



Course Specification

(Postgraduate Programs)

Course Title: Edge and Cloud Computing

Course Code: CE6100

Program: Master of Science in Computer Engineering

Department: Computer and Network Engineering

College: College of Computing

Institution: Umm Al-Qura University

Version: 1.0

Last Revision Date: 12/4/2025

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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 |
| B. | ☒ Required in the Intelligent Systems Track and the Embedded Systems and IoT Track | | ☒ Elective in all other tracks | |

3. Level/year at which this course is offered: (Level 2)

4. Course General Description:

This graduate-level course provides a comprehensive examination of the design, deployment, and management of cloud and edge computing infrastructures. Students will begin by exploring the fundamental motivations behind cloud adoption, including elasticity, scalability, and cost efficiency. Building on these foundations, the course delves into different models of cloud services, various cloud providers, and the advantages and trade-offs associated with each. Students will then progress to edge cloud computing concepts, focusing on hybrid architectures, stakeholder roles, and end-to-end lifecycle management. Special emphasis will be placed on resource provisioning, runtime control, and continuous monitoring and telemetry for intelligent decision-making, resilience, and security. Finally, the course addresses the evolving landscape of cloud and edge technologies, preparing students to understand and influence current and emerging trends in this rapidly growing domain.

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

N/A

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

N/A

7. Course Main Objective(s):

The objective of the course is to introduce the students to edge and cloud computing paradigms. The students will learn about the major components of edge computing architectures. The course provides a hands-on experience on building edge clouds infrastructure. The students will acquire the ability to analyze cloud behavior and fixing issues.



2. Teaching Mode: (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	45	100%
2	E-learning		
3	Hybrid - Traditional classroom - E-learning		
4	Distance learning		

3. Contact Hours: (based on the academic semester)

No	Activity	Contact Hours
1.	Lectures	45
2.	Laboratory/Studio	
3.	Field	
4.	Tutorial	
5.	Others (specify).....	
	Total	45

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	Explain the principles of edge cloud and hybrid cloud architectures, including stakeholder roles and responsibilities, as well as the interplay between core and edge infrastructures.	K2	Lectures	Written report, assignments, and project
1.2	Demonstrate a thorough understanding of the motivations for cloud computing, the key characteristics of elastic computing,	K1 and K2	Lectures	Written report, assignments, and project



Code	Course Learning Outcomes	Code of PLOs aligned with the program	Teaching Strategies	Assessment Methods
	and the distinctions among private, public, hybrid, and community clouds.			
1.3	Identify and compare major cloud providers, their service offerings, and how architectural decisions impact cost, performance, and scalability.	K1	Lectures	Written report, assignments, and project
2.0	Skills			
2.1	Apply best practices to provision both virtual and physical resources effectively, ensuring systems meet performance requirements under dynamic workloads.	S1	Tutorials and projects	Project report and oral presentation
2.2	Develop strategies for continuous integration and deployment (CI/CD), updating and evolving running systems while maintaining service availability and integrity.	S1	Tutorials and projects	Project report and oral presentation
2.3	Utilize advanced monitoring and telemetry tools to assess system health, diagnose performance issues, and implement runtime control mechanisms for optimal system reliability and security.	S4	Tutorials and projects	Project report and oral presentation
2.4	Present state-of-the-art techniques from the research literature in cloud and edge computing	S3	Discussion	Oral presentation
3.0	Values, autonomy, and responsibility			
3.1	Embrace the principles of DevOps and a culture of continuous learning, recognizing that advanced cloud and edge operations demand ongoing adaptation to evolving technology landscapes.	V1	Discussion, brainstorming, and self learning	Written report, oral presentation, and project

C. Course Content:

No	List of Topics	Contact Hours
1.	The Cloud Computing Book: Motivations for cloud	2
2.	The Cloud Computing Book: Elastic computing and its advantages	2
3.	The Cloud Computing Book: Types of clouds and cloud providers	2
4.	Edge Cloud Operations: Introduction	2
5.	Edge Cloud Operations: Cloud Computing Architectures: Edge Cloud, Hybrid Cloud, Stakeholders, Control and Management, DevOps	6
6.	Edge Cloud Operations: Resource Provisioning: the process of bringing virtual and physical resources online	6
7.	Edge Cloud Operations: Lifecycle Management: updating and evolving a running system over time	6
8.	Edge Cloud Operations: Runtime Control	6
9.	Edge Cloud Operations: Monitoring and Telemetry: monitor system behavior, evaluate performance, make informed provisioning decisions, respond to failures, identify attacks, and diagnose problems	6
7.	Current Trends in Edge and cloud computing	7
Total		45

D. Students Assessment Activities:

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Homeworks and assignments		30%
2.	Projects		50%
3.	Presenting research papers		20%

*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	The Cloud Computing Book: The Future of Computing Explained by Douglas Comer, 1st Edition, Chapman and Hall/CRC, 2021, ISBN-10: 0367706806, ISBN-13: 978-0367706807
	Edge Cloud Operations: A Systems Approach by Larry Peterson, Scott Baker, Andy Bavier, Zack Williams, and Bruce Davie, Systems Approach LLC, 2022, ISBN-10: 1736472127, ISBN-13: 978-1736472125 https://ops.systemsapproach.org https://github.com/SystemsApproach/ops



	The instructor provides recent research papers in the area of edge and cloud computing for students to present during class. Might include papers from ACM SoCC and IEEE Transactions on Cloud Computing.
Supportive References	The instructor may provide as per requirements.
Electronic Materials	The instructor may provide as per requirements.
Other Learning Materials	The instructor may provide as per requirements.

2. Educational and Research Facilities and Equipment Required:

Items	Resources
Facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	Classrooms
Technology equipment (Projector, smart board, software)	Projector
Other equipment (Depending on the nature of the specialty)	The instructor may provide as per requirements.

F. Assessment of Course Quality:

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	Students, Program Leaders	Indirect
Effectiveness of students' assessment	Program Leaders	Direct
Quality of learning resources	Students, Faculty	Indirect
The extent to which CLOs have been achieved	Students, Faculty, Program Leaders	Direct and Indirect
Other		

Assessor (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify))

Assessment Methods (Direct, Indirect)

G. Specification Approval Data:

COUNCIL /COMMITTEE	Computer and Network Engineering Department Council
REFERENCE NO.	The 18 th Session Of The Academic Year 1446
DATE	15/4/2025

