# **Concepts of Database Management, Tenth Edition**

# **Module One: Introduction to Database Management**

# **A Guide to this Instructor’s Manual:**

We have designed this Instructor’s Manual to supplement and enhance your teaching experience through classroom activities and a cohesive module summary.

This document is organized chronologically, using the same heading in **red** that you see in the textbook. Under each heading, you will find (in order): Lecture Notes that summarize the section, Figures and Boxes found in the section, if any, Teacher Tips, Classroom Activities, and Lab Activities. Teacher Tips and activities are geared toward quizzing your students, enhancing their critical thinking skills, and encouraging experimentation within the software.

**Table of Contents**

[Module Objectives 2](#_Toc17965257)

[JC Consulting Company Background 2](#_Toc17965258)

[Selecting a Database Solution 3](#_Toc17965259)

[Storing Data 3](#_Toc17965260)

[Identifying Database Management Systems 4](#_Toc17965261)

[Advantages of a Properly Designed Relational Database 5](#_Toc17965262)

[Key Factors for a Healthy Relational Database 6](#_Toc17965263)

[Big Data 6](#_Toc17965264)

[Preparing for a Career in Database Administration and Data Analysis 6](#_Toc17965265)

[Introduction to the Pitt Fitness Database Case 7](#_Toc17965266)

[Introduction to the Sports Physical Therapy Database Case 7](#_Toc17965267)

[End of Module Material 8](#_Toc17965268)

[Key Terms 8](#_Toc17965269)

Module Objectives

The learning objectives for Module 1 are:

* Examine JC Consulting (JCC), the company used for many of the examples throughout the text
* Define basic database terminology
* Describe database management systems (DBMSs)
* Explain the advantages and key factors for a healthy relational database system
* Prepare for a career in database administration
* Review Pitt Fitness, a company used in a case that appears at the end of each module
* Review Sports Physical Therapy, a company used in another case that appears at the end of each module

JC Consulting Company Background

LECTURE NOTES

* Describe the JC Consulting (JCC)
* Use Figure 1-1 to illustrate the problems associated with using spreadsheets to maintain this data
  + Data redundancy
  + Difficulty accessing related data
  + Limited security features
  + Multiple updates
  + Size limitations
* Define redundancy
  + Duplication of data or the storing of the same data in more than one place
* Discuss the problems redundancy causes
  + Wastes space
  + Makes changes more cumbersome
  + Leads to inconsistencies and inaccuracies
  + Leads to lower quality information which leads to poorer decision making
* Use Figure 1-2 to introduce the type of data that JCC must be able to store and retrieve
  + Point out that the amounts in the Estimate column in Figure 1-2 are not stored in the database but are calculated. The total for the project estimate is also calculated.

FIGURES: 1-1, 1-2

TEACHER TIPS

Students will work with JCC in every module. They should become familiar with this fictitious company and the type of data it needs to maintain to develop project estimates. The same type of data needs to be stored by other consulting companies or service providers.

If you want to personalize the database, you can have students add their name as a client or employee or you can have them rename the database using their own name rather than JCConsulting.

CLASSROOM ACTIVITIES

1. Group Activities: Place students in groups and distribute order forms found on the web. Ask the groups to determine the data the company must store and the data that is calculated.

2. Class Discussion: Ask students what other type of data a service provider such as JCC might need to maintain.

3. Critical Thinking: JCC needs to maintain data on employee benefits. Should JCC store this data in a spreadsheet? Why or why not?

Selecting a Database Solution

LECTURE NOTES

* Define entity
  + Person, place, object, event, or transaction for which you want to store and process data
* Define attribute
  + Characteristic or property of an entity
  + Also called a field or column in many database systems
* Define relational database
  + A structure that can store information about multiple types of entities, the attributes of those entities, and the relationships among the entities
* Use Figure 1-3 to discuss the Clients and Projects entities and the attributes for each entity
* Define relationship
  + An association between entities
* Define one-to-many relationship
  + Each client is associated with many projects, but each project is associated with only one client
* Use Figure 1-4 to explain the one-to-many relationship between clients and projects

FIGURES: 1-3, 1-4

TEACHER TIPS

Database concepts such as entity, attribute, and relationship are key terms. Use examples that students can relate to, for example, a school database or a database maintained to access driver’s license data. The data needed for an employment application form supports a good discussion of attributes and entities.

CLASSROOM ACTIVITIES

1. Class Discussion: Ask students to list the attributes to describe common entities such as students, classes, and instructors.

2. Quick Quiz

What is an entity? (Answer: A person, place, object, event, or transaction for which you want to store and process data)

Storing Data

LECTURE NOTES

* Define data file and flat file
  + A file used to store data as a list, such as a spreadsheet
* Point out the differences between a flat file and a relational database
* Use Figure 1-5 to review the tables (entities) that make up the JCC relational database
  + Employees, Clients, Projects, ProjectLineItems, TaskMasterList
* Use Figure 1-6 to illustrate the problems with storing project estimates in the alternative table structure
* Review the Q & As in this section
* Define entity-relationship (E-R) diagram
  + Visual way to represent a database
* Use Figure 1-7 to illustrate an E-R diagram and review the entities, attributes, and relationships in the JCCC database

FIGURES: 1-5, 1-6, 1-7

TEACHER TIPS

Figure 1-5 lists the five tables that make up the JCC database. Each table represents an entity. The data in the tables are related through common fields. It is these relationships that allow the user to access data from more than one table and produce reports, queries, and forms. Encourage students to use the embedded Q & As to test their understanding of the concepts as well as the design of the JCC database.

CLASSROOM ACTIVITIES

1. Class Discussion: Ask students to list the attributes to describe common entities such as students, classes, and instructors.

2. Critical Thinking: What happens when the relationship between two entities is “many-to-many”? (Answer: a third table needs to be created that is positioned on the “many” side of a one-to-many relationship with each of the first two entities.)

3. Quick Quiz

1. In the database environment, what is a one-to-many relationship? (Answer: An association between two entities where one record in one entity relates to zero, one, or many records in the second entity.)
2. What is a relational database? (A structure that that contains data about many categories of information as well as the relationships between those categories)

Identifying Database Management Systems

LECTURE NOTES

* Define database management system (DBMS)
  + A program or collection of programs, through which users interact with a database
* Use Figure 1-8 to discuss common popular relational database management programs
* Use Figure 1-9 to discuss popular software stacks. These are constantly changing and the term “stack” is not consistent across different types of stacks.
* Discuss the typical environment where these relational database systems are used
  + Access, Oracle, Db2, MySQL, SQL Server, PostgreSQL, SQLite
* Define database design
  + Determining the structure of a desired database, the entities, attributes, and relationships
* Define forms
  + Screen objects used to maintain, view, and print data from a database
* Use Figures 1-10 and 1-11 to illustrate forms used in an Access database
* Use Figure 1-12 to illustrate a report created from an Access database

FIGURES: 1-8, 1-9, 1-10, 1-11, 1-12

TEACHER TIPS

Discuss the problems students have encountered with redundant data. They may have experienced these frustrations at doctor’s appointments, with government requirements, or with the college itself.

Microsoft Access currently is the most popular DBMS for use with personal computers. There are versions of Oracle, DB2, MySQL, and SQL Server that run under several different operating systems. MySQL is open-source software that is available at no cost. Both Oracle and SQL Server provide Express versions that can be downloaded at no cost. These Express versions are subsets of the complete versions. PostgreSQL and SQLite are both open source, freeware.

CLASSROOM ACTIVITIES

1. Class Discussion: Ask students how they have managed their own data. Have any used Access or any other relational database management software?

2. Group Activities: Divide the class into small groups. Ask each group to determine the fields that could be used to describe a student in one of the following situations:

1. A database that stores information about students in a student organization
2. A database that stores information about students in a course
3. A database that stores information about students on an athletic team
4. A database that stores information about student health records

Advantages of a Properly Designed Relational Database

LECTURE NOTES

* Use Figure 1-13 to discuss the advantages of database processing
  + Better information is provided
  + Data and information are shared
  + Multiple business information requirements are addressed
  + Data redundancy is minimized
  + Data consistency is applied
  + Referential integrity is enforced
  + Security is increased
  + Productivity is increased
  + Data is freed from individual applications
* Define database administrator or database administration (DBA)
  + Person or group in charge of the database
* Define referential integrity
  + A relational database concept stating that table relationships must be consistent and follow integrity constraints
* Define integrity constraint
  + Rule that a relationship must follow to prevent the creation of orphan records.
  + Orphan records are records in an entity (table) on the “many” side of a relationship that do not have a matching record with the entity (table) on the “one” side of a relationship.
* Define data security
  + Protection of data from threats including the prevention of unauthorized access to the database, encryption of data as it travels through a network, protection against data corruption, and protection against all other electronic and physical attacks to the data
* Define data independence
  + A quality that allows you to change the structure of a database without requiring you to change the programs that access the database

FIGURE: 1-13

CLASSROOM ACTIVITIES

1. Group Activities: Divide the class into nine small groups. Assign each group a different advantage. Ask them to give a practical example of the advantage using a university database.

2. Class Discussion: Ask each student to list one place (for example, doctor’s office, dentist’s office, employer, school) where data about them is stored. Write the list on the board. Ask students what happens when data that is stored about them is incorrect.

3. Critical Thinking: If a database is not maintained or if incorrect data is entered into the database, serious problems can occur. What problems could occur if a student database is not maintained? What problems could occur if a database that maintains medical records data (such as a hospital database) has incorrect data?

4. Critical Thinking: One of the advantages of database processing is: getting more information for the same amount of data. Using a medical records database, provide some specific examples of this advantage.

Key Factors for a Healthy Relational Database

LECTURE NOTES

* Use Figure 1-14 to discuss the key factors for a healthy relational database and how that might be important to their career
  + Design
  + Security
  + Talent

FIGURE: 1-14

CLASSROOM ACTIVITIES

1. Group Activities: Divide the class into three groups. Assign each group a different key factor. Ask them to give a practical example of the disadvantage using a university database.

2. Critical Thinking: Ask students to research data-intensive job opportunities. List the job titles on the board.

3. Critical Thinking: One of the disadvantages of database processing is the greater impact of failure. If the student database or the learning management system (for example, *Blackboard* or *Canvas*) at your university is unavailable, how does that affect you? How does it affect your instructors?

Big Data

LECTURE NOTES

* Define big data
  + the large volume of data produced by every digital process, system, sensor, mobile device, and social media exchange
* Define structured data
  + traditional in its retrieval and storage
* Define unstructured data
  + data that is not organized or easily interpreted by traditional relational database models
* Define metadata
  + descriptive data stored with input sources
* Point out that big data is a source for ongoing discovery and analysis. The demand for information from big data will require new approaches to database management, architecture, tools, and practices.

CLASSROOM ACTIVITIES

1. Classroom Discussion: Big data is often seen as a controversial issue today. Everyone seems to be collecting it, analyzing it, making money from it, and praising it. Have students discuss whether they feel there are potential problems with collecting, storing, and distributing big data.

Preparing for a Career in Database Administration and Data Analysis

LECTURE NOTES

* Describe the role of a database administrator
  + managing the physical aspects of the database such as installing, maintaining, and testing hardware and software to designing and improving the database to provide efficient and effective access to the information.
* Describe the role of a data analyst
  + use tools and algorithms to mine a database for answers, information, trends, and insights
* Explain the requirements of a database administrator and data analyst
  + for DBAs, college degrees and certifications from software vendors
  + for data analysts, college degrees
* Point out that both roles are valuable to organizations and command salaries that reflect this value.

CLASSROOM ACTIVITIES

1. Classroom Discussion: Have students discuss the types of careers they are seeking that involve using or managing databases.

Introduction to the Pitt Fitness Database Case

* Use Figures 1-15 through 1-19 to describe the Pitt Fitness database case
* Use Figure 1-20 to illustrate the E-R diagram for Pitt Fitness
* Use Q & A 1-9 and other questions in the “Introduction to the Pitt Fitness Database Case” section to test students’ understanding of Pitt Fitness

FIGURES: 1-15, 1-16, 1-17, 1-18, 1-19, 1-20

TEACHER TIPS

The Pitt Fitness database has five entities: Instructors, Classes, Customers, Reservations, and ClassInstructors. There is a one-to-many relationship (one customer can have many reservations) between the Customers table and the Reservations table. The common field between the two tables is CustomerID. There is a one to many relationship (one class can have many reservations) between the Classes table and the Reservations table. The common field between the two tables is the ClassID field. Because one instructor can teach many classes and one class can be taught by many instrutors, there is a many-to-many relationship between instructors and classes. The ClassInstructors table relates instructors and classes by including the InstructorID field and the ClassID field. The InstructorID field is the common field between the ClassInstructors and Instructors tables. The ClassID field is the common field between the ClassInstructors and Classes tables.

CLASSROOM ACTIVITIES

1. Class Discussion: Ask students if there are any other attributes they would add to the Iinstructors table and to the Customers table.

2. Critical Thinking: What other attributes could you use to uniquely identify each class?

3. Critical Thinking: Why is the price of a class in the Reservations table and not in the Classes table?

Introduction to the Sports Physical Therapy Database Case

* Use Figures 1-21 through 1-24 to describe the Sports Physical Therapy database case
* Use Figure 1-25 to illustrate the E-R diagram for Sports Physical Therapy database
* Use Q & A 1-10 and the questions in the “Introduction to the Sports Physical Therapy Database Case” section to test students’ understanding of Sports Physical Therapy

FIGURES: 1-21, 1-22, 1-23, 1-24, 1-25

CLASSROOM ACTIVITIES

1. Class Discussion: Ask students if there are any other attributes they would add to the Owner table.

2. Assign a Project: Have students visit a local business to find out how the business uses a database.

End of Module Material

* Review questions require students to recall and apply the important material in the module.
* The JC Consulting, Pitt Fitness, and Sports Physical Therapy exercises test students’ knowledge of the module material.

Key Terms

* algorithm
* attribute
* big data
* column
* data analyst
* data file
* data independence
* data redundancy
* data security
* database
* database administration (DBA)
* database administrator (DBA)
* database design
* database management system (DBMS)
* encryption
* entity
* entity-relationship (E-R) diagram
* field
* flat file
* form
* integrity
* integrity constraint
* many-to-many relationship
* metadata
* NoSQL
* one-to-many relationship
* orphan record
* record
* redundancy
* referential integrity
* relational database
* relationship
* report
* row
* software stack
* structured data
* table
* unstructured data

[Top of Document](#_Excel_2007)