MAKERERE UNIVERSITY BUSINESS SCHOOL
FACULTY OF COMPUTING AND INFORMATICS
DEPARTMENT OF INFORMATION SYSTEMS

ACADEMIC YEAR	: 2024/2025
YEAR OF STUDY	: Two
SEMESTER	: Two
PROGRAMME	: Diploma in Computer Science
COURSE UNIT	: Database Systems
LECTURER(S)	: Mutebi Bashir (0774760578 | bmutebi@mubs.ac.ug)

COURSE DESCRIPTION

This course provides an in-depth understanding of database systems, focusing on the design, implementation, and management of databases. Students will learn about different types of databases, data modelling techniques, SQL query writing, and database security. Through practical exercises and hands-on projects, students will develop the skills necessary to design efficient databases, manipulate data, and implement security measures, preparing them for careers in database management and related fields.

COURSE OBJECTIVES

- To analyse different types of databases and the roles of Database Management Systems (DBMS) in managing data.
- To create data models using Entity Relationship Diagrams (ERDs) to represent data structures effectively.
- To design and construct database objects, including tables, constraints, and views, to support efficient data storage and management.
- To apply SQL commands to retrieve, manipulate, and analyse data in relational databases.
- To evaluate and implement security strategies to protect database systems from threats and vulnerabilities.

LEARNING OUTCOMES

By the end of this course the learners will be able to:

- Differentiate between various database types and justify the use of a DBMS in different scenarios.
- Design Entity Relationship Diagrams (ERDs) to model complex data requirements for a database system.
- Construct and manage database objects such as tables, constraints, and views, demonstrating a clear understanding of their roles in database management.
- Retrieve and manipulate data using SQL queries, applying functions and operators to perform data analysis and filtering tasks.
- Assess database security risks and implement appropriate security measures to ensure data integrity and confidentiality.

COURSE CONTENT

WEEK/S	TOPIC	COVERAGE
1	Introduction to Database Systems	● Overview of Databases ● Types of Databases (e.g., relational, NoSQL) ● Key Concepts: Tables, Records, Fields ● Database Management Systems (DBMS) ● Advantages & Disadvantages of DBMS
2 & 3	Data Modelling & Entity Relationship Diagramming.	● Basics of Data Modelling ● Conceptual and Physical models ● Entity-Relationship (ER) Model Overview ● Entities and Attributes ● Relationships and Cardinality ● Developing Entity Relationship Diagrams (ERDs) ● Role of Keys in Data Modelling
4	Introduction to SQL and Writing Simple Queries	● Defining what SQL is ● Discuss categories of SQL ● Explore SQL*Plus tool ● Use of SELECT statement ● Querying all columns ● Querying multiple columns ● Use of DESCRIBE command ● Use of column alias
5 & 6	Limiting and sorting retrieved data sets	● Data sorting using ORDER BY clause ● Sorting of NULL values [NULLS FIRST, NULLS LAST] ● Use of DISTINCT keyword ● Use of the WHERE clause ● Use of comparison operators [=, !=, >, <, >=, <=, ANY, ALL] ● Use of logical operators [AND, OR, NOT] ● Use of other operators [IN, NOT IN, BETWEEN, IS NULL, IS NOT NULL] ● Pattern matching using LIKE operator
7	Single Row Functions	● Define single row functions ● Single row character functions [INITCAP, LENGTH, UPPER, LOWER, CONCAT, LPAD, RPAD, LTRIM, RTRIM] ● Single row numerical functions [ABS, CEIL, FLOOR, POWER, ROUND]
8	Group Row Functions or Aggregate functions	● Define group row functions ● Use of available group row functions [AVG, COUNT, MAX, MIN, MEDIAN, SUM] ● Grouping data using GROUP BY clause ● Limiting grouped data using HAVING clause
9	Joins	● Define what joins are ● Outer Joins [ANSI Syntax] i.e. RIGHT OUTER JOIN, LEFT OUTER JOIN, FULL OUTER JOIN

10 & 11	Creating Database Objects i.e. tables, constraints and views	• Explore different data types • Creating and naming of tables. • Adding columns to created tables • Modifying, renaming and dropping of table columns • Renaming and dropping of tables • Create constraints [PRIMARY KEY, NULL, NOT NULL, UNIQUE, FOREIGN KEY, CHECK]. Note: ERD will be used for this.
12	Data Manipulation	• Inserting data into tables • Updating rows in the table • Deleting rows from a table • Deleting values from a table
13	Database Security	• Database Security Concepts i.e. Authentication, Authorisation, Auditing • Database Security Threats • Implementing Security Measures

RECOMMENDED TEXT AND REFERENCES

1. SQL – My Reference
2. Mutebi, B. (2022). SQL Series – Videos. YouTube. *Learn SQL From Scratch*
3. **Rob, P., & Coronel, C.** (2022). *Database systems: Design, implementation, & management* (13th ed.). Cengage Learning.
4. **Harrington, J. L.** (2016). *Relational database design and implementation* (4th ed.). Morgan Kaufmann.
5. **Mullins, C. S.** (2016). *Database Development and Management: A Comprehensive Guide* (3rd ed.). Wiley.
6. Alapati, S. (2009). *Expert Oracle Database 11g administration*. Springer.

COURSE MATERIALS

All students are required to install Oracle Database 11g Express Edition on their computers to facilitate hands-on practice. The software will be provided during class, or you can download it from Oracle's official website. Additionally, all relevant learning materials will be uploaded and made accessible on the e-learning platform at www.mubsep.ac.ug. Ensure you have the software installed and are familiar with accessing course materials online for a smooth learning experience.

DELIVERY METHOD

To master SQL, students need to practice writing and analyzing code extensively. This course will involve working with numerous well-annotated SQL examples to cover both basic and advanced commands. Key learning resources include textbooks, lectures, class discussions, and case studies. Each lecture will be supported by quizzes, exercises, and Q&A sessions. Homework assignments and class projects will challenge students to apply their knowledge.

ATTENDANCE AND PARTICIPATION

Timely and regular attendance is essential for your success in this course. You **must attend at least 75% of the classes to meet the minimum requirement to sit for exams**. Please arrive on time and stay for the entire session, as late arrivals may result in missed announcements and activities. **For online classes, always log in using your official name**. If you miss a class due to illness or an emergency, contact me to arrange make-up work.

ASSESSMENT:

Assessment methods for this course include individual and group-based coursework assignments, class tests, individual presentations, and written examinations. Please note that make-up tests and coursework will only be allowed if prior notification is given and a legitimate, documented reason is provided for missing the scheduled assessments. It is essential to inform me as soon as possible if you are unable to attend or submit work on the scheduled dates.

Course Work (30%)

NB: Where appropriate Individual tasks and class assignments will be given out for no marks

Final Exam (70%)

Pass Mark (50)

ACADEMIC HONESTY

Students are expected to uphold the highest standards of academic integrity throughout this course. All work submitted must be your own, and any use of external sources, including code and research, must be properly cited. Plagiarism, cheating, or any form of academic dishonesty will not be tolerated and may result in disciplinary action. It is essential to engage honestly in all assessments to foster a fair and respectful learning environment.