



# CSCI235 – Database Systems

## Subject Outline

[sjapit@uow.edu.au](mailto:sjapit@uow.edu.au)

27 March 2025



# Staffing

<b>Academic Program Director:</b>	<b>A/Prof. Casey Chow</b>
<b>Subject Moderator :</b>	<b>Dr. Janusz Getta</b>
<b>Lecturer :</b>	<b>Mr. Sionggo Japit</b> <b><u><a href="mailto:sjapit@uow.edu.au">sjapit@uow.edu.au</a></u></b>

# Objectives

---

- The subject presents more advanced topics in the modern **relational database technology** and the new **non-relational (NoSQL) database technologies**.
- The relational database technology component of the subject includes
  - i. **database normalization,**
  - ii. **introduction to indexing in relational database system,**
  - iii. **advanced programming in SQL and programming of database server with stored PL/pgSQL procedures, functions, and triggers,**
  - iv. **concurrency control and database recovery techniques, as well as**
  - v. **design and programming of distributed database systems.**

# Objectives

---

- The non-relational (NoSQL) database technology component of the subject includes
  - i. **the key-value data model,**
  - ii. **document-oriented model,**
  - iii. **column-family stores,**
  - iv. **graph data model, and**
  - v. **new approaches to data distribution, consistency preservation, and transaction processing.**

# Learning Outcome

---

Upon completion of this subject, students will be able to:

- Adapt a theory of relational database normalization to prove the correctness of relational database designs
- Design and create stored procedures, stored functions and database triggers in advanced SQL and in PL/SQL
- Design and create effective database transaction based on the principles of transaction processing and theory of concurrency in database systems
- Design and create relational databases



# Learning Outcome

---

- Summarise the principles of modern non-relational (NoSQL) database technologies, design and create key-value and document-oriented database systems
- Design and implement modern non-relational (NoSQL) database systems, apply indexing to improve performance of database application, use replication and sharding to design and to implement more reliable and more efficient database applications.



# Study Schedule (Indicative)

Session	Topic	Comment
1	<ul style="list-style-type: none"><li>• Database normalization: anomalies, functional dependencies, derivation rule, finding minimal keys.</li><li>• Database normalization: normal forms, other data dependencies, decomposition of relational schema.</li></ul>	
2	<ul style="list-style-type: none"><li>• Programming database server: PL/pg SQL, cursors, stored procedures and functions, and database triggers.</li></ul>	Assignment 1 handout

# Study Schedule (Indicative)

Session	Topic	Comment
3	<ul style="list-style-type: none"><li>Tutorial/Laboratory Tasks</li></ul>	
4	<ul style="list-style-type: none"><li>Programming data server and database indexing: database triggers, indexing in relational database system.</li></ul>	
5	<ul style="list-style-type: none"><li>Concurrency control in database systems: database transactions, serializability, 2 phase locking protocol, optimistic protocols, isolation levels.</li></ul>	Assignment 2 specification and briefing.



# Study Schedule (Indicative)

Session	Topic	Comment
6	<ul style="list-style-type: none"><li>Tutorial/Laboratory Tasks</li></ul>	
7	<ul style="list-style-type: none"><li>Distributed database systems: distributed relational database systems: architecture, design, concurrency control.</li></ul>	
8	<ul style="list-style-type: none"><li>NoSQL database systems: an overview, key-value data model, document- oriented data model, new approaches to data distribution and consistency preservation.</li></ul>	Assignment 3 specification and briefing.

# Study Schedule (Indicative)

Session	Topic	Comment
9	<ul style="list-style-type: none"><li>Tutorial/Laboratory Tasks</li></ul>	
10	<ul style="list-style-type: none"><li>NoSQL database system MongoDB: data model (BSON document), database design, query language, data definition and data manipulation languages.</li></ul>	

# Study Schedule (Indicative)

Session	Topic	Comment
11	<ul style="list-style-type: none"><li>• NoSQL database system MongoDB: replication and sharding.</li><li>• NoSQL database system MongoDB: pipelining, aggregation, text search, and indexing.</li></ul>	
12	<ul style="list-style-type: none"><li>• Tutorial/Laboratory Tasks</li></ul>	
13	<ul style="list-style-type: none"><li>• Other database systems: graph databases, column databases, SSD and In-memory databases.</li></ul>	

# Assessment

Assessment	Percentage of Final Mark	Remarks
Three Assignments Assignment 1 worth 10% Assignment 2 worth 10% Assignment 3 worth 10%	30%	Assignments are due in end of weeks 4, 6 and 8 respectively.
Laboratory Tasks: Implement 3 laboratories. Implement Task 1 and 2 worth 3 marks each, and Implementation tasks 3 worths 4%.	$3\% + 3\% + 4\% = 10\%$	
Final Examination	60%	The examination is schedule to be in the Examination Period.

# Assessment

To be eligible for a Pass in this subject a student must achieve a mark of at least 40% (24/60) for the exam.

Failure to meet this requirement will result in a TF (Technical Fail) grade being given if the overall subject mark is 50% or higher.

# Assessment Criteria

- Assignments will be accessed, and marks will be awarded for **correct, comprehensive, and appropriate application** of the materials covered in this subject.



# Notes on Assessment

---

Please make sure you read through the Notes on Assessment listed in the Subject Outline. Here are some of the important notes:

- Only one submission is accepted for each assignment.
- The due dates on assignment are final. In the event that the dates have to be changed, due to unforeseen circumstances, the dates will be informed to the students accordingly.

# Notes on Assessment

---

- All assignments must be submitted via the subject's site at the Moodle. **No part of assignment will be accepted as electronic mail.**
- Please make sure your userid and password to access to Moodle is working properly.

**It is your responsibility to keep a copy (or backup) of all your assignments' works.**





# Notes on Assessment

---

- Late assignments will be penalized with a 25% reduction in mark for each day late. **Please submit your assignments early and ensure you have sufficient time to submit in case you encountered with Internet problem.**
- Request for extensions should be made by submitting an academic consideration (AC) request with a supporting documentation via SMP (Student Management Package) prior to the due date. The AC request will be evaluated, and appropriate decision will be made by the academic program director.

# Using Generative Artificial Intelligence (GenAI)

---

GenAI technology (such as ChatGPT or Microsoft Co-pilot) is reshaping the University experience worldwide. UOW is committed to embracing GenAI as a tool to enhance learning experiences and develop vital work-readiness skills. However, **misuse or use of GenAI in assessments where prohibited constitutes academic misconduct** (as specified by [University Policy](#)).

# Using Generative Artificial Intelligence (GenAI)

---

It is **important that students check if GenAI is permitted for each assessment task and how it is to be used and acknowledged**. Please read the student guidance available on how to use GenAI ethically and critically, equally recognising its capabilities and limitations.

# Plagiarism

---

- The University policy on copying does not allow you to copy software as well as your assessment solutions from another person.
- Copying of other student's work is unacceptable.
- You have a responsibility to ensure that your assessment solutions are your own work.
- You must ensure that others do not obtain access to your solutions for the purpose of copying a part of them.
- Where such plagiarism is detected, **BOTH** of the assessments involved will receive **NO** marks.

# Textbook

---

## Prescribed Textbook:

- Elmasri R. and Navathe S. B., *Database systems*, 7<sup>th</sup> ed. Pearson Education, 2017.

## Reference Textbook:

- T.Connoly, C. Begg, Database Systems, A Practical Approach to Design, Implementation, and Management, Chapter 14.4 Functional Dependencies, Chapter 15.1 More on Functional Dependencies, Pearson Education Ltd, 2015
- Garcia-Molina H., Ullman J.D., and Widom J.D., *Database systems: the complete book*. Prentice Hall International Limited, 2002.
- Ramakrishnan R. and Gehrke J., *Database management systems*, 3<sup>rd</sup> ed. MC Graw-Hill, 2003.
- Grant Allen, Bob Bryla, and Darl Kuhn, *Oracle SQL Recipes: A Problem-Solution Approach*, APRESS, 2009.
- Moller A., Schwartzbach M., An Introduction to XML and Web Technology, Addison Wesley 2006
- Sadalge P.J., Fowler M., NoSQL Distilled A Brief Guide to Emerging World of Polyglot Persistence Addison Wesley 2013

