

Mercer County Community College

Division of Business and Technology

IST 253

DATA BASE CONCEPTS

COURSE DESCRIPTION:

This course is an introduction to data base concepts for data processing practitioners; covers hierarchical, network, relational data base designs. Uses Oracle data base software in the laboratory.

Text (s): **Reference Division Booklist**

Prerequisites: IST 109, Algebra

Co-requisites: none

Credits: 3

Lecture Hours: 3

Studio/Lab Hours: 0

Food and drink are strictly prohibited in classrooms as per health and safety laws. Students may not bring in chemicals or cleaning fluids without the appropriate MSD sheets.

Course Coordinator: Winston H. Maddox

Latest Review: Fall 2003

EVALUATION

A minimum of five (5) tests will be given. An optional exam will be given to provide a make-up opportunity for students who miss one of the regular tests. There will be no further make-up opportunities. Students who complete all of the regular tests need not take the final.

Topic No. Topic Description

- I.** Introduction
- II.** Input/Output Processing and file Organization
- III.** Database Applications
- IV.** Database Management Systems: Application Development
- V.** Data Structures for Database Processing
- VI.** Specifying Database Requirements
- VII.** Relation Definition and Normalization
- VIII.** Logical Database Design
- IX.** Multi-user processing and Database administration
- X.** Designing Database Applications
- XI.** Relational Processing with SQL
- XII.** Relational Database Application
- XIII.** Transaction Processing and the Hierarchical Model
- XIV.** The Network Data Model and Codasyl DBTG
- XV.** Fundamentals of Distributed Database Processing

Topic I Introduction

Source: Chapter I

Objectives:

- To establish reasons for studying database processing
- To compare file processing systems and database processing systems.
- To define the term database.
- To define database applications.
- To describe the evolution of database within the organizational context, the end-user context, and the distributed database processing.

Topic II Input/Output Processing and File Organization

Source: Supplemental

Objectives:

- To review the characteristics of direct access peripheral devices.
- To identify and describe different record formats.
- To explain how computer systems accomplish I/O tasks.
- To identify the tasks involved in retrieving a record from disk.
- To describe sequential file processing and buffering.
- To illustrate indexed sequential file organization and processing.
- To discuss direct file organization and hashing schemes.
- To discuss virtual storage organization and I/O handling.
- To define the terms byte, field, logical and physical record, logical and physical file, primary and secondary key, unique and no unique key, schema, subschema, and internal view.

Topic III Data Applications
Source: Chapter 2

Objectives:

- To define the term database application
- To illustrate the system components of a database application: hardware, software, data, procedures, and people.
- To define the functional components of a database application: mechanisms for updating data, for displaying, and for controlling database access.
- To illustrate the overlapping information requirements of common-database applications.

Topic IV Database Management Systems: Application Development
Source: Chapter 3/Supplemental

Objectives:

- To define database management system
- To describe generic functions of DBMS products.
- To describe the subsystems of a DBMS.
- To present the steps used to develop database applications.
- To interpret data flow diagrams for existing systems.
- To identify alternatives for the five components of a database processing system.
- To identify both subjective and objective techniques for evaluating alternatives.
- To identify the tasks involved in design and implementation of a database processing system.
- To describe the functions of database utilities such as recovery, backup, restart, and load.

Topic V Data Structures for Data Base Processing
Source: Supplemental

Objectives:

- To introduce trees, simple networks, and complex networks.
- To show the relevance of data structures to database processing.
- To introduce (or view) linked concepts and illustrate their usefulness with typical file processing examples.
- To understand how trees can be implemented using linked lists and inverted lists.
- To understand how simple networks can be represented using linked lists and inverted lists.
- To understand how complex networks can be represented using linked lists and inverted lists.
- To introduce the single/double arrow notation used for the remainder of the book.
- To understand how secondary unique and non-unique keys can be represented using linked lists and inverted lists.

Topic VI Specifying Database Requirements
Source: Chapter 4

Objectives:

- To present a process for developing and documenting database application requirements.
- To define the term object.
- To demonstrate the use of object diagrams to illustrate database requirements.
- To define the concept of property domain.
- To show the relationship between objects and object views.
- To define application requirements in terms of their update, display, and control mechanisms.

Topic VII Relation Definition and Normalization
Source: Chapter 5

Objectives:

- To learn how to design database relations that do not have anomalies.
- To define normalization.
- To define and identify types of modification anomalies.
- To define and identify types of functional dependencies.
- To convert relations that have anomalies into first, second, third, Boyce-Codd, fourth, and domain/key normal forms.
- To learn how to compress relations form related attributes.

Topic VIII Logical Database Design
Source: Chapter 6

Objectives:

- To define and identify the three binary relationships.
- To learn the notation used in relation diagram.
- To use the binary relationships to represent trees (hierarchies), simple networks, and complex networks.
- To define and identify five object types.
- To represent each object type using relations.

- To perform logical design by transforming objects into relations.

Topic IX Multi-User Processing and Database Administration
Source: Chapter 7/Supplemental

Objectives:

- To describe problems inherent in the multi-user database environment.
- To define the functions of the database administrator (DBA).
- To describe the functions of the DBMS which pertain to concurrent database processing.
- To define the terms transaction, before image, after image, rollback, and rollforward.
- To define the terms object, entity, action, and authorization constraint as they pertain to database security.
- To describe recovery, backup, restart and load functions.
- To discuss the importance of database administration.
- To define the DBA's role in the management of data activity (OTIS).
- To describe DBA responsibilities for maintenance of the database structure (OTIS).
- To explain performance statistics the DBA should collect and how these statistics should be used.
- To discuss economics and control.
- To define DBA personnel and placement within an organization (OTIS).

TOPIC X Designing Database Applications
Source: Chapter 8/Supplemental

Objectives:

- To describe the functions of a database application.
- To explain the function of a database application in materializing objects from stored data.
- To describe how an application prints, queries, and updates objects.
- To describe how an application gives the user control over processing.
- To explain how an application maintains database security and data integrity.
- To explain materialization of objects and object views.
- To describe a four-step process for database application design.
- To present guidelines for form design and report design.
- To present database update guidelines that preserve referential integrity.
- To understand the complexities of database design.
- To understand the inputs, and processes for logical database design.
- To understand the inputs, outputs, and processes for physical database design.
- To recognize some of the models for database design and the characteristics of these models.
- To understand the process for database design and implementation.

Topic XI Relational Processing With SQL
Source: Chapter 9

Objectives:

- To explain how the relational model is closer to the user's perspective than other data models.
- To explain the impact of the relational model on end-user database processing.
- To define the terms relation, tuple, domain, attribute, candidate key, and primary key.
- To describe how binary relationships are expressed in the relational model, including trees, simple networks, and complex networks.
- To explain and illustrate relational algebraic operations, including union, difference, product, projection, selection, and join.
- To illustrate how to express database queries in relational algebra.
- To introduce the relational data access language SQL, illustrating its use in querying single tables and multiple tables.
- To demonstrate the use of SQL to update data.

Topic XII Relational Database Application
Source: Chapter 11

Objectives:

- To explain the database constructs employed by database 2 (DB2).
- To illustrate the use of DB2 data definition language to create tables, views, and indexes.
- To illustrate the use of DB2 to modify and delete various database constructs.
- To illustrate the use of SQL as implemented in DB2 to manipulate database data.
- To explain how application programs can access DB2.
- To explain how DB2 handles the issues of concurrent processing, backup and recovery, and security.

Topic XIII Transaction Processing and the Hierarchical Model
Source: Chapter 12

Objectives:

- To describe the characteristics of transaction processing applications.
- To explain the characteristics of databases based on the hierarchical model.
- To illustrate database structures employed by a hierarchical DBMS product.
- To illustrate how trees, simple networks and complex networks are represented.
- To describe and illustrate various data manipulation statements used to retrieve and update database data.

Topic XIV The Network Data Model and CODASYL DBTG
Source: Chapter 13

Objectives:

- To explain and illustrate the CODASYL DBTG network data model
- To examine the data constructs employed in the CODASYL data model.
- To present the CODASYL DBTG data definition language.
- To illustrate how each object type is represented within the CODASYL model.
- To discover how domain, intra-record, and inter-record constraints are handled by the DBTG model.
- To learn how schemas and subschemas are defined.
- To learn the concepts behind CODASYL DBTG data manipulation language.

Topic XV Fundamental of Distributed Database Processing
Source: Chapter 15

Objectives:

- To describe the fundamental concepts of distributed database processing.
- To explore design considerations for a distributed database system.
- To describe the major problems encountered in a distributed system.