

Computer Science 6908
Fall 2020

Course Name: Database Technology and Applications

Class Time: 3:30pm – 4:45pm, T, Th

Instructor: Jian Tang

Office Hours: 2:15pm – 3:15pm, T, Th, or by appointment

Textbook: “Database Management Systems”, 3rd Ed., Raghu Ramkrishnan, Johannes Gehrke, McGraw – Hill Education, ISBN: 0-07-246563-8 (E-copy available from the web)

Reference: “Fundamentals of Database Systems”, 7th ED, Ramez Elmasri, Shamkant B. Navathe, Pearson Education Ltd, ISBN 13: 978-1-292-09761-9 (E-copy available from the web)

Objectives: To introduce students to database processing, database management systems and database design considerations. Additional topics covered include the theory and methodologies essential for the relational database design, implementation and management under the corporation as well as web application environment.

Prerequisites: COMP 3725 or COMP 2004, and COMP 3754 or COMP 2007

Representative topics:

- A review of relational data model
 - Concepts and notations
 - SQL
 - Nested SQL
 - Embedded SQL
- Database applications on web
 - Client-server architecture of web applications
 - HTML
 - Python
- Queries using relational algebra
- Storage organizations
 - Hardware aspects
 - Storing files on a disk
 - Operations of files
 - Index structures
 - Hashing
 - B+-tree
- A review of FD and normal forms
 - Relational decomposition and dependency preservation
 - Lossless joins
- Query processing
 - Implementation of select, project and join
 - Cost analysis of implementation schemes
- Overview of transaction management
 - The ACID property

- Transactions and schedules
- Problems caused by concurrent executions
- Problems caused by aborted transactions
- Serializability and recoverability
- Concurrency control
 - Lock-based concurrency control
 - 2PL
 - Timestamp-based concurrency control
- Crash recovery
 - The log
 - Checkpointing
 - Redo phase
 - Undo phase

Course Schedule (for reference only, subject to change)

week	date	Content
1	Sept. 10	Introduction, review of relational model
2	Sept. 15, 17	SQL and nested SQL
3	Sept. 22	Database in web applications, HTML, Python
3	Sept. 24	Relational algebra
4	Sept. 29, Oct. 1	Relational algebra
5	Oct. 6, 8	Storage organization, B+ tree
6	Oct. 12 – 13	Mid-term break, no class
6	Oct. 15	Hash
7	Oct. 20	Query processing and implementation:25 mins
7	Oct. 22	Review, query processing and implementation
8	Oct. 27	Review, query processing and implementation
8	Oct. 29	FD and normal forms
9	Nov. 3, 5	FD and normal forms, LJ and DP
10	Nov. 10	LJ and DP
10	Nov. 12	Transaction, concurrency control
11	Nov. 17	Concurrency control
11	Nov. 19	Crash recovery
12	Nov. 24, 26	Crash recovery
13	Dec. 1	Crash recovery
13	Dec. 3	Crash recovery, review

Evaluations and schedules*

title	coverage	weight	due date
Assignment 1	RD, SQL, relational algebra	4%	Oct. 1
Assignment 2	Relational algebra, storage organization, B+ tree	4%	Oct. 15
Assignment 3	Hash, query processing	4%	Nov. 3
Assignment 4	FD and normal forms	4%	Nov. 17
Assignment 5	Tran. magt, con. control and crash recovery	4%	Dec. 3
Project1	Database application on the web	12%	Oct. 9
Project2	Implementation of relational algebra with B+tree	23%	Nov. 23
Final	full coverage	45%	To be determined

*The due dates may change depending on the progress of the classes.

*Project1 is an individual project. Project2 is a group project with at most two members.

*Assignments and projects are designed to be the independent work of each student (and each group for the group project). Word-to-word copying (including superficial modification) is an academic offence. Identical copies will receive zero for both copies.

Method of Lecture Delivery: The entire course will be taught online throughout the semester. A combination of synchronous and asynchronous delivery will be used for the lectures. In most cases, I will give live lectures at the assigned time-slots. Depending on the circumstances, however, I may post the pre-recorded lectures on or before the assigned class time. When this happens, I will inform you in advance.

- A statement of Memorial University's commitment to accommodation of students with disabilities:

Memorial University of Newfoundland is committed to supporting inclusive education based on the principles of equity, accessibility and collaboration. Accommodations are provided within the scope of the University Policies for the Accommodations for Students with Disabilities(www.mun.ca/policy/site/policy.php?id=239). Students who may need an academic accommodation are asked to initiate the request with the Glenn Roy Blundon Centre at the earliest opportunity (www.mun.ca/blundon).

- A statement regarding academic integrity:

Students are expected to adhere to those principles which constitute proper academic conduct. A student has the responsibility to know which actions, as described under Academic Offences in the University Regulations, could be construed as dishonest or improper. Students found guilty of an academic offence may be subject to a number of penalties commensurate with the offence including reprimand, reduction of grade, probation, suspension or expulsion from the University. For more information regarding this policy, students should refer to the University Regulations for Academic Misconduct (Section 6.12) in the University Calendar.