

## Course E-Syllabus

1	<b>Course title</b>	Database technologies and applications
2	<b>Course number</b>	1902324
3	<b>Credit hours</b>	3
	<b>Contact hours (theory, practical)</b>	3
4	<b>Prerequisites/corequisites</b>	Database Management Systems (1902224)
5	<b>Program title</b>	Computer Information Systems
6	<b>Program code</b>	2
7	<b>Awarding institution</b>	BSc
8	<b>School</b>	King Abdullah II School for Information Technology
9	<b>Department</b>	Computer Information Systems
10	<b>Level of course</b>	Third Year
11	<b>Year of study and semester (s)</b>	First 2022/2023
12	<b>Final Qualification</b>	BS.c
13	<b>Other department (s) involved in teaching the course</b>	None
14	<b>Language of Instruction</b>	English
15	<b>Teaching methodology</b>	<input type="checkbox"/> Blended <input type="checkbox"/> Online
16	<b>Electronic platform(s)</b>	<input checked="" type="checkbox"/> Moodle <input type="checkbox"/> Microsoft Teams <input type="checkbox"/> Skype <input type="checkbox"/> Zoom <input type="checkbox"/> Others.....
17	<b>Date of production/revision</b>	November/2022

### 18 Course Coordinator:

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### 19 Other instructors:

### ٢٠ Course Description:

This course covers the principles of distributed databases and how they differ from centralized databases. It focuses on understanding the concepts of designing and managing distributed databases. Furthermore, the course introduces the problems of distributed data management, especially in the case of heterogeneous databases. The course will cover the most broadly adopted systems and techniques in the field of data integration for distributed environments, such as data warehousing, Big data management and NoSQL alternatives. Case studies in the field of healthcare information systems and e-commerce information systems are given as examples for data integration issues. The course will provide a cohesive overview regarding the importance of data management and data analytics in the era we are living.

## ۲۱ Course aims and outcomes:

A- Aims:

**To understand the difference between the centralized and distributed database systems in general. Also, the course aims to introduce the students to the needed techniques that are used to design and manage a distributed database, such as fragmentation, query processing, recovery and replication. Furthermore, the course introduces the issue of managing big and heterogenous databases in different applications areas.**

**B– Intended Learning Outcomes (ILOs):**

Upon successful completion of this course students should acquire the following learning outcomes:

A- Knowledge and Understanding: Students should:

- A1) Understand distributed database design.
- A2) Understand query processing in a distributed database system.
- A3) Understand some of the problems and solutions of database failures and recoveries
- A4) Understand concurrency control and database correctness
- A5) Understand distributed database limitations and consequences.

B- Intellectual skills: with the ability to:

- B1) Design distributed database and process queries over a local area network.
- B2) Recognize concurrency controls in a centralized database, locks and deadlocks.
- B3) Recognize causes for database failures and recovery techniques.
- B4) Calculate the queries cost to evaluate the best technique for query processing

**C- Subject specific skills- with ability to:**

- C1) Discuss distributed databases design and query processing.
- C2) Evaluate database concurrency controls and propose a solution for database deadlocking problems.
- C3) Ability to identify the challenges faced by information systems using distributed database
- C4) Discuss case studies for information systems and learn about new alternatives for managing data

**D- Transferable skills – with ability to:**

- D1) Work individually to solve problems and within a group to present new solutions to data distribution.
- D2) Interact with the other study groups to understand distributed query processing.
- D3) Write and prepare a report to explain challenges and solutions for proposed case studies in data management

## ۲۲. Topic Outline and Schedule:

<b>Week</b>	<b>Lecture</b>	<b>Topic</b>	<b>Teaching Methods*/platform</b>	<b>Evaluation Methods**</b>	<b>References</b>
1	1.1	Background (ERD + Normalization)	Synchronous lecturing/meeting		Book and Slides
	1.2	Background (Relational Algebra)	Synchronous lecturing/meeting		Book and Slides
	1.3	Practice HW	Asynchronous lecturing	Forum discussion	Book and Slides
2	2.1	Introduction to Distributed Databases	Synchronous lecturing/meeting		Book and Slides
	2.2	Introduction to Distributed Databases	Synchronous lecturing/meeting		Book and Slides
	2.3	Students discussions	Asynchronous lecturing	Forum discussion	Book and Slides
3	3.1	Distributed Database Systems Architecture	Synchronous lecturing/meeting		Book and Slides
	3.2	Distributed Database Systems Architecture	Synchronous lecturing/meeting		Book and Slides
	3.3	Reading Lecture	Asynchronous lecturing		Book and Slides
4	4.1	Distributed Database Design	Synchronous lecturing/meeting		Book and Slides
	4.2	Horizontal fragmentation	Synchronous lecturing/meeting		Book and Slides
	4.3	Practice Exercise	Asynchronous lecturing		Book and Slides
5	5.1	Horizontal fragmentation discussion	Synchronous lecturing/meeting		Book and Slides
	5.2	Vertical fragmentation	Synchronous lecturing/meeting		Book and Slides
	5.3	Vertical fragmentation	Synchronous lecturing		Book and Slides
6	6.1	Vertical fragmentation	Synchronous lecturing/meeting		Book and Slides
	6.2	Revision	Synchronous lecturing/meeting		Book and Slides
	6.3	Practice worksheet	Asynchronous lecturing	Forum discussion	Book and Slides
7	7.1	Discussion of worksheet	Asynchronous lecturing/meeting		Book and Slides
	7.2	Midterm Exam	Synchronous lecturing/meeting	Midterm Exam	Book and Slides
	7.3	Midterm Discussion	synchronous lecturing		Book and Slides
8	8.1	Distributed Query Processing – Part1	Synchronous lecturing/meeting		Book and Slides

	8.2	Distributed Query Processing - Part1	Synchronous lecturing/meeting		Book and Slides
	8.3	Practice worksheet	Asynchronous lecturing		Book and Slides
9	9.1	Distributed Query Processing – Part2	Synchronous lecturing/meeting		Book and Slides
	9.2	Distributed Query Processing – Part2	Synchronous lecturing/meeting		Book and Slides
	9.3	Practice worksheet	Asynchronous lecturing	Forum discussion	Book and Slides
10	10.1	Discussion of worksheet	Synchronous lecturing/meeting		Book and Slides
	10.2	Short Exam	Synchronous lecturing/meeting	Short Exam	Book and Slides
	10.3	Discussion of Exam	Synchronous lecturing		Book and Slides
11	11.1	Data integration	Synchronous lecturing/meeting		Book and Slides
	11.2	Data integration	Synchronous lecturing/meeting		Book and Slides
	11.3	Data integration case studies	Asynchronous lecturing		Book and Slides
12	12.1	Distributed Data management	Synchronous lecturing/meeting		Book and Slides
	12.2	Issues and up to date solutions	Synchronous lecturing/meeting		Book and Slides and videos
	12.3	Reading case studies	Asynchronous lecturing		Book and Slides and papers
13	13.1	Big data management techniques	Synchronous lecturing/meeting		Book and Slides
	13.2	Data warehousing and map reduce	Synchronous lecturing/meeting		Book and Slides
	13.3	Case study	Asynchronous lecturing	Forum discussion	Book and Slides
14	14.1	NoSQL alternatives for managing Big Data	Synchronous lecturing/meeting		Book and Slides
	14.2	NoSQL alternatives for managing Big Data	Synchronous lecturing/meeting		Book and Slides
	14.3	Research paper discussion	Asynchronous lecturing	Forum discussion	Book and Slides
15	15.1	Research paper discussion	Synchronous lecturing/meeting		Book and Slides
	15.2	Revision and discussions	Asynchronous lecturing		Book and Slides
	15.3	Final Exam	Synchronous lecturing/meeting		Book and Slides

- Teaching methods include: Synchronous lecturing/meeting; Asynchronous lecturing/meeting
- Evaluation methods include: Homework, Quiz, Exam, pre-lab quiz...etc

### ۲۳ Evaluation Methods:

Opportunities to demonstrate achievement of the ILOs are provided through the following assessment methods and requirements:

Evaluation Activity	Mark	Topic(s)	Period (Week)	Platform
Midterm Exam	30	Introduction, Database design, Horizontal and vertical fragmentations	7 <sup>th</sup>	JUExams
Short Exam	10	Query processing	9 <sup>th</sup>	Paper-based
Research project	10	NoSQL databases	12 <sup>th</sup>	
Final Exam	50	All topics	15 <sup>th</sup>	JUExams

⌚ **Course Requirements (e.g: students should have a computer, internet connection, webcam, account on a specific software/platform...etc):**

Computer, internet,

⌚ **Course Policies:**

B-Absences from exams and handing in assignments on time:

- All projects and assignments are to be uploaded to the course website.
- Upload assignments to elearning.ju.edu.jo (moodle) by 11:55 PM on its due date.
- Everyone should check their e-mail and moodle regularly. Students are responsible for information posted there. If critical information is posted in moodle that you must read today, an announcement to check moodle will be sent to the mailing list.
- Project should be determined by the end of the 7<sup>th</sup> week of the semester. I'll provide you with some suggested project.

C- Health and safety procedures:

D- Honesty policy regarding cheating, plagiarism, misbehavior:

E- Grading policy:

F- Available university services that support achievement in the course:

**References:**

A- Required book(s), assigned reading and audio-visuals:

Principles Of Distributed Database Systems, Third Edition 2011. M. Tamer Özsu • Patrick Valduriez  
DOI 10.1007/978-1-4419-8834-8

Hasselbring, W. (2000). Information system integration. Communications of the ACM, 43(6), 32-38.  
Chicago


Vittorini, P., Angelone, A. M., Cofini, V., Fabiani, L., Mattei, A., & Necozone, S. (2017, April). A Case Study on the Integration of Heterogeneous Data Sources in Public Health. In International Conference on Bioinformatics and Biomedical Engineering (pp. 411-423). Springer, Cham.

Park, Y., Shankar, M., Park, B. H., & Ghosh, J. (2014, March). Graph databases for large-scale healthcare systems: A framework for efficient data management and data services. In Data Engineering Workshops (ICDEW), 2014 IEEE 30th International Conference on (pp. 12-19). IEEE.

B. Recommended books, materials, and media:

Introduction to database systems Almasri 6<sup>th</sup> edition. (chapter 25)  
Videos and forums on the e-learning website.

**Additional information:**

Name of Course Coordinator: -Reem Al Fayez      -Signature:       Date: 30/11/2022  
Head of Curriculum Committee/Department: ----- Signature: -----  
Head of Department: ----- Signature: -----  
Head of Curriculum Committee/Faculty: ----- Signature: -----  
Dean: ----- Signature: -----