

# CS3402: DATABASE SYSTEMS

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## Effective Term

Semester A 2023/24

## Part I Course Overview

### Course Title

Database Systems

### Subject Code

CS - Computer Science

### Course Number

3402

### Academic Unit

Computer Science (CS)

### College/School

College of Engineering (EG)

### Course Duration

One Semester

### Credit Units

3

### Level

B1, B2, B3, B4 - Bachelor's Degree

### Medium of Instruction

English

### Medium of Assessment

English

### Prerequisites

CS1315 Introduction to Computer Programming or  
CS2310 Computer Programming or  
CS2311 Computer Programming or  
CS2313 Computer Programming or  
CS2315 Computer Programming or  
CS2360 Java Programming or equivalent

### Precursors

Nil

### Equivalent Courses

Nil

### Exclusive Courses

Nil

## Part II Course Details

### Abstract

This course is aimed at equipping students with the knowledge of database design, as well as, the ability to use database management systems in an effective manner. The course will also provide an insight into database management techniques and concepts, namely, indexing, query optimization, transactions, concurrency control, and database recovery.

### Course Intended Learning Outcomes (CILOs)

CILOs		Weighting (if DEC-A1 DEC-A2 DEC-A3 app.)		
1	Design a database schema using the entity-relationship and relational data models.			x
2	Improve an existing database schema through the normalization process.		x	
3	Use SQL as a Data Definition Language (DDL) and a Data Manipulation Language (DML) effectively.		x	
4	Demonstrate good understanding of database management techniques and concepts.			x

#### A1: Attitude

Develop an attitude of discovery/innovation/creativity, as demonstrated by students possessing a strong sense of curiosity, asking questions actively, challenging assumptions or engaging in inquiry together with teachers.

#### A2: Ability

Develop the ability/skill needed to discover/innovate/create, as demonstrated by students possessing critical thinking skills to assess ideas, acquiring research skills, synthesizing knowledge across disciplines or applying academic knowledge to real-life problems.

#### A3: Accomplishments

Demonstrate accomplishment of discovery/innovation/creativity through producing /constructing creative works/new artefacts, effective solutions to real-life problems or new processes.

### Teaching and Learning Activities (TLAs)

TLAs	Brief Description	CILO No.	Hours/week (if applicable)	
1	Lecture	The lecture will focus on the introduction to concepts and techniques about database design, normalization, query, and management.	1, 2, 3, 4	3 hours/week

2	Tutorial	Students will work on hands-on exercises and laboratory to practice database knowledge learnt from lectures. They are required to create databases, perform some queries, and manage databases using an actual database management system (e.g., Oracle).	1, 2, 3, 4	8 hours/semester
3	Assignment	Assignments are intended to require students to solve theoretical and practical problems related to the lectures and tutorials. Students will also have the opportunity to use their database knowledge to solve real-world data management problems through assignment questions.	1, 2, 3, 4	After class

**Assessment Tasks / Activities (ATs)**

ATs	CILO No.	Weighting (%)	Remarks (e.g. Parameter for GenAI use)
1 3 Assignments X1 assignment every 4 weeks)	1, 2, 3, 4	15	
2 Midterm Examination	1, 2, 3	25	

**Continuous Assessment (%)**

40

**Examination (%)**

60

**Examination Duration (Hours)**

2

**Additional Information for ATs**

For a student to pass the course, at least 30% of the maximum mark for the examination must be obtained.

**Assessment Rubrics (AR)****Assessment Task**

Assignments

**Criterion**

1.1 Ability to design a database using a data modeling principles covered in the course

**Excellent (A+, A, A-)**

High

**Good (B+, B, B-)**

Significant

**Fair (C+, C, C-)**

Moderate

**Marginal (D)**

Basic

**Failure (F)**

Inadequate

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**Assessment Task**

Assignments

**Criterion**

1.2 Ability to translate express a database design in SQL

**Excellent (A+, A, A-)**

High

**Good (B+, B, B-)**

Significant

**Fair (C+, C, C-)**

Moderate

**Marginal (D)**

Basic

**Failure (F)**

Inadequate

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**Assessment Task**

Assignments

**Criterion**

1.3 Ability to use a database management system to store and manipulate data

**Excellent (A+, A, A-)**

High

**Good (B+, B, B-)**

Significant

**Fair (C+, C, C-)**

Moderate

**Marginal (D)**

Basic

**Failure (F)**

Inadequate

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**Assessment Task**

Midterm Exam

**Criterion**

2.1, 3.1 Ability to demonstrate a good understanding of basic and advanced materials covered in the course

**Excellent (A+, A, A-)**

High

**Good (B+, B, B-)**

Significant

**Fair (C+, C, C-)**

Moderate

**Marginal (D)**

Basic

**Failure (F)**

Inadequate

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**Assessment Task**

Final Exam

**Criterion**

2.1, 3.1 Ability to demonstrate a good understanding of basic and advanced materials covered in the course

**Excellent (A+, A, A-)**

High

**Good (B+, B, B-)**

Significant

**Fair (C+, C, C-)**

Moderate

**Marginal (D)**

Basic

**Failure (F)**

Inadequate

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## Part III Other Information

### Keyword Syllabus

Database design methodology: entity-relationship model, functional dependency, normalization, data definition language. Query Language: SQL, relational algebra, query by example. Data model: relational model. Database management issues:

integrity, trigger, user constraint, security. Transaction management: ACID properties, concurrency control, serializability, locking protocols, deadlock.

### Syllabus

- Introduction  
Database history. File-based system vs database. Database components. Architecture. Data independence. Data models.
- File organization  
Physical data organization: Ordered file. Indexed file. Hash file.
- Data model and query  
Relational model: schema, primary key, foreign key, algebra, database operators. Data definition. SQL.
- Database design  
Entity Relationship model. Data redundancy. Functional dependency. Normalization: BCNF, 3NF.
- Transaction management  
Concurrency Control: ACID Properties, Serializability, Locking Protocols, deadlock detection and prevention.

### Reading List

#### Compulsory Readings

Title	
1	Elmasri R. and Navathe S. B. (2010) Fundamentals of Database Systems. Addison Wesley, 6th edition.

#### Additional Readings

Title	
1	Silberschatz A., Korth H. and Sudarshan S. (2010) Database System Concepts. McGraw-Hill Companies Inc., 6th edition.