Faculty of Computer Science
Dalhousie University

DALHOUSIE
UNIVERSITY
FACULTY OF
COMPUTER SCIENCE

CSCI 4140 – Advanced Database Systems – Fall 2023
Course Information and Syllabus

It should be noted that there may be some adjustments made to this syllabus until the end of the first two weeks of the classes. Minor adjustments are likely in the evaluation scheme and submission dates.

THERE WILL BE NO CONVERTING OF FINAL
GRADES TO PASS/ILL THIS SEMESTER.
ALL LETTER GRADES WILL BE FINAL!

Couse/Instructor Information

Instructor:	Dr. Peter Bodorik	Office:	Goldberg 316
E-mail:	Peter.Bodorik@dal.ca	Office Hours:	T, R: TBA

Class Time:	T, R 13:05- 14:25
Tut:	M 11:35-12:55
Course Homepage:	CSCI 4140 on Brightspace

Important Dal Academic Dates

For all official dates, including withdrawal dates from a course without or with penalty, see Dal's academic dates.

Course Description (CSCI 4140-Calendar-Course-Description)

This course covers advanced Database (DB) topics including, but not limited to: DB design, normalization query processing and optimization, transaction processing, concurrency control and recovery, and distributed databases. Additional topics may include object-oriented databases, multi-databases, data integration and data warehousing.

Prerequisites: CSCI 2141.03 and (CSCI 2170.03 or CSCI 3120.03)
Exclusions: CSCI 3140.03

Learning Outcomes

See https://academics.cs.dal.ca/curriculum/manage/course/CSCI/4140 for learning outcomes.

Class Format and Course Communication

- See the course home page on Brightspace for course information, including announcements, calendar, assignments, project, exams (quizzes, tests, midterms, examinations, …) - and their dates.
- Content will be delivered via a combination of lectures, tutorials, assignments, and tests/exams – any course material will be provided via handouts in class or on Brightspace.
- All assignments, unless informed otherwise, are due at 11:59 p.m., on the due date.
- Course announcements will be posted on **B**rig**hspace** (*Bspace*) or emailed to the course mail list of the students' Dal email addresses, i.e., the email addresses that Bspace uses.
  - It is the student's responsibility to check their Dal e-mail with sufficient frequency. You should consider forwarding the course emails to your personal email account that you check frequently. For information on your Dal e-mail see: https://www.dal.ca/dept/its/o365/services/email.html
- This course is delivered as an *in-person course*. There will be various impromptu quizzes/exercises (with submissions) or surveys in classes throughout the term in which you will be asked to participate. Thus, if you do not attend classes, you are not able to participate. Thus, although the course attendance is not taken in classes or tutorials, your class participation will be noted by the instructor and/or the TA.

Faculty of Computer Science
Dalhousie University

DALHOUSIE
UNIVERSITY
FACULTY OF
COMPUTER SCIENCE

- There are three tests held during the classes or tutorials that you are expected to attend in person (tests will be announced at least 1-2 weeks in advance).
- Classes may be recorded on request; however, the recordings are on a best effort basis without any guarantees. For instance, equipment may fail (e.g., microphone or other adapters that are required for recording), or there may be network connection issues that may prevent or stop recordings. Setting up recording requires time that I might not have if have meetings just before the classes.
  - o Thus, if you know that you will be unable to attend a class, you should have some classmate who will keep you up to date on the coverage of the course material. (See the statements on the *Course Participation* below.)

Evaluation Criteria *(Note that these may be amended within the first two weeks of classes)*

- *Assignments (40%)*
  - o Assignments do not have equal weights (Al:6%, A2:14%, A3:11%, A4:6%, A5:3%)
  - o Late assignments will not be accepted unless a late penalty clause has been announced or a permission for late submission has been obtained prior to the deadline.
  - o Peer-to-peer learning is encouraged and thus discussion on course material or assignments are encouraged. However, exchange of solutions, or partial solutions is not permitted for individual assignments.
  - o All assignments may be checked with a plagiarism detection software. Also, be prepared to demonstrate your assignment software on request. Furthermore, make sure that you provide your information on FCS Git repository and provide access to the assignments to your TA, markers, and the course instructor.
  - o All assignments are individually performed and submitted. The exception might be the last assignment – if so – there will be an announcement about it.

- *Course Participation (7%)*
  - o Course participation is determined by the course instructor using observations during lectures and tutorials, and by your participation in impromptu quizzes or surveys. *If you do not attend classes, you are not able to participate*.
    - ▪ Important: *Normally, students receive a course participation grade that is an average calculated over assignments and tests (with weights as described above). However, the course participation grade may be increased or decreased if the observations, as made by the TA and by the instructor, warrant it.*

- *Tests (53%)*
  - o There will be three tests with each test having approximately the same weight.
  - o Tests are compulsory. If a student misses a test due to health or personal reasons, the student is responsible to submit SDA prior to the test's date/time and email the instructor requesting to schedule a make-up test. Recall that tests will be held during class or tutorial times that you are expected to be able to attend.

To pass the course, a student must obtain a passing grade on the average of the course-work components <u>and</u> a passing grade over exams (average over all tests (not quizzes)).

Tentative Dates

Tests (in-class during lectures or tutorials)

Test 1 … Oct 5
Test 2 … Oct 31
Test 3 … Dec 4

Note that there may be changes to the test dates due to conflicts with other courses, delays in course progress, or other unforeseen reasons.

Assignment (all assignments are due at 23:59 (11:59 p.m.) on the due date of the assignment)

A1 … Sep 20
A2 … Oct 14

Faculty of Computer Science
Dalhousie University

DALHOUSIE
UNIVERSITY
FACULTY OF
COMPUTER SCIENCE

A3 … Nov 1
A4 … Nov 24
A5 … Dec 1

Notes

- If re-submission of course work is permitted, e.g., to correct major deficiencies, loss of marks will result, depending on the nature of deficiencies/corrections (i.e., the normal rubric is no longer applicable).
- A minimum C grade is required in this course if it is core to your FCS degree, or if it will be used as a prerequisite for a subsequent CSCI course.
- As of 2019, students who receive a grade lower than C in the same required CS course twice, will be dismissed.
- The grade conversion scale in Section 17.1 of the Academic Regulations, Undergraduate Calendar will be used as a guideline. However, some adjustments may be made to the bands that define the grades.

- *The use of the Student Declaration of Absence (SDA) in this course:*

  o From Dalhousie's website (https://www.dal.ca/campus_life/safety-respect/student-rights-and-responsibilities/academic-policies/student-absence.html):
     - You can submit a maximum of two separate Student Declaration of Absence forms per course during a term. (Note: Faculty, College, School, instructor or course-specific guidelines may set a lower maximum.)
     - If you have recurring short-term or long-term absences, you are strongly encouraged to meet your Faculty, Declared Major Advisor or your Faculty Program Coordinator.

  o All course work, including assignments and tests, must be completed and their completion is not excused by submitting an SDA.
     - You may submit an *SDA if you will miss a test due to illness*, but you must also contact instructor to discuss and schedule alternate date for writing the test. Note that the SDA must be submitted *prior to the* test for which the SDA is submitted. Furthermore, on the same day you are submitting the SDA, you must also email the instructor with a requests to reschedule the test. However, *if you do attempt to write the test, SDA is not applicable, and your attempt will be marked.*
          If you miss a make-up test also, documentation may have to be required and the issue will have to be resolved with input from the Assistant Dean.
     - You may submit an *SDA if your illness, or some other extenuating circumstance, prevents you from submitting your assignment on-time*. However, your SDA must be submitted on or before the date the assignment is due, and at same time you must also email the instructor with information how much work you have accomplished on the assignment thus far and with a suggestion for an alternate submission date. The instructor may ask you for evidence of any work you have done thus far. Please, be aware that if you submit your SDA on the assignment due-date (or the day before) and have no, or little evidence of having done any work on the assignment, you will receive a zero!

  o This is a generic statement that is applicable only to assignments/projects that require or permit group work: An *SDA may not be used* as an excuse for not contributing, whether partially or fully, towards any *group* work. Team/group effort is over a longer period. If you feel that your illness has prevented you from contributing to the assignment/project to the point that your evaluation (peer-to-peer or the instructor's evaluation) may be affected negatively, then you should meet with your academic advisor who might contact the course instructor in order to consult on possible options - there are only three: (i) Do some make-up individual work that is deemed suitable by the course instructor and the academic advisor; (ii) continue with the work group with standard evaluation; (iii) withdraw from the course.

Grading/Marking Appeals

Although we do strive for consistency and correctness in marking, we are all humans and mistakes can be made. If you feel that your assignment has not been marked appropriately, you may appeal it within a certain time frame (3-days from return of your marked/graded assignment/quiz/test). In short, when appealing your mark for your assignment or test, you

Faculty of Computer Science
Dalhousie University

DALHOUSIE
UNIVERSITY
FACULTY OF
COMPUTER SCIENCE

need to describe specifically which part you feel was marked wrong and why it was marked wrong. You submit your request, with the information listed above, in the assignment box *Grade-Review-Request* (*Assessments -> Assignments -> Grade-Review-Request*). Make sure that your request is in a file named using the following notation:

"GrReview-XX-YYYYY-B00ZZZ", where
- XX is the course-work short-name, e.g., A3, Q2, T1;
- YYYYY is your Last name; and
- B00ZZZZZZ is your Student ID (Banner ID).

Examinations/Tests

- Photo ID is required.
- Closed book.
- No dictionaries, notes, calculators, cell phones, PDAs, talking slide rulers, or other electronic aids allowed.
- ***During tests***, there will be ***no hats, caps, or brims/visors or other headgear that will prevent the test invigilator to see your eyes*** (e.g., caps and brims must be turned backwards). Any exemption to this must be sought at the beginning of the course (and you need to indicate why to receive approval). The instructor has the right to assign students to specific seats.

Class Attendance and Related

Although the class attendance is not mandatory except for tests, class attendance is strongly encouraged. Also, class participation is one of the evaluation categories and, of course, if you do not attend classes, you are not able to participate.

Texts and Resources

The textbook for the course is:

Database Systems: Design, Implementation, and Management, 13th Edition
by *Carlos Coronel and Steven Morris*
Student Edition ISBN: 978-1-337-62790-0; Loose Leaf Edition ISBN: 978-1-337-68882-6
Earlier editions are acceptable.
Digital version available at: https://www.vitalsource.com/en-ca/

If you search the web, you may find that there are many other sources available for digital, loose leaf, or hard cover versions of the textbook. However, you need to mind the copyright laws.

Reading:
Principles of Distributed Database Systems, 3rd Edition
by *M. Tamer Özsu* and *Patrick Valduriez*
Springer
Digital version is available (*for free*) through our Dal Library at: Ozsu & Valduriez - Principles of DDB Systems
(There should be a link to a downloadable PDF version of the text.)

Tentative List of Topics

• Relational Data Model o Data models, Relational data model o Relational algebra • Structured Query Language o Data definition language o Data manipulation language o Views	• Concurrency Control (CC) o Serializability theory o Pessimistic CC methods o Locking-based CC methods o Timestamp-based CC methods o Optimistic CC methods o Deadlock Management

Faculty of Computer Science
Dalhousie University

DALHOUSIE
UNIVERSITY
FACULTY OF
COMPUTER SCIENCE

o   Triggers and stored procedures
• Data Modelling
    o   ER and ERD models
    o   Conceptual, logical and physical data models
    o   Translation of an ERD model to relations
• Normalization of Database Tables
    o   Normal forms
    o   Normalization process
• Transactions
    o   Transactional properties
    o   Types of transactions
	• Database Reliability
	    o Transaction failures
	    o Recovery methods
	    o Checkpointing
	    o Distributed environment and transactions
	        ▪ 2-Phase Commit
	• Query Optimization
	    o Client-side SQL tuning
	    o Server-side DBMS tuning
	    o Query optimization phases
	• Other Selected Topics[1], such as
	    o Distributed environment and transactions
	    o NoSQL DBs

Missed or Late Academic Requirements due to Student Absence - Submission

Dalhousie students are asked to take responsibility for their own short-term absences (3 days or less) by submitting a completed *Student Declaration of Absence* (SDA) to an assignment submission box on Brightspace. Recall that only two separate Student Declaration of Absence forms may be submitted per course during a term.

Using the form - If you experience a short-term absence that is no longer than three consecutive days, you need to submit your SDA on the course Brightspace, wherein the file name containing your SDA must the following format:

"SDA-XX-YYYYY-B00ZZZ", where
- XX is the course-work short-name and number, e.g., A3, Q2, T1;
- YYYYY is your Last name; and
- B00ZZZZZZ is your Student ID (Banner ID).

Course-work Due Dates

Note that the due dates, posted in the course syllabus stored on Brightspace in the module *Syllabus and Admin* However, they may be amended, e.g., due to conflicts with coursework/tests in other courses.

Responsible Computing Policy
Usage of all computing resources in the Faculty of Computer Science must be within the Dalhousie Acceptable Use Policies (http://its.dal.ca/policies/) and the Faculty of Computer Science Responsible Computing Policy. For more information please see https://www.cs.dal.ca/downloads/fcs_policy_local.pdf

Use of Plagiarism Detection Software

All submitted code may be passed through a plagiarism detection software, such as the plagiarism detector embedded in Codio, the Moss (https://theory.stanford.edu/~aiken/moss/) Software Similarity Detection System, or similar systems. If a student does not wish to have their assignments passed through plagiarism detection software, they should contact the instructor for an alternative. Please note, that code not passed through plagiarism detection software will necessarily receive closer scrutiny. STUDENT SUBMISSION OF ASSIGNMENTS AND USE OF ORIGINALITY CHECKING SOFTWARE POLICY

Culture of Respect[2]

Every person has a right to respect and safety. We believe inclusiveness is fundamental to education and learning. Misogyny and other disrespectful behavior in our classrooms, on our campus, on social media, and in our community is unacceptable. As a community, we must stand for equality and hold ourselves to a higher standard.

---

[1] If time permits, one or more of these topics.

[2] Source: Speak Up! © 2005 Southern Poverty Law Center. First Printing. This publication was produced by Teaching Tolerance, a project of the Southern Poverty Law Center. Full "Speak Up" document found at: https://www.dal.ca/cultureofrespect.html - revised by

Faculty of Computer Science
Dalhousie University

DALHOUSIE
UNIVERSITY
FACULTY OF
COMPUTER SCIENCE

What we all need to do:
1. **Be Ready to Act:** This starts with promising yourself to speak up to help prevent it from happening again. Whatever it takes, summon your courage to address the issue. Try to approach the issue with open-ended questions like "Why did you say that?" or "How did you develop that belief?"
2. **Identify the Behavior:** Use reflective listening and avoid labeling, name-calling, or assigning blame to the person. Focus the conversation on the behavior, not on the person. For example, "The comment you just made sounded racist, is that what you intended?" is a better approach than "You're a racist if you make comments like that."
3. **Appeal to Principles:** This can work well if the person is known to you, like a friend, sibling, or co-worker. For example, "I have always thought of you as a fair-minded person, so it shocks me when I hear you say something like that."
4. **Set Limits:** You cannot control another person's actions, but you can control what happens in your space. Do not be afraid to ask someone "Please do not tell racist jokes in my presence anymore" or state "This classroom is not a place where I allow homophobia to occur." After you have set that expectation, make sure you consistently maintain it.
5. **Find or be an Ally:** Seek out like-minded people that support your views, and help support others in their challenges. Leading by example can be a powerful way to inspire others to do the same.
6. **Be Vigilant:** Change can happen slowly, but do not let this deter you. Stay prepared, keep speaking up, and do not let yourself be silenced.

Student Health and Wellness

Taking care of your health is important. As a Dalhousie student, you have access to a wide range of resources to support your health and wellbeing. Students looking to access physical or mental health & wellness services at Dalhousie can go to the Student Health & Wellness Centre in the LeMarchant Building. The team includes: registered nurses, doctors, counsellors and a social worker. Visit **dal.ca/studenthealth** to learn more and book an appointment today.

Students also have access to a variety of online mental health resources, including telephone/texting counselling and workshops/training programs. Learn more and access these resources at d**al.ca/mentalhealth**.

University Statements

This course is governed by the academic rules and regulations set forth in the University Calendar and the Senate. https://academiccalendar.dal.ca/Catalog/ViewCatalog.aspx?pageid=viewcatalog&catalogid=69&chapterid=3457&loaduseredits=False

Territorial Acknowledgement

Dalhousie University is located in Mi'kma'ki, the ancestral and unceded territory of the Mi'kmaq. We are all Treaty people.

Dalhousie acknowledges the histories, contributions, and legacies of the African Nova Scotia people and communities who have been here for over 400 years.

Internationalization

At Dalhousie, 'thinking and acting globally' enhances the quality and impact of education, support-ing learning that is "interdisciplinary, cross-cultural, global in reach, and orientated toward solving problems that extend across national borders." https://www.dal.ca/about-dal/internationalization.html

Academic Integrity

At Dalhousie University, we are guided in all of our work by the values of academic integrity: honesty, trust, fairness, responsibility and respect. As a student, you are required to demonstrate these values in all of the work you do. The University provides policies and procedures that every member of the university community is required to follow to ensure academic integrity. (read more: http://www.dal.ca/dept/university_secretariat/academic-integrity.html)

Susan Holmes from a document provided April 2015 by Lyndsay Anderson, Manager, Student Dispute Resolution, Dalhousie University, 902.494.4140, lyndsay.anderson@dal.ca www.dal.ca/think.

Accessibility

The Student Accessibility Centre is Dalhousie's centre of expertise for matters related to student ac-cessibility and accommodation. If there are aspects of the design, instruction, and/or experiences within this course (online or in-person) that result in barriers to your inclusion please contact: https://www.dal.ca/campus_life/academic-support/accessibility.html for all courses offered by Dalhousie with the exception of Truro.

Conduct in the Classroom — Culture of Respect

Substantial and constructive dialogue on challenging issues is an important part of academic inquiry and exchange. It requires willingness to listen and tolerance of opposing points of view. Consideration of individual differences and alternative viewpoints is required of all class members, towards each other, towards instructors, and towards guest speakers. While expressions of differing perspectives are welcome and encouraged, the words and language used should remain within acceptable bounds of civility and respect.

Diversity and Inclusion — Culture of Respect

Every person at Dalhousie has a right to be respected and safe. We believe inclusiveness is fundamental to education. We stand for equality. Dalhousie is strengthened in our diversity. We are a respectful and inclusive community. We are committed to being a place where everyone feels welcome and supported, which is why our Strategic Direction prioritizes fostering a culture of diversity and inclusiveness (Strategic Priority 5.2). (read more: http://www.dal.ca/cultureofrespect.html)

Student Code of Conduct

Everyone at Dalhousie is expected to treat others with dignity and respect. The Code of Student Conduct allows Dalhousie to take disciplinary action if students don't follow this community expectation. When appropriate, violations of the code can be resolved in a reasonable and informal manner—perhaps through a restorative justice process. If an informal resolution can't be reached, or would be inappropriate, procedures exist for formal dispute resolution. (read more: https://cdn.dal.ca/content/dam/dalhousie/pdf/dept/university_secretariat/policy-repository/Code%20of%20Student%20Conduct%20rev%20Sept%202021.pdf)

Fair Dealing Policy

The Dalhousie University Fair Dealing Policy provides guidance for the limited use of copyright protected material without the risk of infringement and without having to seek the permission of copyright owners. It is intended to provide a balance between the rights of creators and the rights of users at Dalhousie. (read more: https://www.dal.ca/dept/university_secretariat/policies/academic/fair-dealing-policy-.html)

Originality Checking Software

The course instructor may use Dalhousie's approved originality checking software and Google to check the originality of any work submitted for credit, in accordance with the Student Submission of Assignments and Use of Originality Checking Software Policy. Students are free, without penalty of grade, to choose an alternative method of attesting to the authenticity of their work, and must inform the instructor no later than the last day to add/drop classes of their intent to choose an alternate method. (read more: https://cdn.dal.ca/content/dam/dalhousie/pdf/dept/university_secretariat/policy-repository/OriginalitySoftwarePolicy.pdf)

Student Use of Course Materials

These course materials are designed for use as part of the CSCI courses at Dalhousie University and are the property of the instructor unless otherwise stated. Third party copyrighted materials (such as books, journal articles, music, videos, etc.) have either been licensed for use in this course or fall under an exception or limitation in Canadian Copyright law. Copying this course material for distribution (e.g. uploading material to a commercial third party website) may lead to a violation of Copyright law.

Learning and Support Resources

Please see https://www.dal.ca/campus_life/academic-support.html