New York City College of Technology/CUNY
Computer Systems Technology Department

CST1204 - Introduction to Databases

Course Description:

This course introduces students to the role and place of databases in Information Systems (IS). The course explains the advantages of databases compared to file systems, describes the basic functionality of the Database Management Systems (DBMS)—the special software needed for running a database, and shows how a database functions with other parts of the IS.

The course concentrates on relational databases (RDB), explains the organization of data within tables in the RDB and the role of the integrity constraints: the primary and foreign keys.

The major portion of the course is concerned with Structured Query Language (SQL)—the language of creating and supporting RDBs, and manipulating the relational data. The students learn how to create tables, specify constraints, populate tables with data, and manipulate the data: create, update, delete, and retrieve the data.

Demonstrations of database concepts and practical work are performed in one of the relational DBMSs. This will include the creation of tables, manipulation of data in the tables, queries using one or more tables, and importing/exporting data to other applications.

2 class hours, 2 lab hours, 3 credits

Course Objectives:

Upon successful completion of the course, the student should be able to:

1. Understand the role of a database in an IS, and the relationships databases have with other parts of the IS.
2. Understand the organization of the data in the RDB, the concepts of the table structure, the primary and the foreign keys.
3. Create tables according to a given design, including choosing data types for columns and declaring the column and the table constraints (primary key, foreign key, NOT NULL, CHECK).
4. Populate tables with data and manipulate the data (create, update, delete and retrieve).
5. Program data retrieval queries, including:
    a. Select data from one table for various retrieval conditions.
    b. Select data from several tables with the help of joins or subqueries, and for various retrieval conditions.
    c. Perform aggregate calculations on data from one or several tables.
    d. Populate tables with data from other applications and export data to other applications (including spreadsheets).

General Education Outcomes:

1. SKILLS/Inquiry/Analysis: Students will employ scientific reasoning and logical thinking.
2. SKILLS/Communication: Students will communicate in diverse settings and groups, using written (both reading and writing), oral (both speaking and listening), and visual means
3. VALUES, ETHICS, RELATIONSHIPS / Professional/Personal Development: Students will work with teams, including those of diverse composition. Build consensus. Respect and use creativity.

Prerequisites*:*

CST1100 Introduction to Computers, CST1101 Programming and Problem Solving

Required Materials**:**

Pratt, Philip J. and Mary Z. Last. 2009. A Guide to SQL, 9th edition. Boston: Cengage Learning
ISBN-13: 978-1-111-52727-3
ISBN-10: 1-111-52727-X

Students are encouraged to have a USB storage device for class projects.

Academic Integrity Policy**:**

Students and all others who work with information, ideas, texts, images, music, inventions, and other intellectual property owe their audience and sources accuracy and honesty in using, crediting, and citing sources. As a community of intellectual and professional workers, the College recognizes its responsibility for providing instruction in information literacy and academic integrity, offering models of good practice, and responding vigilantly and appropriately to infractions of academic integrity. Accordingly, academic dishonesty is prohibited in The City University of New York and at New York City College of Technology and is punishable by penalties, including failing grades, suspension, and expulsion. The complete text of the College policy on Academic Integrity may be found in the catalog.

Grading:

Passing grades are given only if all assignments are completed. The professor reserves the right to ask you to defend any of your assignments or tests. Your final grade is based on the following:

- 10% - Participation
- 30% - Three Exams
- 20% - Final Exam
- 40% - Homework assignments

Course Outline**:**

Week	Topic	Chapter
1-2	Introduction to database concepts Relational databases • Entities Attributes and Relationships • Functional Dependence • Primary keys • Database Design	2

	• Design method • Database design requirements • Database design process example • Normalization (first, second and third normal form) • Diagrams for database design	
3-4	Creating Tables • Introduction to Oracle • Creating a table • Dropping a table • Using Data types • Using nulls • Adding rows to a table via the Insert command • Viewing table Data • Correcting Errors in a table • Saving SQL Commands TEST ONE	3
5	SQL. Single Table Queries Simple Queries • Retrieving certain columns and all rows • Retrieving all columns and all rows • Using the WHERE Clause • Using compound conditions • Using the BETWEEN Operator • Using computer columns • Using the LIKE operator • Using the IN Operator Sorting • Using the ORDER BY clause • Additional Sorting Options	4
6-7	Simple Queries (Continued) Using Functions • Using the COUNT function • Using the SUM function • Using the AVG, MAX and MIN functions • Using the DISTINCT Operator Grouping • Using the GROUP BY clause • Using a HAVING Clause • Having vs. WHERE Nulls Subqueries – brief introduction	4
8-9	Multiple Table Queries Querying Multiple Tables • Joining Two tables Comparing joins, IN and EXISTS • Using the IN operator • Using the EXISTS Operator • Using a Subquery within a subquery • Using alias • Joining a table to itself	5

	• Using a self join on a primary key column • Joining several tales • ALL and ANY • Special Operations (Inner and outer join and product) TEST TWO	
10-11	Updating Data • Creating a new table from an existing table • Changing existing data in a table • Adding a new row to an existing table • Commit and rollback • Transactions • Changing ad deleting existing rows • Changing a value in a column to null • Changing a table's structure • Dropping a table	6
12	Database Administration • Creating and using views • Using a view to update data • Dropping a view • Security • Indexes • System catalog • Integrity constraints in SQL	7
13-14	SQL Functions and Procedures • Using SQL in a programming environment • Using functions • Concatenating columns • Stored procedures • Error handling • Using update procedures • Selecting multiple rows with a procedure	8
15	Review and FINAL	

Assessment criteria:

For the successful completion of this course a student should be able to:	**Evaluation methods and criteria**
1. Understand the role of a database in an IS.	1. Students will demonstrate on homework and exams what functions the database provides in an IS.
2. Understand the relationships databases have with other parts of the IS.	2. Students will demonstrate on homework and exams how the programs in an IS and users of an IS interact with databases.
3. Understand the organization of the data in the RDB, the concepts of the table structure, the primary and the	3. Students will demonstrate on homework, exams, and lab projects that they can specify the properties of the attributes of a table

foreign keys.	including the primary and foreign keys, and the required constraints.
4. Populate the tables of a database and manipulate the data (read, update, delete).	4. Students will perform projects using the chosen DBMS to create a database, populate it with data, and manipulate the data.
5. Perform calculations on data from one or more tables using the aggregate functions.	5. Students will perform lab assignments that require the use of aggregate functions for several calculations.
6. Write queries that join several tables.	6. Students will demonstrate on homework, exams, and lab projects that they can write queries joining several tables.
7. Demonstrate the ability to write subqueries.	7. Students will demonstrate on homework and exams the use of subqueries.
8. Import and export data from other applications.	8. Students will perform lab assignments that employ exporting/importing data from databases to other applications.

General Education Outcomes and Assessment:

Learning Outcomes	**Assessment Method**
SKILLS/Inquiry/Analysis Students will employ scientific reasoning and logical thinking.	Several programming assignments that will employ logical reasoning techniques learned.
SKILLS/Communication Students will communicate in diverse settings and groups, using written (both reading and writing), oral (both speaking and listening), and visual means	Group project that will employ both reading, writing and communication skills as well as interpersonal skills.
VALUES, ETHICS, RELATIONSHIPS / Professional/Personal Development Students will work with teams, including those of diverse composition. Build consensus. Respect and use creativity.	Group project that will employ interpersonal skills.