



Course Specification

(Bachelor)

Course Title: **Cloud Application Development**

Course Code: **SE3603**

Program: **BSc in Software Engineering**

Department: **Software Engineering**

College: **College of Computing**

Institution: **Umm Al Qura University**

Version: **1.0**

Last Revision Date: **22/04/2025**



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A. General information about the course:

1. Course Identification

1. Credit hours: (3)

2. Course type

A. University College Department Track Others
 B. Required Elective

3. Level/year at which this course is offered: (3rd year/ 5th or 6th level) or (4th year/8th level)

4. Course General Description:

This course is designed to give you a comprehensive view of the world of cloud computing and Big Data. In this course we cover a multitude of technologies that comprise the modern stack of cloud computing.

We start by introducing some major concepts in cloud computing, the economical foundations of cloud computing, and the concept of Big Data. We also cover the concept of software defined architectures, and how cloud service providers organize their offerings. We also will compare Infrastructure as a Service offered by the big three: Amazon, Google, and Microsoft, including Infrastructure as a Service, Platform as a Service, and Software as a Service along a few others.

Serverless computing has gained massive popularity in recent years, as it is both economical and easy to use and deploy. We cover serverless computing, serverless storage, and middleware required to weave on-site or end-user applications to serverless resources. We then shift our focus slightly to the topic of big data programming, and how Big Data systems are now mainly deployed in cloud environments. We cover MapReduce programming in both Apache Hadoop and Apache Spark.

The next three weeks focus on cloud storage services. We introduce cloud object storage systems, virtual hard drives (block storage), and virtual archival storage options, including a discussion of Dropbox. This course also introduces large-scale data

5. Pre-requirements for this course (if any):

SE2301 - Software Modelling and Analysis

6. Co-requisites for this course (if any):

N/A

7. Course Main Objective(s):



To provide a comprehensive understanding of cloud computing principles, architectures, and technologies, including foundational cloud models (IaaS, PaaS, SaaS), networking and serverless computing, scalable data storage and processing, big data frameworks, analytics, machine learning in the cloud, and container orchestration, while exploring current trends and future developments in the field.

2. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	60	100%
2	E-learning	0	0
3	Hybrid <ul style="list-style-type: none"> • Traditional classroom • E-learning 	0	0
4	Distance learning	0	0

3. Contact Hours (based on the academic semester)

No	Activity	Contact Hours
1.	Lectures	30
2.	Laboratory/Studio	30
3.	Field	0
4.	Tutorial	0
5.	Others (specify)	0
Total		60

B. Course Learning Outcomes (CLOs), Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Code of PLOs aligned with the program	Teaching Strategies	Assessment Methods
1.0	Knowledge and understanding			
1.1	- Understand the fundamental concepts of cloud computing and service models (IaaS, PaaS, SaaS).	K\	Lectures, Exercises	Quizz, Lab, Assignment, Project, Exam



Code	Course Learning Outcomes	Code of PLOs aligned with the program	Teaching Strategies	Assessment Methods
1.2	- Explain the principles of networking (IP, HTTP, REST, VPC) and their role in cloud infrastructure.	K1	Lectures, Exercises	Quizz, Lab, Assignment, Project, Exam
1.3	- Identify key tools and frameworks for big data processing (MapReduce, Hadoop, Spark, HDFS).	K1	Lectures, Exercises	Quizz, Lab, Assignment, Project, Exam
2.0	Skills			
2.1	- Design and deploy cloud-based solutions using appropriate service models and storage techniques.	S2	Lectures, Exercises	Quizz, Lab, Assignment, Project, Exam
2.2	- Implement serverless applications and real-time data streaming pipelines in the cloud.	S1	Lectures, Exercises	Quizz, Lab, Assignment, Project, Exam
2.3	- Optimize data storage and analytics workflows using tools like Spark SQL, HIVE, and data lakes.	S1	Lectures, Exercises	Quizz, Lab, Assignment, Project, Exam
3.0	Values, autonomy, and responsibility			
3.1	Appreciate the role of cloud computing in driving innovation and efficiency across industries.	V1	Lectures, Exercises	Quizz, Lab, Assignment, Project, Exam
3.2	Embrace the importance of ethical practices in cloud computing, focusing on security and privacy.	V1	Lectures, Exercises	Quizz, Lab, Assignment, Project, Exam

C. Course Content

No	List of Topics	Contact Hours
1.	Course Orientation + Cloud Computing Foundations, Cloudonomics, and cloud models: IaaS, PaaS, SaaS	4
2.	Networking, IP, HTTP, REST, VPC	4





3.	Serverless Computing	4
4.	Big Data Programming: MapReduce model, Hadoop, YARN, Spark and HDFS	4
5.	Data Storage Part 1: Cloud-based Storage (Object, filesystem, archival)	4
6.	Data Storage Part 2: Cloud-based Databases and Data warehousing (RDBMS, NewSQL, NoSQL)	4
7.	Data Storage Part 3: Scalable Data Storage (Caching, HBase, Spark SQL, HIVE, Queues, PubSub systems)	4
8.	Cloud Based Analytics: Data Cube, Columnar storage, Data Lake	4
9.	Graph Processing, Graph Databases and Machine Learning in the Cloud	8
10.	Fast Data Processing and Streaming in the Cloud	4
11.	Virtualization, Containers and Docker	4
12.	Container Orchestration Part 1: Docker Swarm, ECS and ACI	4
13.	Container Orchestration Part 2: Kubernetes	4
14.	Future Developments in the Cloud, Course Wrap-up	4
Total		60

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Assignments and Quizzes	2-14	15
2.	Projects	2-14	15
3.	Practicals	2-14	10
4.	Mid Term	7	20
5.	Final Exam	16-17	40

*Assessment Activities (i.e., Written test, oral test, oral presentation, group project, essay, etc.).

E. Learning Resources and Facilities

1. References and Learning Resources

Essential References	<ul style="list-style-type: none"> Kleppmann, M. (2017). <i>Designing data-intensive applications: The big ideas behind reliable, scalable, and maintainable systems</i>. O'Reilly Media. ISBN 978-1449373320.
Supportive References	
Electronic Materials	
Other Learning Materials	





2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	Traditional Classroom
Technology equipment (projector, smart board, software)	Multimedia Projector
Other equipment (depending on the nature of the specialty)	N/A

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	Students	Direct, Indirect
Effectiveness of Students' assessment	Faculty, Peer reviewer	Direct, Indirect
Quality of learning resources	Faculty, Course coordinator	Direct, Indirect
The extent to which CLOs have been achieved	Course coordinator, Program management committee	Direct
Other		

Assessors (Students, Faculty, Program Leaders, Peer Reviewers, Others (specify))

Assessment Methods (Direct, Indirect)

G. Specification Approval

COUNCIL /COMMITTEE	SOFTWARE ENGINEERING DEPARTMENT COUNCIL
REFERENCE NO.	THE 17 TH MEETING FOR THE ACADEMIC YEAR 1446H
DATE	22/04/2025

