SCIT
School of Computing and Information Technology
Faculty of Engineering & Information Sciences

SIM Session 2, 2025
Subject Outline
CSCI235 – Database Systems

General Information

Lecturer/Tutor:	Sionggo Japit
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Subject Moderator:	Dr. Janusz Getta
Credit Points:	6 credit points
Duration:	1 session
Lecture Times & Location:	Refer to SIM student portal

Subject Description

The subject covers advanced topics in modern relational database technology and introduces emerging non-relational (NoSQL) databases. The relational database component includes database normalization, indexing, and programming with PL/pgSQL stored procedures, functions, and triggers. It also covers concurrency control, recovery techniques, and the design and programming of distributed database systems. The NoSQL component explores key-value data models, document-oriented databases, column-family stores, graph databases, and new approaches to data distribution, consistency preservation, and transaction processing.

Subject Learning Outcomes

On successful completion of this subject, students will be able to:

1. Adapt a theory of relational database normalization to prove the correctness of relational database designs.
2. Design and create stored procedures, stored functions, and database triggers in advanced SQL and in PL/pgSQL.
3. Design and create effective database transaction based on the principles of transaction processing and theory of concurrency in database systems.
4. Summarise the principles of distributed database systems, design and create distributed relational databases.
5. Summarise the principles of modern non-relational (NoSQL) database technologies, design and create key-value and document-oriented database systems.
6. 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.

Graduate Qualities

"Graduate Qualities" are the aspirational qualities that students will progressively develop through their learning experiences at UOW. These Graduate Qualities are not achieved in a single subject - their development is an ongoing process across an entire program of study. This subject will contribute to the following Graduate Qualities:

Graduate quality	Covered in	Assessed in
Innovation and design	Lectures, laboratories	Assignments, final examination
Informed	Lectures, laboratories	Assignments, final examination
Independent learners	Laboratories	Assignments
Problem solvers	Lectures, laboratories	Assignments, final examination

Further information can be found at:
http://eis.uow.edu.au/future-students/graduate-qualities/

Recent Improvements

SCIT is committed to ongoing improvements and is constantly monitoring feedback from students and staff.

Lecture Schedule

The lecture schedule provided below is subject to variation.

Lecture/Lab	Topic	Comments
1	• Database normalization: anomalies, functional dependencies, derivation rule, finding minimal keys. • Database normalization: normal forms, other data dependencies, decomposition of relational schema.	
2	• Programming database server: PL/pgSQL, cursors, stored procedures and functions, and database triggers.	
3	Tutorial/ Laboratory Tasks	
4	• Programming data server and database indexing: database triggers, indexing in relational database system.	
5	• Concurrency control in database systems: database transactions, serializability, 2 phase locking protocol, optimistic protocols, isolation levels.	Assignment 1 due. Assignment 2 Specification and briefing.
6	Tutorial Laboratory Tasks	
7	• Distributed database systems: distributed relational database systems: architecture, design, concurrency control	
8	• NoSQL database systems: an overview, key-value data model, document-oriented data model, new approaches to data distribution and consistency preservation.	Assignment 2 due. Assignment 3 Specification and briefing.
9	Tutorial Laboratory Tasks	

10	• NoSQL database system MongoDB: data model (BSON document), database design, query language, data definition and data manipulation languages.	
11	• NoSQL database system MongoDB: replication and sharding • NoSQL database system MongoDB: pipelining, aggregation, text search, and indexing	Assignment 3 due
12	Tutorial Laboratory Tasks	
13	• Other database systems: graph databases, column databases, SSD and In-memory databases.	

Method of Presentation

The subject will be presented as a series of lectures and tutorials. The lectures and tutorials will be delivered in 'online' mode using Cisco Webex technology.

Students must be aware that they are responsible for their own learning. Students must prepare adequately for lectures and tutorials in order to properly digest the material presented in those forms. Students are expected to undertake private study in order to fully understand and integrate all the material covered in this unit.

Lecture notes and other subject resources will be available from the subject's Moodle site which can be accessed via the `SOLS' link on the page http://www.uow.edu.au/student/index.html. **These notes may not include some of the examples and explanations given in lectures**.

From time-to-time important messages regarding changes and/or additions to assessment details will be posted to this site. Any messages so posted will be deemed to have been communicated to all students enrolled in the subject. It is the student's own responsibility to check the website regularly for any such information.

Textbook

Elmasri R. and Navathe S. B., *Fundamentals of database systems,* 7th ed. Pearson, 2017.
Ramakrishnan R. and Gehrke J., *Database management systems,* 3rd ed. MC Graw-Hill, 2003.

References

[1] Thomas Connolly and Carolyn Begg, *Database systems – A Practical Approach to Design, Implementation, and Management*, Sixth Edition, The Pearson Education Inc, 2015.

[2] Elmasri R. and Navathe S.B., Database Systems Models, Languages, and Application Programming, 6th ed., The Pearson Education Inc, 2011.

[3] Morton K., Osborne K., Pro Oracle SQL, Apress 2013.

[4] Cumming A., Russel G., SQL hacks, O'Reill, 2007.

[5] Trioashko V., SQL design patterns: the expert guide to SQL programming, Rampant Techpress, 2006

[6] Feuerstein S. Oracle PL/SQL best practices, O'Reilly Media, Inc., 2008.

[7] Gupta S., Oracle Advanced PL/SQL Developer Professional Guide, Packt Publishing, 2012.

[8] Banker K., Bakkum P., MongoDB in Action: Covers MongoDB version 3.0, Manning, 2016

[9] Harrison G. Next Generation Databases, NoSQL, NewSQL, and Big Data, Apress, 2015

[10] Blaha, M., Premerlani, W., Object-Oriented Modelling and Design for Database Applications, Prentice-Hall Inc. 1998, Chapters 2, 3, 4.

[11] Blaha, M., Patterns of Data Modelling. CRC Press, 2010, chapter 1 – 7, 11, 13.

The readings/references are recommended only and are not intended to be an exhaustive list. Students are encouraged to use the library catalogue and databases to locate additional readings.

Assessment

Assessment Items	Percentage of Final Mark	Due date
Three Assignments: • Assignment 1 is worth 10% • Assignment 2 is worth 10% • Assignment 3 is worth 10%	30%	Assignments are due in the sessions 6, 9 and 12 respectively. See the notes below and the study schedule above.
Laboratory Tasks: • Implement 3 laboratories tasks.	3% + 3% + 4% = 10%	
Final Examination	60%	Examination period

Notes on 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.

All assignments are compulsory and must be completed independently. Failure to submit a component of assessment is equivalent to receiving 0 marks.

IMPORTANT: It is your responsibility to keep a copy of all work submitted.

- As assignments are to assess student's understanding of subject material, each assignment must be solved using only material covered up to that point in time in the course, unless otherwise is explicitly stated in the assignment.

- Late assignments will be marked but the mark awarded will be reduced by 25% for each day late. Assignments will not be accepted more than four days late.

- Penalties will apply to all late work, except when your lecturer has granted special consideration or an extension. Requests for extensions should be emailed to the lecturer, prior to the assignment due date.

- Students must abide by the laboratory rules posted in the laboratory.

- Students are advised to purchase flash memory or thumb drives. This memory storage can be used to keep current and archive copies of solutions to your assignments and laboratory tasks. Loss or damage of disks is not an excuse for failure to submit the assignments or laboratory works. It is students' responsibility to make sure that their assignments and laboratory tasks can be submitted on time.

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).

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. For example:

1.1. **Generative AI is not a substitute for decision-making**: GenAI should complement, not replace, your critical thinking and decision-making skills.

1.2. **Output quality depends on prompts:** The quality of GenAI outputs is influenced by prompting. Poorly constructed or unclear prompts may generate outputs that are incorrect.

1.3. **Fact verification is essential:** GenAI outputs can be fabricated, presenting inaccurate information or contain harmful bias. Verify all GenAI outputs against reliable sources.

1.4. **Protect data and copyright:** Many GenAI technologies collect information in ways that breach privacy and data protection provisions, particularly where the source material is confidential or subject to copyright. Please check the Terms and Conditions of GenAI technologies and if unsure, contact UOW Copyright Guidance.

1.5. **Transparency in use:** Where required, you must acknowledge GenAI use, including providing prompt histories and detailing how GenAI was utilised.

1.6. **Thoughtful and appropriate application:** Be mindful of when and how to use GenAI tools. Assess its appropriateness for each use, and refrain from use when not suitable.

If you have any questions, please contact your Subject Coordinator.

Plagiarism – University's Academic Integrity Policy

The University's policy on acknowledgement practice and plagiarism provides detailed information about how to acknowledge the work of others: http://www.uow.edu.au/about/policy/UOW058648.html. The University's Academic Integrity Policy, Faculty handbooks and subject guides clearly set out the University's expectation that students submit only their own original work for assessment and avoid plagiarising the work of others or cheating. Re-using any of your own work (either in part or in full) which you have submitted previously for assessment is not permitted without appropriate acknowledgement or without the explicit permission of the Subject Coordinator. Plagiarism can be detected and has led to students being expelled from the University.

The use by students of any website that provides access to essays or other assessment items (sometimes marketed as 'resources'), is extremely unwise. Students who provide an assessment item (or provide access to an assessment item) to others, either directly or indirectly (for example by uploading an assessment item to a website) are considered by the University to be intentionally or recklessly helping other student to cheat. Uploading an assessment task, subject outline or other course material without express permission of the university is considered academic misconduct and students place themselves at risk of being expelled from the University.

When you submit an assessment task, you are declaring the following:

1. It is your own work, and you did not collaborate with or copy from others.
2. You have read and understand your responsibilities under the University of Wollongong's Academic Integrity Policy on plagiarism.
3. You have not plagiarised from published work (including the internet). Where you have used the work from others, you have referenced it in the text and provided a reference list at the end of the assignment.

Student must remember that:

- Plagiarism will not be tolerated.
- Students are responsible for submitting original work for assessment, without plagiarising or cheating, abiding by the University's Academic Integrity Policy as set out in the University Handbook, the University's online Policy Directory and in Faculty handbooks and subject guides.

Additional Information

This outline should be considered in conjunction with policy documents available through the University of Wollongong website. Those policies are subject to revision.

Please see the additional documentation provided with this subject outline.