CS3402: DATABASE SYSTEMS

Effective Term
Semester A 2024/25

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 Computing (CC)

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 app.)	DEC-A1	DEC-A2	DEC-A3
1	Design a database schema database schema using the entity-relationship and relational data models.			x	
2	Improve an existing database schema through the normalization process.		x		
3	Apply 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.

Learning and Teaching Activities (LTAs)

	LTAs	Brief Description	CILO No.	Hours/week (if applicable)
1	Lecture	Students will engage in learning concepts and techniques about database design, normalization, querying, storage, and management.	1, 2, 3, 4	3 hours/week

2	Tutorial	Students will work on hands-on exercises and in the laboratory to practice the database knowledge they have learned from lectures. They will engage in creating databases, performing queries, and managing databases using an actual database management system (e.g., Oracle).	1, 2, 3, 4	8 hours/semester
3	Assignment	Students will solve theoretical and practical problems related to the lectures and tutorials. They will also have the opportunity to use their database knowledge to solve real-world data management problems through assignment questions.	1, 2, 3, 4	3 times/semester

Assessment Tasks / Activities (ATs)

	ATs	CILO No.	Weighting (%)	Remarks (e.g. Parameter for GenAI use)
1	3 Assignments (1 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

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

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

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

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

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.