Course Outline

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Course Details

Course Code	COMP9311
Course Title	Database Systems
Convenor	Helen Paik (/users/z2181240)
Admin	Helen Paik (/users/z2181240)
Classes	**Lectures** : online (video recordings), see the course menu for details Timetable for all classes (/COMP9311/20T2/timetable)
Consultations	To be advised
Units of Credit	6
Course Website	http://cse.unsw.edu.au/~cs9311/20T2/ (http://cse.unsw.edu.au/~cs9311/20T2/)
Handbook Entry	http://www.handbook.unsw.edu.au/postgraduate/courses/current/COMP9311.html (http://www.handbook.unsw.edu.au/postgraduate/courses/current/COMP9311.html)

Course Summary

This course explores in depth *the **practice** of developing database applications* and *the **theory** behind relational database* management systems (RDBMSs). This course focuses on Database Design. It will also give an overview of the technologies used in implementing database management systems and the past, present and future of database systems and database research.

Large data resources are critical to the functioning of just about every significant modern computer application, and so knowledge of how to manage them is clearly important in industry. In the context ofthe further study, understanding how to use databases effectively is essential for courses such as COMP9321 Data Services Engineering and COMP9322 Software Service Design and Engineering. COMP9311 also provides a foundation for further study in advanced database topics, such as COMP9315 Database Systems Implementation and COMP9318 Data Mining. Database concepts are also relevant in courses such as COMP9319 Web Data Compression and Search and COMP6714 Information Retrieval and Web Search.

Assumed Knowledge

There is no formal prerequisite for the course. But we assume you have background similar to what you would have obtained in a undergraduate engineering/science degree.

Student Learning Outcomes

By the end of the course, you should be able to:

1. develop accurate, non-redundant data models
2. realise data models as relational database schemas
3. formulate queries via the full range of SQL constructs
4. use stored procedures and triggers to extend DBMS capabilities
5. understand performance issues in relational database applications
6. understand the overall architecture of relational DBMSs
7. understand the concepts behind transactions and concurrency control
8. appreciate query and transaction processing techniques within RDBMSs
9. appreciate the past, present and future of database technology

Glossary :

- **DBMS** : DataBase Management System ... software system to support database manipulation
- **RDBMS** : Relational DBMS ... the most popular style of DBMS (refers to underlying data model)
- **SQL** : Structured Query Language ... the ANSI standard language for manipulating RDBMS

This course contributes to the development of the following graduate capabilities:

Graduate Capability	**Acquired in**
Scholars capable of independent and collaborative enquiry, rigorous in their analysis, critique and reflection, and able to innovate by applying their knowledge and skills to the solution of novel as well as routine problems	Lectures and Labs
Entrepreneurial leaders capable of initiating and embracing innovation and change, as well as engaging and enabling others to contribute to change	Assignment design and development
Professionals capable of ethical, self- directed practice and independent lifelong learning	Online forum discussion, meetings with course staff members
Global citizens who are culturally adept and capable of respecting diversity and acting in a socially just and responsible way	Online forum discussion

Teaching Strategies

- **Lectures** : deliver the basic concepts and explain with detailed examples

- **Lab Work** : help students implement basic database components with real-life database instance. To train students sufficiently in the practical programming skills in database systems, the lab exercises mainly focus on the database programming languages namely SQL and PLpgSQL. The lab works are designed to be self-guided, do-it-yourself tasks. However, there will be support lab help sessions scheduled weekly all throughout the term.
- **Consultation and Lab Support Sessions** : weekly consultation to provide personalized advice to students on their progress in the course.
- **Assessments:** measure the student's learning progress and outcome, especially on the practical skills relevant to the course
    - **Quizzes** : to help students keep up with the weekly lectures, every week an online quiz will be released covering important concepts taught in that week. To encourage students to take the quiz, there is small amount of assessment marks allocated to quizzes.
    - **Assignments** : two assignments, each designed to give practical experiences of applying the important concepts in real problems. These are individual work and assessed as such.

Teaching Rationale

This course is taught the way it is because:

- We want to produce students who are highly competent in both theoretical knowledge as well as in practical skills. In this course, primarily lectures provide the theoretical knowledge which is followed by labs/assignments to practice the technical skills. The course will have an emphasis on problem-solving for real applications.
- We want to make students feel welcome and part of the learning community. Creating such a learning community takes all of us to make sure that we respect each other (even when we are not seeing face to face), we make each other feel safe to ask questions and be curious.
- We want to equip the students with the resources and skills to to seek further knowledge and update themselves with the latest trends in the subject matter after the course is finished.

Student Conduct

The **Student Code of Conduct** (Information (https://student.unsw.edu.au/conduct) , Policy (https://www.gs.unsw.edu.au/policy/documents/studentcodepolicy.pdf)) sets out what the University expects from students as members of the UNSW community. As well as the learning, teaching and research environment, the University aims to provide an environment that enables students to achieve their full potential and to provide an experience consistent with the University's values and guiding principles. A condition of enrolment is that students *inform themselves* of the University's rules and policies affecting them, and conduct themselves accordingly.

In particular, students have the responsibility to observe standards of equity and respect in dealing with every member of the University community. This applies to all activities on UNSW premises and all external activities related to study and research. This includes behaviour in person as well as behaviour on social media, for example Facebook groups set up for the purpose of discussing UNSW courses or course work. Behaviour that is considered in breach of the Student Code Policy as discriminatory, sexually inappropriate, bullying, harassing, invading another's privacy or causing any person to fear for their personal safety is serious misconduct and can lead to severe penalties, including suspension or exclusion from UNSW.

If you have any concerns, you may raise them with your lecturer, or approach the School Ethics Officer (mailto:ethics-officer@cse.unsw.edu.au) , Grievance Officer (mailto:grievance-officer@cse.unsw.edu.au) , or one of the student representatives.

Plagiarism is defined as (https://student.unsw.edu.au/plagiarism) using the words or ideas of others and presenting them as your own. UNSW and CSE treat plagiarism as academic misconduct, which means that it carries penalties as severe as being excluded from further study at UNSW. There are several on-line sources

to help you understand what plagiarism is and how it is dealt with at UNSW:

- Plagiarism and Academic Integrity (https://student.unsw.edu.au/plagiarism)
- UNSW Plagiarism Procedure (https://www.gs.unsw.edu.au/policy/documents/plagiarismprocedure.pdf)

Make sure that you read and understand these. Ignorance is not accepted as an excuse for plagiarism. In particular, you are also responsible that your assignment files are not accessible by anyone but you by setting the correct permissions in your CSE directory and code repository, if using. Note also that plagiarism includes paying or asking another person to do a piece of work for you and then submitting it as your own work.

UNSW has an ongoing commitment to fostering a culture of learning informed by academic integrity. All UNSW staff and students have a responsibility to adhere to this principle of academic integrity. Plagiarism undermines academic integrity and is not tolerated at UNSW. Plagiarism at UNSW is defined as using the words or ideas of others and passing them off as your own.

If you haven't done so yet, please take the time to read the full text of

- UNSW's policy regarding academic honesty and plagiarism (https://student.unsw.edu.au/plagiarism)

The pages below describe the policies and procedures in more detail:

- Student Code Policy (https://www.gs.unsw.edu.au/policy/documents/studentcodepolicy.pdf)
- Student Misconduct Procedure (https://www.gs.unsw.edu.au/policy/documents/studentmisconductprocedures.pdf)
- Plagiarism Policy Statement (https://www.gs.unsw.edu.au/policy/documents/plagiarismpolicy.pdf)
- Plagiarism Procedure (https://www.gs.unsw.edu.au/policy/documents/plagiarismprocedure.pdf)

You should also read the following page which describes your rights and responsibilities in the CSE context:

- Essential Advice for CSE Students (https://www.engineering.unsw.edu.au/computer-science-engineering/about-us/organisational-structure/student-services/policies/essential-advice-for-cse-students)

Assessment

Item	Topics	Due	Marks	Contributes to Learning Outcomes
Quizzes	All topics	Weeks 1,2,3,4,5,7,8,9,10	10%	1-10
Assignment1	Data Modelling + SQL DDL	Week 5	20%	1-2
Assignment2	SQL and PLpgSQL programming	Week	30%	3-4
Final Exam	All topics	Exam period	40%	1-10

Course Schedule

Week	Lectures	Labs	Assignments	Quizzes	Notes
1	Course introduction, Data Modelling Textbook ref: Chapters 3 & 4	Lab01 – setting up a database server	-	Quiz 1	-

2	Relational Data Model and Constraints, Relational Mapping and SQL (Data Definition) Textbook ref: Chapters 5 & 9	Lab02 – schema definition and data constraints	Ass1 release	Quiz 2	-
3	Relational Algebra and SQL Textbook ref: Chapters 6, 7 & 8	-	-	Quiz 3	*
4	SQL and PLpgSQL programming (I) Textbook ref: Chapters 6 & 7, plus PostgreSQL documentation	Lab03 – SQL queries and view definitions	-	Quiz 4	*
5	SQL and PLpgSQL programming (II), Database Application Programming Textbook ref: Chapters 6, 7 & 10, plus PostgreSQL documentation	Lab04 - PLpgSQL functions	Ass1 due, Ass 2 release	Quiz 5	-
6	QUIET WEEK	QUIET WEEK	-	-	-
7	Relational Design Theory Textbook ref: Chapters 14 & 15	Lab05 - database tiggers	-	Quiz 7	*
8	Database Architecture and Indexes, Query Processing Textbook ref: Chapters 2, 16, 18 & 19	Lab06 - a practice on SQLite (an alternative DB)	-	Quiz 8	-
9	Transactions, Concurrency Textbook ref: Chapters 20, 21 & 22	Lab07 - more practice on SQLite	Ass2 due	Quiz 9	*
10	Future DB technologies, course revision Textbook ref: Chapters 24 & 25	-	-	Quiz 10	-

Resources for Students

Textbook:

- Fundamentals of Database Systems by Elmasri & Navathe, 7th edition, Addison-Wesley, UNSW Bookshop (https://www.bookshop.unsw.edu.au/details.cgi?ITEMNO=9781292097619) , eBook (Pearson) (https://pearson.com.au/9781292097626)

Other References:

- A First Course in Database Systems by Jeffery D. Ullman, Jennifer Widom, a recent edition, Prentice Hall
- Database Management Systems by R. Ramakrishan, 3rd edition, McGraw-Hill, 2003
- The Theory of Relational Databases by D. Maier, 1st edition, Computer Science Press, 1983

Special Consideration

Special consideration is the process for assessing the impact of short-term events beyond your control (exceptional circumstances), on your performance in a specific assessment task. All special consideration requests you may have on a specific assessment tasks (e.g., for giving an extension) will be managed through

the standard UNSW special consideration policy and procedures. For details, please visit UNSW special consideration Web site (https://student.unsw.edu.au/special-consideration) .

Course Evaluation and Development

This course is evaluated each session using the myExperience system.

In the previous offering of this courses, students noted that some of the examples in relational design theory were not easy to follow and could have presented better. The switch between PostgreSQL and SQLite was inconvenient. Also, some of the quiz questions were too easy in that a straight look up of the lecture notes was all that was required to find the answer.

Based on their comments, we have better prepared the examples for the relational design theory topic and check their correctness. We will bring SQLite exercise earlier - so that students can more time to practice. The quizzes (main purpose) are there to make sure that weekly revision of the lecture materials happen. So some questions deliberately reference lecture notes. However, from this term, we will make some of the quiz questions less obvious to answer to encourage more higher order thinking on the lecture topics.

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