# CS 5200 - Introduction to Database Management Systems (Section 10)

# Khoury College of Computer Sciences

**Northeastern University, Vancouver Campus**

**Spring 2025**

**Dr. Hazra Imran**

*We acknowledge that the land on which we gather is the unceded territory of the Coast Salish Peoples, including the territories of the xʷməθkʷəy̓əm (Musqueam), Sḵwx̱wú7mesh(Squamish), and səl̓ílwətaɬ (Tsleil-Waututh) Nations.*

# Class Schedule and Teaching Team Information

|  |  |
| --- | --- |
| Class Hours | Wednesday 3:15 – 5:15 pm |
| Class Location | Vancouver: 1426 |
| Instructor | **Dr. Hazra Imran** ([h.imran@northeastern.edu](mailto:h.imran@northeastern.edu))  Please use Piazza for all course-related questions; use email only for emergencies. |
| TAs | Fu, Annan ([fu.anna@northeastern.edu](mailto:fu.anna@northeastern.edu))  Hortua Leal, Robert ([hortualeal.r@northeastern.edu](mailto:hortualeal.r@northeastern.edu)) |
| Office Hours | **Hazra’s OH -** Please use this link to schedule office hours: <TBA>  **TA’s OH -** Please use this link to schedule office hours: <TA s OH>  TAs are NOT to be contacted over emails or via private chat. Posts to "All Instructors" on Piazza are how you should address private posts, and TAs can see those posts. |

# Catalog Description

Introduces relational database management systems as a class of software systems. Prepares students to be sophisticated users of database management systems. Covers design theory, query language, and performance/tuning issues. Topics include relational algebra, SQL, stored procedures, user-defined functions, cursors, embedded SQL programs, client-server interfaces, entity-relationship diagrams, normalization, B-trees, concurrency, transactions, database security, constraints, object-relational DBMSs, and specialized engines such as spatial, text, XML conversion, and time series. Includes exercises using a commercial relational or object-relational database management system.

# Course Prerequisites

No prerequisite course.

# Course Objectives

* Create an operational relational database from an analysis of a domain
* express a data model using UML and ERD
* write complex relational queries in SQL
* construct analytical databases using star and snowflake schemas
* abstract queries with relational algebra and domain relational calculus
* build client/server applications using embedded SQL combined with stored procedures and triggers
* understand the architecture of database engines including query planning and execution
* define data storage infrastructures, including RAID
* explain data storage solutions using partitioning, sharding, and distribution
* manage concurrent access to data using transactions and concurrency control protocols

# Course Modality

* Lectures will not be recorded unless there are exceptional circumstances, such as severe weather or the instructor’s inability to conduct in-person classes.
* Lectures will not be live streamed as the course is in-person and not online. However, if a student is absent for an extended period due to an emergency, arrangements may be made for online participation. These decisions will be made on a case-by-case basis. Students needing this accommodation should contact the instructor via a private post on Piazza to request permission.

# Course Schedule

*Note: This is a tentative schedule and may change. Please check the Canvas course page for the most current schedule and topics.*

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| --- | --- | --- |
| **Week** | **Date**  **(Wed)** | **Class Topic** |
| 1 | Jan 8 | Getting Stated and Introduction to Databases and DBMS |
| 2 | Jan 15 | Conceptual Modeling |
| 3 | Jan 22 | Logical Modeling |
| 4 | Jan 29 | Relational Database Design & Normalization |
| 5 | Feb 5 | Realizing A Database Schema |
| 6 | Feb 12 | Data Retrieval with SQL |
| 7 | Feb 19 | Application Development |
| 8 | Feb 26 | Practicum I |
|  | Mar 5 | NO CLASS - SPRING BREAK |
| 9 | Mar 12 | Relational Algebra |
| 10 | Mar 19 | Query Processing & Indexing |
| 11 | Mar 26 | Concurrency & Transactions |
| 12 | Apr 2 | Data Warehousing & OLAP |
| 13 | Apr 9 | Practicum II |
| 14 | Apr 16  (Last class) | Database Architectures |
|  | Apr 22 - 26 | Final Exam Period |

# Pre-class Work

This course, along with other MSCS courses at the Vancouver campus of Northeastern University, will be taught using a pedagogical technique known as *Flipped/Hybrid* classroom approach. This method optimizes our class time by moving away from traditional lectures and PowerPoint presentations. Instead, you will come to class having completed assigned readings and a pre-class quiz to familiarize yourself with the material.

In class, we will focus on applying these concepts through targeted problems and activities, enhancing your understanding and retention. This approach requires more preparation and engagement from both the instructor and students compared to passive lecture-based models. Our class time will be dedicated to developing computational thinking skills—solving problems, building conceptual understanding, and creating efficient algorithms. This will help you grow into a proficient computer scientist rather than just a programmer. And then during class, you will *apply* your understanding of these core concepts through carefully chosen problems and activities, which will enable you to *solidify* your knowledge.

To ensure you gain the most from this course, you must come prepared to each session, having completed all assigned readings, videos, and quizzes. Our classes are scheduled for only 2 hours per week, as opposed to the typical 3.25 hours for other four-credit courses at Northeastern, reflecting the emphasis on pre-class work. Failure to complete these tasks will make it challenging to keep up with in-class activities and assignments.

Expect to spend approximately 10 to 12 hours per week on course-related activities, including pre-class work, class attendance, and assessments.

If you plan to travel during the term, schedule interviews, or attend private functions, you are still responsible to submit all work on time – be sure to manage your schedule and work ahead.

# Course Components and Evaluation

* **Quizzes** - Quizzes will be administered at the beginning of each class to test your understanding of the pre-class material. These quizzes will impact your overall grade and must be completed at the start of class. Late submissions will not be accepted. Review the pre-class materials thoroughly; discussions with peers are encouraged, but quiz responses must be individual.
* **Class Activities** - Lectures will be accompanied by in-class activities.  Students are encouraged to discuss with their peers to complete the given activities. In-class activities will be graded based on efforts.
* **Assignments** - All assignments must be completed individually.
* **Practicums -** Practicums are small, focused projects designed to be completed by teams of two, requiring a substantial collaborative effort (approximately 15–20 hours per team). A dedicated week is provided for each practicum to ensure teams have sufficient time to plan, execute, and finalize their work. The practicums are mandatory and must be submitted as a team. To ensure fairness and accountability within the teams, the following requirements are in place:
  + Demo Walkthroughs (Review or Viva Voce)**:** Teams must present their work during scheduled sessions to explain their approach, outcomes, and decisions.
  + Team Self-Evaluation**:** Each team must submit a self-evaluation reflecting on their collaboration, effort distribution, and lessons learned. Failure to submit this evaluation will result in an automatic score of 0 for the practicum.
  + Attendance Requirement**:** Both team members must attend the scheduled demo or review. Failing to appear or demo as a team will result in a score of 0 for the practicum
  + **Teamwork Policy -** Each group member will receive the same grade as the group's. However, individual grades can be adjusted by up to 30% if the group members feel that an individual has not contributed equally. Members in a group will have the opportunity to submit an evaluation of their group members anonymously.

# Grading Scheme

# Assignments (40%)

# Quizzes (10%)

# In class activities (5%)

# Practicum I - Reviews/Demos (20%)

# Practicum II - Reviews/Demos (25%)

# Piazza

Piazza will be used for class discussion and course announcements. It also provides students with a platform for getting you help fast and efficiently from classmates, the TAs, and the instructors. Rather than emailing questions to the teaching staff, we encourage you to post your questions on Piazza. If you have trouble with Piazza, you can get help [from team@piazza.com](mailto:from team@piazza.com).

Here is the link : <https://piazza.com/northeastern/spring2025/cs5200_hi>

# Late Policy

All assignments and project submissions are due at midnight on their due date, they will be accepted *up to one day* after the deadline. Late submissions will be penalized one percent for every hour late, e.g., an assignment 15 hours late will receive a 15% penalty.

**Make-up quizzes** will not be given.  The lowest quiz grade will be dropped to accommodate unforeseen circumstances.

If there is a legitimate reason why a student will not be able to complete an assignment on time, then they should contact the instructor beforehand.  Under extreme circumstances, as decided on a case-by-case basis by the instructor, students may be allowed to make up assignments without first informing the instructor.

Students who take this course are often surprised by just how much time this course requires of them. You are advised to budget your time wisely and to start working on an assignment the day it is posted.

# Re-grades

Any grading errors you believe you have found on an assignment submission must be sent through Piazza instructor post with the subject line "**CS 5200: regrade request for Assignment X**". Time is a precious commodity, so please do not spend instructor office hours or TA office hours arguing about points. Regrade requests must be made in writing no later than one week after graded work is returned to the class. Regrade requests that are made later than one week from the date the graded work is returned to the class will not be honored.

# Course Grade Cutoffs:

93.00–100.00    A

90.00–92.99      A-

86.00–89.99      B+

82.00–85.99      B

77.00–81.99      B-

73.00–76.99      C+

69.00–72.99      C

65.00–68.99.     C-

0.00–64.99        F

Cutoffs are flexible and subject to change. Your final score will not be rounded up.

# Course Materials

There is an associated Canvas page for this course. I will use it to post weekly reading assignments, lecture materials, assignments, feedback, and grades.

## Textbook

All textbooks and recommended readings will be provided digitally, with particular chapters and readings often integrated directly into the modules themselves. The main texts used in this course should be directly accessible via the O’Reilly website using your Northeastern email:

* [*Database Management Systems*](http://pages.cs.wisc.edu/~dbbook/) 3rd edition, by Raghu Ramakrishnan and Johannes Gehrke. ISBN: 978-0072465631, McGraw-Hill, 2002
* Introduction to Database Systems by ITL Education Solutions Limited
* Database Systems: Concepts, Design and Applications by S. K. Singh
* Learning MySQL, 2nd Ed., by Vinicius M. Grippa, Sergey Kuzmichev
* Learning SQL, 3rd Ed., by Alan Beaulieu
* MongoDB: The Definitive Guide, 2nd Edition, by Kristina Chodorow
* Docker: Up & Running, 3rd Ed., by Karl Matthias, Sean P. Kane

### ***Tools and Technologies***

* MySQL
* MongoDB
* Docker (for running databases in containers)
* phpMyAdmin (for managing MySQL databases)
* drawio (for creating ERDs)

# General Policies

## Attendance

You are expected to attend every class and participate actively. We start each class on time. If you need to miss a class due to illness, a family emergency, or religious observance, please inform me via email. An online attendance option is available but is strictly limited to students who provide a valid reason for not being able to attend in person; this option will only be available for the duration of the specified reason. Depending on the circumstances, documentation may be required to support this request. Regardless of the reason for your absence, you are responsible for catching up on any missed material and obtaining notes from a classmate. Students with repeated absences will be evaluated by the faculty to determine their ability to meet the course objectives and continue in the course.

## Academic Integrity

Each student must pursue their academic goals honestly and be accountable for all submitted work. Representing another person's work as your own is not acceptable.

This class has strict standards for using borrowed code: if you use more than three lines of code from a source, you must cite it. A URL or notation (e.g., "MATLAB help files") is sufficient. For entire functions, note the source at the beginning of the code segment and include any original credit information. Also, provide a brief description of what you used and any changes or contributions you made.

Examples of academic dishonesty include:

* Collaborating with others on an individual assignment.
* Submitting work done by another student, with or without their knowledge.
* Submitting work primarily found online or provided by someone outside the class.
* Submitting work from someone who took this course in the past, whether at Northeastern or another institution.
* Providing or receiving significant help on an assignment.

If you're unsure about what constitutes a violation, ask the instructor. Unless stated otherwise (e.g., for a group project), assignments are to be completed individually. While discussing concepts with others is allowed, direct collaboration is not.

If you steal someone else's work, you will fail the class. If someone uses your work, you will also fail. Violations of academic integrity on a homework assignment will result in a zero for that assignment. Repeated violations or dishonesty on the final project will result in a failing grade for the course.

The university's academic integrity policy discusses actions regarded as violations and consequences for students <http://www.northeastern.edu/osccr/academic-integrity.>

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## Student Feedback

Your opinions are very important to me. All students are strongly encouraged to use the TRACE (Teacher Rating and Course Evaluation) system <https://www.northeastern.edu/trace/> near the end of the course to evaluate this course.  A reminder about TRACE should arrive via email about two weeks before the end of the course.  In addition, I will be asking for your feedback at least once about halfway through the semester. However, if you have concerns about the course, don’t wait until you are asked. You can contact me any time!

# Classroom Environment

To maintain an optimal learning environment, everyone shares the responsibility of creating a respectful and non-disruptive space for discussion. Students are expected to behave in a way that does not disrupt teaching or learning. Comments should be constructive and free from harassment. Disagreements are encouraged but must be respectful and based on facts, not personal biases. The instructor may intervene if conversations stray from these guidelines. Repeated unprofessional or disrespectful behavior may lead to a lower grade or other consequences. Respectful engagement with ideas is a key part of this course.

# Title IX Policy, Sexual harassment, and safety

Northeastern University and its faculty are committed to creating a safe and open learning environment for all students. If you or someone you know has experienced discrimination, harassment, or sexual violence (including sexual harassment, sexual assault, dating/domestic violence, or stalking), please know that help and support are available. Northeastern strongly encourages all members of the community to take action, seek support, and report incidents of discrimination, harassment, and sexual violence to the Office for University Equity and Compliance (OUEC) through the Online Discrimination Complaint Form found at <https://www.northeastern.edu/ouec/file-a-complaint/>.

Please be aware that faculty members are Mandatory University Reporters who are required to disclose information about alleged discrimination, harassment, and sexual violence (including sexual harassment, sexual assault, dating/domestic violence, or stalking) to the OUEC. If the OUEC receives a report, a member of their office will reach out to offer information about available rights, support resources and pathways towards a resolution as a member of the campus community. Community members are not required to respond to this outreach.

If you, or another community member you know wishes to speak to a confidential resource who does not have this reporting responsibility, please contact any of the following confidential resources. These confidential resources are not required to report allegations of discrimination to the University without your signed release.

* [Find@Northeastern](https://www.northeastern.edu/uhcs/find-at-northeastern/): Offers 24/7 mental health support via phone at 877.233.9477 (in the U.S.) or +1.781.457.7777 (outside the U.S.).
* [Sexual Violence Resource Center](https://open.studentlife.northeastern.edu/): The SVRC provides confidential, trauma-informed support services to Northeastern students who have experienced any form of sexual violence (i.e., sexual assault, sexual harassment, sexual exploitation, domestic/dating violence, and/or stalking). Request services online at <https://bit.ly/svrequestform>.
* Confidential Resource Advisor: The CRA provides confidential, restorative informed support services to Northeastern students who have been accused of sexual or identity based harm. Request services online at <https://bit.ly/svrequestform>.
* Please visit <https://www.northeastern.edu/ouec> for a complete list of reporting options and support resources both on- and off-campus and contact the OUEC ([ouec@northeastern.edu](mailto:ouec@northeastern.edu)) at any time.

# Students With Disabilities

The goal is that every student should be able to participate in this course. If you require any special accommodation, let me know immediately so that we can work out appropriate arrangements.

Students who have disabilities who wish to receive academic services and/or accommodations should visit the Disability Access Services (<https://drc.sites.northeastern.edu/>) or call (844) 688-6287.

If you have already done so, please provide your letter from the DAS to the instructor early in the semester to arrange those accommodations.

# AI Tool Usage in Web Development

I understand that there are numerous resources available to assist you. In fact, I encourage you to use resources on the web and AI assistants such as Copilot, ChatGPT, and others. While you may use AI assistants as needed, I require that you let me know which ones you used, for what purpose, and that you include clear acknowledgments in your code. Furthermore, you are responsible for knowing how your code works and must be able to explain any code you copied or borrowed. While you may use assistants for inspiration and to get started, you must learn from what you copied and ensure that you fully understand it

If you have questions about plagiarism policy or AI tool usage, please reach out!

# Inclusivity

## Name and Pronoun Usage

As this course includes class discussion, it is vitally important for us to create an educational environment of inclusion and mutual respect. This includes the ability for all students to have their chosen gender pronoun(s) and chosen name affirmed. If the class roster does not align with your name and/or pronouns, please inform the instructor of the necessary changes.

Inclusion Statement

I believe that diversity and inclusiveness are essential for excellence in academic discourse and innovation. In this class, I respect and value perspectives from all races, ethnicities, gender expressions and identities, religions, sexual orientations, disabilities, socioeconomic backgrounds, and nationalities. I welcome suggestions for diversifying class materials and assignments. If any class meetings conflict with your religious events, please contact me to make alternative arrangements.

All participants are expected to treat each other, including the instructor, with courtesy and respect. Disrespectful behavior and harassing statements will not be tolerated and may lead to disciplinary action.