

The Hong Kong University of Science and Technology

UG Course Syllabus

Course Title: Database Management Systems (Fall, 2024-2025)

Course Code: COMP3311

Credits: 3

pre-/co-requisites: COMP 2011 OR COMP 2012 OR COMP 2012H

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Course Description

A database management system (DBMS) is primarily concerned with efficiently and effectively managing data. This course introduces the topic through lectures, tutorials and by providing hands-on experience in designing, implementing and querying a database using a commercial database management system. The first half of the course focuses on how to analyze and represent the (structured) data requirements of an application using the entity-relationship (E-R) model and the relational model as well as how to query relational data using structured query language (SQL). The second half of the course focuses on the key services provided by a relational database management system to store, query and safeguard data in a multi-user environment. Recent technologies for managing less-structured data are briefly discussed.

Objectives: The course provides students with both a theoretical and a practical foundation for understanding the capabilities and use of a database management system. For the theoretical part, students learn the major concepts and techniques used by a database management system to manage data. For the practical part, students use a commercial DBMS to design, implement and query a database to support the data requirements of a small application.

On successful completion of this course, students are expected to be able to do the following.

- Explain important concepts in database management systems including: database system architecture; data models; logical and physical database design; query languages and query processing; database services including transaction management, concurrency control and database recovery.
- Apply database theories and techniques to practical database applications.
- Analyze a real-world problem requiring data management, design a database for the problem and implement appropriate queries using a commercial DBMS to manage the data for the problem.

Syllabus:

- E/R Model
- Relational Model and Algebra
- SQL
- Functional Dependencies
- Relational Database Design
- Physical File Organization
- Database Indexing
- Physical Database Organization

- Database Access Methods
- Transactions, Recovery and Concurrency Control
- Database API and Database Connectivity
- NOSQL and Big Data

Assessments:

Assessment Task	Contribution to Overall Course grade (%)
Mid-Term	30%
Assignments	30%
Final examination	40%

Required Texts and Materials

Textbook

- [Database System Concepts](#), A. Silberschatz, H. Korth, and S. Sudarshan.
- [Principles of Database Management](#), W. Lemahieu, S.V. Broucke, B. Baesens

Reference

- [Database Management Systems](#), Raghu Ramakrishnan and Johannes Gehrke.