1 Teaching Staff

Course coordinator
Dr. Qing Wang:


Lecturers
- Dr. Mohammad Yamin will give the lectures in Weeks 1-4.
  
  **Phone:** 51766  
  **Email:** mohammad.yamin@anu.edu.au  
  **Office:** Room B240, Building 115, RSISE  
  **Drop-in Session:** Tuesday 11:30am-12:30pm (Week 1 – Week 4)

- Dr. Qing Wang will give the lectures in Weeks 5-12.
  
  **Phone:** 54625  
  **Email:** qing.wang@anu.edu.au  
  **Office:** Room B245, Building 115, RSISE  
  **Drop-in Session:** Wednesday 2pm-3pm (Week 1 – Week 13)

All students are encouraged to use the discussion forum of the course website hosted on Wattle to ask questions about assignments, SQL assessment, final exam and course material. In this way, everyone in the class can benefit from the experience of their fellow students. If you want to personally discuss your problems with the lecturers, you are welcome to visit his/her office during the Drop-in Sessions or send an email to make an appointment.
Tutors

– Anila Sahar Butt, anila.butt@anu.edu.au
– Ali Foroushha, u5270083@anu.edu.au
– Jennifer Taylor, u4852974@anu.edu.au
– Mingyuan (Nicolas) Cui, u5323288@anu.edu.au
– Yi Lin, u4776528@anu.edu.au
– Miranda Zhang u5214628@anu.edu.au

2 Course Description

This course is an introduction to relational databases and the general skills for designing and using them. The topics include: relational data model, structured query language (SQL), entity-relationship model, functional dependencies, (de-)normalisation, relational algebra, query optimisation, transactions and security. To deepen the understanding of relational database technologies, we will also introduce some popular non-relational database systems, so called NoSQL databases, including Amazon’s Dynamo, Google’s BigTable, and MongoDB.

Learning Outcomes: On satisfying the requirements of this course, students will have the knowledge and skills to:

• Describe the basic concepts of the relational model and understand the underlying mathematical foundation;
• Use the SQL language to define, query and manipulate relational databases;
• Apply conceptual database modelling methods such as entity-relationship model to design a relational database;
• Apply functional dependencies and normal forms to evaluate the quality of a relational database design;
• Understand query optimization, transaction and security management in relational databases;
• Appreciate the state of the art and current industry development of NoSQL databases.

3 Course Website

The course website is available through Wattle
All the lecture slides (both presentation and printable formats), lecture recordings lab exercises, handouts, news and announcements, online discussion forum, supplementary reading materials and lab sign-up will be made available through Wattle. Note that, lecture recordings sometimes may not be available due to various technical reasons.

The lecturers will update the course website as and when required. Students are expected to regularly check the course website for the latest information.

4 Recommended Textbook

The recommended (not required) textbook for this course is

*Fundamentals of Database Systems*

This book has also been published under different titles and with different front covers (see below). Other editions (4th, 5th or 6th editions) are also fine. The textbook is available from the Co-op bookshop. Some copies are available in the reserve section of the Hancock Library.

*Database systems: models, languages, design, and application programming*
6th edition, R. Elmasri and S. Navathe
Pearson, 2011
Note that, the course will not cover all chapters in this textbook, and on the other hand, some topics that we will learn in this course are also not covered by this textbook.

For lab activities, we will use the open source relational database management system PostgreSQL. The PostgreSQL documentation is recommended for additional reading. It includes an excellent SQL reference.

http://www.postgresql.org/docs/9.1/static/index.html

The documentation is available, along with the PostgreSQL software and other resources from the PostgreSQL web-site:

http://www.postgresql.org

5 Course Activities

This course will be delivered on campus with weekly lectures, and laboratory sessions, as per the timetables for this semester.

5.1 Lectures

There are two sessions of lectures (three hours in total) each week from Week 1 to Week 12:
We will arrange guest lectures by industry professionals on topics related to databases, aiming to provide industry exposure to students. Further details will be announced in class and in Wattle.

Please refer to Section 12 for the tentative schedule of weekly topics. Some topics may be shifted around depending on how we progress.

5.2 Lab sessions

There will be 7 two-hour lab sessions during Weeks 3-10. The labs serve the purpose of deepening the understanding of the lecture material and preparing students for the assignments, SQL assessment and final exam. There will be 8-9 different lab groups (depending on the number of enrolled students), with each one allocated a day of the week, time and lab room. An indicative timetable is as follows.

<table>
<thead>
<tr>
<th>Group Number</th>
<th>Date and Time</th>
<th>Lab Room</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Tuesday 12pm-2pm</td>
<td>CSIT N113 (Building 108)</td>
</tr>
<tr>
<td>2</td>
<td>Tuesday 4pm-6pm</td>
<td>CSIT N112 (Building 108)</td>
</tr>
<tr>
<td>3</td>
<td>Wednesday 9am-11am</td>
<td>CSIT N112 (Building 108)</td>
</tr>
<tr>
<td>4</td>
<td>Wednesday 1pm-3pm</td>
<td>CSIT N112 (Building 108)</td>
</tr>
<tr>
<td>5</td>
<td>Wednesday 3pm-5pm</td>
<td>CSIT N112 (Building 108)</td>
</tr>
<tr>
<td>6</td>
<td>Thursday 9am-11am</td>
<td>CSIT N114 (Building 108)</td>
</tr>
<tr>
<td>7</td>
<td>Thursday 2pm-4pm</td>
<td>CSIT N112 (Building 108)</td>
</tr>
<tr>
<td>8</td>
<td>Friday 1pm-3pm</td>
<td>CSIT N112 (Building 108)</td>
</tr>
<tr>
<td>9</td>
<td>Friday 3pm-5pm</td>
<td>CSIT N114 (Building 108)</td>
</tr>
</tbody>
</table>

Each student must register in one of the lab groups using Wattle.

Lab exercises will be posted in Wattle before each session. Please refer to Section 12 for the lab activities.

5.3 Assignments

There are three assignments required in the course. The assignment specifications will be made available in Wattle two weeks before the due dates.

<table>
<thead>
<tr>
<th>Item</th>
<th>Requirement</th>
<th>Due Date</th>
<th>Weighting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assignment 1</td>
<td>Pair/Individual</td>
<td>Tue 9am Week 6</td>
<td>15%</td>
</tr>
<tr>
<td>Assignment 2</td>
<td>Pair/Individual</td>
<td>Tue 9am Week 8</td>
<td>10%</td>
</tr>
<tr>
<td>Assignment 3</td>
<td>Pair/Individual</td>
<td>Tue 9am Week 11</td>
<td>10%</td>
</tr>
</tbody>
</table>
The assignments need to be submitted both through Wattle electronically and to the assignment box in the student foyer (i.e., on the ground floor of the CSIT building) in a hard copy. They will be marked and returned within two weeks of the submission deadline.

- **Assignment 1** can be done individually or in pair. Students are expected to 1) design an entity-relationship model for a database application, 2) translate an entity-relationship model into a relational model. This assignment relates to the topics covered by the lectures in Weeks 1-4.

- **Assignment 2** can be done individually or in pair. Students are expected to: 1) use functional dependencies to design databases, 2) be able to determine the normal forms of a relation schema and apply the algorithms of decomposition for 3NF and BCNF. This assignment relates to the topics covered by the lectures in Weeks 5-6.

- **Assignment 3** can be done individually or in pair. Students are expected to: 1) write relational algebra queries for retrieving data from a database, 2) translate SQL queries into the equivalent relational algebra expressions, 3) evaluate and optimize relational algebra queries. This assignment relates to the topics covered by the lectures in Weeks 8-9.

**Late assignments** All assignments are required to be submitted before or on the due dates. Extensions can only be granted in some exceptional circumstances like illness with a medical certificate. A late assignment, without prior approval of the lecturers, will incur a penalty of 10% of the total available marks for that assignment per day.

Please note that:

- The group partners of one assignment need not to be the group partners of another assignment. For each joint assignment, please submit only a single copy of your work. Both group partners will normally receive the same mark.

- Students should keep a copy of all assessment items that are submitted.

- The lecturers reserve the right to question students orally on their submitted work.

- The lecturers/tutors will provide feedback to the students on their assignments. Students are encouraged to seek individual feedback from the lecturers/tutors.

### 5.4 Readings

Students are requested to read the following chapters from the text book and the supplementary reading materials as we progress through the course.
6 Course Grade

The course grade consists of the following components:

- **35% assignments**: There are three assignments in total. They will cover both practical skills and theoretical concepts.
- **12% SQL assessment**: It contains 10 SQL questions to be solved in a lab environment. For COMP2400 students, SQL solutions will be assessed by tutors in Week 9. For COMP6240 students, a two-hour SQL lab exam will be held in Week 9.
- **3% quiz**: An online quiz will be held in Weeks 12-13.
- **50% final exam**: A written exam will be held at the end of semester (closed book). It will last two and a half hours, and will cover the whole course content.

To pass the course, it is required to obtain at least 40% in the final exam, i.e., 20 marks out of 50, and at least 50% as a combined total of assignments, SQL assessment, quiz and final exam, i.e., 50 marks out of 100. **In addition to these, normally, you have to have attempted every assessment component for being considered as pass.**

**School policy**: Any appeals regarding an assessment in this course must be submitted in writing within two weeks of the assessment results being released in Wattle.

Final marks may be scaled.
7 Time Commitment

It is expected that students spend approximately 146 hours work on this course. The workload is expected to be distributed as follows:

<table>
<thead>
<tr>
<th>Activities</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attendance to lectures</td>
<td>33</td>
</tr>
<tr>
<td>Lab attendance</td>
<td>7*2</td>
</tr>
<tr>
<td>Homework/readings</td>
<td>12*4</td>
</tr>
<tr>
<td>Assignments</td>
<td>3*13</td>
</tr>
<tr>
<td>SQL assessment</td>
<td>12</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>146</strong></td>
</tr>
</tbody>
</table>

Please note that,

- the amount of time you will need to spend on study also depends on other factors such as your prior knowledge and learning style;
- these hours do not include the time you spend studying for your final exam.

8 Student Feedback

The lecturers and all other people involved in the teaching of this course highly value the constructive students’ feedback. For this purpose, all students are requested and encouraged to participate in the following anonymous feedback surveys:

(a) Week 3 and Week 5 Survey on teaching pace and teaching material;
(b) Student Evaluations of Learning and Teaching (SELT) survey at the end of the teaching on all issues of teaching and learning.

9 Cooperation and Plagiarism

Discussing the course content and activities with other students is a great way to learn, and we encourage it. However, work you hand in for assessment must be your own.

The Australian National University has guidelines and formal policies on academic honesty which you must adhere to:

http://academichonesty.anu.edu.au
Assignments submitted electronically, may be run through plagiarism detecting software, and tutors will be asked to look out for copied work. Students found indulging in plagiarism will be given a zero mark for the plagiarised assignment. Any incidents of plagiarism will be taken seriously and can result in disciplinary action.

10 Manage Your Own Learning

It is your job to learn the course content. The teaching team is there to help you do this, but do not assume that the official course activities (lectures, labs, assignments) are “enough”. The laboratory exercises, and the exercises suggested in lectures provide an opportunity to assess your understanding of the course material. The textbook has exercises and review questions at the end of each chapter.

Monitor your own progress and understanding. If you do not understand something, then do something about it. Here are some suggestions.

- Re-read the relevant lecture notes, lab notes and sections of the textbook.
- Post a message on the discussion forum.
- Find alternative sources in the library or on the internet.
- Ask your class-mates.
- Talk to your tutors or the lecturers.

In this course, we will provide feedback and support in many different ways:

- Through comments to the class during briefing and lectures.
- Through the course website - students should consult this regularly.
- In written form on your assignments, or in lectures/labs by the lecturers/tutors.
- By email, where appropriate.
- In individual consultation during the one-on-one sessions.

Students who need assistance in undertaking the course because of disability or other circumstances should contact Qing or the Disabilities Office as soon as possible so the necessary arrangements can be made.
11 More Information

This course outline assumes that students are familiar with the following policies of the university:

- Current Students Information available at:
  http://cs.anu.edu.au/study/currentstudents

- CS Handbook available at:

- Special/Supplementary Examination guidelines/policies available at:
  http://cs.anu.edu.au/study/currentstudents/assessmentissues

- ANU Academic Honesty and Plagiarism guidelines/policies available at:
  http://academichonesty.anu.edu.au/
## Tentative Course Schedule

<table>
<thead>
<tr>
<th>Weeks</th>
<th>Lectures</th>
<th>Labs</th>
<th>Assignments</th>
<th>Readings (New Edition)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Introduction to Database Systems</td>
<td>No labs</td>
<td>–</td>
<td>Chapters 1 &amp; 2</td>
</tr>
<tr>
<td>2</td>
<td>Relational Data Model</td>
<td>No labs</td>
<td>–</td>
<td>Chapter 3</td>
</tr>
<tr>
<td>3</td>
<td>Structured Query Language</td>
<td>Lab 1: Lab environment</td>
<td>–</td>
<td>Chapters 4 &amp; 5</td>
</tr>
<tr>
<td>4</td>
<td>Entity-Relationship Model</td>
<td>Lab 2: Basic SQL</td>
<td>–</td>
<td>Chapters 7, 8 &amp; 9</td>
</tr>
<tr>
<td>5</td>
<td>Functional Dependencies</td>
<td>Lab 3: Database modelling (RDM/ERM)</td>
<td>–</td>
<td>Chapter 15 (1-5)</td>
</tr>
<tr>
<td>6</td>
<td>Normalisation</td>
<td>Lab 4: Functional dependencies</td>
<td>Assign 1 due</td>
<td>Chapter 16 (1-4)</td>
</tr>
<tr>
<td>7</td>
<td>Guest Lectures and Revision</td>
<td>Lab 5: Normalisation</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>8</td>
<td>Relational Algebra</td>
<td>Lab 6: Advanced SQL</td>
<td>Assign 2 due</td>
<td>Chapter 6 (1-5)</td>
</tr>
<tr>
<td>9</td>
<td>Query Processing and Optimization</td>
<td>SQL Assessment</td>
<td>–</td>
<td>Chapter 19 (1, 7-10)</td>
</tr>
</tbody>
</table>
| 10    | Transactions and Security | Lab 7: Relational algebra and Query Optimization | – | Chapter 21 (1-3, 6)  
Chapter 24 (1-4) |
| 11    | NoSQL Databases | No labs | Assign 3 due | supplementary readings |
| 12    | NoSQL Databases and Revision | No labs | – | – |
| 13    | No lectures and labs | Quiz | – | – |

### Mid-semester Break

### Final Examination Period