Course Specification

(Postgraduate Programs)

Course Title:	Distributed Systems
Course Code:	CE6028
Program:	Master of Science in Computer Engineering
Department:	Computer and Network Engineering
College:	College of Computing
Institution:	Umm Al-Qura University
Version:	2.0
Last Revision Date:	17/5/2026

Table of Contents

A. General information about the course:

1. Course Identification:

1. Credit hours: (3)				
2. Course type				
A.	☐University	☐ College	☒ Department	☐Track
B.	☒ Required		☐Elective	
3. Level/year at which this course is offered: (Level 2)				
4. Course General Description:				

This course focuses on advanced theoretical and practical aspects of distributed systems, emphasizing scalability, consistency, and fault tolerance in real-world systems. It provides an in-depth exploration of cutting-edge research and techniques in distributed computing, preparing students to design and analyze robust distributed systems. The course covers the following key topics:

- Advanced Concepts in Distributed Systems:
- Architecture of distributed systems
- Communication and Networking in Distributed Systems
- Interprocess Communication
- Distributed Algorithms
- Fault tolerance and recovery in distributed systems and algorithms
- Distributed File Systems

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):

1. Understand the design principles in distributed systems and the architectures for distributed systems.
2. Apply various distributed algorithms related to clock synchronization, concurrency control, deadlock detection, load balancing, voting etc.

3. Analyze fault tolerance and recovery in distributed systems and algorithms for the same.
4. Analyze the design and functioning of existing distributed systems and file systems.
5. Implement different distributed algorithms over current distributed platforms

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 design principles in distributed systems and the architectures for distributed systems.	K1 and K2	Lectures, and reading assignments	Written exams, assignments, projects and oral presentations

Code	Course Learning Outcomes	Code of PLOs aligned with the program	Teaching Strategies	Assessment Methods
2.0	**Skills**			
2.1	Analyze fault tolerance and recovery in distributed systems and algorithms.	S4	Lectures, project, discussions, tutorials	Written exams, assignments, projects and oral presentations
2.2	Analyze the design and performance of existing distributed systems.	S4		
2.3	Implement different distributed algorithms over current distributed platforms	S1		
2.4	Apply various distributed algorithms related to clock synchronization, concurrency control, deadlock detection, load balancing, voting etc	S2		
3.0	**Values, autonomy, and responsibility**			
3.1	Work in a team to implement a project in distributed systems	V2	Group assignments and projects	Group assignments and projects

C. Course Content:

No	List of Topics	Contact Hours
1.	Introduction and types of distributed systems	3
2.	Architecture of distributed systems	6
3.	Processes in Distributed Systems	6
4.	Communication and Networking in Distributed Systems	6
5.	Naming in Distributed Systems	6
6.	Coordination and synchronization algorithms	6

7.	Consistency and replaction	4
8.	Fault tolerance and recovery in distributed systems	6
9.	Modern distributed systems	2
Total		**45**

D. Students Assessment Activities:

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Assessment through written tests/quizzes	3, 8, 16	40
2.	Assessment through assignments	11	30
3.	Assessment through projects	14	30

*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	M. Van Steen, A.S. Tanenbaum, Distributed Systems, Third Edition, CreateSpace Independent Publishing Platform, 2017.
Supportive References	Ajay D. Kshemkalyani and Mukesh Singhal, Distributed Computing: Principles, Algorithms and Systems, Cambridge University Press, 2011
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 18th Session Of The Academic Year 1446**
DATE	**15/4/2025**