

ECE 356: Database Systems

University of Waterloo

Fall 2020

Brief Overview

Relational databases empower the vast majority of dynamic websites as well as a variety of information management systems in private and public sector organizations. ECE356 explores the concepts and techniques that make such databases convenient, efficient, and reliable. The course additionally includes a brief introduction to data mining and NoSQL.

Teaching Team

Instructor: Dr. Wojciech Golab wgolab@uwaterloo.ca

TAs: Raavi Soni r9soni@uwaterloo.ca
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Note: Please include “ECE356” in the subject line of any email to members of the teaching team.

Meeting Times

Lectures: Monday/Friday 11:30am–12:50pm, **held virtually using bongo**

Tutorials: Wednesday 7:00–7:50pm, **held virtually using bongo**

Office hours: TBD, **held virtually using bongo**

Note 1: The video and audio streams of lectures and tutorials will be recorded and shared with the class via LEARN. These recordings will include questions from the audience, as well as a transcript of the live chat. If you do not wish to have your image or voice recorded, then kindly ask your questions using the live chat, or during a break when the recording is paused.

Note 2: In the event that the bongo virtual classroom becomes unavailable due to a technical problem, the contingency plan for lectures will be to switch to Prof. Golab’s WebEx meeting room, which is accessible via the following URL: <https://uwaterloo.webex.com/meet/wgolab>

Evaluation

Coursework will include the following components:

Textbook homework problems:	0%	(not graded but essential for exam preparation)
Assignments/Labs:	50%	(several labs, varying weights, done in groups)
Quizzes/Exams:	50%	(done individually)

Note 1: The course instructor reserves the right to use alternative evaluation structures in special circumstances, at his discretion, in a manner that benefits the student. For example, accommodations may be offered to students affected directly or indirectly by COVID-19.

Note 2: The course instructor also reserves the right to use alternative evaluation structures, as needed, in the event that he is incapacitated by illness and unable to deliver lectures or organize course material. For example, certain topics and deliverables might be skipped, and the relative weights of different coursework items may be rebalanced to compensate.

Note 3: The quizzes and exams (if applicable) will be open book in the sense that you are permitted to refer to the documents shared by the teaching team via the course's LEARN site. You may also refer to the MySQL Reference Manual (<https://dev.mysql.com/doc/refman/8.0/en/> or older versions), and use the MySQL server provided by the teaching team to test your SQL queries. You may *not* collaborate with another individual (e.g., via a shared database, telephone calls or text messages, Internet chat, or websites like Stack Overflow) while completing quizzes and exams, and you may *not* post the questions publicly.

Learning Objectives

Upon successful completion of the course, students should be able to:

- model data using entity-relationship (ER) diagrams
- understand the relational model and design a relational schema for a data set
- express queries using both relational algebra and Structured Query Language (SQL)
- execute SQL commands against a remote database using Java Database Connectivity (JDBC)
- identify integrity constraints and functional dependencies in data
- apply the theory of database normalization to optimize the design of a relational schema
- use indexes effectively to speed up relational database workloads
- understand the basics of transaction execution, concurrency control, and recovery in databases
- understand SQL injection attacks, as well as password hashing and salting
- perform simple data mining and analytics operations on real data sets
- design a denormalized schema for a NoSQL database

Teaching Materials

Required course textbook: Silberschatz, Korth, and Sudarshan: *Database System Concepts*, 6th edition (ISBN 0073523321) or 7th edition (ISBN 0078022150).

Courseware: We will use LEARN to distribute lecture notes, homework problem sets, lab materials, quizzes, and exams (if applicable).

Labs

The course includes open labs, which will be organized by the teaching team. Designated portions of the lab work may be completed in small groups, as determined by the teaching team. Lab deliverables may include code, live demonstrations, and lab reports. Code and lab reports will be submitted electronically using a LEARN drop box. For live demos, if applicable, the teaching team may pose technical questions to any group member during assessment. All group members must be familiar with the details of the solution. The teaching team may reorganize groups, as needed, for academic purposes.

Lateness and Absence

Deadlines for lab deliverables will be specified in the lab manual. Late submissions will be penalized 10% per day (or fraction thereof). For example, a lab report that is late by 5 minutes will be penalized 10%, and a lab report that is late by 28 hours will be penalized 20%.

A missed exam will receive a grade of 0% unless the student is incapacitated during the exam due to illness, in which case a valid medical certificate showing the degree of incapacitation must be presented. The instructor reserves the right to reject medical certificates where the degree of incapacitation is based on the patient's own description of the illness, rather than on a professional medical examination by a licensed physician. Depending on the degree of incapacitation shown on the medical certificate, and the type of medical assessment, the instructor will either assign 0% or, at his discretion, will make alternative arrangements such as increasing the weight of the final exam by up to 15%.

Grading and Regrading

All coursework items, including exams, will be graded on the basis of completeness, correctness, and clarity. Members of the teaching team may also evaluate students' proficiency in the use of software in connection with lab work. Homework problem sets will not be graded but are important for success on exams. Students are encouraged to ask homework-related questions during tutorials and during office hours.

Where appropriate, students are expected to test their own solutions to problems using appropriate input data. In the event that a student's solution differs substantially from the solution recognized by the teaching team, the student may be asked to provide sample inputs and outputs to evaluate the correctness of their solution.

Students who feel that they have been graded unfairly may request that a coursework item be re-graded, in which case the entire item (e.g., lab or exam) will be re-graded. As a result, the grade may increase, decrease, or remain unchanged. The teaching team may refuse to re-grade coursework if there is evidence that the solution was modified or otherwise tampered with after submission.

Collaboration

Although aspects of the course may involve collaborative work, each student is responsible for learning all the material covered in lectures, tutorials, labs, and homework problem sets. Quizzes and exams may cover both theory and practice, including your ability to read and write SQL code.

Lab work may be completed in small groups, as specified in the lab manual. Members of the teaching team may assign or rearrange such groups for academic reasons, and may even request that certain students work alone. Students are encouraged to seek help from the teaching team for lab work. Copying code or documentation from other lab groups (including from past offerings of ECE356, ECE456, or ECE656) is forbidden, and constitutes an academic offence under Policy 71. Students are free to use any code samples included with course materials (e.g., course textbook, lectures notes, or lab manual), or provided in materials referenced by course materials (e.g., MySQL Reference Manual). Any code copied

from existing sources, whether in binary or source form, must be acknowledged clearly (i.e., say what was copied and from where) in the deliverables.

General Policies and Information

Academic integrity: In order to maintain a culture of academic integrity, members of the University of Waterloo community are expected to promote honesty, trust, fairness, respect and responsibility. [Check [the Office of Academic Integrity](#) for more information.]

Grievance: A student who believes that a decision affecting some aspect of his/her university life has been unfair or unreasonable may have grounds for initiating a grievance. Read [Policy 70, Student Petitions and Grievances, Section 4](#). When in doubt, please be certain to contact the department's administrative assistant who will provide further assistance.

Discipline: A student is expected to know what constitutes academic integrity to avoid committing an academic offence, and to take responsibility for his/her actions. [Check [the Office of Academic Integrity](#) for more information.] A student who is unsure whether an action constitutes an offence, or who needs help in learning how to avoid offences (e.g., plagiarism, cheating) or about "rules" for group work/collaboration should seek guidance from the course instructor, academic advisor, or the undergraduate associate dean. For information on categories of offences and types of penalties, students should refer to [Policy 71, Student Discipline](#). For typical penalties, check [Guidelines for the Assessment of Penalties](#).

Appeals: A decision made or penalty imposed under [Policy 70, Student Petitions and Grievances](#) (other than a petition) or [Policy 71, Student Discipline](#) may be appealed if there is a ground. A student who believes he/she has a ground for an appeal should refer to [Policy 72, Student Appeals](#).

Note for students with disabilities: [AccessAbility Services](#), located in Needles Hall, Room 1132, collaborates with all academic departments to arrange appropriate accommodations for students with disabilities without compromising the academic integrity of the curriculum. If you require academic accommodations to lessen the impact of your disability, please register with AccessAbility Services at the beginning of each academic term.

Turnitin.com and alternatives: Plagiarism detection software (Turnitin) may be used to screen coursework deliverables in this course. In the first week of the term, details will be provided on request about the arrangements for the use of Turnitin and alternatives in this course.

Useful URLs

LEARN:

<https://learn.uwaterloo.ca/d2l/home/581756>