

Course Introduction

SWEN 304

Database System Engineering
Trimester 2, 2017

Coordinator: Dr Hui Ma

Lecturer: Dr Pavle Mogin

Engineering and Computer Science



People

- Lecturer and course coordinator:
 - Dr. Hui Ma
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- Lecturer:
 - Dr. Pavle Mogin
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- Lecturer:
 - TBA

People

- Tutors:
 - Alexandre Sawczuk da Silva
 - Chen Wang
 - Qurrat Ul Ain
 - Mansour Javaher
- School office: CO358, Ph. 463 5341
- Class representative: please nominate

Lectures

- Three lectures per week (2 lectures + 1 tutorial)

Day	Time	Where
Monday	15:10 -- 16:00	HU LT323
Tuesday	15:10 -- 16:00	HU LT323
Thursday	15:10 -- 16:00	HU LT323

- Slides will be posted on the course website
- Expected workload: 10 - 12 hours a week

Tutorials and Help Desks

- Lectures and tutorials will not be strictly divided
- In principle, Thursday time slot will be for tutorials
- What:
 - Stuff from lectures,
 - Extending stuff from lectures,
 - Assignments, and
 - Projects
- Help desks will be offered from week 3 in the labs (CO238 or CO219) to help you with your assignments and projects
 - Details will be posted on the course website and announced in the lectures

Assessment

- Assessment:

Assignment 1:	5%	}	20%	}	40%
Assignment 2:	5%				
Assignment 3:	5%				
Assignment 4:	5%				
Project 1:	10%	}	20%		
Project 2:	10%				
Final examination	60%				

To Pass the Course

- Mandatory Requirements:
 - at least 40% of all marks for projects and assignments.
- To pass the course
 - meet the mandatory requirements
 - at least a **D** grade for the final exam
 - at least a **C-** grade overall

Online Resources

- Slides and other information will be posted on the course website:

https://ecs.victoria.ac.nz/Courses/SWEN304_2017T2/

- Discussion Forum:

http://ecs.victoria.ac.nz/cgi-bin/yabb/YaBB.pl?board=SWEN304_2017T2

Assignments and Projects

- Helpful Links:
 - PostgreSQL documentation,
 - Java Tutorial Manual

General Information

- Prerequisite:
COMP 261 (or SWEN 221),
ENGR 123 (or MATH 161)
- Textbook:
ElMasri, Navathe: **Fundamentals of Database Systems**, Sixth Edition, Addison Wesley
 - An ebook is available on the Internet (google it), e.g.,
http://www.cvauni.edu.vn/imgupload_dinhkem/file/CSDL/Fundamentals_of_Database_Systems,_6th_Edition.pdf

Why Learn Database Systems?

- Databases and database systems are essential components of everyday life
 - Traditional database applications: student records, census data, bank accounts, etc.
 - Multimedia databases: images, audio, video streams
 - Geographic information systems (GIS): maps, weather data, satellite images
 - Data warehouses and online analytical processing (OLAP)
 - Real-time and Active Databases
 - Cloud Databases and NoSQL databases like Cassandra and MongoDB (**SWEN 432**)
 - Many other applications

Why Learn Database Systems?

- Databases play a critical role in almost all areas where computers are used, e.g. business, e-commerce, engineering, medicine, government, education
- Efficiency of an application depends on the quality of (logical and physical) data organization
- Databases is a matured area with a sound theoretical foundation and great practical knowledge
- We need to understand fundamentals of database technology
- This course is an introduction to database systems and database system engineering

An Example

- UNIVERSITY database
 - Information concerning students, courses, and grades in a university environment
- **Data records**
 - STUDENT
 - COURSE
 - GRADES
- Specify structure of records of each file by specifying **data type** for each **data element**
 - String of alphabetic characters
 - Integer, etc.

An Example (cont'd.)

- Construct UNIVERSITY database
 - Store data to represent each student, course, and grade report as a record in appropriate file
- Relationships among the records
- We can query and update the database

An Example (cont'd.)

- Examples of queries:
 - Retrieve the transcript
 - List the names of students who took the 'SWEN304' course and their grades
 - List the prerequisites of the 'SWEN304' course

- Examples of updates:
 - Change the major of 'Smith' to 'SWEN'
 - Create a new course 'WISE'
 - Enter a grade of 'A' for 'Smith' in the 'SWEN304'

An Example (cont'd.)

- Phases for designing a database:
 - Requirements specification and analysis
 - Conceptual design
 - Logical design
 - Physical design

An Example (cont'd.)

STUDENT			
Id	Lname	Fname	Major
300111	Smith	Susan	COMP
300121	Bond	James	MATH
300132	Smith	Susan	COMP

COURSE			
Course_id	Cname	Points	Dept
SWEN304	DB sys	15	Engineering
COMP301	softEng	20	Engineering
MATH214	DisMat	15	Mathematics

GRADES		
Id	Course_id	Grade
300111	SWEN304	A+
300111	COMP301	A
300111	MATH214	A
300121	COMP301	B
300132	COMP301	C
300121	SWEN304	B+
300132	SWEN304	C+

Actors on the Scene

- **Database administrators (DBA)** are responsible for:
 - Authorizing access to the database
 - Coordinating and monitoring its use
 - Acquiring software and hardware resources
- **Database designers** are responsible for:
 - Identifying the data to be stored
 - Choosing appropriate structures to represent and store this data
- **End users:** people whose jobs require access to the database
 - e.g., Casual users, Naïve or parametric users, sophisticated users, standalone users

Actors on the Scene (cont'd.)

- **System analysts**
 - Determine requirements of end users
- **Application programmers**
 - Implement these specifications as programs

Workers behind the Scene

- **DBMS system designers and implementers**
 - Design and implement the DBMS modules and interfaces as a software package
- **Tool developers**
 - Design and implement **tools**
- **Operators and maintenance personnel**
 - Responsible for running and maintenance of hardware and software environment for database systems

Topics

- Introduction to Database Systems (basic terms and concepts),
- Relational data model (RDM) and database management system (DBMS),
- Structured Query Language (SQL),
- Query optimization
- Stored procedures, Triggers, and User Defined Functions

- Database Design
 - ER Data Model
 - Update Anomalies
 - Lossless Join
 - Functional Dependencies
 - Normal Forms and Normalization
- Transaction processing, concurrency control, and recovery

Plan for next lecture

- Databases (DB) and data
- Database management systems (DBMS)
- Database systems (DBS)
- Reading:
 - Chapter 1 of the textbook