

# SFWRENG 3DB3 Databases

## Fall 2021

September 7, 2021

This course is an introduction to the design and implementation of relational database management systems. Topics covered include the relational model, ER design, database design, integrity constraints, relational algebra, SQL query language, transactions, concurrency control, and advanced topics. Course work will include assignments, a midterm, and a final exam.

**Prerequisites:** COMPSCI/SFWRENG 2DM3 (or an equivalent course).

**Course Time:**

Lectures: Mon/Wed/Thurs at 1:30pm - 2:20pm, Virtual (MS Teams)

Lecture recordings will be made available after the lecture.

Tutorials:

(T01) Tues 1:30pm - 2:20pm ETB 238

(T02) Mon 12:30pm - 1:20pm ETB 235

(T03) Wed 11:30am - 12:20pm ETB 235

**Professor:** Fei Chiang

Email: fchiang@mcmaster.ca

Office hours: Mon 11:30am - 12:30pm, or by appointment (MS Teams).

**Teaching Assistants:**

- Morteza Alipour Langouri
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  - Office hours: Fri 2-3pm (MS Teams)
  
- Levin Noronha
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  - Office hours: Thurs 2:30 - 3:30pm (MS Teams)

- Lucia Cristiano
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  - Office hours: Tues 3-4pm (MS Teams)

**Textbook:** The required textbook for this course is "Database Management Systems" (3rd edition) by R. Ramakrishnan, J. Gehrke. It is available at the McMaster University bookstore.

**Grading:** All marks will be based on submitted assignments (via Avenue), the midterm, and the final exam.

- Assignments: 40% (3 assignments: A1 (12%), A2 (14%), A3 (14%)  
A3 due date during the last week of classes)
- Midterm: 20% (scheduled for **Thurs. Oct. 21, 2021** during lecture time)
- Final Exam: 40%

## Course and Learning Objectives

Students should know and understand:

1. The significance of the ER model and list its main components.
2. When views, indexes, and constraints should be used, and describe the performance considerations associated with each construct.
3. Differences among indexing schemes, and when they're applicable.
4. The problems caused by redundancy in database design.
5. The 4 transaction properties that DBMS guarantee.
6. Several data-intensive sustainability issues.
7. The different locking protocols used in a DBMS and their properties and behaviour.
8. Deadlock prevention and detection mechanisms.

Students should be able to:

1. Use a relational database management system to load data into tables, and to write SQL to retrieve desired data records.
2. Write a query using relational algebra.
3. Develop an E-R model for a given application. Translate a given E-R model to a relational model.

4. Given a data instance, identify whether it's normalized as (3NF, or BCNF), and whether a decomposition is dependency preserving or a lossless join. If not, describe the normalization/decomposition steps.
5. Identify when anomalies can occur in interleaved transactions.
6. Identify a serializable schedule.
7. Detect deadlocks given a series of transactions.

## **Notice Regarding Possible Course Modifications**

The instructor and the University reserve the right to modify elements of the course during the term. The university may change the dates and deadlines for any or all courses in extreme circumstances (e.g., severe weather, labour disruptions, etc.). Changes will be communicated through regular McMaster communication channels, such as McMaster Daily News, A2L and/or McMaster email. If either type of modification becomes necessary, reasonable notice and communication with the students will be given with explanation and the opportunity to comment on changes. It is the responsibility of the student to check their McMaster email and course websites regularly during the term and to note any changes.

## **Late Assignment Policy**

Late assignments will only be accepted within the first 5 days past the due date, at a penalty of 20% per day. That is, a 20% penalty is imposed within the first 24hrs from the due date time, and an additional 20% deduction is imposed for each subsequent 24hrs thereafter. For example, an assignment submitted within 48hrs of the due date day and time incurs a 40% late penalty. No assignments will be accepted beyond 5 days past the due date.

## **Missed Work and MSAF**

In the event of an absence for medical or other reasons, students should review and follow the Academic Regulation in the Undergraduate Calendar "Requests for Relief for Missed Academic Term Work".

Missed assignments and tests without an MSAF/official documentation receive a mark of zero. If a student misses the midterm, there is no alternative date/time to write the midterm. Students submitting MSAFs for missed work must contact the instructor. After instructor approval and confirmation, the value (weight) of the missed work will be transferred and added to the final exam weight.

## **Assignment Re-marking**

Requests for assignment re-marking must follow the below procedure:

1. All re-marking requests must be directed towards the TAs first. Any requests sent to the instructor will be forwarded to the TAs for their initial assessment.
2. All re-marking requests are to be done in writing, listing each concern you have. That is, please state: (a) the rubric criteria in question; (b) your concern/issue where you believe an error has been made and the corresponding justification; (c) the mark you received that is in dispute.
3. Please note that when you submit a re-marking request, we will review each of your concerns, plus review your entire assignment content to put your concerns in context of the entire assignment. Hence, your assignment mark may go up or down (from your original mark).
4. In your email subject line, put [CS 3DB3 Re-marking Request] so we can clearly identify all requests.
5. The TA marking your assignment will acknowledge receipt of your request within 3 business days.
6. The deadline for the TAs to receive all written re-marking requests is within 7 calendar days of the return date.

## **Servers and Databases**

The course will be using the IBM DB2 database system installed on departmental servers. Each student will be given access to these servers and their own local database instance. Each student is responsible for verifying that they have access to the servers, and an operational database instance during the first two weeks of classes. Any access and setup issues should be raised to the TAs and instructor during the first two weeks of classes to ensure proper connectivity and setup to complete assignments.

## **Academic Integrity**

You are encouraged to discuss course content with fellow students, but your submitted assignments, tests, and exam should be based on your own work, ideas, and conclusions. Copying from other students or external sources (without appropriate citation) is strictly prohibited. Do not misrepresent someone else's work as your own. When you submit assignments with your name on it, you are certifying that you have done the work on that assignment yourself.

You are expected to exhibit honesty and use ethical behaviour in all aspects of the learning process. Academic credentials you earn are rooted in principles of honesty and academic integrity. Academic dishonesty is to knowingly act or fail to act in a way that results or could result in unearned academic credit or advantage. This behaviour can result in serious consequences, e.g. the grade of zero on an assignment, loss of credit with a notation on the transcript (notation reads: "Grade of F assigned for academic dishonesty"), and/or suspension or expulsion from the university

It is your responsibility to understand what constitutes academic dishonesty. For information on the various types of academic dishonesty please refer to the Academic Integrity Policy, located at [www.mcmaster.ca/academicintegrity](http://www.mcmaster.ca/academicintegrity)

The following illustrates only three forms of academic dishonesty:

- Plagiarism, e.g. the submission of work that is not one's own or for which other credit has been obtained.
- Improper collaboration in group work.
- Copying or using unauthorized aids in tests and examinations.

In this course we will be using a web-based service (Turnitin.com) to reveal authenticity and ownership of student submitted work. Students will be expected to submit their work electronically either directly to Turnitin.com or via Avenue to Learn (A2L) plagiarism detection (a service supported by Turnitin.com) so it can be checked for academic dishonesty.

Students who do not wish to submit their work through A2L and/or Turnitin.com must still submit an electronic and/or hardcopy to the instructor. No penalty will be assigned to a student who does not submit work to Turnitin.com or A2L. All submitted work is subject to normal verification that standards of academic integrity have been upheld (e.g., on-line search, other software, etc.). To see the Turnitin.com Policy, please go to [www.mcmaster.ca/academicintegrity](http://www.mcmaster.ca/academicintegrity).

## **Conduct Expectations**

As a McMaster student, you have the right to experience, and the responsibility to demonstrate, respectful and dignified interactions within all of our living, learning and working communities. These expectations are described in the Code of Student Rights & Responsibilities (the "Code"). All students share the responsibility of maintaining a positive environment for the academic and personal growth of all McMaster community members, whether in person or online. It is essential that students be mindful of their interactions online, as the Code remains in effect in virtual learning environments. The Code applies to any interactions that adversely affect, disrupt, or interfere with reasonable participation in University activities. Student disruptions or behaviours that interfere with university functions on online platforms (e.g. use of Avenue 2 Learn, WebEx or Zoom for delivery), will be taken very seriously and will be investigated. Outcomes may include restriction or removal of the involved students' access to these platforms.

## **Accessibility**

Students with disabilities who require academic accommodation must contact Student Accessibility Services (SAS) to make arrangements with a Program Coordinator. Student Accessibility Services can be contacted by phone 905-525-9140 ext. 28652 or e-mail [sas@mcmaster.ca](mailto:sas@mcmaster.ca). For further information, consult McMaster University's Academic Accommodation of Students with Disabilities policy.

## **Academic Accommodation for Religious, Indigenous or Spiritual Observances (RISO)**

Students requiring academic accommodation based on religious, indigenous or spiritual observances should follow the procedures set out in the RISO policy. Students requiring a RISO accommodation should submit their request to their Faculty Office normally within 10 working days of the beginning of term in which they anticipate a need for accommodation or to the Registrar's Office prior to their examinations. Students should also contact their instructors as soon as possible to make alternative arrangements for classes, assignments, and tests.

## **Discrimination**

The Faculty of Engineering is concerned with ensuring an environment that is free of all adverse discrimination. If there is a problem, that cannot be resolved by discussion among the persons concerned, individuals are reminded that they should contact their Department Chair and the Human Rights and Equity Services (HRES) office as soon as possible.

## **Copyright and Recording**

Students are advised that lectures, demonstrations, performances, and any other course material provided by an instructor include copyright protected works. The Copyright Act and copyright law protect every original literary, dramatic, musical and artistic work, including lectures by University instructors. The recording of lectures, tutorials, or other methods of instruction may occur during a course. Recording may be done by either the instructor for the purpose of authorized distribution, or by a student for the purpose of personal study. Students should be aware that their voice and/or image may be recorded by others during the class. Please speak with the instructor if this is a concern for you.