DEPARTMENT OF MATHEMATICAL AND COMPUTATIONAL SCIENCES
UNIVERSITY OF TORONTO MISSISSAUGA

CSC343H5F LEC0101
Introduction to Databases
Course Outline - Fall 2019

Class Location & Time	Wed, 09:00 AM - 11:00 AM IB 140
Instructor	Michael Liut
Office Location	DH-3017
Office Hours	TBD
E-mail Address	michael.liut@utoronto.ca
Course Web Site	https://q.utoronto.ca

Course Description

Introduction to database management systems. The relational data model. Relational algebra. Querying and updating databases: the query language SQL. Application programming with SQL. Integrity constraints, normal forms, and database design. Elements of database system technology: query processing, transaction management. [24L, 12P]

Prerequisite: CSC263H5, CSC290H5
Exclusion: CSC343H1, CSCC43H3 (SCI)
Distribution Requirement: SCI

Students who lack a pre/co-requisite can be removed at any time unless they have received an explicit waiver from the department. The waiver form can be downloaded from here.

Learning Outcomes

Students should know and understand:

1. The significance of the Entity-Relationship model and be able to list its main components.
2. When views, indexes, and constraints should be used, and describe the performance considerations associated with each construct.
3. The differences among indexing schemes, and when they are applicable.
4. The problems caused by redundancy in database design.
5. The 4 transactional properties that the 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 compose tables, load data into tables, and to write SQL to retrieve desired data records.
2. Write a query using relational algebra (RA), as well as, translate RA to SQL (and vice versa).
3. Develop an Entity-Relationship model for a given application. Translate a given Entity-Relationship model to a relational model.
4. Given a data instance, identify whether its normalized (e.g. 3NF, BCNF, etc.), 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. Understand the outcome of a series of transactions and any detect deadlocks that may result.

Textbooks and Other Materials

Required Textbook

Database Management Systems - 3rd Edition. R. Ramakrishnan and J. Gehrke. McGraw-Hill. ISBN: 0072465638 // 9780072465631.

Supplementary Textbook

Database Systems Concepts - 7th Edition. A. Silberschatz, H. F. Korth, and S. Sudarshan. McGraw-Hill. ISBN: 0078022150 // 9780078022159.

Other Material

Access to a computer and an SSH client.

Assessment and Deadlines

Type	Description	Due Date	Weight
Assignment	Group Selection	2019-09-18	1%
Assignment	Group Assignment 1	2019-10-08	10%
Assignment	Group Assignment 2	2019-11-05	10%
Assignment	Group Assignment 3	2019-12-03	10%
Lab	Lab Exercises	On-going	8%
Term Test	Midterm Examination	2019-10-30	21%
Final Exam	Final Examination	TBA	40%
		Total	100%

More Details for Assessment and Deadlines

Group Selection will be due on the date of the second lecture. Those who submit on time will receive the 1% (of one's final grade), while those who fail to submit on time will receive a 0 for this category. A student will not be permitted to submit any assignments until the group selection procedures are completed (this also means that you will not have a repository for submission on MarkUs until this task is complete).

Assignments must be **submitted by 11:59PM EST** on the day due. Assignments are to be completed in groups of two and build off of one another (e.g. the solution for Assignment 1 will be needed for you to solve Assignment 2). Groups must remain together for the duration of the semester. For accommodations, Instructor approval must be communicated in writing. To submit your assignment, check your work into your repository (on MarkUs). Both partners **MUST understand ALL** parts of the assignments. We may schedule and conduct interviews for some or all assignments, after the due date, to determine if both partners have a good understanding of the entire assignment. Those who do NOT, will receive a ZERO on it.

Labs will be completed in your respective practical time slots under the supervision of the Teaching Assistant(s). There will be a total of 12 Practicals consisting of 10 Labs (i.e. there will be 10 evaluated pieces of work). You must attend your registered section and **submit your work to the TA on duty before leaving** The labs are participation based and will be worth 1% (of one's final

grade) each. Those who complete 7/10 labs, and receive 1% on each of them, will be awarded the full 8% (of one's final grade) for the Lab category in this course.

The **Midterm Examination** (i.e. Term Test) will cover everything taught up until the week prior (i.e. last lecture). It is a written, comprehensive, examination that will take place during lecture time.

The **Final Examination** will test cumulative knowledge, with a heavier emphasis on material not covered by the term test (concepts will build off of the term test). You **must earn 40% or above on the Final Examination to pass the course**; otherwise, your final course mark will be set no higher than 47 (out of 100). The Final Exam will be scheduled by the Office of the Registrar at UTM.

Penalties for Lateness

Labs must be submitted by the end of your assigned tutorial. Late labs will not be accepted.

Assignments will be docked 20% per day of lateness. After three (3) days, the assignment will no longer be accepted.

Examinations (Midterm and Final) are not subject to late penalties; they must be written and completed during their scheduled timeslots.

Religious Holidays: if a religious holiday will keep you from completing any assigned work, please let the Instructor know as soon as possible (but no later than two weeks before the due date), and we will work out a mutually agreeable (reasonable) accommodation.

Procedures and Rules

Missed Term Work

To request special consideration, bring supporting documentation to the Instructor in person during office hours at least one week in advance.

In case of illness, bring a U of T medical certificate to the Instructor within one week of the missed work. The certificate must specify the exact period during which you were unable to carry out your academic work. For other reasons, the Instructor will request a relevant form of evidence.

As the assignments build off of one another, accommodations must be discussed well in advance (more than 2 weeks) of the due date with the Instructor.

Exact accommodations will be determined on a case-by-case basis and will not be given automatically. In other words, you risk getting a mark of zero for missed work unless you contact your Instructor promptly.

As general advice, if you have any concerns or questions regarding your situation, please contact your instructor or your College Registrar, as they are well-equipped to help you with anything you may be going through.

Missed Final Exam

Students who cannot write a final examination due to illness or other serious causes must file an online petition **within 72 hours of the missed examination**. Original supporting documentation must also be submitted to the Office of the Registrar **within 72 hours of the missed exam**. Late petitions will **NOT** be considered. If illness is cited as the reason for a deferred exam request, a U of T Verification of Student Illness or Injury Form must show that you were **examined and diagnosed at the time of illness and on the date of the exam, or by the day after at the latest**. Students must also record their absence on ACORN on the day of the missed exam or by the day after at the latest. Upon approval of a deferred exam request, a non-refundable fee of $70 is required for each examination approved.

Academic Integrity

Honesty and fairness are fundamental to the University of Toronto's mission. Plagiarism is a form of academic fraud and is treated very seriously. The work that you submit must be your own and cannot contain anyone elses work or ideas without proper

attribution. You are expected to read the handout How not to plagiarize (http://www.writing.utoronto.ca/advice/using-sources/how-not-to-plagiarize) and to be familiar with the Code of behaviour on academic matters, which is linked from the UTM calendar under the link Codes and policies.

All of the work you submit must be done by you alone, and your work must not be submitted by someone else. Plagiarism is academic fraud and is taken very seriously. The department uses software that compares programs for evidence of similar code. Please read the Rules and Regulations from the U of T Calendar (especially the Code of Behaviour on Academic Matters): http://www.governingcouncil.utoronto.ca/policies/behaveac.htm

Please do not cheat. It is unpleasant for everyone involved, including us. Here are some general guidelines to help you avoid plagiarism:

- Never look at another student's assignment solution. Never show another student your assignment solution. This applies to all drafts of a solution and to incomplete and even incorrect solutions.
- Keep discussions with other students focused on concepts and examples. Never discuss assignments before the due date with anyone but your Instructor and your Teaching Assistants.
- During the Midterm/Final Examination, once you enter the room, only communicate with the Invigilator(s), Instructor, and/or Teaching Assistant(s).
- Ensure that notes, electronics, and/or communication devices (e.g. cell phone, tablet, computer, etc.) are not on your physical person while in the Midterm/Final Examination room.

Turnitin

This course will be using a web-based service (Turnitin.com) to reveal plagiarism. Students submit their assignment/work electronically to Turnitin.com where it is checked against the internet, published works and Turnitin's database for similar or identical work. If Turnitin finds similar or identical work that has not been properly cited, a report is sent to the Instructor showing the Student's work and the original source. The Instructor reviews what Turnitin has found and then determines if he/she thinks there is a problem with the work. Students who do not wish to submit their work to Turnitin.com must still submit a copy to the Instructor. No penalty will be assigned to a Student who does not submit work to Turnitin.com. All submitted work is subject to normal verification that standards of academic integrity have been upheld (e.g., online search, etc.). To see the Turnitin.com Policy, please go to https://teaching.utoronto.ca/ed-tech/teaching-technology/turnitin/.

MOSS

MOSS (Measure Of Software Similarity), by Stanford University, is an automated system that will be used to detect the similarity of software programs for the purpose of detecting plagiarism. All submitted work is subject to verification.

Final Exam Information

Duration:	3 hours
Aids Permitted:	None

Additional Information

Overview of Topics (in order)

1. Introduction to Databases
2. The Relational Model
3. The Entity-Relationship Model
4. SQL (Intro, DML, DDL, constraints, triggers)
5. Aggregation and JOINS
6. Relational Algebra
7. Views and Indexes
8. Relational Database Design (Design Theory, Schema Decomposition, Normalization)
9. Transactions and Concurrency Control (Properties, Conflicts, Recoverability, Locking)
10. Introduction to NoSQL and MongoDB (if time permits)
11. Hadoop vs. GFS vs. Cassandra (if time permits)
12. Final Exam Review

Website/Online Content

Quercus will be used to host all of this course's online content (e.g. slides, exercises, handouts, assignments, etc.).

MarkUs will be used for the collection of student's submissions for assessed work (e.g. assignments).

Discussion Board

As an alternative to emailing questions, this course will be utilizingPiazza for Q&A. Students, Teaching Assistants, and the Instructor have the opportunity to answer questions. If you believe that the majority of students would benefit to an answer, please make a Piazza post rather than sending an email.

Please note: if the question is of a personal/private nature, do send an email.

Email Policy

Emails will be returned within two-to-three business days (i.e. 2-3 work-days, not including weekends and school recognized holidays).

Office Hours

An open door policy is in effect. If my door is open, please feel free to enter, even if it just for a chat or quick question. If it is closed, you may knock.

Outside of regular office hours, please contact me via email to schedule alternative meeting times.

Re-Mark/Re-Grade Requests

1. Assignments

- Re-Mark requests must be submitted to a Teaching Assistant within 10 calendar days of receiving a grade. Re-Mark requests after this time will not be accepted.

2. Term Test/Examination

- Re-Mark requests must be submitted to the Instructor within 10 calendar days of receiving a grade. Re-Mark requests after this time will not be accepted.

Minimum Standards for Submitted Work

For your assignment to be graded, it must meet the minimum standards of a professional computer scientist. All files required to build the program must be submitted, and the program must compile cleanly, without errors or warnings on the lab machines. Last minute difficulties with version control can easily be avoided by ensuring all files are added to the repository well before the deadline, and that you know how to commit and push them. Compiling and testing your work on the teaching lab machines at intermediate stages will avoid last minute problems as well. Submissions that are missing files or do not compile will receive a grade of 0.

Further, all solutions must be typed using LaTeX or a similar word processor. Submissions that are not types will receive a grade of 0.

Communications

It is the student's responsibility to:

- Maintain current contact information with the University, including address, phone numbers, and emergency contact information.
- Use the University provided e-mail address or maintain a valid forwarding e-mail address.
- Regularly check the official University communications channels. Official University communications are considered received if sent by postal mail, by fax, or by e-mail to the student's designated primary e-mail account via their @utoronto.ca alias.
- Accept that forwarded e-mails may be lost and that e-mail is considered received if sent via the student's @utoronto.ca alias.
- Check the UofT/Quercus email and course websites on a regular basis during the term. Further, to check Quercus notifications daily for any course updates/content posting.
- Read and keep current with Piazza and the discussions therein.

Academic Accommodations

Students who require academic accommodation must contact Accessibility Services (AS) to make arrangements with a Program Coordinator. Accessibility Services can be contacted by phone 416-978-8060 or e-mail accessibility.services@utoronto.ca. For further information, consult UofT's policy for Academic Accommodation: http://www.viceprovoststudents.utoronto.ca/publicationsandpolicies/guidelines/academicaccommodation.htm

If a student with a disability chooses NOT to utilize an AS accommodation and chooses to write a standard midterm/exam, a petition for relief may not be filed retroactively (i.e. after the examination is complete).

Protection of Privacy Act (FIPPA)

The Freedom of Information and Protection of Privacy Act (FIPPA) applies to universities. Instructors should take care to protect student names, student numbers, grades and all other personal information at all times. For example, the submission and return of assignments and posting of grades must be done in a manner that ensures confidentiality. http://www.fippa.utoronto.ca/

Student Code of Conduct

The University of Toronto is committed to fostering a safe environment in which community members can pursue their educational goals. While the University assumes no general responsibility for the moral and social behaviour of its students, there are cases in which the University's interest is unique and not adequately recognized by the wider justice system. For such instances, the University has its own set of internal offenses and procedures. Which can be found here. The Code of Student Conduct can be found here.

Last Date to drop course from Academic Record and GPA is November 7, 2019.