The American university in Cairo
Department of Computer Science & Engineering

CSCE 253/2501
Fundamentals of Database Systems

Course Layout – Spring 2014
http://www.cse.aucegypt.edu/~csci253/

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Office: Room 2148 SSE
Office hours: 10:00 – 11:00 am and 1:00 - 2:00 pm UW
Assistant: Eng. Mohamed Said Attia E-mail: Mohamed.said@aucegypt.edu

Textbook:

References:
8. Additional notes prepared by the instructor.

Course Outcomes
After completing the course, students will be able to:

1. Demonstrate knowledge and understanding of the database system concepts, and DBMS functions & architecture
2. Demonstrate knowledge and understanding of a generic procedure to design a database system
3. Analyze and define the data requirements of a database
4. Model the data requirements in the Entity-Relationship Data Model
5. Demonstrate knowledge and understanding of relational data model
6. Demonstrate knowledge and understanding of the relational integrity constraints
7. Design a database in the relational data model
8. Use SQL/DDL to create and maintain a relational database.
9. Use SQL/DML to perform data processing operations (Insert, Update, Delete, and Select) on relational database
10. Use SQL/DCL to enforce data security, control data processing operations and manage user accounts.
11. Demonstrate knowledge and understanding of data normalization theory
12. Use data normalization concepts to refine design of relational databases
13. Apply techniques of database analysis, design and implementation using a RDBMS (Oracle)
14. Research on emerging applications of database systems

Topics:
Part I: Basic Concepts of Database Systems
a) Databases and Database Users. (Ch.1)
   • Characteristics of the Database Approach versus the Traditional File Processing Approach.
b) Database System Concepts and Architecture. (Ch.2)
- Data Models, Schemas, Instances.
- DBMS Architecture and Data Independence.
- Database Languages and Interfaces.
- The Database System Environment.
- Classification of DBMSs.

c) Data Modeling Using the ER Model. (Ch.3)
- Database Design and High-level Conceptual Data Models.
- ER Model Concepts

d) Enhanced ER and Object Modeling. (Ch.4) – Independent Study

Part II: Database Models and Languages

a) The Relational Data Model & Relational Algebra. (Ch. 5&6)
- Relational Model Concepts.
- Relational Integrity Rules.
- The Relational Algebra.

b) Relational Database Design by ER-Relational Mapping. (Ch. 7)

c) SQL-A Relational Database Language. (Ch. 8&9)
- Data Definition in SQL.
- Queries in SQL.
- Update Statements in SQL.
- Views in SQL.
- Embedded SQL.

Part III: Database Design Theory

a) Functional Dependencies and Normalization for Relational Databases. (Ch.10 and 11)
- Informal Design guidelines.
- Functional dependencies.
- Normal Forms.
- Design Algorithms and further Normal Forms.

Part IV: Database Security & Authorization (Ch. 23)

Social and Ethical issues related to database systems.

Projects:
Students are asked and encouraged to develop three projects. The main objectives of these projects are:
- Give the students the opportunity to design relational databases for simple real life applications.
- Give the students the opportunity to be exposed to different popular DBMSs: Oracle, SQL Server, and MySQL.

Students are encouraged to work individually to develop and complete the following three projects:

1. Design and develop a database application for a banking system using:

2. Exending and upgrading the same database application to be Web-based with more data security enforcement using:
   - SQL Server DBMS, Visual Studio .NET, and ADO.NET.

3. (Bonus Project) Design and develop another database application using:
   - MySQL DBMS and PHP as server-side scripting language.
**Research Paper:**
In this assignment, students are encouraged to work in groups of 2. Each group is asked to write a research paper and give a presentation on one of the following topics (*MidTerm Submission on April 23 and final submission on May 11, 2014*).

1. MySQL
2. Web Database Programming Using PHP
3. Record Storage and File Organizations & Indexing Structures
4. Transaction Processing, Concurrency, Recovery, and Backup Controls in DBMS.
5. Automated Database Design Tools (UML & Rational Rose)
6. Real-time Databases
7. Spatial Databases
8. Temporal Databases
9. Mobile Databases
10. GIS Databases
11. Distributed databases
12. Distributed Databases in Oracle, DB2, and SQL Server.
13. Active/Deductive Databases
14. XML Databases
15. DB2 and its Associated Tools
16. Object-Relational DBMSs (SQL3) and OODBMSs
17. Data Mining and Knowledge Discovery
18. Data Warehousing
19. Multi-media Databases
20. On-Line Analytical Processing (OLAP)
21. Database Security

**Assignments:**
1. Database Design in ER and Relational Data Models (*Due Date: TBA*).
2. Query Design in SQL (*Due Date: TBA*).
3. Data Normalization (*Due Date: TBA*).

**Exams:**

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<tr>
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<td>Sunday, March 16, 2014</td>
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<td>Exam II</td>
<td>Sunday, April 27, 2014</td>
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**Grading System:**

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**Attendance Policy:**
Attendance is expected. Whether you come to class or not, you are responsible for keeping up with what happens in class. If you miss a class (other than for illness or emergency), it is not reasonable for you to expect me to repeat the material that was covered in the class you missed just for you. This applies both the content of the class as well as the announcements about class policies, events, deadlines or whatever. The following attendance policy will be applied:

1. The first unexcused absence will not receive a penalty.
2. The 2nd through 6th unexcused absences will receive penalties of 1 percentage point deducted from the total course grade.
3. The next 4 unexcused absences will result in penalties of 2 points deducted from the total course grade.
4. If a student misses more than 10 classes, he/she will automatically receive a grade “F” for the course.
5. The only excuses accepted will be from the Office of Students Affairs. There will be no exceptions.

**Good Luck**