City University of Hong Kong
Course Syllabus

offered by Department of Computer Science
with effect from Semester A 2019/20

Part I Course Overview

Course Title:	Database Systems
Course Code:	CS3402
Course Duration:	1 semester
Credit Units:	3 Credits
Level:	B3
Proposed Area: *(for GE courses only)*	☐ Arts and Humanities ☐ Study of Societies, Social and Business Organisations ☐ Science and Technology
Medium of Instruction:	English
Medium of Assessment:	English
Prerequisites: *(Course Code and Title)*	CS2310 Computer Programming or CS2311 Computer Programming or CS2313 Computer Programming or CS2360 Java Programming or equivalent
Precursors: *(Course Code and Title)*	Nil
Equivalent Courses: *(Course Code and Title)*	CS3462 Introduction to Database Systems
Exclusive Courses: *(Course Code and Title)*	Nil

Part II Course Details

1. Abstract

(A 150-word description about the course)

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.

2. Course Intended Learning Outcomes (CILOs)

(CILOs state what the student is expected to be able to do at the end of the course according to a given standard of performance.)

No.	CILOs[#]	Weighting* (if applicable)	Discovery-enriched curriculum related learning outcomes (please tick where appropriate)		
			A1	*A2*	*A3*
1.	Design a database schema database schema using the entity-relationship and relational data models.			✓	
2.	Improve an existing database schema through the normalization process.		✓		
3.	Use SQL as a Data Definition Language (DDL) and a Data Manipulation Language (DML) effectively.		✓		
4.	Demonstrate good understanding of database management techniques and concepts.			✓	
		100%			

** If weighting is assigned to CILOs, they should add up to 100%.*

[#] Please specify the alignment of CILOs to the Gateway Education Programme Intended Learning outcomes (PILOs) in Section A of Annex.

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 self-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.

3. Teaching and Learning Activities (TLAs)

(TLAs designed to facilitate students' achievement of the CILOs.)

Teaching pattern:

Suggested lecture/tutorial/laboratory mix: 2 hrs. lecture; 1 hr. tutorial.

TLA	Brief Description	CILO No.				Hours/week (if applicable)
		1	2	3	4	
1.	Lecture: Materials will cover database design principles, SQL, as well as, techniques and concepts related to database management systems.	✓	✓	✓	✓	2 Hours
2.	Hands-on practice: The instructor will arrange tutorials and labs where each student can practice solving database problems and using an actual database management system.	✓	✓	✓	✓	1 Hour
3.	Class assignments/projects: Students will also have the opportunity to use their database knowledge to solve real-world data management problems through assignment/project questions.	✓	✓	✓	✓	

4. Assessment Tasks/Activities (ATs)

(ATs are designed to assess how well the students achieve the CILOs.)

Assessment Tasks/Activities	CILO No.				Weighting*	Remarks
	1	2	3	4		
Continuous Assessment: 40%						
3 Assignments (1 assignment every 4 weeks)	✓	✓	✓	✓	15%	
Midterm Examination	✓	✓	✓		25%	
Examination^: 60% (duration: 2 hours)						
Final Examination	✓	✓	✓	✓	60%	
** The weightings should add up to 100%.*					100%	

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

5. Assessment Rubrics

(Grading of student achievements is based on student performance in assessment tasks/activities with the following rubrics.)

Assessment Task	Criterion	Excellent (A+, A, A-)	Good (B+, B, B-)	Fair (C+, C, C-)	Marginal (D)	Failure (F)
1. Assignments	1.1 Ability to design a database using a data modeling principles covered in the course	High	Significant	Moderate	Basic	Inadequate
	1.2 Ability to translate express a database design in SQL	High	Significant	Moderate	Basic	Inadequate
	1.3 Ability to use a database management system to store and manipulate data	High	Significant	Moderate	Basic	Inadequate
2. Midterm Exam	2.1, 3.1 Ability to demonstrate a good understanding of basic and advanced materials covered in the course	High	Significant	Moderate	Basic	Inadequate
3. Final Exam						

Part III Other Information (more details can be provided separately in the teaching plan)

1. Keyword Syllabus

(An indication of the key topics of the course.)

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

1. Introduction
   Database history. File-based system vs database. Database components. Architecture. Data independence. Data models.

2. File organization
   Physical data organization: Ordered file. Indexed file. Hash file.

3. Data model and query
   Relational model: schema, primary key, foreign key, algebra, database operators. Data definition. SQL.

4. Database design
   Entity Relationship model. Data redundancy. Functional dependency. Normalization: BCNF, 3NF.

5. Transaction management
   Concurrency Control: ACID Properties, Serializability, Locking Protocols, deadlock detection and prevention.

2. Reading List

2.1 Compulsory Readings

(Compulsory readings can include books, book chapters, or journal/magazine articles. There are also collections of e-books, e-journals available from the CityU Library.)

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

2.2 Additional Readings

(Additional references for students to learn to expand their knowledge about the subject.)

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