Course Information

*Division:* Business  
*Course Number:* CMP 280  
*Title:* Database Design and Development  
*Credits:* 3  
*Developed by:* Lydia Mata  
*Lecture/Lab Ratio:* 2 Lecture/2 Lab  
*Transfer Status*:  
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<th>ASU</th>
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<td>Elective Credit</td>
<td>ISM Departmental Elective</td>
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*Activity Course:* No  
*CIP Code:* 11.0100  
*Assessment Mode:* Pre/Post Test (50 Questions/50 Points)  
*Semester Taught:* Upon Request  
*GE Category:* None  
*Separate Lab:* No  
*Awareness Course:* No  
*Intensive Writing Course:* No

**Prerequisites**
None

**Educational Value**
This course will serve several target populations:
1. Computer program majors.
2. Those seeking to upgrade their database skills above the Microsoft Access level.
3. Those seeking an understanding of relational database concepts and Structured Query Language (SQL).
4. Other individuals with an interest in gaining move advanced knowledge of databases.

**Description**
This course is designed to provide individuals with a complete introduction to database concepts and the relational database model. Topics include QBE, SQL, normalization, design methodology, DBMS functions, database administration, and other database management approaches, such as client/server databases, object oriented databases, and data warehouses. At the completion of this course, students should be able to understand a user’s database requirements and translate those requirements into a valid database design. Students should have already completed CMP 170 Database Management with Microsoft Access or possess equivalent knowledge.
Supplies
Access to a networked personal computer with Microsoft Access and a SQL Server installed.

Competencies and Performance Standards
1. Identify the essential ideas behind database management.

   Learning objectives
   What you will learn as you master the competency:
   a. Describe basic database terminology.
   b. Describe database management systems.
   c. Explain the advantages and disadvantages of database processing.

   Performance Standards
   Competence will be demonstrated:
   o by completing the casework with a satisfactory score
   o by completing the chapter quiz with a satisfactory score

   Criteria - Performance will be satisfactory when:
   o learner describes basic database terminology
   o learner describes database management systems
   o learner explains the advantages and disadvantages of database processing

2. Describe Query-By-Example and relational algebra.

   Learning objectives
   What you will learn as you master the competency:
   a. Describe the relational model.
   b. Explain Query-By-Example.
   c. Utilize criteria in QBE.
   d. Create calculated columns in QBE.
   e. Calculate statistics in QBE.
   f. Sort data in QBE.
   g. Join tables in QBE.
   h. Update data using QBE.
   i. Explain relational algebra.

   Performance Standards
   Competence will be demonstrated:
   o by completing the casework with a satisfactory score
   o by completing the chapter quiz with a satisfactory score

   Criteria - Performance will be satisfactory when:
   o learner describes the relational model
   o learner explains Query-By-Example
   o learner utilizes criteria in QBE
   o learner creates calculated columns in QBE
   o learner calculates statistics in QBE
3. **Explain the relational model.**

*Learning objectives*

*What you will learn as you master the competency:*

a. Introduce structured query language (SQL).

b. Utilize simple and compound conditions in SQL.

c. Utilize computed fields in SQL.

d. Utilize built-in SQL functions.

e. Utilize subqueries in SQL.

f. Group records in SQL.

g. Join tables in SQL.

h. Perform union operations in SQL.

i. Utilize SQL to update database data.

j. Utilize SQL query to create a table in a database.

*Performance Standards*

*Competence will be demonstrated:*

- by completing the casework with a satisfactory score
- by completing the chapter quiz with a satisfactory score

*Criteria - Performance will be satisfactory when:*

- learner introduces structured query language (SQL)
- learner utilizes simple and compound conditions in SQL
- learner utilizes computed fields in SQL
- learner utilizes built-in SQL functions
- learner utilizes subqueries in SQL
- learner groups records in SQL
- learner joins tables in SQL
- learner performs union operations in SQL
- learner utilizes SQL to update database data
- learner utilizes SQL query to create a table in a database

4. **Describe advanced topics in the relational model.**

*Learning objectives*

*What you will learn as you master the competency:*

a. Define, describe, and use views.

b. Utilize indexes to improve database performance.

c. Examine the security features of a database management system.

d. Describe entity, referential, and legal-values integrity.
e. Perform changes to the structure of a relational database.
f. Utilize the system catalog.

**Performance Standards**

**Competence will be demonstrated:**
- by completing the casework with a satisfactory score
- by completing the chapter quiz with a satisfactory score

**Criteria - Performance will be satisfactory when:**
- learner defines, describes, and uses views
- learner utilizes indexes to improve database performance
- learner examines the security features of a database management system
- learner describes entity, referential, and legal-values integrity
- learner performs changes to the structure of a relational database
- learner utilizes the system catalog

5. **Describe database normalization.**

**Learning objectives**

*What you will learn as you master the competency:*

a. Discuss functional dependence.
b. Discuss primary keys.
c. Define first normal form, second normal form, and third normal form.
d. Describe the problems associated with tables (relations) that are not in first normal form, second normal form, or third normal form, along with the mechanism for converting to all three.
e. Discuss the problems associated with incorrect conversions to third normal form.
f. Define fourth normal form.
g. Describe the problems associated with tables (relations) that are not in fourth normal form and describe the mechanism for converting to fourth normal form.
h. Explain how normalization is used in the database design process.

**Performance Standards**

**Competence will be demonstrated:**
- by completing the casework with a satisfactory score
- by completing the chapter quiz with a satisfactory score

**Criteria - Performance will be satisfactory when:**
- learner discusses functional dependence
- learner discusses primary keys
- learner defines first normal form, second normal form, and third normal form
- learner describes the problems associated with tables (relations) that are not in first normal form, second normal form, or third normal form, along with the mechanism for converting to all three
- learner discusses the problems associated with incorrect conversions to third normal form
- learner defines fourth normal form
- learner describes the problems associated with tables (relations) that are not in fourth normal form and describe the mechanism for converting to fourth normal form
o learner explains how normalization is used in the database design process

6. **Describe database design methodology.**

   **Learning objectives**

   *What you will learn as you master the competency:*

   a. Discuss the general process and goals of database design.
   b. Define user views and explain their function.
   c. Define Database Design Language (DBDL) and use it to document database designs.
   d. Create an entity-relationship (E-R) diagram to visually represent a database design.
   e. Present a methodology for database design at the information level and view examples illustrating this methodology.
   f. Explain the physical-level design process.
   g. Explain top-down and bottom-up approaches to database design and examine the advantages and disadvantages of both methods.
   h. Utilize a survey form to obtain information from users prior to beginning the database design process.
   i. Review existing documents to obtain information prior to beginning the database design.
   j. Discuss special issues related to implementing one-to-one relationships and many-to-many relationships involving more than two entities.
   k. Discuss entity subtypes and their relationships to nulls.
   l. Avoid potential problems when merging third normal form relations.
   m. Examine the entity-relationship model for representing and designing databases.

   **Performance Standards**

   *Competence will be demonstrated:*

   o by completing the casework with a satisfactory score
   o by completing the chapter quiz with a satisfactory score

   **Criteria - Performance will be satisfactory when:**

   o learner discusses the general process and goals of database design
   o learner defines user views and explain their function
   o learner defines Database Design Language (DBDL) and use it to document database designs
   o learner creates an entity-relationship (E-R) diagram to visually represent a database design
   o learner presents a methodology for database design at the information level and view examples illustrating this methodology
   o learner explains the physical-level design process
   o learner explains top-down and bottom-up approaches to database design and examine the advantages and disadvantages of both methods
   o learner utilizes a survey form to obtain information from users prior to beginning the database design process
   o learner reviews existing documents to obtain information prior to beginning the database design
   o learner discusses entity subtypes and their relationships to nulls
   o learner avoids potential problems when merging third normal form relations
   o learner examines the entity-relationship model for representing and designing databases
7. **Explain DBMS functions.**

*Learning objectives*

*What you will learn as you master the competency:*

a. Identify the functions, or services, provided by a database management system (DBMS).
b. Describe how a DBMS handles updating and retrieving data.
c. Examine the catalog feature of a DBMS.
d. Illustrate the concurrent update problem and describe how a DBMS handles this problem.
e. Explain the data recovery process in a database environment.
f. Describe the security services provided by a DBMS.
g. Examine the data integrity features provided by a DBMS.
h. Explain the extent to which a DBMS achieves data independence.
i. Define and describe data replication.
j. Present the utility services provided by a DBMS.

*Performance Standards*

*Competence will be demonstrated:*

- by completing the casework with a satisfactory score
- by completing the chapter quiz with a satisfactory score

*Criteria - Performance will be satisfactory when:*

- learner identifies the functions, or services, provided by a database management system (DBMS)
- learner describes how a DBMS handles updating and retrieving data
- learner examines the catalog feature of a DBMS
- learner illustrates the concurrent update problem and describe how a DBMS handles this problem
- learner explains the data recovery process in a database environment
- learner describes the security services provided by a DBMS
- learner examines the data integrity features provided by a DBMS
- learner explains the extent to which a DBMS achieves data independence
- learner explains the extent to which a DBMS achieves data independence
- learner defines and describe data replication
- learner presents the utility services provided by a DBMS

8. **Describe database administration.**

*Learning objectives*

*What you will learn as you master the competency:*

a. Explain the need for database administration (DBA).
b. Identify DBA’s responsibilities in formulating and enforcing database policies for access privileges, security, disaster planning, and archiving.
c. Identify DBA’s administrative responsibilities for database management system (DBMS) evaluation and selection, DBMS maintenance, data dictionary management, and training.
d. Identify DBA’s technical responsibilities for database design, testing, and performance tuning.
**Performance Standards**

*Competence will be demonstrated:*
- by completing the casework with a satisfactory score
- by completing the chapter quiz with a satisfactory score

**Criteria - Performance will be satisfactory when:**
- learner explains the need for database administration (DBA)
- learner identifies DBA’s responsibilities in formulating and enforcing database policies for access privileges, security, disaster planning, and archiving
- learner identifies DBA’s administrative responsibilities for database management system (DBMS) evaluation and selection, DBMS maintenance, data dictionary management, and training
- learner identifies DBA’s technical responsibilities for database design, testing, and performance tuning

9. **Identify database management approaches.**

**Learning objectives**

*What you will learn as you master the competency:*

a. Describe distributed database management systems (DBMSs).
b. Explain client/server systems.
c. Define data warehouses and explain their structure and access.
d. Discuss the general concepts of object-oriented DBMSs.
e. Summarize the impact of Web access to databases.
f. Provide a brief history of database management.
g. Describe the network and hierarchical data models.

**Performance Standards**

*Competence will be demonstrated:*
- by completing the casework with a satisfactory score
- by completing the chapter quiz with a satisfactory score

**Criteria - Performance will be satisfactory when:**
- learner describes distributed database management systems (DBMSs)
- learner explains client/server systems
- learner defines data warehouses and explain their structure and access
- learner discusses the general concepts of object-oriented DBMSs
- learner summarizes the impact of Web access to databases
- learner provides a brief history of database management
- learner describes the network and hierarchical data models

**Types of Instruction**

Classroom Presentation
On Campus Laboratory
**Grading Information**

**Grading Rationale**

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<tr>
<td>Quizzes</td>
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**Grading Scale**

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