



## Course Specifications

<b>Course Title:</b>	Cluster and Cloud Computing
<b>Course Code:</b>	514 PMDS-3
<b>Program:</b>	Professional Master of Data Science
<b>Department:</b>	Computer Science
<b>College:</b>	Collage of Computer Science and Information Systems
<b>Institution:</b>	Najran University

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## A. Course Identification

<b>1. Credit hours:</b>
<b>2. Course type</b>
a. University <input type="checkbox"/> College <input type="checkbox"/> Department <input checked="" type="checkbox"/> Others <input type="checkbox"/>
b. Required <input checked="" type="checkbox"/> Elective <input type="checkbox"/>
<b>3. Level/year at which this course is offered: Year 2/ Level 6</b>
<b>4. Pre-requisites for this course (if any):</b>
<b>5. Co-requisites for this course (if any):</b>

### 6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	50	100%
2	Blended		
3	E-learning		
4	Distance learning		
5	Other		

### 7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	Lecture	30
2	Laboratory/Studio	20
3	Tutorial	
4	Others (specify)	
	<b>Total</b>	<b>50</b>

## B. Course Objectives and Learning Outcomes

### 1. Course Description

The course aims to develop a deep understanding of the concept of cluster and cloud computing and the issues associated with cloud architecture management from aspects of business structure to software engineering approach, design, development, critical analysis and problem-solving skills in cloud systems projects.

### 2. Course Main Objective

After successful completion of this course students should be able to:

- Explain the fundamental concepts of cluster and cloud computing.
- Know how to distinguish between different cloud technologies.
- Construct a private Cloud on a PC cluster with three or more machines and participate in the design, assembling, configuring, and benchmarking of the private cloud system.
- Be familiar with the recent improvements in different cloud computing environments term of design, performance, and security.

### 3. Course Learning Outcomes

CLOs		Aligned PLOs
1	<b>Knowledge and Understanding</b>	
1.1	Describe the main concepts and practices about the Cluster and Cloud Computing, and differentiate between similar technologies.	K1, K2
1.2	Explain cloud-enabling technologies, cloud mechanisms, and cloud architectures.	K1, K2
2	<b>Skills :</b>	
2.1	Build a cloud system on a PC cluster and implement different techniques to build the cloud system	S1, S2, S3
2.2	Apply cloud computing software to solve real problems.	S2,S3
3	<b>Values:</b>	
3.1	Solve problems and exhibit self-learning abilities in distributed and cloud computing.	C1,C2
3.2		
3.3		
3...		

### C. Course Content

No	List of Topics	Contact Hours
1	Introduction of Cloud Computing	5
2	Cloud Service Models: SaaS, PaaS, and IaaS	8
3	Using Public Cloud Amazon EC2 (workshop)	8
4	MapReduce and Hadoop File System	8
5	Xen, Hadoop, and Spark Installation (workshop)	2
6	Virtualization Techniques (Xen, VMWare, KVM, LXC)	7
7	Apache Spark	7
8	Cluster Networking (ARP, VLAN/VXLAN, NAT)	7
9	Data Center Networking in Facebook and Google	4
10	Software Defined Network (SDN)	4
<b>Total</b>		<b>50</b>

### D. Teaching and Assessment

#### 1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.0	<b>Knowledge and Understanding</b>		
1.1	Understand the main concepts and practices about the Cluster and Cloud Computing, and differentiate between similar technologies.	TS-1: Relate Course Learning Outcomes (CLOs) to the topics  TS-2: Lectures: using PPT presentation and	Assignment, Midterm Exam Project and presentation
...			

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
		<p>other software to address verbally in front of students the concepts associated with examples with taking help of writing on the board as needed.</p> <p>TS-3: Communication: Given to students the main requirements of the project's reports and presentation</p> <p>TS-4: Encourage students to read different journals, seminars or websites at their leisure time to have better understanding about the current developments in cluster and cloud computing Systems.</p> <p>TS-5: Recall the topics of last lecture and the critical issues based on different topics, which certainly helps students to recall memory frequently and store that topic in their memory for long term</p>	
<b>2.0</b>	<b>Skills</b>		
2.1	Build a cloud system on a PC cluster and implement different techniques to build the cloud system	<p>TS-1: Relate Course Learning Outcomes (CLOs) to the topics</p> <p>TS-2: Lectures: using PPT presentation and other software to address verbally in front of students the concepts associated with examples with taking help of writing on the board as needed.</p> <p>TS-3: LAB Work: Every student in the lab is using a separate PC which is connected to a cluster nodes.</p>	Assignment, Midterm Exam, Lab Assessment

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
		Practically showing them how to create a cloud system. TS-4: Tutorial: In the tutorials, we ask students to solve some problems in front of each other's and give them some comments and the right answers. TS-5: Communication: Given to students the main requirements of the project's reports and presentation TS-6: Recall the topics of last lecture and the critical issues based on different topics, which certainly helps students to recall memory frequently and store that topic in their memory for long term.	
3.0	<b>Values</b>		
3.1			
3.2			
...			

## 2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Project, presentation and Quiz	Week 4, 11 and 10	15%
2	Mid Term	Week 7 <sup>th</sup>	20%
4	Lab Activity	Weeks 1-10	5%
5	Lab Assessment 1	Week 10 <sup>th</sup>	10%
6	Final Lab Exam	11th week	10%
7	Final Theory Exam	12 or 13th week	40%
8	Total		100%

\*Assessment task (i.e., written test, oral test, oral presentation, group project, essay, etc.)

## E. Student Academic Counseling and Support

### Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice :

- Each faculty member should set up to 10 hours weekly as office hours in their time tables.
- Academic advisors are assigned to advice and support students.
- Instructors set specific office hours for each course he is teaching. The teaching load of staff members are available in the front of their offices.
- Instructors arrange and provide tutorials to students.

## F. Learning Resources and Facilities

### 1. Learning Resources

<b>Required Textbooks</b>	Erl Thomas, Puttini Ricardo, and Mahmood Zaigham. Cloud Computing: Concepts, Technology & Architecture. (13th Edition).
<b>Essential References Materials</b>	
<b>Electronic Materials</b>	
<b>Other Learning Materials</b>	N/A

### 2. Facilities Required

Item	Resources
<b>Accommodation</b> (Classrooms, laboratories, demonstration rooms/labs, etc.)	<ul style="list-style-type: none"> <li>Lecture Rooms with appropriate number of seats, Projector with Screen and a white board or a smart board.</li> <li>All the computers in all the laboratories should be installed with the latest version of the required software.</li> </ul>
<b>Technology Resources</b> (AV, data show, Smart Board, software, etc.)	<ul style="list-style-type: none"> <li>One PC and one projector and data show in the lecture room</li> <li>Number of PCs according to strength of students in the lab room</li> </ul>
<b>Other Resources</b> (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	MySQL

## G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Effectiveness of Teaching	Student	Online course survey: By the end of each semester, students give their opinions about many factors in the course. They give feedback about the teaching strategies, assessment methods, textbooks, instructor, etc.

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Effectiveness of Teaching	Student	Feedback about Course Learning Outcomes (CLOs): A course survey is distributed to students to take their opinions about the CLOs.
Assessment	Course coordinator	Checks all exams and make sure that they are related to CLOs and appropriate for the course

**Evaluation areas** (e.g., Effectiveness of teaching and assessment, Extent of achievement of course learning outcomes, Quality of learning resources, etc.)

**Evaluators** (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify))

**Assessment Methods** (Direct, Indirect)

## H. Specification Approval Data

<b>Council / Committee</b>	Computer Science Departmental Council
<b>Reference No.</b>	14440203-0185-00002
<b>Date</b>	1st Sep, 2022