Course Description
Students will learn Database Design and Development, Relational Databases, SQL, Database Security, Transactions Processing, and Query Processing.
Prerequisite: None

Course Objectives
At the end of the course, learners will be able to:
- Describe the goals, roles, applications, of database systems
- Demonstrate a detailed understanding of the principles and techniques of database systems design
- Demonstrate a detailed understanding of Relational Database Management Systems (RDMS)
- Specify, design and develop databases for a variety of applications
- Demonstrate competence in SQL
- Demonstrate detailed competence in securing databases

Delivery Methodology
A series of lectures using overhead projector slides will be used. Appropriate case studies will be used to demonstrate database design concepts. This is a lab intensive course; Ms Access, SQL Server and Oracle DBMS will be used to gain practical experience. There will be a major database design project to be undertaken.

Course Content
1. Introduction to Database Systems
   Definition of database System, Major Components of the DBMS Environment, Personnel involved in the DBMS environment, Advantages and Disadvantages of Database,

2. Database Environment
   Three-level Architecture, Data Independence, Database Languages, Classification of Data Models, Typical Functions of a DBMS, Components of a DBMS

3. The Relational Model
   Terminology of the relational model, use of tables to represent data, properties of database relations, identification of candidate, primary and foreign keys, meaning of entity integrity and referential integrity, purpose and advantages of views.

4. Database Planning, Design, and Administration
   Database system development lifecycle, database design: conceptual, logical, and physical design, DBMS selection, data administration and database administration.

5. Entity-Relationship Modeling
   The use Entity–Relationship modeling in database design

6. Normalization
   The purpose and use of normalization in designing a relational database
7. **Database Design Methodology**
   Purpose of a design methodology. Conceptual, logical, and physical design. Use ER modeling to build a conceptual data model. Deriving relations from a conceptual data model. Validate relations using normalization. Mapping logical design to physical design. Designing for target DBMS. Monitoring and Tuning the Operational System

8. **SQL**
   Introduction to SQL; Lab Exercise on SQL

9. **Database Security**
   Importance of database security, threat to database systems, security features of selected DBMS products

10. **Transaction Processing**
    Importance of transactions, properties of transactions, Concurrency Control, Recovery Control

11. **Query Processing**
    Objective of Query Processing, Objective of Query Optimization, Query decomposition, query optimization

**References**
- Connolly and Begg, Database Systems, Addison Wesley
- Date, An Introduction to Database Systems, Addison Wesley