Assumption University
Vincent Mary School of Science and Technology
Department of Computer Science
Course Outline
CSX3006 Database Systems
ITX3006 Database Management Systems
Semester :2/2023

Course Status: 3-credit Major Required Course

Pre-requisite: CSX 3001 Fundamentals of Computer Programming

Class Meeting: Sec 541 Tue. 9:00 – 12:00, VMS0307

Instructor: Asst. Prof. Dr. Rachsuda Setthawong
Office: VMS0609
E-mail: rachsuda@scitech.au.edu
Office Hours: Mon., Tue. 1:00pm – 4:00pm

Text Book: Silberschatz, Henry F. Korth, S. Sudarshan, Database System Concepts, 2nd, 6th ,7th Edition, Abraham McGraw-Hill International

References:
- **PostgreSQL open source database,** available online from https://www.postgresql.org/
- **Interactive Online SQL Training,** Available online from http://www.sqlcourse.com/
- **XAMPP Apache**, https://www.apachefriends.org/index.html

Other Related Book:
- Jeffrey A. Hoffer, V. Ramesh and Helkki Topi, Modern Database Management, 12th Edition, 2016

Course Description:

A detailed study of database systems and database management, type of database systems emphasizing on relational database. The main topics will include functional dependency, normalization, query optimization, integrity and security of database systems, and concurrency control. In addition, it covers organization problem identification, user requirements, current system specification, database planning and data and database administration. Query Language is introduced and practiced through lab exercise with current database management system.

Course Objectives:

The main objective of the course is to equip students with fundamental concepts and skills required to understand, design and implement moderately complex relational databases. The course aims to balance theoretical foundation with practical skills so that students completing the course can continue with advanced courses in database theories and are capable of working on database application development projects. Upon successful completion of the course, students should be able to:
- Describe characteristics of relational database
- Appreciate and enjoy the work of database management system fields in IT career.
- Identify problems of data redundancy from file management and designing appropriate database system to overcome the redundancies.
- Design and evaluate a relational database using Entity-Relationship Model and Normalization process
- Transform conceptual schema into logical schema
- Implement and query a relational database using SQL
- Explain concept of transaction and its importance in multi-user database systems
- Effective interview business owner/user and proposing effective system through implementing database management system.

- Understand different facets of database application design and implementation
- Working as a team to develop a proper database management system for achieving business success within organization/department.

Mark Allocation:

Assignments	10 %
Midterm Exam	20 %
Project	40 %
Final Exam	30 %
Total	100 %

The grades would be officially posted by the Registration Office. All assignments will be returned to students in a timely manner with comments and score.
Students will get the grade 'W' for this course if 1) they withdraw by themselves at Registrar office, or 2) they do not attend the final examination. Otherwise, they will receive their calculated grade with respect to their collected scores.

Other Requirement: 80% attendance is required. (**Students can absent only 3 times**). If students attend the class less than 80% (absent more than 3 times), students will not be allowed to take Final Exam.

Remark: Regarding **Thailand's Personal Data Protection Act BE 2562 (PDPA)** that it will come into full effect on 1 June 2021, it should be addressed clearly that the students' scores and attendance records will be announced as a whole only in the MS Teams for the purpose of classes' operation and management only. Such information must not be duplicated or re-distributed to other since it will violate the PDPA Act.

Assessment Appeal's Policy: Assessment Appeal's Policy: For any assignments/projects and/or examination(s) (EXCLUDING final examination), the lecturer will announce scores and/or discuss with students about solutions approximately within 1-3 weeks after the submission deadline and/or finishing grading. Students may request the lecturer for an assessment appeal, if any, within 1 week or as specified the appeal's deadline by the lecturer. Otherwise, the grading will be finalized.
Remark: for the assessment appeal's policy of final examination, contact registrar office.

Lecture Schedule:

Week	Topics	Chapter
1 (Nov. 14)	**-Course Overview** • The Database Environment • The Database Development Process	1 + ref. 1
2 (Nov. 28)	**-Introduction to Relational Model and Fundamental Relational Algebra Operators** • Structure and formal definition of relational database • Attributes and Domain of Attributes • Tuples, Relations and Relation Schema • Super Keys, Candidate Keys and Primary Keys • Referential Integrity and Foreign keys • Selector operation • Project operation • Union operation • Set difference operation • Cartesian product operation • Rename operation	2
3 (Dec. 12)	**-Additional, Extended Relational Algebra Operators and Modification Operations** • Intersection operation • Natural Join operation • Division operation • Assignment operation • Generalized Projection • Aggregate Functions • Outer Joins • Insertion operations • Deletion operations • Updating operations	2
4 (Dec. 19)	**-Defining database Schema using SQL DDL** • Data Types and Domain Constraints Specifications • Primary Key and Candidate Key Constraints Specifications • Referential Integrity Constraints Specifications **-Submission and Presentation of the Term Project Proposal (Application Wireframe)**	**4**
5 (Dec. 26)	**-Basic Query Composition using SQL DML** • Basic syntax and structure of SQL DML • Select clause • From clause • Where clause • Composition and Evaluation of simple SQL DML queries and translation to/from Relational Algebra • Ordering of tuples • Duplicates and keyword Distinct • Renaming operations • Aggregate Functions and Groupings **-Workshop on online database system development (*self-directed study -- material provided*)**	3
6 (Jan. 2)	**-Basic Query Composition using SQL DML (Cont.)** • NULL value and its effect on queries • Set operations in SQL DML • Modification Operations in SQL DML: Insert, Deletion, Update operations	3
Midterm Examination		

7 (Jan. 23)	**More Complex Query in SQL DML**
	• Nested sub-queries in predicate conditions
	  • IN, NOT IN
	  • SOME, ALL
	  • EXISTS, NOT EXISTS
	  • UNIQUE, NOT UNIQUE
	• Join Operators in SQL DML
	  • Cross Join
		3

Week	Topics	Chapter
	• Inner Joins and Natural Join • Outer Joins • Views and View Expansions	
8 (Jan. 30)	**Conceptual Schema Design using ER model** • Fundamental ER Constructs: Entities, Attributes and Relationships • Simple vs. Composite Attributes • Single vs. Multi-valued Attributes • Derived Attributes • Descriptive Attributes vs. Key Attributes • Cardinality Constraints on Relationships • Participation Constraints	6
9 (Feb. 6)	**More advanced ER modeling techniques and Design Alternatives** • Extended ER Constructs • Strong Entity vs. Weak Entity • Inheritance Hierarchy • Aggregation • Guide to Design Alternatives	6

10 (Feb. 13)	**Transforming Conceptual Schema to Logical Schema**
	• ER Model vs. Relational Model
	• Mapping Strong Entity Sets
	• Dealing with Composite Attributes
	• Dealing with Multi-valued Attributes
	• Mapping Weak Entity Sets
	• Mapping Relationships
	  • Dealing with different Cardinalities
	  • Dealing with different Participations
	• Mapping Inheritance Hierarchy
	• Mapping Aggregations
		6

11 (Feb. 20)	**Term Project Progress Submission** • Submission and Presentation of the App Implementation (without Database Access) • Submission and presentation of DB Design and Schema (ER Diagram and Relational Model)	

12 (Feb. 27)	**Introduction to Normal Forms and Normalization**
	• Measure of Quality in DB Schema
	• Data Redundancy and Functional Dependency
	• Definition and Types of Functional Dependencies
	  • Trivial vs. Non-Trivial
	  • Full vs. Partial dependencies
	  • Transitive dependencies
	• Definition of Keys in terms of Functional Dependencies
	• Prime Attributes vs. Non-Prime Attributes
	• 1st, 2nd, 3rd, BCNF Normal Forms and Decomposition
		7

13 (Mar. 5)	**Term Project Final Submission** • Submission and presentation of the completed App • Submission a list of SQL queries used in the App	
Final Examination		