

**LAGUARDIA COMMUNITY COLLEGE  
CITY UNIVERSITY OF NEW YORK  
DEPARTMENT OF MATHEMATICS ENGINEERING AND COMPUTER SCIENCE**

**MAC 250 Database Concepts and Programming  
4 hours (2hrs lecture, 2hrs lab), 3 credits**

**Catalog Description:** This course will provide students with an understanding of the basic concepts underlying database management systems. Topics include entity relationship, relational database design, structural query language (SQL) and database administration. Students will use SQL to create databases and tables, manipulate data in tables, retrieve data from single and multiple tables and write SQL functions and procedures.

**Instructional objectives:**

- Familiarize students with the role of database in software development.
- Introduce students to conceptual data modeling and database design.
- Familiarize students with relational data models and relational database constraints.
- Introduce students to basic SQL, enabling them to make data definitions specifying constraints, perform data retrieval from databases and handle data manipulation queries.
- Enable students to create and use more complex queries to perform calculations on data, retrieve data from multiple tables and write nested queries.
- Enable students to create views and perform database modifications.
- Introduce students to SQL functions and stored procedures.

**Performance objectives:**

- Identify and explain the role of database in software development.
- Illustrate data modeling concepts using the Entity Relationship model and use it to design databases.
- Identify relational database models and constraints used to design the database.
- Write SQL queries to create tables, select data from tables based on conditions, and update, insert and delete data from tables.
- Write advanced SQL queries to retrieve data from multiple tables and perform calculations on them.
- Write queries used to create views and database modifications.
- Define SQL functions and describe stored procedures used in database applications.

## Recommended textbooks:

- ***Database Systems: The Complete Book***, Garcia Molina, Hector; Ullman, Jeffrey D. and Widom, Jennifer, Pearson 2<sup>nd</sup> edition.
- ***Fundamentals of Database Systems***, Elmasri, Ramez and Navathe, Shamkant B. Pearson 7<sup>th</sup> edition.

## Grading Standards:

HW's (5@3%)	15%
Labs (5@3%)	15%
Projects	10%
Midterm	30%
Final	30%
Total	100%

## Academic Integrity:

This class will be conducted in compliance with LaGuardia Community College's academic integrity policy.

## Attendance:

The maximum number of unexcused absences allowed is 15% of the total class meetings (about 7 hours). Unexcused absences beyond this maximum will result in a grade of WU or F.

## Comments:

The grading standards listed above and the suggested homework problems listed in the course outline are both subject to modification by the instructor

## Course Outline:

**Week 1:** Introduction to database management systems, relational models of data, basics of relational models including attributes, schemas, tuples, domains, relation keys and relational schema in SQL.

**Lab 1:** Setting up the database, HW 1.

**Week 2:** Relational database design, functional dependencies, normalization.

**Lab 2:** Looking at Relational database examples, HW2.

**Week 3:** Conceptual data modeling, Entity Relationship (ER) model, design principles, constraints in ER models, weak entity sets, ER diagrams.

**Lab 3:** Drawing ER models, HW 3.

**Week 4:** Basic SQL, SQL data definition and data types, specifying constraints in SQL, simple queries to create tables, drop tables, projection and selection in SQL, using the WHERE clause, using LIKE, IN and BETWEEN operators.

**Lab 4:** Introduction to SQL queries.

**Week 5:** Basic SQL, sorting.

**Lab 5:** SQL ORDER BY clause

**Week 6:** GROUP BY clause and aggregate functions, review for Midterm

**Lab 6:** Using SQL advanced queries with GROUP BY and HAVING clauses, aggregate functions, HW 4.

**Week 7:** Sub-queries, multiple table inquiries, using SQL joins.

**Midterm**

**Week 8:** SQL joins continued, natural and outer joins.

**Lab 7:** Join multiple tables using SQL joins.

**Week 9:** Database modifications using insertion, deletion and updates.

**Lab 8:** Write queries to insert data, delete data and update tables.

**Week 10:** Triggers and views.

**Lab 9:** Creating triggers and views, HW 5.

**Week 11:** Schema modifications.

**Lab 10:** Modify the schema using SQL.

**Week 12:** SQL functions and stored procedures.

**Lab 11:** Writing simple SQL functions and stored procedures

**Week 13:** Final Exam