Databases 2
420-BD2-ID

Learning Guide

Course Title: Databases 2

Exams 2
Projects: 1

Course Description

In this course, students will learn about the theory behind relational databases, relational database nomenclature, and relational algebra. Students will learn to create functional Structured Query Language (SQL) code to manage databases and manipulate data inputs and outputs. Students will learn to optimize databases through normalization. Students will apply their knowledge with hands-on exercises designed to teach the intricacies of database design methodology.

Course Objectives: Upon successful completion of the course, students will be able to:

- Understand the basic database terminology.
- Describe Database Management Systems (DBMS) and what they accomplish.
- Explain the advantages and disadvantages of database processing.
- Describe the relational database model and why it is the model that is predominantly used by most DBMS.
- Explain what QBE (Query-ByExample) is and its use in in DBMS.
- Apply relational algebra
- Create simple and compound query statements in SQL
- Compute fields in SQL
- Apply built in SQL functions.
- Use subqueries in SQL
- Create tables using SQL queries
- Use SQL to group records, join tables and update data in a database.
- Define, describe and use views.
- Use indexes to improve database performance.
- Examine the security features of a DBMS.
- Discuss entity, referential and legal-values integrity.
- Explain the use of stored procedures, triggers and data macros.
- Discuss functional dependence and primary keys and why they are important facets of database design.
- Explain Normalization and how it is used in database design.
- Define the first normal form, second normal form, third normal form, and fourth normal form and the problems that arise when a database does not meet normalization requirements.
- Discuss the general processes of database design
- Create an entity relationship diagram to represent a database design.
- Discuss top-down and bottom-up approaches to database design and examine the advantages and disadvantages of each
- Explain how a DBMS handles updating and retrieving data.
- Illustrate the concurrent update problem and how a DBMS handles this problem.
- Describe the security services provided by a DBMS
- Examine the data integrity features provided by a DBMS

Course Resources

Concepts of Database Management 9th edition, Joy Starks; Philip Pratt; Mary Last
ISBN-13: 9781337093422
Cengage

SQL in 10 minutes 4th edition, Joy Starks; Philip Pratt; Mary Last
ISBN-13: 9780672336072
Pearson Education

Hardware

- One computer per student

Software/ resources

- A modern web browser (Chrome, Explorer, Edge, Firefox or Safari)
- A DBMS (Typically Microsoft SQL Server, MySQL, or Microsoft Access)

Student Data Files

The textbook activities and exercises may require the student to access certain resource files and materials.

Introduction

Database management is no longer a highly specialized segment that is left to the highly trained professionals limited to working with large mainframe computer systems. Today, database oriented applications systems have become an essential productivity tool for home computer users, small business owners and end users in large organizations. In today's rapid work environment where access to data is a key component of all aspects of decision-making, the need to access data quickly is a critical skill.

The major database software systems have continually added features to increase their ease of use, allowing users to access the data quickly and efficiently. However, in order to truly harness the power of a database and its data, one requires more than just knowledge of the database software itself. Knowledge of the general database environment, database design and structure as well as database application development are key components to understand in order to work effectively with any database work.

In this course, students will learn about the theory behind relational databases, relational database nomenclature, and relational algebra. Students will learn to create functional Structured Query Language (SQL) code to manage databases and manipulate data inputs and outputs. Students will learn to optimize databases through normalization. Students will apply their knowledge with hands-on exercises designed to teach the intricacies of database design methodology.

This course is divided into two parts. First, students will learn about database management in general, relational databases, and a broad overview of SQL (Structured Query Language). The SQL that is covered is not specific to any one specific implementation of SQL. It can be used with MySQL, MariaDB, Microsoft SQL Server and SQL Server Express, IBM DB2, APACHE Open Office database, PostgreSQL, Oracle and many others.

The second half of the course will allow you to do more hands on work with SQL. From Module 8 onward, the lessons will include the practice of SQL syntax by allowing the student to perform the common SQL operations required to work effectively with any database.

Module 1 – Introduction to Database Management

Objectives

- Introduce basic database terminology.
- Describe database management systems (DBMSs).
- Explain the advantages and disadvantages of database processing.
- Explore the Colonial Adventure Tours and Sports Physical Therapy case databases.

Important Note: The first module in this course will serve two purposes. First, it will cover the basic database terminology and the features of DBMSs. Secondly it will provide an overview of the structure of the three databases that will be used as examples and practical activities for modules 1 through 7 in this course.

Before you get started: Installing the datasets for the activities.

Before you start working on the practical exercises in this course, you will need access to the datasets that accompany the chapters in the book that you will be using. For modules 1 to 7, you will be using the Concepts of Database Management book. We will be using **Microsoft Access** for this part of the course and you will find the needed datasets in the course's work files. There are three (3) datasets that are required, Bits, Sports and Colonial.

Once you have the datasets, you can proceed to the reading and practical activities that follow.

- **Reading Activities**

  Concepts of Database Management - Chapter 1: Introduction to Database Management. pp.1-24

☐	Introduction to Database Management. • *Introduction* • *BITS Company Background*	Page: 1 -4
☐	Database Solution • *Database Terminology* • *Storing Data* *Take the time to explore the BITS database tables and answer the Q&A questions on pages 8-9*	Page: 4-10
☐	Database Management Systems.	Page: 10 -12
☐	Advantages of Database Processing Disadvantages of Database Processing Big Data	Page: 13-15
☐	Introduction to the Colonial Adventure Tours Database.	Page: 16 -20

	• *Explore the various tables of the Colonial Adventure Tours Database (You don't need to memorize anything here, just get a sense of the how the database is designed, its tables and the different fields in each table* • *Take a few minutes to work on the Q&A questions on pages 19-20*	
☐	Introduction to the Sports Physical Therapy Database. • *Explore the various tables of the Sports Physical Therapy Database (You don't need to memorize anything here, just get a sense of the how the database is designed, its tables and the different fields in each table* • *Take a few minutes to work on the Q&A questions on pages 22-24*	Page: 33

- **Review Questions:**

  Complete the Review questions 1-24 on pages 25-26. (You do not have to submit them for grading.

- **Practical Activities:**

  For the Practical activities in this course, you will select **one** of the three sets of exercises to complete. The objectives and degree of difficulty are the same for all three.

  For this first lesson, you do not need access to a computer. You will be searching for information manually in the database of your choice. The purpose is to illustrate how accessing information manually can be a lengthy and ineffective process. This will serve to highlight the benefits of working with databases.

☐	Complete BITS Corporation Exercises: Question 1-13	Page: 26
	OR	
☐	Complete Colonial Adventure Tours Case Exercises: Question 1-17	Page: 27
	OR	
☐	Complete Sports Physical Therapy Case Exercises: Question 1-11	Page: 27-28

- **Progress Check**

☐	Complete The Chapter 1 Progress Check Questions 1-15	From work files

Module 2 – Relational Database Models

Objectives

- Describe the relational model.
- Explain Query-By-Example (QBE).
- Use criteria in QBE.
- Create calculated columns in QBE.
- Utilize functions in QBE.
- Sort data in QBE.
- Join tables in QBE.
- Update data using QBE.
- Apply relational algebra.

➢ Reading Activities

Concepts of Database Management Chapter 2: The Relational Model 1: Introduction, QBE, and Relational Algebra. pp.29-74

This is the first chapter that will require you to work with a database. For the purposes of introducing you to working with a database, you will be working with Microsoft Access. Please make sure that your computer has Microsoft Access installed.

☐	The Relational Model 1: • *Introduction* • *Relational Databases* • *Relational Database Shorthand*	Page: 29-32
☐	• *Query-By-Example* • *Simple Queries*	Page: 33
☐	**Practical Activity: Your Turn 2-1**	Page: 34-35
☐	**Practical Activity: Your Turn 2-2**	Page: 35-36
☐	Simple Criteria • *Parameter Queries* • *Operators*	Page: 37-39
☐	**Practical Activity: Your Turn 2-3**	Page: 37
☐	Compound Criteria	Page: 39-43
☐	**Practical Activity: Your Turn 2-4**	Page: 39-40
☐	**Practical Activity: Your Turn 2-5**	Page: 40-41
☐	**Practical Activity: Your Turn 2-6**	Page: 42-43
☐	Computed Fields	Page: 43-45
☐	**Practical Activity: Your Turn 2-7**	Page: 43-44

☐	Functions	Page: 45-48
☐	**Practical Activity: Your Turn 2-8**	Page: 46-47
☐	**Practical Activity: Your Turn 2-9**	Page: 47-48
☐	Grouping	Page: 48
☐	**Practical Activity: Your Turn 2-10**	Page: 48
☐	Sorting • *Sorting on Multiple keys*	Page: 49 - 53
☐	**Practical Activity: Your Turn 2-11**	Page: 49-50
☐	**Practical Activity: Your Turn 2-12**	Page: 50-52
☐	Joining Tables • *Joining multiple tables*	Page: 53-56
☐	**Practical Activity: Your Turn 2-13**	Page: 53-54
☐	**Practical Activity: Your Turn 2-14**	Page: 55
☐	**Practical Activity: Your Turn 2-15**	Page: 55-56
☐	Using an Update Query	Page: 56-57
☐	**Practical Activity: Your Turn 2-16**	Page: 57
☐	Using a Delete Query	Page: 58
☐	**Practical Activity: Your Turn 2-17**	Page: 58
☐	Using a Make-Table Query	Page: 59-60
☐	**Practical Activity: Your Turn 2-18**	Page: 58
☐	Query Optimization	Page: 61
☐	Relational Algebra Please note that the Your Turn 2-19 to 2-26 do	Page: 61-67

	not need to be done as practical activities. They provide the code solution for each one. This section is important as a precursor to SQL and its purpose is to demonstrate the relationships between the different operations.	

- **Review Questions:**

  Complete the Review questions 1-30 on pages 69-70. (You do not have to submit them for grading.

- **Practical Activities:**

  For the Practical activities in this course, you will select **one** of the three sets of exercises to complete. The objectives and degree of difficulty are the same for all three.

  For this second lesson, you may use a computer to complete the queries in Access. In order to do these exercises successfully without impacting the original database for later use, please make a copy of the original database (BITS, Colonial Adventure Tours or Sports Physical Therapy) and use the copy of the database for these exercises.

☐	Complete BITS Corporation Exercises: QBE Question 1-18	Page: 70-71
	OR	
☐	Complete Colonial Adventure Tours Case Exercises: Question 1-18	Page: 72
	OR	
☐	Complete Sports Physical Therapy Case Exercises: Question 1-19	Page: 74

- **Progress Check**

☐	Complete The Chapter 2 Progress Check Questions 1-15	From work files

Module 3 – Introduction to SQL

Objectives

- Introduce Structured Query Language (SQL)
- Create Simple and Compound conditions in SQL
- Compute fields in SQL
- Apply built-in SQL functions
- Use subqueries in SQL
- Group records in SQL
- Join tables using SQL
- Perform Union operations in SQL
- Use SQL to update data
- Create a table using an SQL query

➢ Reading Activities

Concepts of Database Management Chapter 3: The Relational Model 2: SQL. pp.75-130

☐	The Relational Model 2: SQL • *Introduction* • *Getting Started with SQL*	Page: 75-76
☐	Table Creation • *Naming Conventions* • *Data Types*	Page: 77-78
☐	Simple Retrieval • *Numeric Criteria* • *Character Criteria* • *Date Criteria* • *Comparing Two Fields*	Page: 79-87
☐	**Practical Activity: Your Turn 3-1**	Page: 79
☐	**Practical Activity: Your Turn 3-2**	Page: 80-81
☐	**Practical Activity: Your Turn 3-3**	Page: 82-83
☐	**Practical Activity: Your Turn 3-4**	Page: 83-84
☐	**Practical Activity: Your Turn 3-5**	Page: 85

☐	**Practical Activity: Your Turn 3-6**	Page: 86
☐	Compound Conditions	Page: 87-92
☐	**Practical Activity: Your Turn 3-7**	Page: 87-88
☐	**Practical Activity: Your Turn 3-8**	Page: 88-89
☐	**Practical Activity: Your Turn 3-9**	Page: 89-90
☐	**Practical Activity: Your Turn 3-10**	Page: 91-92
☐	Computed Fields	Page: 92-94
☐	**Practical Activity: Your Turn 3-11**	Page: 92-93
☐	**Practical Activity: Your Turn 3-12**	Page: 94
☐	Using Special Operators (LIKE and IN)	Page: 95-97
☐	**Practical Activity: Your Turn 3-13**	Page: 95
☐	**Practical Activity: Your Turn 3-14**	Page: 96-97
☐	Sorting • *Sorting on Multiple Fields*	Page: 98-100
☐	**Practical Activity: Your Turn 3-15**	Page: 98
☐	**Practical Activity: Your Turn 3-16**	Page: 99-100
☐	Built-in Functions	Page: 101-104
☐	**Practical Activity: Your Turn 3-17**	Page: 101-102
☐	**Practical Activity: Your Turn 3-18**	Page: 102-103
☐	**Practical Activity: Your Turn 3-19**	Page: 103-104

☐	Subqueries	Page: 104-105
☐	**Practical Activity: Your Turn 3-20**	Page: 104
☐	Grouping	Page: 105-109
☐	**Practical Activity: Your Turn 3-21**	Page: 105
☐	**Practical Activity: Your Turn 3-22**	Page: 107
☐	Joining Tables • *Complex Joins.*	Page: 110-114
☐	**Practical Activity: Your Turn 3-23**	Page: 110
☐	**Practical Activity: Your Turn 3-24**	Page: 111-112
☐	**Practical Activity: Your Turn 3-25**	Page: 113-114
☐	Union	Page: 114-116
☐	**Practical Activity: Your Turn 3-26**	Page: 115-116
☐	Updating Tables	Page: 116-118
☐	**Practical Activity: Your Turn 3-27**	Page: 116-117
☐	**Practical Activity: Your Turn 3-28**	Page: 117-118
☐	**Practical Activity: Your Turn 3-29**	Page: 118-118
☐	Creating a Table from a Query	Page: 119-120
☐	**Practical Activity: Your Turn 3-30**	Page: 118-119
	Summary of SQL Commands *This section is a review of the SQL Commands that were covered in the lesson. You do not have to redo the exercises. They are there to be*	Page: 120-126

	used as a review.	

- **Review Questions:**

  Complete the Review questions 1-18 on pages 127-128. (You do not have to submit them for grading.

Joining Tables using the JOIN instruction

As you will see later in the course, many implementations of SQL also allow a special JOIN operator to join tables. Compare the next two queries; they do exactly the same thing:

```
SELECT CustomerNum, CustomerName, Customer.RepNum, FirstName, LastName
FROM Rep, Customer WHERE Rep.RepNum=Customer.RepNum
```

```
SELECT CustomerNum, CustomerName, Customer.RepNum, FirstName, LastName
FROM Rep INNER JOIN Customer ON Rep.RepNum=Customer.RepNum
```

In fact, it is even preferable to use the JOIN keyword when joining tables as it makes the code easier to read.

- **Practical Activities:**

  For the Practical activities in this course, you will select **one** of the three sets of exercises to complete. The objectives and degree of difficulty are the same for all three.

  For this third lesson, you may use a computer to complete the queries in Access. In order to do these exercises successfully without impacting the original database for later use, please make a copy of the original database (BITS, Colonial Adventure Tours or Sports Physical Therapy) and use the copy of the database for these exercises.

☐	Complete BITS Corporation Exercises: QBE Question 1-18	Page: 128-129
	OR	
☐	Complete Colonial Adventure Tours Case Exercises: Question 1-19	Page: 129
	OR	
☐	Complete Sports Physical Therapy Case Exercises: Question 1-22	Page: 130

- **Progress Check**

☐	Complete The Chapter 3 Progress Check Questions 1-20	From work files

Module 4 – Views Indexes and Security

Objectives

- Define, describe, and use views.
- Use indexes to improve database performance
- Examine the security features of a DBMS.
- Discuss entity, referential, and legal-values integrity.
- Make changes to the structure of a relational database
- Define and use the system catalog
- Explain the use of stored procedures, triggers, and data macros

➢ Reading Activities

Concepts of Database Management Chapter 4 : The Relational Model 3 Advanced Topics. pp.131-162

☐	Introduction • *Views*	Page: 131-138
☐	Indexes	Page: 138-141
☐	Security	Page: 142
☐	Integrity Rules • *Entity Integrity* • *Referential Integrity* • *Legal Values Integrity*	Page: 142-148
☐	Structure Changes • *Making complex changes* • *System Catalog*	Page: 148-153
☐	Stored Procedures	Page: 153
☐	Triggers • *Triggers in Access 2016* • *Before Macros* • *After Macros*	Page: 153-157

- **Review Questions:**

  Complete the Review questions 1-18 on page 159. (You do not have to submit them for grading.)

- **Practical Activities:**

  For the Practical activities in this course, you will select **one** of the three sets of exercises to complete. The objectives and degree of difficulty are the same for all three.

☐	Complete BITS Corporation Exercises: Question 1-12	Page: 160
	OR	
☐	Complete Colonial Adventure Tours Case Exercises: Question 1-14	Page: 161
	OR	
☐	Complete Sports Physical Therapy Case Exercises: Question 1-12	Page: 162

- **Progress Check**

☐	Complete The Chapter 4 Progress Check Questions 1-15	From work files

Module 5 – Database Normalization

Objectives

- Discuss functional dependence and primary keys.
- Define first normal form, second normal form, third normal form, and fourth normal form.
- Describe the problems associated with tables (relations) that are not in first normal form, second normal form, or third normal form, along with the mechanisms for converting to all three.
- Discuss the problems associated with incorrect conversions to third normal form.
- Describe the problems associated with tables (relations) that are not in fourth normal form and describe the mechanisms for converting to fourth normal form.
- Understand how normalization is used in the database design process.

➢ Reading Activities

Concepts of Database Management Chapter 5: Database Design 1: Normalization. pp.163-188

☐	Introduction	Page: 163-164
☐	Functional Dependence	Page: 165-167
☐	Keys	Page: 167-168
☐	First Normal Form	Page: 168-170
☐	Second Normal Form	Page: 170-173
☐	Third Normal Form	Page: 173-175
☐	Incorrect Decompositions	Page: 176-179
☐	Multivalued Dependencies and Fourth Normal Form	Page: 179-182
☐	Avoiding the Problem with Multivalued Dependencies.	Page: 182-183
☐	Application to Database Design.	Page: 183-184

- **Review Questions:**

  Complete the Review questions 1-15 on page 185-186. (You do not have to submit them for grading.

- **Practical Activities:**

  For the Practical activities in this course, you will select **one** of the three sets of exercises to complete. The objectives and degree of difficulty are the same for all three.

☐	Complete BITS Corporation Exercises: Question 1-6	Page: 186-187
	OR	
☐	Complete Colonial Adventure Tours Case Exercises: Question 1-4	Page: 187
	OR	
☐	Complete Sports Physical Therapy Case Exercises: Question 1-5	Page: 188

- **Progress Check**

☐	Complete The Chapter 5 Progress Check Questions 1-15	From work files

It is now time for your midterm exam. Make sure you are comfortable with select queries, joins and the where clause. Go see your instructor.

Module 6 – Database Design

Objectives

- Discuss the general process and goals of database design.
- Define user views and explain their function.
- Use Database Design Language (DBDL) to document database designs.
- Create an entity-relationship diagram to represent a database design visually.
- Present a method for database design at the information level and view examples illustrating this method.
- Explain the physical-level design process.
- Discuss top-down and bottom-up approaches to database design and examine the advantages and disadvantages of both methods.
- Use a survey form to obtain information from users prior to beginning the database design process.
- Review existing documents to obtain information prior to beginning the database design.
- Discuss special issues related to implementing one-to-one relationships and many-to-many relationships involving more than two entities.
- Identify entity subtypes and their relationships to nulls.
- Learn how to avoid potential problems when merging third normal form relations
- Examine the entity-relationship model for representing and designing databases.

➢ Reading Activities

Concepts of Database Management Chapter 6: Database Design 2: Design Method. pp. 189-230

☐	Introduction • *User views*	Page: 189-190
☐	Information-Level Design Method • *Step 1: Represent the User View as a Collection of tables.* • *Step 2: Normalize the Tables* • *Step 3: Identify All Keys* • *Types of Primary Keys*	Page: 190-193
☐	Database Design Language (DBDL) • *Entity-Relationship (E-R) Diagrams* • *Step 4: Merge the Result into the Design*	Page: 193-196
☐	Database Design Examples • *Entity-Relationship (E-R) Diagrams* • *Step 4: Merge the Result into the Design*	Page: 196-206
☐	**Practical Activity: Your Turn 6-1**	Page: 196
☐	**Practical Activity: Your Turn 6-2**	Page: 202

☐	Physical-Level Design	Page: 206-207
☐	Top-Down versus Bottom-Up Design	Page: 207-208
☐	Survey Form	Page: 208-209
☐	Obtaining Information from Existing Documents	Page: 209-213
☐	One-to-One Relationship Considerations	Page: 213-216
☐	Many-to-Many Relationship Considerations	Page: 216-218
☐	Nulls and Entity Subtypes	Page: 218-221
☐	Avoiding Problems with Third Normal Form When Merging Tables	Page: 222
☐	The Entity-relationship Model	Page: 222-226

- **Review Questions:**

  Complete the Review questions 1-14 on page 228-229. (You do not have to submit them for grading.

- **Practical Activities:**

  For the Practical activities in this course, you will select **one** of the three sets of exercises to complete. The objectives and degree of difficulty are the same for all three.

☐	Complete BITS Corporation Exercises: Question 1-5	Page: 229
	OR	
☐	Complete Colonial Adventure Tours Case Exercises: Question 1-3	Page: 230
	OR	
☐	Complete Sports Physical Therapy Case Exercises: Question 1-3	Page: 230

- **Progress Check**

☐	Complete The Chapter 6 Progress Check Questions 1-20	From work files

Module 7 – DBMS Functions (This module is optional)

Objectives

- Introduce the functions, or services, provided by a DBMS.
- Describe how a DBMS handles updating and retrieving data.
- Examine the catalog feature of a DBMS
- Illustrate the concurrent update problem and describe how a DBMS handle this problem.
- Explain the data recovery process in a database environment.
- Describe the security services provided by a DBMS.
- Examine the data integrity features provided by a DBMS
- Discuss the extent to which a DBMS achieves data independence.
- Define and describe data replication
- Present the utility services provided by a DBMS.

➢ Reading Activities

Concepts of Database Management Chapter 7: DBMS Functions. pp.231-259

☐	Introduction • *Update and retrieve data*	Page: 231-233
☐	Provide Catalog Services	Page: 233-234
☐	Support Concurrent Update • *The Concurrent Update Problem* • *Avoiding the Lost Update Problem* • *Two-Phase Locking* • *Deadlock* • *Locking on PC-Based DBMSs* • *Timestamping*	Page: 234-244
☐	Recover Data • *Journaling* • *Forward Recovery* • *Backward Recovery* • *Recovery on PC-Based DBMSs*	Page: 244-248
☐	Provide Security Services • *Encryption* • *Authentication* • *Authorizations* • *Views* • *Privacy*	Page: 248-250

☐	Provide Data Integrity Services	Page: 250-251
☐	Supporting Data Independence • *Adding a field* • *Changing the length of a field* • *Creating an index* • *Adding or changing a relationship.*	Page: 4252-253
☐	Support Data Replication	Page: 253
☐	Provide Utility Services	Page: 254

- **Review Questions:**

  Complete the Review questions 1-29 on page 256-257. (You do not have to submit them for grading.

- **Practical Activities:**

  For the Practical activities in this course, you will select **one** of the three sets of exercises to complete. The objectives and degree of difficulty are the same for all three.

☐	Complete BITS Corporation Exercises: Question 1-6	Page: 257
	OR	
☐	Complete Colonial Adventure Tours Case Exercises: Question 1-3	Page: 257-258
	OR	
☐	Complete Sports Physical Therapy Case Exercises: Question 1-5	Page: 258-259

- **Progress Check**

☐	Complete The Chapter 7 Progress Check Questions 1-20	From work files

Module 8 – Practical SQL

Objectives

- Use the SELECT statement to retrieve one or more columns of data from a table.
- Use the ORDER BY clause to sort retrieved data.
- Use the WHERE clause to specify search criteria.

Before starting with Module 8, you will need to set up your SQL environment. The next modules have been developed to use generic SQL code without specifically targeting any specific platform. In our case, we will use **Microsoft SQL Server**. SQL Server should already be installed on the College's computers. Go see your instructor if you want to install it on your personal computer as well.

Start **SQL Server Management Studio**. Once you are connected to the server (ask your instructor if you need to access a remote server), you should see a **New Query** button in the menu bar on top. Click it and a window will appear in which you will be able to type your queries. As in ***Access***, remember that you must click the **Execute** button to execute the script. If you examine the rest of the Management Studio interface, you will see that, much like ***Access***, you can create and manage tables using the graphical interface. Since this is a server (unlike ***Access***), you need to create a database before you do anything. You can do that by right clicking on **Databases** on the left side and choosing **New database...**

Before you start the activities below, experiment with Management Studio by trying to create a database and a table using the graphical interface. Then, fill the table with records by right clicking on the table name and choosing **Edit top 200 rows**.

Now we must get ready to do the following activities in SQL Server. In the work file, in the **Modules 8-12** folder, you will find a folder containing two files: **create.txt** and **populate.txt**. Open **create.txt** with the text editor of your choice and examine its content. You should be familiar with most of the code you see as it creates the structure of the database. Now copy the entire content of the file, go in ***Management studio*** and click on the **New query** button. In the white area that just opened, paste the content of **create.txt**. Then, click on the **Execute** button to run the code. You should now see that a new database named **sams** has been created.

We will now fill the tables of the **sams** database with records. Copy the entire content of **populate.txt** and paste it in a new query window (use the **New query** button again). Execute the script by clicking the **Execute** button and you should now have data in your tables. You are now ready to proceed with the exercises below. Make sure that **sams** is the selected database. You can do that by selecting **sams** in the top left drop down list or by writing the line **USE sams;** before you write your queries.

- **Practical Activities**

  SAMS Teach Yourself SQL Lesson 2: Retrieving Data. pp.13-25

☐	The SELECT Statement	Page: 13-14
☐	**Practical Activity: Retrieving Individual Columns**	Page: 14-16
☐	**Practical Activity: Retrieving Multiple Columns**	Page: 16-17
☐	**Practical Activity: Retrieving All Columns**	Page: 18
☐	**Practical Activity: Retrieving Distinct Rows**	Page: 19-20

☐	**Practical Activity: Limiting Results**	Page: 20-23
☐	**Practical Activity: Using Comments**	Page: 23-25

- **Practical Activities**

SAMS Teach Yourself SQL Lesson 3: Sorting Retrieved Data. pp.27-34

☐	**Practical Activity: Sorting Data**	Page: 27-29
☐	**Practical Activity: Sorting by Multiple Columns**	Page: 29-30
☐	**Practical Activity: Sorting by Column Position**	Page: 30-31
☐	**Practical Activity: Specifying Sort Direction**	Page: 31-34

- **Practical Activities**

SAMS Teach Yourself SQL Lesson 4: Filtering Data. pp.35-42

☐	**Practical Activity: Using the WHERE Clause**	Page: 35-37
☐	The WHERE Clause Operators	Page: 37
☐	**Practical Activity: Checking Against a Single Value**	Page: 38
☐	**Practical Activity: Checking for Nonmatches**	Page: 38-39
☐	**Practical Activity: Checking for a Range of Values**	Page: 40
☐	**Practical Activity: Checking for No Value**	Page: 40-42

- **Practical Activities**

SAMS Teach Yourself SQL Lesson 5: Advanced Data Filtering. pp.43-51

☐	**Practical Activity: Combining WHERE clauses –Using the AND operator**	Page: 43-44
☐	**Practical Activity: Using the OR operator**	Page: 45
☐	**Practical Activity: Understanding Order of Evaluation**	Page: 46-47
☐	**Practical Activity: Using the IN Operator**	Page: 47-49
☐	**Practical Activity: Using the NOT Operator**	Page: 49-51

- **Practical Activities**

  SAMS Teach Yourself SQL Lesson 6: Using Wildcard Filtering. pp.53-60

☐	**Using the LIKE Operator**	Page: 53-54
☐	**Practical Activity: The Percent Sign (%) Wildcard**	Page: 54-56
☐	**Practical Activity: The Underscore (_) Wildcard**	Page: 57-58
☐	**Practical Activity: The Brackets ([ ]) Wildcard**	Page: 58-60
☐	**Tips for using Wildcards**	Page: 60

- **Progress Check**

☐	Complete The Session 8 Review Questions 1-20	From work files

Module 9 – Practical SQL

Objectives

- Understand what are calculated fields.
- Create calculated fields in an SQL database.
- Use aliases to refer to calculated fields.
- Use data manipulation functions.
- Use SQL aggregate functions to summarize table data.

➢ **Practical Activities**

SAMS Teach Yourself SQL Lesson 7: Creating Calculated fields. pp.61-70

☐	Understanding Calculated Fields	Page: 61-62
☐	**Practical Activity: Concatenating Fields**	Page: 62-68
☐	**Practical Activity: Performing Mathematical Calculations**	Page: 68-70

➢ **Practical Activities**

SAMS Teach Yourself SQL Lesson 8: Using Data Manipulation Functions. pp.71-80

☐	**Understanding Functions** • ***The Problem with Functions*** • ***Using Functions***	Page: 71-73
☐	**Practical Activity: Text Manipulation Functions**	Page: 73-76
☐	**Practical Activity: Date and Time Manipulation Functions**	Page: 76-79
☐	**Practical Activity: Numeric Manipulation Functions**	Page: 79-80

➢ **Practical Activities**

SAMS Teach Yourself SQL Lesson 9: Summarizing Data. pp.81-91

☐	Using Aggregate Functions	Page: 81-82
☐	**Practical Activity: The AVG( ) Function**	Page: 82-83
☐	**Practical Activity: The COUNT ( ) Function**	Page: 84-85
☐	**Practical Activity: The MAX ( ) Function**	Page: 85-86
☐	**Practical Activity: The MIN ( ) Function**	Page: 86-87

☐	**Practical Activity: The SUM ( ) Function**	Page: 87-88
☐	**Practical Activity: Aggregates on Distinct Values**	Page: 89-90
☐	**Practical Activity: Combining Aggregate Functions**	Page: 90-91

- **Practical Activities**

SAMS Teach Yourself SQL Lesson 10: Grouping Data. pp.93-102

☐	**Practical Activity: Understanding Data grouping**	Page: 93
☐	**Practical Activity: Creating Groups**	Page: 94-
☐	**Practical Activity: Filtering Groups**	Page: 96-98
☐	**Practical Activity: Grouping and Sorting**	Page: 99-101
☐	**Practical Activity: SELECT Clause Ordering**	Page: 101-102

- **Progress Check**

☐	Complete The Session 9 Review Questions 1-15	From work files

Module 10 – Practical SQL

Objectives

- Work with subqueries to filter data and work with calculated fields.
- Use the JOIN statement to join tables
- Combine queries with the UNION statement.
- Insert data into a table with the INSERT statement.
- Update records in a table with the UPDATE statement.
- Delete records in a table with the DELETE statement.

➢ **Practical Activities**

SAMS Teach Yourself SQL Lesson 11: Working with Subqueries. pp.103-111

☐	Understanding Subqueries	Page: 103
☐	**Practical Activity: Filtering by Subquery**	Page: 104-107
☐	**Practical Activity: Using Subqueries as calculated fields**	Page: 108-111

➢ **Practical Activities**

SAMS Teach Yourself SQL Lesson 12: Joining Table. pp.113-123

☐	Understanding Joins • *Understanding Relational Table*s • *Why use Joins*	Page: 113-115
☐	**Practical Activity: Creating a Join**	Page: 116-117
☐	**Practical Activity: The Importance of the WHERE Clause**	Page: 117-119
☐	**Practical Activity: Inner Joins**	Page: 120
☐	**Practical Activity: Joining Multiple Tables**	Page: 120-123

➢ **Practical Activities**

SAMS Teach Yourself SQL Lesson 13: Creating Advanced Joins. pp.125-135

☐	**Practical Activity: Using Table Aliases**	Page: 125-126
☐	**Practical Activity: Using different join types**	Page: 126-128
☐	**Practical Activity: Natural Joins**	Page: 129
☐	**Practical Activity: Outer Joins**	Page: 129-132

☐	**Practical Activity: Using Joins with Aggregate functions**	Page: 132-133
☐	**Using Joins and Join Conditions**	Page: 134

- **Practical Activities**

SAMS Teach Yourself SQL Lesson 14: Combining Queries. pp.137-144

☐	**Understanding Combined Queries**	Page: 137
☐	**Practical Activity: Creating Combined Queries: Using UNION**	Page: 138-140
☐	**UNION Rules**	Page: 140-141
☐	**Practical Activity: Including or Eliminating Duplicate Rows**	Page: 141-142
☐	**Practical Activity: Sorting Combined Query Results**	Page: 142-144

- **Practical Activities**

SAMS Teach Yourself SQL Lesson 15: Inserting Data. pp.145-154

☐	**Understanding Data Insertion**	Page: 145
☐	**Practical Activity: Inserting Complete Rows**	Page: 146-148
☐	**Practical Activity: Inserting Partial Rows**	Page: 149
☐	**Practical Activity: Inserting Retrieved Data**	Page: 150-152
☐	**Practical Activity: Copying from One Table to Another**	Page: 152-154

- **Practical Activities**

SAMS Teach Yourself SQL Lesson 16: Updating and Deleting Data. pp.155-161

☐	**Practical Activity: Updating Data**	Page: 155-157
☐	**Practical Activity: Deleting Data**	Page: 157-160
☐	**Guidelines for Updating and Deleting Data**	Page: 160-161

- **Progress Check**

☐	Complete The Session 10 Review Questions 1-20	From work files

Module 11 – Practical SQL

Objectives

- Create, alter and delete tables in a database.
- Understand what views are, how they work and when they should be used.
- Use views to simplify SQL operations.
- Understand what stored procedures are, how they work and when they should be used.
- Understand the basic syntax for creating and using stored procedures.

➢ **Practical Activities**

SAMS Teach Yourself SQL Lesson 17: Creating and Manipulating Tables. pp.163-173

☐	Creating Tables	Page: 163-164
☐	**Practical Activity: Basic Table Creation**	Page: 164-165
☐	**Practical Activity: Working with NULL Values**	Page: 166-167
☐	**Practical Activity: Specifying Default Values**	Page: 168-169
☐	**Practical Activity: Updating Tables**	Page: 169-171
☐	**Practical Activity: Deleting Tables**	Page: 171-172

➢ **Practical Activities**

SAMS Teach Yourself SQL Lesson 18: Using Views. pp.175-185

☐	Understanding Views • *Why use Views* • *View Rules and Restrictions*	Page: 175-178
☐	**Practical Activity: Creating Views**	Page: 179-180
☐	**Practical Activity: Using Views to reformat Retrieved Data**	Page: 180-182
☐	**Practical Activity: Using Views to Filter Unwanted Data**	Page: 183-184
☐	**Practical Activity: Using Views with Calculated Fields**	Page: 184-185

➢ **Practical Activities**

SAMS Teach Yourself SQL Lesson 19: Working with Stored Procedures. pp.187-196

☐	**Understanding Stored Procedures** • ***Why us Stored Procedures***	Page: 187-190

☐	**Practical Activity: Executing Stored Procedures**	Page: 190-191
☐	**Practical Activity: Creating Stored Procedures (Make sure you use the SQL Server version)**	Page: 191-196

- **Progress Check**

☐	Complete The Session 11 Review Questions 1-15	From work files

Module 12 – Practical SQL

Objectives

- Understand what transactions are, and how to use COMMIT and ROLLBACK statements to manage transactions.
- Use cursors to simplify SQL operations.
- Understand advanced SQL features such as triggers, indexes and constraints.

➢ **Practical Activities**

SAMS Teach Yourself SQL Lesson 20: Managing Transaction Processing. pp.197-204

☐	Understanding Transaction Processing	Page: 197-199
☐	**Practical Activity: Controlling Transactions**	Page: 199-201
☐	**Practical Activity: Using ROLLBACK**	Page: 201
☐	**Practical Activity: Using COMMIT**	Page: 201
☐	**Practical Activity: Using Savepoints**	Page: 202-204

➢ **Practical Activities**

SAMS Teach Yourself SQL Lesson 21: Using Cursors. pp.205-211

☐	Understanding Cursors • *Working with Cursors*	Page: 205-207
☐	**Practical Activity: Creating Cursors**	Page: 207-208
☐	**Practical Activity: Using Cursors**	Page: 208-210
☐	**Practical Activity: Closing Cursors**	Page: 211

➢ **Practical Activities**

SAMS Teach Yourself SQL Lesson 22: Understanding Advanced SQL Features. pp.213-224

☐	**Understanding Constraints**	Page: 213-214
☐	**Practical Activity: Primary Keys** *(SEE NOTE AT BOTTOM OF PAGE)	Page: 214-215
☐	**Practical Activity: Foreign Keys**	Page: 216-217
☐	**Unique Constraints**	Page: 217-218
☐	**Practical Activity: Check Constraints** **(SEE NOTE AT BOTTOM OF PAGE)	Page: 218-219
☐	**Practical Activity: Understanding Indexes**	Page: 220-221

☐	**Practical Activity: Understanding Triggers** ***(SEE NOTE AT BOTTOM OF PAGE)	Page: 222-223
☐	**Database Security**	Page: 224

- **Progress Check**

☐	Complete The Session 12 Review Questions 1-15	From work files

***In SQL Server, the ADD CONSTRAINT PRIMARY KEY syntax goes like this:**

```
ALTER TABLE Vendors
ADD CONSTRAINT PK_vend PRIMARY KEY (vend_id);
```

Of course, this will give you an error, as there already is a primary key on the *Vendors* table. Note that the same syntax goes for the *foreign key* and *unique key* constraints (you must give the constraint a name).

****In SQL Server, the ADD CONSTRAINT CHECK syntax goes like this:**

```
ALTER TABLE Customers
ADD CONSTRAINT CHK_gender CHECK (gender LIKE '[MF]');
```

This will only work if the *gender* field exists. To test the code with a field that actually exists, try this:

```
ALTER TABLE Customers
ADD CONSTRAINT CHK_country CHECK (cust_country IN ('USA','CAN'));
```

Now if you try to add or update the *Customers* table with a country different from *USA* or *CAN*, you should get an error.

*****If the trigger code in the book doesn't work, try this instead:**

```
CREATE TRIGGER customer_state
ON Customers
FOR INSERT, UPDATE
AS
DECLARE @MyID int;
SELECT @MyID = cust_id from inserted;
UPDATE Customers
SET cust_state = Upper(cust_state)
WHERE Customers.cust_id = @MyID;
```

It is now time for your final exam and project. Go see your instructor.