



Welcome to Relational Databases 2021!

Assignment Project Exam Help

COMP2400/COMP6240

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Data & Databases

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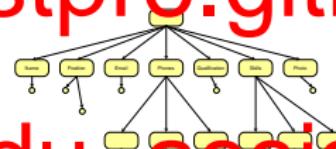
- Structured data
 - have the same defined format
 -

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- Unstructured data

- do not have any predefined format
- e.g., plain text



TYPOGRAPHICAL ART.

We wish it to be distinctly understood that the letter-press department of this paper is not going to be trampled on by any tyrannical crowd of artists in existence. We mean to let the public see that we can lay out, in our own typographical line, all the cartoonists that ever walked. For fear of startling the public we will give only a small specimen of the artistic achievements within our grasp, by way of a first instalment. The following are from Studies in Passions and Emotions. No copyright.





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Motivations for Studying Databases

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Motivations for Studying Databases

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¹ <http://bioinfo.cipf.es>



Motivations for Studying Databases

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- Google's knowledge graph²

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²<https://www.google.com/insidesearch/features/search/knowledge.html>



Database research

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- Three database researchers have received the ACM Turing Award (Nobel Prize of Computing).

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What will you learn?

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Weeks	Topics
1	Introduction to database systems
2	Relational data model and SQL (1)
3	Relational algebra
4	Query processing
5	Database design
6	Relational data model and SQL (2)
7	Relational algebra
8	Query processing
9	Database design
10	Database transaction management
11	NoSQL Databases
12	Revision Sessions

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Both **theory** and **practice** are important!



Course site

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• Wattle (UI) and password:

<http://wattle.anu.edu.au>

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- Tutorial/lab exercises
- Assignment specifications, submission
- Supplementary reading materials
- Course news and discussion forum
- Lab group sign-up
- Useful links
- ...

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Textbook

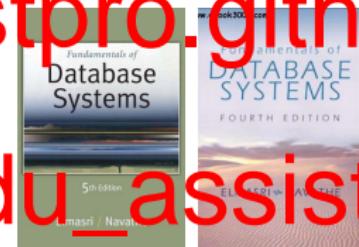
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- Only recommended (not required)

Fundamentals of Database Systems, 7th Edition (Global Edition), R. Elmasri and S. Navathe, 2017

- Or

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- Several copies in the reserve section of the Hancock library.
- Available at the Co-op bookshop.
- In this course, lecture slides and other course materials will be your best reference.



Lab Environment

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- We will use the open source relational database management system PostgreSQL.

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<https://www.postgresql.org/doc>

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The PostgreSQL software and other resources can be found on the PostgreSQL website.

<http://www.postgresql.org>



How will you learn?

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- **Online lectures** (pre-recorded): motivation and formal concepts
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- **Labs** (live) practice by yourself and bridge your learning gaps

Note: **Lab group sign-up** → Open from 12 July (Saturday)!

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- **Wattle discussion forum**: ask questions, discuss with peers, etc.
- **Suggested readings**: textbook and supplementary materials.



Who are we?

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Lectures

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Drop-in Session: Tue 2pm-3pm (Week 10 – Week 12)

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R4.26, Hanna Neumann Building (#145), qing.wang@anu.edu.au

Drop-in Session: Tue 2pm-3pm (Week 10 – Week 12)



Who are the students?

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- We have a wide range of students in the class.

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- Computing, engineering, science, information systems/technology, commerce, finance, arts, “unknown”

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- As of today, we have 650+ students in total!



Who are the students?

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- We will cater for individual needs in this course.
- For **new students** and **non CS students**
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- For **postgraduate students**
 - Related research readings
- For **students who are struggling**
 - Most marks are for core material, you can ignore the advanced stuff and still pass
- For **students who are looking for challenges**
 - Some difficult questions to try on

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Course Policy on Communication

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- Each student is required to respect and comply with the following policy.
 - Students should **post course-related questions on Wattle** instead of

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- Course-related questions which are directed at individual students or tutors may be re-directed to Wattle so the answer can benefit the entire class.
- Students **must not post any hints or solutions to assignments/quizzes/test** on the class discussion forum.
- If you have questions regarding your specific personal circumstances, you can send your email to yu.lin@anu.edu.au.

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What are you expected to do?

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- Watch online lectures, complete quizzes and provide feedback
- Join **workshops** for more running examples and explanations
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- R
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- Submit **assignments** and **test** on or before time
- Attend the **examinations**
- Complete the required **readings**
- **feedback** Think critically and be active!

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If you are having any difficulty, talk to us!



How will our students be assessed?

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- The assessment weighting for COMP2400/6240 students:

5% **Quizzes and Lab**

Best 6 out of 10 quizzes ($0.5\% \times 6 = 3\%$) and
4 = 2%, at your

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15% **Assignment** (Individual)

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NoSQL test
An online test
will be held in

55% **Final exam** A final exam will be held at the end of semester.

- Any appeals regarding an assessment must be submitted **in writing within two weeks** of the assessment results being released on Wattle or by email.



How will you be assessed?

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- To ~~pass the course~~,

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- To ~~get a pass in this course~~,
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- Obtain a final mark above 80.
- Final marks may be scaled as a result of the moderation at the examiners' meeting.



Time Commitment

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- You're expected to spend approximately 120 hours work on this course.

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Homework/readings	32
Assignments/Tests	
Total	

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- The amount of time you will need to spend on study als factors such as your prior knowledge and learning style.
- These hours do not include the time you spend studying for your final exam.



CECS Class Representatives

Why become a course representative?

- Develop skills sought by employers, including interpersonal, dispute resolution, leadership and communication skills.

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nd current issues in higher education.

- Ensure students have a voice to their cou and college

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- Course design and delivery help shape th

courses as well as future improvements for following years.

- Refer to more information on the Wattle site. Please nominate yourself by sending an email to yu.lin@anu.edu.au with the title “Course Representatives for COMP2400/6240” by midday 2 August 2021.



Student Feedback

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- Your feedback on this course will be highly valued!

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- Feel free to provide your feedback in

• We will also have two anonymous feedback channels:

① **Week 6 Survey** on teaching pace, teaching material and tutors;

② **Student Evaluations of Learning and Teaching** (SELT) survey at the end of the teaching on all issues of teaching and learning.



Cooperation and Plagiarism

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- The ANU has guidelines and formal policies on academic honesty which you must adhere to:

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great way to learn, and we encourage it.



However, work uploaded to WeChat will be checked for issues.



Assignments submitted electronically, detected by plagiarism-detecting software, and tutors will be asked to look out for copied work.



Incidents of plagiarism will be taken seriously and can result in disciplinary action.



Manage your own learning

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- Always ask yourself “am I getting this?”

- T

- If you

- Re-read the relevant lecture notes or sections.

- Post a message on the discussion forums.

- Find alternative sources in the library or on the web.

- Ask your classmates.

- Talk to your tutor or the lecturers.

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Tentative course schedule

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Wee			
1			
2			
3			
4			
5			
6	Normalisation	No labs	Assignment 1 due
Mid-semester Break			
7	Relational Algebra	Lab 5: Functions	
8	Query Processing and Optimization	Lab 6: Normalization	
9	Database Security	Lab 7: Relational Query Opti	
10	Database Transactions	Lab 8: Database Transactions	
11	NoSQL Databases	No labs	-
12	Revision sessions	No labs	NoSQL test due
Final Examination Period			

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Work to do in Weeks 1 and 2

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Week 1

- Read the course outline (available on the Wattle course site).

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Week 2

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Week 3

- Watch the online lectures and [com](#)

- Join the workshop on Friday.

- Attend Lab 1 to get familiar with the lab environment.

Students who are not familiar with Unix/Linux
information is available on Wattle.

- Join the drop-in session if you have any questions.

- Contact Yu Lin yu.lin@anu.edu.au if you need assistance in undertaking the course because of disability or other circumstances.

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Lab 1: Lab Environment

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- Log into STREAM at <https://c.csit.anu.edu.au/stream/> to activate your account in the CSIT computing environment. Log in with your ANU ID and password.

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- Students must first use GlobalProtect to enter the ANU VPN.
- Option 2: Setting up a virtual machine on your computer
 - Allow students to set up the lab environment on their computer
 - Students need to download a large file and set up the virtual machine.
- In addition to your lab in Week 2, you are very welcome to bring your questions to the following ad-hoc drop-in sessions (Aug 3, Tue 3-4pm and Aug 6, Fri 3-5pm) in Week 2.

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Databases in Our Lives

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Name a

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- What kind of data it needs to store?
- What kind of queries it needs to answer?
- What is the role of databases in it?
- Why do we need to organise data in databases?

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Databases in Our Lives

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³ <http://www.abs.gov.au/websitedbs/censushome.nsf/home/2016>



Databases in Our Lives

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AUSTRAC receives and stores transaction reporting entities in Australia, including banks, casinos and superannuation funds, to help combat money-laundering and terrorism financing activities.

⁴ <http://www.austrac.gov.au/>



Databases vs. Spreadsheets

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Databases vs. Spreadsheet

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Student ID	Student Name	Address	Course	Semester
103	Elsie	9 Watkin Street, Bruce 2617	COMP2400	2018 S1
102	Teddy	10, Gould Street, Turner		2018 S2
...
...

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Question: Can you identify any issues in doing this?



Databases vs. Spreadsheet

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Student ID	First Name	Last Name	Address	Course	Semester
103	Elsie	Watkin	9 Watkin Street, Bruce 2617	COMP2400	2018 S1
102	Teddy	Gould	10, Gould Street, Turner		2018 S1
103	Elsie	Watkin	9 Watkin Street, Bruce 2617	COMP2400	2018 S2
...	2018 S2

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Question 1: How can we ensure that the same student does not enrol in the same course in the same semester twice?

Please refer to the Relational Data Model in Week 2.



Databases vs. Spreadsheet

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Student ID	Student Name	Address	Course	Semester
103	Elsie	9 Watkin Street, Bruce 2617	COMP2400	2018 S1
102	Teddy	10, Gould Street, Turner		2018 S1
...
...

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Question 2: How can we print out all the courses in S2 2018 along with the number of enrolled students?

Please refer to SQL in Week 3.



Databases vs. Spreadsheet

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Student ID	First Name	Last Name	Middle Name	Semester
100123456	John	Doe	J	2018 S1
100123457	Jane	Doe	J	2018 S1
100123458	John	Smith	J	2018 S1

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Question 3: How can we model students and courses? How can we model the relationship between them?

Please refer to Entity-Relationship Model in Week 4.



Databases vs. Spreadsheet

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Stud				Semester
10				2018 S1
10				2018 S1
103	Elsie	9 Watkin Street, Bruce 2617	COMP2400	2018 S2
102	Teddy	10, Gould Street, Turner		18 S2
...
...

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Question 4: Would “Name” and “Address” be redundant information in the above table with respect to “StudentID”?

Please refer to Functional Dependencies in Week 5.



Databases vs. Spreadsheet

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Student ID	Student Name	Address	Subject	Semester
101				2018 S1
102	Elsie	9 Watkin Street, Bruce 2617	COMP2400	2018 S2
103	Teddy	10, Gould Street, Turner		18 S2
...

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Question 5: Should we split the above table into multiple smaller ones to reduce the redundancy?

Please refer to Normalisation in Week 6.



Databases w.r.t. Mathematics

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Question 6: What is a computer's point of view on creating, querying and updating databases?

Please refer to Relational Algebra in Week 7.



Databases w.r.t. Computers

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Question 7: How will a computer process and execute your input command?

Please refer to Query Processing and Optimisation in Week 8.



Databases Security

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Question 8: How can we protect the databases from hackers?

Please refer to Databases Security in Week 9.



Databases Transactions

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Question 9: How can we keep a database consistent even in cases of system failure?

Please refer to Databases Transactions in Week 10.



Relational Databases vs. NoSQL Databases

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Question 10: What are the opportunities and challenges of databases in the big data era?

Please refer to NoSQL Databases in Week 11.



(credit cookie) Set Notation and Russell's Paradox

- Two ways of specifying a set

$\{x_1, \dots, x_n\}$ (i.e., list all the elements in a set)

- $S = 1, 2, 3, 4, 5$
-

/

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- $\{x | x \in \mathbb{N}\}$, i.e., the set of natural numbers.
- $\{x | x \notin x\}$.

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(credit cookie) Set Notation and Russell's Paradox

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- Let $R = \{x | x \notin x\}$, i.e., the set of all sets that do not contain themselves as members.
- $R \in R \implies R$ contains itself as its members
- $R \notin R \implies R$ does not contain itself as its members $\implies R \in R$
- The barber is the “one who shaves all those, and those only, who do not shave themselves”. The question is, does the barber shave himself?
- Bertrand Russell was awarded the Nobel Prize for Literature in 1950.

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