



**COLLEGE OF INFORMATION TECHNOLOGY
DEPARTMENT OF INFORMATION TECHNOLOGY**

COURSE SYLLABUS/ SPECIFICATION

Course Code & Title: ITCS 511–Advanced Database Systems

Weight: (3 - 0 - 3)

Prerequisite: None

NQF Level Allocated: 9

NQF Notional Hours / Credits: 120 notional hours/ 12 NQF credit

Description: This course explores databases as the underlying framework of information system which store, manipulate and retrieve data with particular emphasis on the relational model and relational systems. Students are expected to design and implement a relational database within the concept of an information system using appropriate analysis and modeling techniques and a modern Database Management System as well as to understand RDBMS, advantages and disadvantages of different query languages and concurrency control and basic query processing.

Objective:

1. To provide a comprehensive overview of Database concepts, technologies and methodologies.
2. To critically plan, analyze, design, implement, and test database projects.
3. To construct advanced database query using SQL.
4. To critically understand and discuss selected advanced database topics.

Semester: 2

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Intended Learning Outcomes (ILOs):

A. Knowledge and Understanding	NQF Level
A1. <u>Concepts and Theories</u> : Demonstrate critical knowledge and understanding of relational database systems and concepts embedded in the storage, manipulation and retrieval of data.	Knowledge: theoretical understanding [Level 9]
A2. <u>Contemporary Trends, Problems and Research</u> : Demonstrate critical awareness of the current problems, research issues and methods, technological advancements in the field of database.	Knowledge: theoretical understanding [Level 9]
B. Subject-Specific Skills	NQF Level
B1. <u>Problem Solving</u> : Identify and solve complex problems using a range of specialized skills, techniques related to various database issues.	Communication, ICT and Numeracy Skills [Level 9] Knowledge: Practical application [Level 9] Generic, Problem Solving and Analytical Skills [Level 9]
B2. <u>Modeling and Design</u> : Develop database models for real-world problems and design their solutions using SQL language.	Communication, ICT and Numeracy Skills [Level 9] Knowledge: Practical application [Level 9]
B3. <u>Application of Methods and Tools</u> : Apply specialized methods and advanced tools to design and implement database systems including but not limited to SQL language, distributed database management systems, data mining, and data warehousing.	Knowledge: Practical application [Level 9] Communication, ICT and Numeracy Skills [Level 9]
C. Critical Thinking Skills	NQF Level
C1. <u>Analytic</u> : Critically analyze and evaluate different phases in database design, management and identify scope, objectives and characteristics in addition to identifying requirements for every step.	Generic, Problem Solving and Analytical Skills [Level 9]
C2. <u>Synthetic</u> : Develop and integrate components of database systems to deal with complex problems using ER model, schema, and DBMS languages.	Generic, Problem Solving and Analytical Skills [Level 9]
C3. <u>Creative</u> : Develop creative ideas to deal with complex problems in the advanced database applications and obtain efficient solutions.	Knowledge: Practical application [Level 9] Generic, Problem Solving and Analytical Skills [Level 9] Communication, ICT and Numeracy Skills [Level 9]
D. General and Transferable Skills	NQF Level
D1. <u>Communication</u> : Express ideas effectively, in written and oral form, to a diverse range of audience using appropriate techniques and tools.	Communication, ICT and Numeracy Skills [Level 9]

	9] Knowledge: Practical application [Level 9]
D2. Teamwork and Leadership: Work as a productive team member and cooperate with others in order to grasp the skills of a database manager leading a team.	Competence: Autonomy, Responsibility and Context [Level 8]
D3. Organizational and Developmental Skills: Demonstrate ability to organize ideas and effectively allocate time in given assignment.	Competence: Autonomy, Responsibility and Context [Level 8]

Course Structure (Outline)

Week	Hours	ILOs	Unit/Module or Topic Title	Teaching Method	Assessment Method
1	3	A1	Introduction and Database Concepts, Database System Concepts and Architecture	Lecture / class discussion	Oral Participation
2	3	A1, B2	Data Modeling, Entity-Relationship	Lecture	Oral Participation
3	3	A1,B2, C1,C2,D3	Relational Models, Relational Database Constraints	Lecture	Oral Participation
4	3	A1, B2,B3, C1,C2, D1, D3	Relational Database Constraints	Lab session & Software demo / supervised group lab work	Assignment 1 / Oral participation
5	3	A1, B2, C1	Relational Algebra	Lecture / In-class Exercises	In-class Exercises
6	3	A1, B1	SQL Language, Schema Definition	Lab session & Software demo/ supervised group lab work	In-Lab Exercises
7	3	B1,B3,C1	SQL Language queries	Lab session & Software demo /Lecture	In-Lab Exercises
8	3	B1,B2,B3 C1,C2	SQL Language queries	Lab session & Software demo / supervised lab work	Midterm Exam
9, 10	6	A1, B1,B2, B3, C1,C2	Query Processing	Lecture /	In-class Exercises/ Assignment 2

				In-class Exercises	
11	3	A1,B1,B2, C1, C2	Functional Dependencies and Normalization for Relational Databases	Lecture/ In-class Exercises	Oral Participation / In-class Exercises
12	3	A1, A2,B1	Distributed database management systems	Lecture/ class discussion	Oral Participation
13	3	A1, A2, C1,B1, B2	Object-Oriented Database concepts	Lecture/ class discussion	Oral Participation
14	3	A1, A2, B1, B2, C1	Data Warehouse	Lecture/ class discussion	Oral Participation/ In-class Exercises
15	3	A2, B1, B2,B3, C1, C2, C3, D1, D2, D3	Students Presentations and reports of Team Research Projects	Presentation of Projects by Students	Evaluation of Project Presentations & Reports
16	2				Final Exam

Teaching Materials:

Textbook(s):	Elmasri R. and Navathe S., Fundamentals of Database Systems, 7th Edition, Pearson, 2015
Handout(s):	Instructor's power point slides
Reference(s):	<ol style="list-style-type: none"> 1. Connolly T. and Begg C., Database Systems, A practical Approach to Design, Implementation, and Management, 6th Edition, Pearson, 2014. 2. Carlos Coronel, Keeley Crockett, Steven Morris, and Peter Rob, Database Principles: Fundamentals of Design, Implementation, and Management, Cengage Learning ,2013. 3. Avi, Silberschatz, Henry F. Korth, S. Sudarshan, Database System Concepts, 7th Edition , McGraw-Hill, 2010 4. David M. Kroenke, David J. Auer, Scott L. Vandenberg, and Robert C. Yoder, Database Concepts, 8th, Pearson, 2017.

	<p>5. Hector Garcia-Molina, Jeffrey D. Ullman, Jennifer Widom, Database Systems: The Complete Book, 2ed, Prentice Hall, 2009</p> <p>6. More references are available in the course website in Moodle.</p>
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ASSESSMENT:

Type of Assessment	Description	ILOs	Weighting
Research Assignments	The assignments consist of essay, problem-solving and research based theoretical questions regarding topics in advanced database systems covered during the course. The purpose of the assignment is to assess students where they must demonstrate their extensive and detailed knowledge and critical understanding of database systems.	A2, B1, B2, C1, D1,D3	20%
Oral Participation	Students will be questioned orally to demonstrate their understanding and knowledge of the topics covered during class lectures and lab sessions.	A1, D1	3%
Midterm Exam	The midterm exam will be an in-class 1-hour exam that will consist of short-answer, essay, and problem solving questions and cover the topics studied in the first 8 weeks. Students will be asked to design and model some components of database.	A1,B1,B2,B3,C1,C2	20%
Team Project Report and Presentation	The class will be divided into teams of 2-5 students where each team will be asked to study a problem in advanced database systems utilizing the skills and tools learned in class. Teams are required to plan and execute the project that may involve the development and implementation of database models for real-world problems and their solutions, the application of Data Warehousing and OLAP techniques and/or the development and integrations of database systems components using ER model, schema, and DBMS languages. In the final week, each team will have to submit their research report explaining the research problem, research methods used, analysis and the conclusion highlighting the research findings and results. The report must explain precisely the work accomplished by each student. Each team will be required to make a presentation summarizing the research conducted and its	A2, B1, B2,B3, C1, C2, C3, D1, D2, D3	17%

	findings. Each team member has to participate in the presentation. Team-based work will be examined and evaluated as a whole as well as the individual work of each student. Team members will be tested individually during the presentation by peers and the instructor.		
Final Exam	The final exam is comprehensive and will be of two hours duration. It will consist of short-answer, essay and problem-solving questions including questions to develop parts of database systems to solve real-life problems.	A1, B1, B2,B3, C1, C2, C3	40%
Overall			100%

Admissions	
Pre-requisites	None
Minimum number of students	4
Maximum number of students	20

Ahlia University values academic integrity. Therefore, all students must understand the meaning and consequences of cheating, plagiarism and other academic offences under the Code of Student Conduct and Disciplinary Procedures (see www.ahlia.edu.bh/integrity for more information).