Ahmadu Bello University, Zaria, Nigeria

Department of Mathematics

**COSC 406: Advanced Database Systems**

# Syllabus

**Instructor** Prof. S.B. Junaidu

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**Catalog Course Description**:

Basic database concepts. Conceptual modeling. Relational data model. Relational theory and languages. Database design. Database security and integrity. Introduction to query processing and optimization. Introduction to concurrency and recovery.

**Suggested Lab Work:**

Students work in small teams to design and implement real life database systems. Students use ER diagram for conceptual modeling. For implementation, students learn and use an appropriate relational database management system. Students may also implement, using some procedural language, the Select and Join relational operators.

**Course Objectives:**

1. **[Basic Concepts & Features of Database Systems]** To understand the basic concepts of databases, RDBMS and database theory.
2. **[Database Design Models & Methodology]**   
   To understand database design, development, and implementation.
3. **[Advanced topics]**

To introduce advanced topics like query processing & optimization, concurrency, and recovery.

1. **[Practice with A Real Database Management System]**Get an experience to work in a team environment.

**Course Learning Outcomes:**

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

1. understand the basic concepts of databases, RDBMS and database theory.
2. understand and develop conceptual and relational data model.
3. understand relational algebra, and use data description/manipulation languages (SQL).
4. understand the basics of query processing and optimization, concurrency controls and database recovery.
5. gain work experience in a lab project as a team member or leader.

**Textbook**

**Fundamentals of Database Systems,** by Ramez Elmasri and Shamkant Navathe, Addison Wesley, 5th Edition, 2007.

**Course Outline (Tentative)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Main Topic** | **Sub-Topic** | **Chapter** | **# Of Lectures** |
| **Introduction** | Databases and Database Users | [1] | 2 |
| Database Systems Concepts and Architecture | [2] | 3 |
|  |  | **5** |
| **Data Models** | Entity-Relationship Model | [3] | 3 |
| Enhanced Entity-Relationship Model | [4] | 2 |
| The Relational Data Model | [5] | 2 |
| ER and EER Mapping | [7] | 2 |
|  |  | **9** |
| **Relational Database Languages** | Relational Algebra | [6.1 – 6.5] | 4 |
| Relational Calculus | [6.6 – 6.7] | 2 |
| SQL | [8] | 6 |
|  |  | **12** |
| **Database Design** | Functional Dependencies and Normalization | [10] | 3 |
| Practical Database Design | [12.1,12.2] | 1 |
| File Organization | [13.3 – 13.7] | 3 |
| [14.1 – 14.3] |
| Physical Database Design and Tuning | [16] | 1 |
|  |  | 8 |
| **System Implementation Techniques** | Query Processing & Optimization | [15.1, 15.7] | 2 |
| Transaction Processing | [17.1 – 17.3] | 1.5 |
| Concurrency Control | [18.1, 18.2] | 1.5 |
| Database Recovery | [19.1] | 1 |
|  |  | **6** |
|  | **Total Number of Lectures** |  | **40** |