Miami Dade College

Course Description

CGS1540C| Database Concepts Design | 4.00 credits

This course is designed for computer science majors and non-majors who require a fundamental knowledge of databases and database management systems. Students will learn how to design, implement and use databases to maintain and manipulate data. Students should have knowledge of basic computer concepts or seek faculty advisement.

Course Competencies:

Competency 1: The student will demonstrate an understanding of fundamental database concepts by: Defining data.

1. Defining information
2. Describing the process by which information is derived from data
3. Describing how a database is implemented
4. Distinguishing between variant database models, how they differ, and the advantages of each model
5. Describing the advantages (i.e., improved data consistency, quality, integrity) and disadvantages of using databases (i.e., cost and complexity)
6. Conducting online research to locate and identify the different database engines, models, and providers
7. Defining and providing examples of a database transaction

Competency 2: The student will demonstrate conceptual design principles by:

1. Performing a use case analysis and determining the functional requirements from the use case
2. Identifying non-functional requirements that will affect a solution design
3. Analyzing data requirements to determine data entities and attributes
4. Analyzing entities and attributes to determine their relationships

Competency 3: The student will demonstrate the ability to create a database design by:

1. Describing all data types (e.g., CHAR, NUMBER, etc.)
2. Discussing the basic tenets of proper database design by describing the impact of:
    a. Data duplication
    b. Data redundancy
    c. Data integrity
    d. Implicit information storage
    e. Referential integrity
3. Developing and creating an entity relationship diagram for modeling a database
4. Describing and executing the general methods of design using 3NF (third-normal form) to eliminate redundancy, partial and transitive dependencies
5. Modeling each of the following constructs in an E-Rdiagram:
    a. composite attribute
    b. multi-valued attribute
    c. derived attribute
    d. associative entity
    e. identifying relationships
    f. minimum and maximum cardinality constraints

Competency 4: The student will demonstrate an understanding of basic SQL (Standard Query Language) syntax by:

1. Describing the basic characteristics of the Standard Query Language
2. Writing SQL statements to create simple tables
3. Creating data integrity controls
4. Changing/updating table definitions

5. Inserting, updating, and deleting data/records
6. Writing and implementing single table queries
7. Writing and implementing basic queries formatted for specific output

Competency 5: The student will demonstrate the ability to optimize information retrieval by:

1. Relating tables in the design
2. Identifying the data elements by which to relate tables
3. Writing complex SELECT statements, including the use of various JOIN, SUBQUERIES, and conditional expressions
4. Relating tables in the database
5. Describing the advantages of using an index, and implementing different types of indexes on tables.
6. Describing how a database implements and uses indexing (i.e., B-Tree, Bitmap, etc.)
7. Describing referential integrity and how it is enforced
8. Describing foreign keys and their use when relating tables

Competency 6: The student will describe Business Intelligence/Decision Support Systems, their use and implementations by:

1. Describing the two major categories, Online Analytical Processing (OLAP) and data mining applications, including their uses and applications
2. Describing the components of data warehousing structures used by OLAP and data mining systems.
3. Comparing and contrasting a data warehouse versus a data mart
4. Describing the three levels in a data warehouse application
5. Developing the requirements for a data mart and using various schemes for determining and modifying dimension attribute values

Learning Outcomes:

- Solve problems using critical and creative thinking and scientific reasoning.
- Formulate strategies to locate, evaluate, and apply information.
- Use computer and emerging technologies effectively.