

COMP 3005A: Database Management Systems - Fall 2026

We, the people of the Faculty of Science at Carleton University, acknowledge that our campus is located on the traditional, unceded territories of the Algonquin Anishinabeg people. Miigwetch for your hospitality and stewardship of this territory and the teachings that come from it. We are grateful for this land, the air that we breathe, and the water that sustains us all as well as for the animals, plants and other living beings: these enable us to research, teach, mentor, support, study, and learn. We recognize our responsibility to our natural environment and to reconciliation with Indigenous peoples.

Course Information

Instructor	Abdelghny Orogat
Email	abdelghny.orogat@carleton.ca
Office location	Posted in Brightspace
Office hours	Posted in Brightspace
Best ways to be in touch	In class, by email, or during office hours
Teaching Assistants	A list of teaching assistants and their contact information will be posted in Brightspace once the course starts.
TA office hours	TA office hours start in the second week. Dates and times are posted in Brightspace.
Section and CRN	Section A, CRN 31134 (in-person section, campus presence)
Lecture times	Monday and Wednesday, 17:35 - 18:55
Tutorial times	This course has no scheduled tutorials.
Class location	Please check Carleton Central for the room location. Rooms may change during the first three weeks of the term.
Course website	Brightspace
Term dates	Lectures run from 09-Sep-2026 to 11-Dec-2026.
Course delivery	In person on campus for every week of the term. There is no online or hybrid component.

For information about Carleton's academic year, including registration and withdrawal dates, class suspensions, fall break, and statutory holidays, see Dates, Deadlines and Regulations - Registrar's Office and the Academic Year.

Course Calendar Description

COMP 3005 [0.5 credit] Database Management Systems. Introduction to the concepts of database management systems and database design. Topics may include: entity-relationship modelling, normalization, reduction to relational schemas, SQL, file and data organization, indexing, hash tables, join algorithms, query processing, query optimization, and concurrency control. Lectures three hours a week.

- **Prerequisites:** Prerequisites additional credit for BUSI 3400.

- **Prerequisite(s):** COMP 1805 with a minimum grade of C-, and either COMP 2402 or (SYSC 2004 and SYSC 2100).

If you do not meet the prerequisites for this course, you must withdraw from it or you will be de-registered. Please verify your record against the current Undergraduate Calendar.

Course Overview

This course provides a thorough introduction to database systems, covering core topics such as SQL, relational design, and application development. It also introduces advanced concepts like query optimization and NoSQL models, preparing students to work with both traditional and modern data management systems.

Topics discussed in this course

- Relational Model.
- Comprehensive SQL Coverage (DDL, DML, DQL).
- Relational Database Design.
- Application Development.
- Physical Storage Systems and Data Storage Structures.
- Query Processing and Optimization.
- NoSQL Types (Document-Oriented and Graph-Oriented, with examples such as MongoDB, RDF, SPARQL, Neo4J).

Learning Outcomes

By the end of this course, students will be able to apply core concepts of database systems, including relational algebra, SQL, normalization, and ER modeling. They will develop practical skills in designing and querying both relational and NoSQL databases (e.g., MongoDB, RDF/SPARQL, Neo4J, Milvus), and understand key techniques in query processing and optimization. The course also emphasizes analytical thinking, inclusive teamwork, and responsible data management in real-world and research contexts.

This course is taught in a way that is intended to be accessible to students from a range of backgrounds and levels of prior programming experience. Examples, datasets, and group work are chosen to be inclusive, and students are encouraged to raise any barrier to participation with the instructor early in the term so that it can be addressed.

Learning Materials and Course-Related Costs

Students are not required to purchase textbooks or other learning materials for this course. All required material is posted on Brightspace at no cost. The textbooks below are optional and are meant to be used as an extra source of reference to complement the topics discussed in class.

Learning Material	Options for Purchasing	Approximate Cost
Avi Silberschatz, Henry F. Korth, and S. Sudarshan. Database System Concepts. Seventh Edition. McGraw-Hill. ISBN 9781260084504. (Optional)	Bookstore, Amazon, second-hand copies, library reserve	\$47

Ramez Elmasri and Shamkant B. Navathe. Fundamentals of Database Systems. Seventh Edition. ISBN 9780133970777. (Optional)	Bookstore, Amazon, second-hand copies, library reserve	\$246
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Costs shown are estimates for a single copy, taken from current bookstore and publisher listings, and may change. There are no access codes or online publisher platforms attached to either textbook, so second-hand copies are fully acceptable. No lab manuals, course packs, software licences, or field work costs are associated with this course. All software used in the course (PostgreSQL, MongoDB, Neo4J, Milvus, and related tools) is free and open source, and can also be accessed through the SCS computer labs.

Students who need support with the cost of technology or course materials can look into government financial aid, refurbished hardware options, and the study and computing spaces available on campus.

Topics Covered, Release Dates, and Deadlines

The schedule below is the planned coverage for the term. If any due date has to change, students will receive at least two weeks of notice through Brightspace.

No class is held and no coursework is due during the fall break period, from Sunday 25-Oct-2026 to Sunday 01-Nov-2026. There are no tests or midterms in this course, so no test is scheduled adjacent to the break.

Week	#	Date	Topic	Assignments and Deliverables
Week 1	1	Wed 09-Sep	Database Introduction and Course Outline	
Week 2	2	Mon 14-Sep	Relational Algebra	
	3	Wed 16-Sep	Tuple Relational Calculus	
Week 3	4	Mon 21-Sep	SQL - DDL and DML	Assignment 1 Released: 21-Sep-2026 Due: 04-Oct-2026 Topics: RA, TRC, and simple SQL
	5	Wed 23-Sep	SQL (DQL: SELECT-FROM-WHERE-...)	
Week 4	6	Mon 28-Sep	SQL (DQL: AGR()-GROUP BY-HAVING-SETS-...)	
	7	Wed 30-Sep	SQL (DQL: Complex Queries and SubQueries)	
Week 5	8	Mon 05-Oct	SQL (DQL: VIEWS-INDEX-FUNCTIONS-...)	Assignment 2 Released: 05-Oct-2026 Due: 18-Oct-2026 Topics: SQL and ER
	9	Wed 07-Oct	Entity-Relationship (ER) Model	
Week 6	-	Mon 12-Oct	Statutory holiday. University closed, no class.	
	10	Wed 14-Oct	Entity-Relationship (ER) Mapping	
Week 7	11	Mon 19-Oct	Functional Dependencies and Normalization Theory	FINAL PROJECT RELEASED 19-Oct-2026
	12	Wed 21-Oct	Application Development	
Week 8	-	26-Oct to 30-Oct	Fall break, no classes.	
Week 9	13	Mon 02-Nov	Project Discussion	Assignment 3 Released: 02-Nov-2026

Week	#	Date	Topic	Assignments and Deliverables
				Due: 15-Nov-2026 Topics: Application Development, Functional Dependencies and Normalization
	14	Wed 04-Nov	Physical Storage	
Week 10	15	Mon 09-Nov	Data Storage Structures and Indexing	
	16	Wed 11-Nov	Query Processing	
Week 11	17	Mon 16-Nov	Query Optimization	Assignment 4 Released: 16-Nov-2026 Due: 29-Nov-2026 Topics: Physical Storage Systems, Query Processing and Optimization
	18	Wed 18-Nov	NoSQL - Introduction	
Week 12	19	Mon 23-Nov	NoSQL - Document-Oriented Database (MongoDB)	
	20	Wed 25-Nov	NoSQL - Graph-Oriented Database (Directed Edge-Labelled Graph [RDF])	
Week 13	21	Mon 30-Nov	NoSQL - Graph-Oriented Database (Directed Edge-Labelled Graph [SPARQL])	Assignment 5 Released: 30-Nov-2026 Due: 06-Dec-2026 Topics: NoSQL
	22	Wed 02-Dec	NoSQL - Graph-Oriented Database (Property Graph [Neo4J])	
Week 14	23	Mon 07-Dec	NoSQL - Graph-Oriented Database (Property Graph [Neo4J - CYPHER])	FINAL PROJECT DUE 08-Dec-2026
	24	Wed 09-Dec	NoSQL - Vector DB (Milvus)	
	25	Fri 11-Dec	Research Topic: Text-to-SQL (Classes follow a Monday schedule on this day.)	

Assessment Scheme

Grade breakdown

COMPONENT	GRADE VALUE	DATE
Assignments (5)	30%	Due dates listed in the schedule above. The best 4 out of 5 assignments count.
Final Project	30%	DUE 08-DEC-2026
Final Exam (centrally scheduled)	40%	Scheduled by Scheduling and Examination Services between 12-Dec-2026 and 23-Dec-2026. The exam schedule is published online on 09-Oct-2026.

No component's weight will transfer to another component.

Requirements to pass the course

- **Students must obtain at least 45% on the final exam to pass the course.**
- The final exam is closed book and covers everything discussed in class over the term.
- Assignments and the final project are individual work unless the instructions for a specific deliverable state otherwise.

Component details

- **Assignments.** Five assignments are released on the dates listed in the schedule. Each has a two-week window, except Assignment 5, which has a one-week window. Only the best 4 out of 5 count toward the final grade, so one missed assignment is already accounted for and no further exceptions are made for any reason. Assignments are submitted through Brightspace.
- **Final Project.** The project is released on 19-Oct-2026 and is due on 08-Dec-2026. It is discussed in class during the Project Discussion lecture, and the full specification is posted on Brightspace.
- **Final Exam.** The final exam is centrally scheduled and written in person during the December examination period. Do not make travel plans for that period until the exam schedule is published.
- **Marks and remarking.** Marks are posted on Brightspace. Any issue with the marking of an assignment should first be raised with the TA who marked it, and only brought to the instructor if the TA does not resolve it. Remarking requests must be made no later than two weeks after the marks are posted. After that, no remarking is done.

Conduct during quizzes, tests, and exams

All quizzes, tests, and exams are expected to be completed individually and without electronic aid; any communication or access of electronic devices (e.g., cellphones) during a quiz, test, or exam will be considered cheating. Use of Smart Glasses (or other similar assistive technologies) before or during a quiz, test, or exam is strictly prohibited and is considered an academic integrity violation. Even if you have prescription glasses with assistive technologies, you will not be allowed to use them during quizzes, tests, or exams, so please make sure that you have acceptable prescription glasses. The proctor has the right to ask to inspect your glasses before or during a quiz, test, or exam. In addition, unless authorized with PMC accommodations, you are NOT allowed to use headphones nor earbuds during a quiz, test, or exam. Also, during a quiz, test, or exam, if you choose to wear a baseball cap, sunglasses, or anything else that would prevent a proctor from monitoring where your eyes are focused, you will likely be asked by a proctor to move to a different seat. Lastly, you must submit your quiz, test, or exam before leaving the classroom, or it will not be graded.

Late and Missed Work

Late work

- Assignments may be submitted up to one day (24 hours) after the deadline with a 10% penalty. After 24 hours, no submission is accepted and the assignment receives a mark of 0. The best-4-of-5 rule applies to that assignment as it does to any other.
- The final project is not accepted late.
- Assignments and the project must be submitted to Brightspace to be marked. Never email an assignment or the project to a TA or to the instructor. Technical problems do not exempt you from this requirement, so upload your progress regularly and make your final submission at least one hour before the deadline.

Missed work: short-term (5 days or less)

If you are unable to meet a deadline for a short-term reason, submit the Academic Consideration for Coursework form and notify the instructor by email. For assignments, the best-4-of-5 rule normally resolves a single short-term absence, so no separate accommodation is granted for one missed assignment. For the final project, an approved short-term consideration results in an extension, which is set on a case-by-case basis. You may submit the form for this course at most twice.

Missed work: long-term (more than 5 days)

For circumstances lasting longer than five days, follow the process for long-term academic consideration for coursework and contact the instructor as early as possible so that arrangements can be made.

Missed final exam

If you cannot attend the final exam, you must apply to defer it. There is no other solution. Note the Registrar's Office rules regarding a missed deferral.

Course Policies

1. Collaborating on assignments is strictly disallowed. If collaboration is found, all students involved will be given a mark of 0 and the case will be reported to the Office of the Dean of Science.
2. Posting assignment or project solutions on discussion boards before the due date and time is prohibited, and the student involved will be given a mark of 0 for that deliverable.
3. Sharing assignment, project, or exam specifications, or posting them to sites such as Chegg, CourseHero, or OneClass, is always considered academic misconduct. You are never permitted to post, share, or upload course materials without the explicit permission of the instructor.
4. If you need help, please see a TA or the instructor during office hours.
5. Course announcements are made through Brightspace. You are responsible for the content of those announcements.

Use of Generative AI

Rationale

The graded work in this course exists to build and then measure your own ability to reason about data models, write queries, and design a database. A generative AI system can produce a plausible schema or SQL query without you understanding either, and code generators are especially unreliable on query optimization and NoSQL data modelling, where a fluent-looking answer is often wrong. Over-reliance on auto-generated solutions leaves you unable to debug your own project and unprepared for the final exam, which is written in person without any electronic aid. The policy below is set on that basis.

Where AI use is permitted

- Studying and understanding course topics. You may use AI tools to explain a concept from the lectures, generate extra practice questions for yourself, walk through a worked example, or ask why a query you already wrote behaves as it does.
- Basic grammar and punctuation checking of written text you have already written yourself (e.g., Grammarly).

Where AI use is not permitted

The use of AI systems to produce any part of a graded assignment, the final project, or the final exam is strictly prohibited and will be treated as academic misconduct. This includes, but is not limited to, chatbots and code generators (e.g., ChatGPT, Google Gemini, Microsoft Copilot, Claude), IDE-integrated completion tools, research assistants (e.g., Elicit), and image generators (e.g., Stable Diffusion, DALL-E). It applies whether the output is pasted in directly or edited afterwards, and it applies to code, SQL, ER diagrams, schemas, and written explanations alike.

Documenting AI use

- Nothing generated by an AI system may appear in a graded submission, so there is normally nothing to document.
- If you used an AI tool while studying and it shaped how you approached a graded deliverable, state that in a short note at the top of your submission: which tool, and what you used it for. Declaring this honestly is never itself a penalty.
- Any material you use but did not originate must be cited in IEEE style. Manufactured or misleading references are treated as evidence of plagiarism and considered academic misconduct.

Everything you submit for evaluation must be the result of your own work and only your own work.

As our understanding of the uses of AI and its relationship to student work and academic integrity continues to evolve, students are required to discuss their use of AI in any circumstance not described here with the course instructor to ensure it supports the learning goals for the course.

Academic Integrity

Students are expected to uphold the values of academic integrity, which include fairness, honesty, trust, and responsibility. Examples of actions that compromise these values include but are not limited to plagiarism, accessing unauthorized sites for assignments or tests, unauthorized collaboration on assignments or exams, and using artificial intelligence tools when the assessment instructions say it is not permitted.

Misconduct in scholarly activity will not be tolerated and will result in consequences as outlined in Carleton University's Academic Integrity Policy. Reported offences are reviewed by the Office of the Dean of Science. Information about the process and the applicable sanctions can be found on the Faculty of Science Academic Integrity website.

Students are expected to familiarize themselves with and abide by the policy. Claiming ignorance of or confusion about the academic integrity standards as described in the policy does not excuse a student from responsibility for violations of those standards.

If you are unsure of the expectations regarding academic integrity, including how to use and cite references and whether collaboration with classmates is permitted for a given deliverable, then you must ask the instructor before you submit.

Student Concerns

If you have any concerns regarding this course, your first point of contact is me. Please email me or visit during my office hours, and I will do my best to address your concerns. If I cannot resolve the issue, the next point of contact is the School of Computer Science at studentconcerns@scs.carleton.ca. If the concern remains unresolved, the final point of contact is the Office of the Dean of Science at ODScience@carleton.ca. Please follow this order of contact. You may also bring your concerns to Ombuds Services.

Student Rights and Responsibilities

Students are expected to act responsibly and engage respectfully with other students and members of Carleton and the broader community. See the Rights and Responsibilities Policy for details regarding the expectations of non-academic behaviour of students. Those who participate with another student in the commission of an infraction of this policy will also be held liable for their actions.

Academic Accommodations

Carleton is committed to providing academic accessibility for all individuals. You may need special arrangements to meet your academic obligations during the term. The accommodation request processes, including information about the Academic Consideration Policy for Students in Medical and Other Extenuating Circumstances, are outlined on the Academic Accommodations website.

Students with disabilities

If you have a documented disability requiring academic accommodations in this course, please contact the Paul Menton Centre for Students with Disabilities (PMC) at 613-520-6608 or pmc@carleton.ca for a formal evaluation, or contact your PMC coordinator to send your instructor your Letter of Accommodation at the beginning of the term. You must also contact the PMC no later than two weeks before the first in-class scheduled test or exam requiring accommodation. After requesting accommodation from the PMC, meet with the instructor as soon as possible to ensure arrangements are made. For more details, visit the Paul Menton Centre website.

Survivors of sexual violence

As a community, Carleton University is committed to maintaining a positive learning, working, and living environment where sexual violence will not be tolerated, and where survivors are supported through academic accommodations as per Carleton's Sexual Violence Policy. For more information about the services available and to obtain information about sexual violence and support, visit carleton.ca/sexual-violence-support.

Accommodation for student activities

Carleton University recognizes the substantial benefits that result from a student participating in activities beyond the classroom experience. Reasonable accommodation must be provided to students who compete or perform at the national or international level. Please contact the instructor with any request for academic accommodation during the first two weeks of class, or as soon as possible after the need is known. For more details, see the policy.

Mental Health and Wellness

Your wellbeing matters, and support is available. The Carleton Wellness website lists health, counselling, and peer support services available to students. If something is affecting your ability to participate in this course, please reach out early.

School of Computer Science Resources

Undergraduate academic advisors

The Undergraduate Advisors for the School of Computer Science are available in Room 5302HP, or by email at scs.ug.advisor@cunet.carleton.ca. The undergraduate advisors can assist with information about prerequisites and preclusions, course substitutions and equivalencies, understanding your academic audit, and the remaining requirements for graduation. They will also refer students to appropriate resources such as the Science Student Success Centre, Learning Support Services, and Writing Tutorial Services.

SCS computer laboratory

Students taking a COMP course can access the SCS computer labs. The lab schedule and location can be found at carleton.ca/scs/tech-support/computer-laboratories. All SCS computer lab and technical support information can be found at carleton.ca/scs/tech-support. Technical support staff may be contacted in person or virtually; see contact IT support for details.

SCS laptop requirement

Every student enrolled in a 1000-level course offered by the School of Computer Science is required to have a laptop. This includes COMP 1001, COMP 1005, and COMP 1006. For more information, visit carleton.ca/scs/scs-laptop-requirement and review the requirements at laptop specifications.