepts including data distribution, durability, consistency and redundancy. We will discuss distributed file systems, NoSQL databases and object storage. HDFS, CephFS, HBASE, MongoDB, Cassandra, DynamoDB, S3, Swift and Ceph Object Gateway will be presented as case studies. Finally, students will understand the details of the MapReduce programming model and gain a broad overview of the Spark, GraphLab programming models as well as message queues and stream processing.

	Course Goals and Learning Outcomes
Goal 1	**Students will learn the fundamental ideas behind Cloud Computing, the evolution of the paradigm, its applicability; benefits, as well as current and future challenges.**
Learning Outcomes	**Explain:** **1.1** The core concepts of the cloud computing paradigm: **1.2** How and why this paradigm shift came about. **1.3** The characteristics, advantages and challenges brought about by the various models and services in cloud computing.
Goal 2	**Master the basic ideas and principles in data center design; cloud management techniques and cloud software deployment considerations;**
Learning Outcomes	2.1 Apply fundamental concepts in cloud infrastructures to understand the tradeoffs in power, efficiency and cost. 2.2 Know how to leverage and manage single and multiple datacenters 2.3 Build and deploy cloud applications that are resilient, elastic and cost-efficient

Goal 3	**Differentiate between CPU, memory and I/O virtualization techniques that serve in offering software, computation and storage services on the cloud; Software Defined Networks (SDN) and Software Defined Storage (SDS).**
Learning Outcomes	**3.1** Discuss system, network and storage virtualization and outline their role in enabling the cloud computing system model. **3.2** know cloud storage technologies. **3.3** And relevant distributed file systems, databases and object storage.
Textbook	**1.** Handbook of Cloud Computing by Borko Furht · Armando Escalante **2015**.
Supplementary References	**1.** Cloud Computing, the complete cornerstone to Cloud Computing Best Practices. **2.** Cloud Computing: Concepts, Technology & Architecture by Thomas Erl, Zaigham Mahmood, and Ricardo Puttini, Second Printing, **2013**.

Course Timeline

Week	Number of Hours	Course Topics	Pages (Textbook)	Notes
01	**1 1 1**	Fundamental of Cloud Computing.	**3-20**	
02	**1 1 1**	Cloud Computing Technologies and Applications.	**21-47**	
03	**1 1 1**	Key Enabling Technologies for Virtual Private Clouds.	**47-65**	
04	**1 1 1**	The Role of Networks in Cloud Computing Data-Intensive Technologies for Cloud Computing.	**65-83 3-137**	
05	**1 1 1**	Survey of Storage and Fault Tolerance Strategies Used in Cloud Computing	**137-157**	
06	**1 1 1**	Scheduling Service Oriented Workflows Inside Clouds Using an Adaptive Agent Based Approach.	**159-183**	
07	**1 1 1**	Cloud weaver: Adaptive and Data-Driven Workload Manager for Generic Clouds **First Exam 20%**	**219-239**	
08	**1 1 1**	Enterprise Knowledge Clouds: Architecture and Technologies.	**239-255**	
09	**1 1 1**	Integration of High-Performance Computing into Cloud Computing Services.	**255-277**	
10	**1 1**	Vertical Load Distribution for Cloud Computing via Multiple Implementation Options.	**277-309**	

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11	1 1 1	Cloud Types and Services	335-357	
12	1 1 1	Service Scalability Over the Cloud. **Second Exam: 20%**	357-379	
13	1 1 1	Scientific Services on the Cloud.	379-407	
14	1 1 1	Enterprise Knowledge Clouds: Applications and Solutions	437-453	
15	1 1 1	Cloud@Home: A New Enhanced Computing Paradigm	375-395	
16	1 1 1	**Final Exam 50%**		

Theoretical Course Evaluation Methods and Weight	Participation = 10% First Exam 20% Second Exam 20% Final Exam 50%	**Practical (Clinical) Course Evaluation Methods**	Semester Students' Work = 50% (Reports, Research, Quizzes, Etc.) Final Exam = 50%

Approved by Head of Department		**Date of Approval**	

Extra information (to be updated every semester by corresponding faculty member)

Name of Teacher		Office Number	
Phone Number (Extension)		Email	_____@zuj.edu.jo
Office Hours			