

# Course Introduction

SWEN304 / SWEN439

Database System Engineering

Trimester 1, 2021

Lecturer: Dr Hui Ma

**Engineering and Computer Science**



# People

- Lecturer and course coordinator:
  - A/Prof. Hui Ma
  - CO 259
  - Ph: (extn) 5657
  - [Hui.Ma@ecs.vuw.ac.nz](mailto:Hui.Ma@ecs.vuw.ac.nz)
  - Office hour: 2-3pm, Thursday

# People

- Tutors:
  - Tao Shi [Tao.Shi@ecs.vuw.ac.nz](mailto:Tao.Shi@ecs.vuw.ac.nz)
  - Hiroshika Premarathne [premarhiro@myvuw.ac.nz](mailto:premarhiro@myvuw.ac.nz)
  - Vincent Yu [yuyong1@myvuw.ac.nz](mailto:yuyong1@myvuw.ac.nz)
  - Kaan Demir [demirkaan97@gmail.com](mailto:demirkaan97@gmail.com)
  
- School office: CO358, Ph. 463 5341
  
- Class representative:
  - please nominate and fill the form at:  
<http://www.vuwsa.org.nz/class-representatives/>

# Lectures

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

Day	Time	Where
Tuesday	11:00 -- 12:00	HM LT002
Thursday	11:00 -- 12:00	HM LT104
Friday	11:00 -- 12:00	HM LT104

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

# Tutorials and Help Desks

- Lectures and tutorials will not be strictly divided
- In principle, Friday time slots will be for tutorials
- What:
  - Stuff from lectures,
  - extending stuff from lectures,
  - Assignments, and
  - Projects
- Help desks will be offered from week 2 in the labs (CO238 or CO246) to help you with your assignments and projects
  - Details will be posted on the course website and announced in the lectures

# SWEN304 Assessment

- Assessment:

Assignment 1:	15%	}	<b>35%</b>	}	<b>75%</b>		
Assignment 2:	10%						
Assignment 3:	10%						
Project 1:	20%	}	<b>30%</b>				
Project 2:	10%						
Test	35%						

# SWEN439 Assessment

- Assessment:

Assignment 1:	15%	}	<b>25%</b>	}	<b>70%</b>		
Assignment 2:	5%						
Assignment 3:	5%						
Project 1:	20%	}	<b>30%</b>				
Project 2:	10%						
Essay	15%						
Test	30%						

# To Pass the Course

- Mandatory Requirements:
  - at least 40% of the overall marks for projects and assignments
  - achieve at least a D grade for the test
- To pass the course
  - meet the mandatory requirements
  - at least 50% grade overall



# Online Resources

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

[https://ecs.wgtn.ac.nz/Courses/SWEN304\\_2021T1/WebHome](https://ecs.wgtn.ac.nz/Courses/SWEN304_2021T1/WebHome)

[https://ecs.wgtn.ac.nz/Courses/SWEN439\\_2021T1/WebHome](https://ecs.wgtn.ac.nz/Courses/SWEN439_2021T1/WebHome)

- Discussion Forum for Assignment 1-3, Project1-2:

[https://ecs.wgtn.ac.nz/cgi-bin/yabb/YaBB.pl?board=SWEN304\\_2020T1](https://ecs.wgtn.ac.nz/cgi-bin/yabb/YaBB.pl?board=SWEN304_2020T1)

- Discussion Forum for SWEN439 Essay:

[https://ecs.wgtn.ac.nz/cgi-bin/yabb/YaBB.pl?board=SWEN439\\_2021T1](https://ecs.wgtn.ac.nz/cgi-bin/yabb/YaBB.pl?board=SWEN439_2021T1)

# Online Resources

- Zoom Link to attend the lecture  
<https://vuw.zoom.us/my/swen304>
- Video of Lectures can be accessed via Blackboard
- Assignments and Projects
  - Helpful Links:
    - PostgreSQL documentation,
    - Java Tutorial Manual

# General Information

- Prerequisite:
  - COMP 261 or SWEN 221; and
  - ENGR 123 or MATH 161
  
- Textbook:

ElMasri, Navathe: **Fundamentals of Database Systems**, Sixth Edition, Addison Wesley

# 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
  - 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
- The 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 an 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

# Topics

- 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