| 1 | **Course title** | Advanced Database Systems |
|---|---|---|
| 2 | **Course number** | 1902423 |
| 3 | **Credit hours** | ٣ |
| | **Contact hours (theory, practical)** | ٣ |
| 4 | **Prerequisites/corequisites** | Introduction to Database Systems (1902223) |
| 5 | **Program title** | Computer Information Systems |
| 6 | **Program code** | ٢ |
| 7 | **Awarding institution** | The university of Jordan |
| 8 | **School** | King Abdullah II School for Information Technology |
| 9 | **Department** | Computer Information Systems |
| 10 | **Level of course** | Undergraduate |
| 11 | **Year of study and semester (s)** | 4th year, first and second semesters |
| 12 | **Final Qualification** | Bachelor of Science in Computer Information Systems |
| 13 | **Other department (s) involved in teaching the course** | None |
| 14 | **Language of Instruction** | English |
| 15 | **Teaching methodology** | ☐Blended☐Online |
| 16 | **Electronic platform(s)** | ☐Moodle ☒Microsoft Teams ☐Skype ☐Zoom ☐Others………… |
| 17 | **Date of production/revision** | 13th October, 2020 / revision 22th October, 2022 |

**18 Course Coordinator:**

Dr. Reem Al Fayez
Office: KASIT, CIS, GF floor, office #8
Officehours:  via email or Microsoft Teams
Phone number: 962-6-5355000 Ext: 22565
Email address: r.alfayez@ju.edu.jo

**19 Other instructors:**

## ٢٠. Course Description:

By successfully completing this course, students will have an overall understanding of advanced aspects of database management systems including complex data types, application interfaces, concurrency control, and transaction management, database recovery, indexing and hashing, data warehousing, and OLAP. In addition to case studies about data integration between heterogenous databases. Students will undertake practical homework that involves programing APIs to retrieve and manage complex data types such as JSON and XML. Furthermore, the students will be introduced to reading research articles and work in groups to summarize and discuss research papers in one of the topics introduced in the course.

## ٢١. Course aims and outcomes:

**Aims:**

This course covers the advanced aspects of database management systems (DBMS). Through the widely used databases, concentrating on aspects of relational databases that best demonstrate advanced design principles and good practice will give the student the required knowledge to use databases for many purposes.

**The main objectives of the Advanced DBMS course are:**

1. Understand the principles of database recovery.
2. Understand the principles of Transaction Management.
3. Understand the principles of Concurrency Control.
4. Describe other database architectures.
5. Understand big data management, data warehousing and OLAP
6. Understand different types of databases

**Intended Learning Outcomes (ILOs):** Upon successful completion of this course, students will be able to…

**A- Knowledge and Understanding:**
   A1) Understand the concept of specialization/generalization and union in the EER diagram
   A2) Understand the principles of relational algebra operations.
   A3) Discuss/explain the design of a suitable database components and environments.
   A4) Discuss/explainthe major functions of a DBMS.
   A5) Discuss/ explain the essential concepts and major principles relevant to the professional and      ethical responsibilities of being a developer, in particular, database security and integrity**.**

**B-Intellectual skills-with ability to**
   B1) Design a database using the concepts of ER and EER models.
   B2) Analyze normal forms (up to BCNF) based on functional dependencies.
   B3) Identify and being able to use the major functions of a DBMS such as recovery, transaction management and concurrency control.
   B4) Describe and use other models such as OO and semi-structured models.

**C- Practical Skills-With ability to**
   C1) Analyze complex schedules and decide on their serializability using the presidency graph (PG).
   C2) Know how the system detects deadlocks and what strategies it uses to resolve them using the WFG.
   C3) Gain background theory that will be practiced in the lab.

**D- Transferable Skills-With ability to**
   D1) Gain experience to perform well in both individual and teamwork assignment.
   D2) Work effectively by delivering assignments on time to meet the deadlines.
   D3) Use of creativity and innovation in problem solving.
   D4) Develop communication skills and logical thinking abilities.

**٢٢. Topic Outline and Schedule:**

| Week | Lecture | Topic | Teaching Methods*/platform | Evaluation Methods** | References |
|------|---------|-------|---------------------------|---------------------|------------|
| 1 | 1 | Introduction to the course | Lectures | | Book and Slides |
| | 2 | Basic DB revision | Lectures | | Book and Slides |
| | 3 | Application development | Lectures | | Book and Slides |
| 2 | 1 | Application development | Lectures | | Book and Slides |
| | 2 | Application development | Lectures | | Book and Slides |
| | 3 | Discussion and cases | Lectures | | Book and Slides |
| 3 | 1 | Complex data types | Lectures | | Book and Slides |
| | 2 | Complex data types: JSON and XML | Lectures | Forum Discussion | Book and Slides |
| | 3 | Complex data types: RDF | Lectures | | Book and Slides |
| 4 | 1 | Transaction management | Lectures | | Book and Slides |
| | 2 | Transaction management | Lectures | | Book and Slides |
| | 3 | HW discussion | | | Book and Slides |
| 5 | 1 | Concurrency control | Lectures | | Book and Slides |
| | 2 | Concurrency control | Lectures | | Book and Slides |
| | 3 | Discussion and Worksheets | Lectures | Worksheet | Book and Slides |
| 6 | 1 | Database Recovery | Lectures | | Book and Slides |
| | 2 | Database Recovery | Lectures | | Book and Slides |
| | | Midterm | | | Revi |
| 7 | 1 | Data warehousing | Lectures | | Book and Slides |
| | 2 | Data warehousing | Lectures | | Book and Slides |
| | 3 | Data warehousing | Lectures | | Book and Slides |
| 8 | 1 | OLAP concept | Lectures | | Book and Slides |
| | 2 | OLAP | Lectures | | Book and Slides |
| | 3 | OLAP | Lectures | In class Discussion | Book and Slides |
| 9 | 1 | Data warehousing case studies | Lectures | | Book and Slides |
| | 2 | Introduction to scientific research | Lectures | | Book and Slides |
| | 3 | HW Discussion | Lectures | | Book and Slides |
| 10 | 1 | Hashing and Indexing | Lectures | | Book and Slides |
| | 2 | Hashing and Indexing | Lectures | | Book and Slides |
| | 3 | Hashing and Indexing | Lectures | | Book and Slides |
| 11 | 1 | Revision | Lectures | | Book and Slides |
| | 2 | Case studies | Lectures | | Book and Slides |
| | 3 | Group Project Discussion | Lectures | | Book and Slides |

| 12 | 1 | Group Project Discussion | Lectures | In class presentation | Book and Slides |
|----|---|--------------------------|----------|-----------------------|-----------------|
|    | 2 | Group Project Discussion | Lectures | In class presentation | Book and Slides |
|    | 3 | Group Project Discussion | Lectures | In class presentation | Book and Slides |
| 13 | 1 | Group Project Discussion | Lectures | In class presentation | Book and Slides |
|    | 2 | Group Project Discussion | Lectures | In class presentation | Book and Slides |
|    | 3 | Group Project Discussion | Lectures | In class presentation | Book and Slides |
| 14 |   | Revision | Lectures | In class presentation | Book and Slides |
| | | | Final Exam | | |

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

## ٢٣ 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, pre-processing, clustering | 7th | Paper-based |
| Lab based HWs | 20 | 4 topics detailed above | | E-Learning |
| Final Exam | 50 | All topics | 14th | Paper-based |
| | | | | |
| | | | | |

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

Students should have a computer, Internet Connection, Microsoft office 2016, webcam and an account on Microsoft Teams.

## ٢٥ Course Policies:

**A-** *Attendance policies:*

*Maximum allowable absence 15% of number of Lectures/Semester*

**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.

**C-** *Health and safety procedures:*

*University Regulations*

**D-** *Honesty policy regarding cheating, plagiarism, misbehavior:*

*It is the student's responsibility to ensure that he/she is adhere with cheating, plagiarism, misbehavior.*

**E-** *Grading policy:*

*The grading policy is subject to change at the end of the semester according to the overall performance of students.*

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

٢٦ **References:**

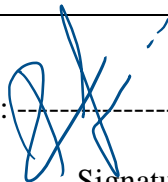A- Required book(s), assigned reading and audio-visuals:
Database System Concepts
Seventh Edition
Silberschatz, Korth. Sudarshan, 2019

B- Recommended books, materials and media:
Lecture notes and slides from DB books
Cheat sheets about practical topics

**٢٧ Additional information:**

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│                                                                           │
│ - Students are encouraged to make heavy use of the library, E-LIBRARY http://ezlibrary.ju.edu.jo/login or from │
│ within the university using (http://e-library)                            │
│                                                                           │
│ - The instructor can make changes to this syllabus when necessary.        │
│                                                                           │
│ - University regulations will be preserved at all times                   │
│                                                                           │
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Name of Course Coordinator: ---Dr. Reem Al Fayez--Signature:-------------- Date: November,2021

Head of Curriculum Committee/Department: ------------------------- Signature: ------------------------

Head of Department: ---------------------------------------------------- Signature: ----------------------

Head of Curriculum Committee/Faculty: -------------------------------------- Signature: ------------------

Dean: -----------------------------------------------------Signature: ------------------------------------------

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