

# CS2102

# Database Systems

*Slides adapted from Prof. Chan Chee Yong*

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LECTURE 00

ADMIN MATTERS

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# Prerequisites

## Advanced programming

- CS1020/E
- CS2020
- CS2030
- CS2040/C
- ❖ *You will need to code for project, in a programming language you might have to learn (e.g., JavaScript, Python, PHP, etc)*

## Discrete Mathematics

- CS1231
- MA1100
- ❖ *You need a good understanding of logic for the second half of the module (functional dependencies and normal forms)*


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# Learning objectives

The aim of this module is to introduce the fundamental concepts and techniques necessary for the understanding and practice of design and implementation of database applications and of the management of data with relational database management systems.

The module covers practical and theoretical aspects of design with entity-relationship model, theory of functional dependencies, and normalization by decomposition in third and Boyce-Codd normal forms.

The module covers practical and theoretical aspects of programming with SQL data definition and manipulation sublanguages, as well as relational algebra/calculus.



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# Learning objectives

## Specifics

- How to design an entity-relationship data model to capture the data requirements for an application and translate the conceptual data model to a relational database schema
- How to refine a relational database schema using schema decompositions to avoid update anomalies
- How to use SQL to define relational schemas and write SQL queries on the schemas
- How to reason about the correctness of relational queries based on the concepts of formal query languages (relational algebra/calculus)
- How to apply knowledge of relational database systems to develop database applications

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# Workload and assessment

**Number of credits** = 4

**Workload per week** = ~10 hours

- Lecture 2 hours
- Tutorial 1 hour
- Assignment & Project 4 hours
- Preparatory 3 hours

**Tentative module assessment** (*maybe shifted  $\pm 5\%$* )

- Tutorial attendance & participation 5%
- Assignments 15%
- Team projects 20%
- Midterm assessment 20%
- Final assessment 40%

# Lectures

## Lecturer

- **Adi** Yoga Sidi Prabawa
- *Email:* dcsaysp@nus.edu.sg
- *Office:* COM2-02-55
- *Phone:* 6516-6520



## Time and Location

- Monday, 1600-1800
- I3 Auditorium

## Web lectures

- Lectures will be recorded and made available on IVLE
- Web lectures are meant to reinforce revision & learning
  - They are not to be used as substitute for attending lectures

# Lectures

Week	Topic
1	Admin matters & light introduction ( <i>self-read</i> ) <b>[public holiday]</b>
2	Introduction
3	SQL #1
4	Entity relationship data model
5	SQL #2
6	SQL #3
	<b>Recess Week</b>
7	Application development with SQL
8	<u>Midterm assessment</u> <i>[Up to week 7 materials]</i>
9	Schema refinement: functional dependencies
10	Schema refinement: functional dependencies & normal forms
11	Schema refinement: normal forms <b>[public holiday; makeup]</b>
12	NoSQL & NewSQL
13	Course review

# Tutorial

## Teaching Assistants

- Aaron Seah Ter Chuen
  - e0266255@u.nus.edu



- Lim Cheng Yang
  - e0203248@u.nus.edu



- Wang Jinyi
  - e0037325@u.nus.edu



- Yang Shuqi
  - e0253743@u.nus.edu





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# Tutorial

## Specifics

- **Duration**      45 minutes
- **Start**            week 3

## Materials

- Only selected tutorial questions will be discussed in class
- Students will be pre-assigned to discuss selected questions

## Marking

- **Attendance**      2%
- **Participation**    3%

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# Assignments

Individual assignments

## Tentative deadlines

- Assignment #1: File processing Week 3
- Assignment #2: Entity-relationship model Week 5
- Assignment #3: SQL Week 7
- Assignment #4: Schema refinement Week 12

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# Project

## Objective

- Develop a web-based database applications

## Team project

- Each team consists of 4 members ( $\pm 1$  based on divisibility)
- Team members could belong to different tutorial groups
- Team registration using Luminus will be opened by end of **Week 2**
- Teams to be formed by the end of **Week 3**
- If you are unable to form a team or you belong to a team with fewer than 4 members, you may be assigned/reassigned to a random team

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# Project

## Deadlines

- Project team registration Week 3
- 10-min alpha demo Week 8
  - *during tutorials*
- Report and code submission Week 12
- 20-min final demo Week 13

# Important dates (summary)

## Assessments

- |                       |                   |                       |
|-----------------------|-------------------|-----------------------|
| ◦ Midterm assessments | 30 September 2019 | <i>week 8 lecture</i> |
| ◦ Final assessments   | 27 November 2019  | <i>&gt; week 13</i>   |

## Projects deadlines

- |                     |                  |                            |
|---------------------|------------------|----------------------------|
| ◦ Team registration | 31 August 2019   | <i>end of week 3</i>       |
| ◦ Alpha demo        | 15 October 2019  | <i>tutorial of week 9</i>  |
| ◦ Report & code     | 09 November 2019 | <i>end of week 12</i>      |
| ◦ Final demo        | 12 November 2019 | <i>tutorial of week 13</i> |

## Assignment deadlines

- |                             |                   |                       |
|-----------------------------|-------------------|-----------------------|
| ◦ File processing           | 31 August 2019    | <i>end of week 3</i>  |
| ◦ Entity-relationship model | 14 September 2019 | <i>end of week 5</i>  |
| ◦ SQL                       | 05 October 2019   | <i>end of week 7</i>  |
| ◦ Schema refinement         | 09 November 2019  | <i>end of week 12</i> |

## Make-up lecture

- |               |                  |                            |
|---------------|------------------|----------------------------|
| ◦ Lecture #11 | 03 November 2019 | <i>Saturday of week 11</i> |
|---------------|------------------|----------------------------|

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# Course policies


## Students' responsibilities

- Attending lectures & tutorials
- Checking Luminus & emails for course-related announcements & updates

## Late submission policy

- Late assignment/project submission will NOT be accepted without prior approval from the lecturer

## Lecture slide

- Lecture slide may contain empty spaces for you to write during lecture
  - A more completed slide (without animation) will be released after the lecture
  - Lecture slide will contain all necessary examinable materials
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# Course policies

## Material clarifications

- For clarifications on lecture materials, the best way is to make use of Luminus discussion forum
- Questions emails to the lecturer may be posted (*anonymously*) to Luminus and answered there

## Office hours

- My office is at COM2-02-55
- Official office hours for consultation
  - Wednesday 1200-1400
- You may email ([dcsaysp@nus.edu.sg](mailto:dcsaysp@nus.edu.sg)) to arrange for consultation sessions
  - *Alternatively, if you see my door opened or light on, just knock on the door*

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# Plagiarism policy

*All students share the responsibility for upholding the academic standard and reputation of the University. Academic honesty is a prerequisite condition in the pursuit and acquisition of knowledge. Academic dishonesty is any misrepresentation with the intent to deceive or failure to acknowledge the source or falsification of information or inaccuracy of statements or cheating at examinations/tests or inappropriate use of resources. There are many forms of academic dishonesty and plagiarism is one of them. **Plagiarism is generally defined as the practice of taking someone else's work or ideas and passing them off as one's own (The New Oxford Dictionary of English).** The University does not condone plagiarism*

<http://www.comp.nus.edu.sg/cug/plagiarism/>





# Plagiarism policy

*Students should adopt this rule – **You have the obligation to make clear to the assessor which is your own work, and which is the work of others.** Otherwise, your assessor is entitled to assume that everything being presented for assessment is being presented as entirely your own work. This is a minimum standard.*

*A student may not knowingly intend to plagiarize, but that should not be used as an excuse for plagiarism. **Students should seek clarification from their instructors or supervisors if they are unsure whether or not they are plagiarizing the work of another person.***

<http://www.nus.edu.sg/registrar/adminpolicy/acceptance.html>

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# Plagiarism policy

*Any student found to have **committed** or **aided** and **abetted** the offence of plagiarism may be subject to disciplinary action. In addition, the student may receive a reduced grade (possibly even zero mark) for the relevant academic assignment, project, or thesis; and could receive a failed grade for the module. Any student caught plagiarizing will be required to retain the plagiarized module as graded, and will not be allowed to exercise the S/U option for that module.*

- This includes
  - Giving your answers to a friend
  - Using your friends' answers as your own
- ❖ We have **zero-tolerance** policy for plagiarism in this module

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# Conventions

**Mathemathese** *(or, what would the Lecturer say to look smart)*

- This includes formal definitions, etc
- Will be colored green-ish
- Will typically be accompanied by explanations and/or examples

**Keywords** *(or, what you need to look out for)*

- Will be colored red-ish

**Code** *(or, what would programmer say to look smart)*

- This includes pseudo-codes, etc
- Will be in monospace font such as `console`

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# Tools

## Database

- PostgreSQL
  - <https://www.postgresql.org/download/>
  - Interactive installer by EnterpriseDB

## Repository

- Git
  - <https://git-scm.com/book/en/v2/Getting-Started-Installing-Git>

## Assessments and Assignments

- Exemplify
  - <https://wiki.nus.edu.sg/display/DA/Download+Exemplify>

# Reference books

- Raghu Ramakrishnan & Johannes Gehrke  
**Database Management Systems**  
McGraw-Hill, Third Edition, 2003.  
(QA76.9 Dbm.Ra 2003)
- Avi Silberschatz, Hank Korth & S. Sudarshan  
**Database Systems Concepts**  
McGraw-Hill, Sixth Edition, 2011.  
(QA76.9 Dbm.Si 2011)
- ❖ *Books are not compulsory, they are for supplementary reading materials*

# Reference books

- Hector Garcia-Molina, Jeffrey Ullman & Jennifer Widom  
**Database Systems: The Complete Book**  
Prentice Hall, Second Edition, 2009.  
(QA76.9 Dbm.Gar 2009)
- Ramez Elmasri & Sham Navathe  
**Fundamentals of Database Systems**  
Pearson, Seventh Edition, 2016.  
(QA76.9 Dat.El 2016)
- ❖ *Books are not compulsory, they are for supplementary reading materials*