Course Specification
(Bachelor)

Course Title:	ionCloud Computing & Virtualizat
Course Code:	**4 CNET (CNET 477 Elective-1)
Program:	Computer & Network Engineering
Department:	Electrical & Electronics Engineering
College:	Engineering & Computer Science
Institution:	Jazan University
Version:	3
Last Revision Date:	20 may 2024

Table of Contents

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: (Level 8/ Year 4)					
4. Course General Description:					
Brief history of cloud computing, advantages, cloud characteristics and challenges of cloud computing are explained. Cloud delivery, cloud deployment models, roles and boundaries are discussed. Understanding of various architectural models of cloud computing, the concepts of virtualization and cloud orchestration. Fundamental cloud security concepts, security threats, attacks and cloud architectures are explained.					
5. Pre-requirements for this course (if any)**:**					
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6. Co-requisites for this course (if any)**:**					
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7. Course Main Objective(s):					
1. Understand basic concepts related to cloud computing technologies 2. Explain different cloud delivery & deployment models. 3. Compare the operation, implementation and performance of cloud computing systems. 4. Get familiar with cloud virtualization, cloud storage, data management and data visualization. 5. Identify security implications in cloud computing.					

2. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	60	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**	26
2.	**Laboratory/Studio**	26
3.	**Field**	-
4.	**Tutorial**	-
5.	**Others (specify)**	8
Total		60

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

Code	Course Learning Outcomes	Code of PLOs aligned with program	Teaching Strategies	Assessment Methods
1.0	**Knowledge and understanding**			
1.1	**Explain** the basic concepts, terminologies, strengths, and limitations of Cloud Computing.	**K1**	➢ Lectures ➢ Classroom discussions ➢ Lab exercises.	➢ Assignment 1 ➢ Mid-Term Exam ➢ Final Exam
1.2	**Describe** various models, current	**K3**	➢ Lectures ➢ Classroom discussions ➢ Lab exercises	➢ Assignment 1 ➢ Mid-Term Exam

Code	Course Learning Outcomes	Code of PLOs aligned with program	Teaching Strategies	Assessment Methods
	developments in Cloud Computing.			➢ Final Exam
2.0	**Skills**			
2.1	**Apply** virtualization technology, scaling and storage mechanisms using latest tools.	**S2**	➢ Lectures ➢ Classroom discussions ➢ Lab exercises	➢ Assignment 1 ➢ Mid-Term Exam ➢ Final Exam ➢ Lab Exam
2.2	**Analyze** the cloud security threats and its agents in cloud environment	**S2**	➢ Lectures ➢ Classroom discussions ➢ Lab exercises	➢ Assignment 2 ➢ Mid-Term Exam ➢ Final Exam ➢ Lab Exam
2.3	**Demonstrate** various cloud architectures and specialized cloud mechanisms.	**S5**	➢ Lectures ➢ Classroom discussions ➢ Lab exercises	➢ Assignment 2 ➢ Mid-Term Exam ➢ Final Exam ➢ Lab Exam
2.4	**Communicate** effectively in presentations to demonstrate their work.	**S4**	➢ Classroom discussions ➢ Lab exercises	➢ Assignments ➢ Case study / Mini Projects
3.0	**Values, autonomy, and responsibility**			
3.1	**Perform** Self-study and self-assessment through assignments and case studies.	**V2**	➢ Classroom discussions ➢ Lab exercises	➢ Assignments ➢ Case study / Mini Projects

C. Course Content

No	List of Topics	Contact Hours
1.	**CHAPTER 1: Understanding Cloud Computing** **1.1 Origins and Influences** ● Definitions ● Technology Innovations	6T+4P

	● Clustering ● Grid Computing Virtualization **1.2 Basic Concepts and Terminology** ● Scaling ● Horizontal scaling ● Vertical Scaling **1.3 Goals and Benefits** ● Reduced Investments and Proportional ● Costs Increased Scalability ● Increased Availability and Reliability **1.4 Risks and Challenges** ● Increased Security Vulnerabilities ● Reduced Operational Governance Limited Portability Between Cloud Providers	
2.	**CHAPTER 2: Fundamental Concepts and Models** **2.1 Roles and Boundaries** ● Cloud Provider ● Cloud Consumer ● Cloud Service Owner ● Cloud Resource Administrator ● Additional Roles ● Organizational Boundary ● Trust Boundary **2.2 Cloud Characteristics** ● On-Demand Usage ● Ubiquitous Access ● Multitenancy ● Elasticity ● Measured Usage Resiliency **2.3 Cloud Delivery Models** ● Infrastructure-as-service ● Platform-as-a-Service ● Software-as-a-Service **2.4 Cloud Deployment Models** ● Public Clouds ● Community Clouds ● Private Clouds ● Hybrid Clouds	6T+6P
3.	**CHAPTER 3: Cloud-Enabling Technology** **3.1 Data Center Technology** ● Automation ● Remote Operation Management ● Data Center **3.2 Virtualization Technology** ● Hardware Independence ● Operating System-Based Virtualization ● Hardware-Based Virtualization	4T+4P

	3.2 Web Technology ● Basic Web Technology ● Web Applications **3.3 Cloud Infrastructure Mechanisms** ● Cloud usage Monitor Mechanisms ● Monitoring agent ● Resource agent ● Polling agent	
4.	**CHAPTER 4: Fundamental Cloud Security** **4.1 Basic Terms and Concepts** ● Confidentiality ● Integrity ● Authenticity ● Availability ● Threat ● Vulnerability ● Risk ● Security Controls **4.2 Threat Agents** ● Anonymous Attacker ● Malicious Service Agent ● Trusted Attacker ● Malicious Insider **4.3 Cloud Security Threats** ● Traffic Eavesdropping ● Malicious Intermediary ● Denial of Service	4T+4P
5.	**CHAPTER 5: Specialized Cloud Mechanisms** ● Automated Scaling Listener ● Load Balancer ● SLA Monitor ● Pay-Per-Use Monitor ● Audit Monitor ● Failover System ● Active-Active ● Active-Passive ● Hypervisor ● Resource Cluster	3T+4P
6.	**CHAPTER 6: Fundamental Cloud Architectures** ● Workload Distribution Architecture ● Resource Pooling Architecture ● Dynamic Scalability Architecture ● Elastic Resource Capacity Architecture ● Service Load Balancing Architecture ● Cloud Bursting Architecture	3T+4P

	Review of all course contents	2T + 2P
	Final Exam	2T+2P
Total		**60**

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Assignments	4th week	10%
2.	Midterm Exam	7th -8th week	20%
3.	Mini Project	13th week	10%
4.	Lab Exam	13th week	20%
.5	Final Theory Exam	14th week	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	1. Cloud Computing 2nd Edition by Daniel Kirsch and Judith Hurwitz, Published by: John Wiley & Sons, 2020, ISBN 978-1119546658. 2. Cloud Computing: Concepts, Technology & Architecture ,Pearson Service Technology Series from Thomas Erl, 1st Edition, 2013, ISBN-13: 978-0133387520
Supportive References	1. Cloud Native Architectures, by Tom Laszewski, Kamal Arora, Erik Farr and Piyum Zonooz, 2018, ISBN 978-1787280540
Electronic Materials	• https://lms.jazanu.edu.sa/webapps/login/ (Blackboard) • www.tutorialspoint.com • www.cloudschool.com/courses
Other Learning Materials	-

2. Required Facilities and equipment

Items	Resources
facilities	Classroom equipped with projector and whiteboard and sufficient seating arrangements

Items	Resources
(Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	Lab with software installed and individual computer terminal for each student.
Technology equipment (projector, smart board, software)	Whiteboards and projectors for classroom and lab Following software for lab work:
Other equipment (depending on the nature of the specialty)	Servers for demonstrating virtualization concepts are required

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	Students, HOD	Indirect, Direct
Effectiveness of Students assessment	CT / CC / HoD	Direct
Quality of learning resources	TL / CRC / PQC	Indirect, Direct
The extent to which CLOs have been achieved	CT / CC /TL / PQC	Indirect, Direct
Other	-	-

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

Assessment Methods (Direct, Indirect)

G. Specification Approval

COUNCIL /COMMITTEE	**DEPARTMENT COUNCIL**
REFERENCE NO.	**ENGCSEEE2411**
DATE	**10/10/24**