Republic of Yemen
Minster of Higher Education
and Scientific Research
Sana'a University
Faculty of Computer & IT
Quality Assurance Unit

الجمهورية اليمنية
وزارة التعليم العالي والبحث العلمي
جامعة - صنعاء
كلية الحاسوب وتكنولوجيا المعلومات
وحدة ضمان الجودة

Course Specification of Distributed and Cloud Computing

Course No (.....)

2020/2021

Head of Department	Vise Dean for Qulity Assurance	Dean of the Faculty	Dean of Development center and Quality Assurance
Assoc. Prof. Mansour N. Ali	Dr. Anwar Al-Shamiri	Dr. Nagi Al-Shibani	Assoc. Prof. Dr.Huda Al.Emad

Rector of Sana'a University

Prof. Dr. Qassim Mohammed Abbas

I. Course Identification and General Information:

1	**Course Title:**	Distributed and Cloud Computing				
2	**Course Code & Number:**					
3	**Credit hours:**	C.H				TOTAL
		Th.	Seminar	Pr	Tr.	
		2	-	2	-	3
4	**Study level/ semester at which this course is offered:**	2nd Semester - 3th Level				
5	**Pre –requisite (if any):**	Operating Systems, Computer Networks				
6	**Co –requisite (if any):**	None				
7	**Program (s) in which the course is offered:**	Information Technology				
8	**Language of teaching the course:**	English/Arabic				
9	**Study System**	Term based system				
10	**Mode of delivery:**	Full Time				
11	**Location of teaching the course:**	Faculty of Computer and Information Technology				
12	**Prepared By:**	Dr. Anwar Al-Shamiri				
13	**Date of Approval**					

Head of Department	Vise Dean for Qulity Assurance	Dean of the Faculty	Dean of Development center and Quality Assurance
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II. Course Description:

This course explores the principles of distributed computing systems with different skills that enable students to understand the goals and architectures of distributed computing, analyze, design, and implement a distributed system taking into account the most important design issues and impact criteria. It explores different types of distributed systems including grids, clusters, overlay networks, and cloud. As an example of distributed systems, the course covers main topics of cloud computing including the cloud converging technologies, service models, virtualization, cloud storage, cloud frameworks and security. Moreover, cloud computing technologies such as Hadoop, MapReduce, NoSQL, Hive will be addressed. The course will be covered theoretically in the class and practically in the labs. Basic knowledge of computer networking and systems as well as Internet technology is required to satisfy the objectives of the course.

III.	Course Intended learning outcomes (CILOs) of the course	Referenced PILOs
a.1	Show understanding of the concepts, components, and issues of distributed and cloud computing	**A4**
a.2	Explain cloud enabling technologies, cloud mechanisms, service models, deployment models, cloud architectures, and security.	
b.1	Compare the differences between various distributed computing middleware and their communication mechanisms.	**B3 , B5**
b.2	Design a distributed computing system using middleware where appropriate.	
c.1	Build a private cloud computing environment to demonstrate the cloud functions.	**C1, C5**

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c.2	Implement distributed software and deploy this software on the cloud based on a given specification.	
d.1	Negotiate and communicate effectively with work environment in both written and oral formats.	**D1, D4**
d.2	Exhibit self-learning abilities in distributed and cloud computing.	

(A) Alignment Course Intended Learning Outcomes of Knowledge and Understanding to Teaching Strategies and Assessment Strategies:

Course Intended Learning Outcomes	Teaching strategies	Assessment Strategies
a1. Show Understanding of the concepts, components, and issues of distributed and cloud computing.	Lectures, presentation, Class discussions	Written examinations, Quizzes.
a2. Explain cloud enabling technologies, cloud mechanisms, service models, deployment models, cloud architectures, and security.	Lectures, presentation, Class discussions.	Written examinations, Quizzes

(B) Alignment Course Intended Learning Outcomes of Intellectual Skills to Teaching Strategies and Assessment Strategies:

Course Intended Learning Outcomes	Teaching strategies	Assessment Strategies
b1. Compare the differences between various distributed computing middleware and their communication mechanisms.	Lectures Class discussions.	Assignments, Written examinations, Presentations.

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	Presentations	
b2.Design a distributed cloud-based system using appropriate middleware and programming environment.	Lectures Class Discussions.	Assignments, Written examinations, Presentations.

© Alignment Course Intended Learning Outcomes of Professional and Practical Skills to Teaching Strategies and Assessment Strategies:

Course Intended Learning Outcomes	Teaching strategies	Assessment Strategies
c1. Build a private cloud computing environment to demonstrate the cloud functions.	Lab experiment, Problems Solving	Quizzes, Written examinations, Project assignment
c2. Implement distributed software and deploy this software on the cloud based on a given specification	Lab experiment, Problems Solving	Quizzes, Exams, Project assignment

(D) Alignment Course Intended Learning Outcomes of Transferable Skills to Teaching Strategies and Assessment Strategies:

Course Intended Learning Outcomes	Teaching strategies	Assessment Strategies
d1. Negotiate and communicate effectively with work environment in both written and oral formats.	Group discussions work. Seminar/presentation	Technical or practical reports /Presentations
d2.Exhibit self-learning abilities in distributed and cloud computing.	Guided individual reading.	Technical or practical reports /Presentations

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	Individual and group project work.	

IV. Course Content:

A – Theoretical Aspect:

Order	Topic List / Units	Learning Outcomes	Sub Topics List	Number of Weeks	Contact hours
1	Introduction to Distributed and Cloud Computing	a1,a2,b1	- Characterization of Distributed systems. - Technologies for Network-Based Systems: multi-core and multi-threading; - Distributed and Cloud Computing Models: client-server; clusters; grids; peer-to-peer.	2	4
2	Enabling Technologies for Building Distributed Systems	a2,b1	- Socket Programming: datagram sockets; stream-mode sockets - Remote Method Invocation and XML-RPC - Extensible Markup Language (XML): XML markup; XML namespaces; XML schema	2	4
3	Service-Oriented Architecture for Distributed Computing	a1,a2,b2, c2	- Service and Service-Oriented Architectures - Web Services: simple object access protocol (SOAP); building web services with SOAP; web services description language (WSDL); Web service implementation	3	6

			- RESTful Web Services: architectural principles of REST; REST vs. SOAP; RESTful		
5	Cloud Computing Architecture	a2,b2,c1,c2,d1,d2	- Service Models: public clouds; private clouds; hybrid clouds - Layer and Types of Clouds: IaaS; PaaS; SaaS	1	2
6	Virtualization	a2,c1,d1,d2	- Virtualization: Level of virtualization; virtualization support at the OS level; middleware support; virtualization of CPU, memory, and i/o devices; virtualization tools	1	2
7	Cloud Programming Environments	a2,b2,c2,d1,d2	- MapReduce, Hadoop and Big Data - NoSQL data stores. Table-based (Google BigTable), key-based (Amazon Dynamo), and Cassandra. The Hector API.	2	4
8	Cloud Security and Trust Management.	a2,b1	- Cloud security stack - Cloud Security Defense Strategies - Distributed Intrusion/Anomaly Detection - Data and Software Protection Techniques	2	4
9	Ubiquitous computing and Internet of things	a2,b1,c1,c2	- Enabling Technologies for the Internet of Things - Architectures of the IoT - Mobile cloud computing and cloudlets.	1	2
Number of Weeks /and Units Per Semester				**14**	28

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B - Practical Aspect: (if any)

Order	Tasks/ Experiments	Number of Weeks	Contact Hours
1	Multi-Threading, Programming Socket RMI, RPC	3	6
2	Web Services & Xml	2	4
4	Virtualization	2	4
5	Design a Private cloud	3	6
6	MapReduce	2	4
7	HIVE and NoSQL	2	4
	Number of Weeks /and Units Per Semester	14	28

V. Teaching strategies of the course:

- Lectures
- Class discussions
- Lab experiments
- Problems Solving
- Guided individual reading.
- Individual and group project work
- Group discussions work
- Seminar/presentation

VI. Assignments:

No	Assignments	Aligned CILOs(symbols)	Week Due	Mark
1	Chatting Application using (RPC /RMI)	b1,c2,d1,d2	4th	4
2	Write a webservice to calculate the currency exchange Rate	b1,c2,d1,d2	7th	3
4	Write a MapReduce application for words indexing in a file	b2,c1,c2,d1,d2	13th	3
Total				10

VII. Schedule of Assessment Tasks for Students During the Semester:

No.	Assessment Method	Week Due	Mark	Proportion of Final Assessment	Aligned Course Learning Outcomes
1	Assignments	4th, 7th,13th	10	10%	b2, bc1, c2,d1,d2
2	Projects (single\group)	12th	5	5%	b2, b1,c1,c2,d1,d2
3	Mid Term Exam practical	6th	5	5%	b1,b2,c1,c2,d1
4	Mid Term Exam Theoretical	8th	10	10%	a1,a2,b1,b2
5	Final Exam (practical)	15th	10	10%	a1,a2,b1,b2,c1,c2
6	Final Exam (theoretical)	16th	60	60%	a1,a2,b1,b2,c1,c2
	Total		100	100%	

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VIII. Learning Resources:

1- Dan C. Marinescu, 2017, Cloud Computing: Theory and Practice,2nd Ed ,Morgan Kaufmann Publishers
2- G. Coulouris, J. Dollimore, T. Kindberg, and G. Blair, (2013), "Distributed Systems: Concepts and Design", ٦th Edition, Pearson.

1- Required Textbook(s) (maximum two).

1. Geoffrey C. Fox, Jack Dongarra, Kai Hwang, (2013), "Distributed and Cloud Computing From Parallel Processing to the Internet of Things",
2. C. Surianarayanan, Pethuru Raj Chelliah - Essentials of Cloud Computing_ A Holistic Perspective (2019, 1st ed, Springer International Publishing.

2- Essential References.

1- Chandrasekaran K., 2015, Essentials of cloud computing, 1st ed,CRC Press
2- Rajkumar Buyya, James Broberg, and Andrzej Gościński,2011, "Cloud computing: principles and paradigms", Wiley.
3- Rajkumar Buyya, Christian Vecchiola andS. ThamaraiSelvi , 2013, "Mastering Cloud Computing Foundations and Applications Programming", Morgan Kaufmann

3- Electronic Materials and Web Sites *etc*.

- https://www.tutorialspoint.com/cloud_computing/index.htm

https://www.tutorialandexample.com/cloud-computing-tutorial/

- https://data-flair.training/blogs/best-cloud-computing-books/

https://www.guru99.com/cloud-computing-for-beginners.html

https://www.javatpoint.com/cloud-computing-tutorial

IX. Course Policies:

Unless otherwise stated, the normal course administration policies and rules of the Faculty of Computer and Information Technology apply. For the policy, see: ----------

The University Regulations on academic misconduct will be strictly enforced. Please refer to ----------

1	**Class Attendance:**

Head of Department	Vise Dean for Qulity Assurance	Dean of the Faculty	Dean of Development center and Quality Assurance
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	A student should attend not less than 75 % of total hours of the subject; otherwise he will not be able to take the exam and will be considered as exam failure. If the student is absent due to illness, he/she should bring a proof statement from university Clinic
2	**Tardy:** For late in attending the class, the student will be initially notified. If he repeated lateness in attending class he will be considered as absent.
3	**Exam Attendance/Punctuality:** A student should attend the exam on time. He is Permitted to attend an exam half one hour from exam beginning, after that he/she will not be permitted to take the exam and he/she will be considered as absent in exam.
4	**Assignments & Project** The assignment is given to the students after each chapter; the student has to submit all the assignments for checking on time.
5	**Cheating:** For cheating in exam, a student will be considered as fail. In case the cheating is repeated three times during his/her study the student will be disengaged from the Faculty.
6	**Plagiarism:** Plagiarism is the attending of a student the exam of a course instead of another student. If the examination committee proofed a plagiarism of a student, he will be disengaged from the Faculty. The final disengagement of the student from the Faculty should be confirmed from the Student Council Affair of the university.
7	**Other policies:** - Mobile phones are not allowed to use during a class lecture. It must be closed, otherwise the student will be asked to leave the lecture room - Mobile phones are not allowed in class during the examination. - Lecture notes and assignments my given directly to students using soft or hard copy

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Faculty of Computer & Information Technology

Department of Information System

Program of Information System

Course syllabus of Distributed and Cloud Computing

Course No (.....)

Head of Department	Vise Dean for Qulity Assurance	Dean of the Faculty	Dean of Development center and Quality Assurance
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Template for Course Plan (Syllabus)

I. - Information about Faculty Member Responsible for the Course:							
Name of Faculty Member		Office Hours					
Location& Telephone No.		SAT	SUN	MON	TUE	WED	THU
E-mail							

II. Course Identification and General Information:						
1-	Course Title:	Distributed and Cloud Computing				
2-	Course Number & Code:					
3-	Credit hours:	C.H				Total
		Th.	Seminar	Pr.	F. Tr.	
		2	-	2		3
4-	Study level/ semester at which this course is offered:	2nd Semester - 3th Level				
5-	Pre –requisite (if any):	Operating Systems, Computer Networks				
6-	Co –requisite (if any):	None				
7-	Program (s) in which the course is offered:	Information Technology				
8-	Language of teaching the course:	English				
9-	Study System	Term based system				
10-	Mode of delivery:	Full time				

Head of Department	Vise Dean for Qulity Assurance	Dean of the Faculty	Dean of Development center and Quality Assurance
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11-	**Location of teaching the course:**	Faculty of Computer and Information Technology

III. Course Description:

This course explores the principles of distributed computing systems with different skills that enable students to understand the goals and architectures of distributed computing, analyze, design, and implement a distributed system taking into account the most important design issues and impact criteria. It explores different types of distributed systems including grids, clusters, overlay networks, and cloud. As an example of distributed systems, the course covers main topics of cloud computing including the cloud converging technologies, service models, virtualization, cloud storage, cloud frameworks and security. Moreover, cloud computing technologies such as Hadoop, MapReduce, NoSQL, Hive will be addressed. The course will be covered theoretically in the class and practically in the labs. Basic knowledge of computer networking and systems as well as Internet technology is required to satisfy the objectives of the course.

IV. Intended learning outcomes (ILOs) of the course:

a1. Show Understanding of the concepts, components, and issues of distributed and cloud computing

a2.Explain cloud enabling technologies, cloud mechanisms, service models, deployment models, cloud architectures, and security.

b1. Compare the differences between various distributed computing middleware and their communication mechanisms.

b2. Design a distributed computing system using middleware where appropriate.

c1.Build a private cloud computing environment to demonstrate the cloud functions.

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c2.Implement distributed software and to deploy this software on the cloud based on a given specification
d1.Negotiate and communicate effectively with the work environment in both written and oral formats.
d2.Exhibit self-learning abilities in distributed and cloud computing.

V. Course Content:

A – Theoretical Aspect:

Order	Topic List / Units	Sub Topics List	Week Due	Contact hours
1	Introduction to Distributed and Cloud Computing	- Characterization of Distributed systems - Technologies for Network-Based Systems: multi-core and multi-threading; - Distributed and Cloud Computing Models: client-server; clusters; grids; peer-to-peer	1st & 2nd	4
2	Enabling Technologies for Building Distributed Systems	- Socket Programming: datagram sockets; stream-mode sockets - Remote Method Invocation and XML-RPC - Extensible Markup Language (XML): XML markup; XML namespaces; XML schema	3th&4th	4

3	Service-Oriented Architecture for Distributed Computing	- Service and Service-Oriented Architectures - Web Services: simple object access protocol (SOAP); building web services with SOAP; web services description language (WSDL); Web service implementation - RESTful Web Services: architectural principles of REST; REST vs. SOAP; RESTful	5th - 7th	6
4	Midterm Exam	- Midterm exam	8th	2
5	Cloud Computing Architecture	- Service Models: public clouds; private clouds; hybrid clouds - Layer and Types of Clouds: IaaS; PaaS; SaaS -	9th	2
6	Virtualization	- Virtualization: Level of virtualization; virtualization support at the OS level; middleware support; virtualization of CPU, memory, and i/o devices; virtualization tools	10th	2
7	Cloud Programming Environments	- MapReduce, Hadoop and Big Data - NoSQL data stores. Table-based (Google BigTable), key-based (Amazon Dynamo), and Cassandra. The Hector API.	11th&12th	4
8	Cloud Security and Trust Management.	- Cloud security stack - Cloud Security Defense Strategies - Distributed Intrusion/Anomaly Detection	13th &14th	4

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		- Data and Software Protection Techniques		
9	Ubiquitous computing and Internet of things	- Enabling Technologies for the Internet of Things - Architectures of the IoT - Mobile cloud computing and cloudlets	15th	2
10	Final Exam		16th	2
	Number of Weeks /and Units Per Semester		16	32

B - Practical Aspect: (if any)

Order	Tasks/ Experiments	Week Due	Contact Hours
1	**Multi-Threading, Programming Socket RMI, RPC**	**1st-3th**	**6**
2	**Web Services & Xml**	**4 th-5 th**	**4**
3	**Mid Term Exam**	**6 th**	**2**
4	**Virtualization**	**7th-8th**	**4**
5	**Design a Private cloud**	**9th-12th**	**6**
6	**MapReduce**	**12th-13th**	**4**
7	**HIVE and NoSQL**	**14th-15th**	**4**
8	**Final Exam**	**16th**	**2**
	Number of Weeks /and Units Per Semester	**16**	**32**

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VI. Teaching strategies of the course:

- Lectures
- Class discussions
- Lab experiments
- Problems Solving
- Guided individual reading.
- Individual and group project work
- Group discussions work
- Seminar/presentation

VII. Assignments:

No	Assignments	Aligned CILOs	Week Due	Mark
1	Chatting Application using (RPC /RMI)	b1,c2,d1,d2	4th	4
2	Write a webservice to calculate the currency exchange Rate	b1,c2,d1,d2	7th	3
3	Write a MapReduce application for words indexing in a file	b2,c1,c2,d1,d2	13th	3
	Total Score			10

VIII. Schedule of Assessment Tasks for Students During the Semester:

Assessment	Type of Assessment Tasks	Week Due	Mark	Proportion of Final Assessment
1	Assignments	4th, 7th,13th	10	10%

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2	Projects (single\group)	12th	5	5%
3	Mid Term Exam practical	6th	5	5%
4	Mid Term Exam Theoretical	8th	10	10%
5	Final Exam (practical)	16th	10	10%
	Final Exam (theoretical)	16th	60	60%
Total			100	100%

IX. Learning Resources:

1. Dan C. Marinescu, 2017, Cloud Computing: Theory and Practice,2nd Ed ,Morgan Kaufmann Publishers
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3- Electronic Materials and Web Sites *etc*.

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https://www.tutorialandexample.com/cloud-computing-tutorial/

- https://data-flair.training/blogs/best-cloud-computing-books/

https://www.guru99.com/cloud-computing-for-beginners.html

https://www.javatpoint.com/cloud-computing-tutorial

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اللجنة الإشرافية

م.	الاســـم	الصـــــفة	التوقيع
١	أ.م.د. عبد الماجد الخليدي	نائب عميد الكلية للشؤون الأكاديمية	
٢	أ.م.د. احمد مجاهد	نائب عميد مركز التطوير الأكاديمي وضمان الجودة	
٣	د. حسين الأشول	ممثل المركز في الكلية	
٤	أ.د. إبراهيم المطاع	نائب رئيس الجامعة للشؤون الأكاديمية	

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