

Course Outline (W2026)

COE848: Fundamentals of Data Engineering

Instructor(s)	Yasaman Ahmadiadli [Coordinator] Office: https://torontomu.zoom.us/j/8136636145 OR ENG332 with appointment Phone: TBA Email: yahmadiadli@torontomu.ca Office Hours: Tuesdays 1:30 - 3 PM via Zoom
Calendar Description	Data engineering is core to the effective development of scalable software applications. Rich data management schemes are needed to handle the sizeable Big Data that is available for processing. This course will cover related topics such as entity-relation diagrams, relational databases, data definition and manipulation languages, structured data representations formats, development of novel vocabularies and semi-structured data and also novel concepts in NoSQL databases.
Prerequisites	COE 528
Antirequisites	None
Corerequisites	None
Compulsory Text(s):	1. Database Systems: The Complete Book, by Hector Garcia-Molina, Jeffrey D. Ullman, and Jennifer D. Widom, Prentice Hall, 2nd Edition, 2008, ISBN: 0131873253
Reference Text(s):	1. Elmasri, Ramez, and Sham Navathe. Fundamentals of Database Systems. Seventh edition., Pearson, 2016. 2. Coronel, Carlos, and Steven (Morris Morris. Database Systems: Design, Implementation, and Management. 13 th edition, Cengage Learning, 2019.
Learning Objectives (Indicators)	At the end of this course, the successful student will be able to: <ul style="list-style-type: none"> 1. Use engineering knowledge to solve real world open-ended engineering problems. Use the specialized engineering knowledge to design specific components, systems, or processes. (1c) 2. Use engineering knowledge to solve real world open-ended engineering problems. Use the specialized engineering knowledge to design specific components, systems, or processes. (1d) 3. Anticipate the needs of the project, customize design processes, analyzes progress, and revises plans as necessary. Generate solutions for complex engineering design problems (4a), (4b) 4. Design and develop software tools that adhere to specific project specifications relating to data modeling and data model designs. (5a) 5. Design and implement a data-focused software project. Demonstrate the project to the Teaching Assistant through oral communication and get feedback and evaluate and improve the project modeling and implementation based on the technical feedback (6b)

6. Anticipate legal requirements related to the software project and managing and storing data. Customize modeling and implementation based on these requirements. **(9b)**
7. Systematically account for professional codes of ethics in data modeling and software design and implementation. **(10a)**

NOTE: Numbers in parentheses refer to the graduate attributes required by the Canadian Engineering Accreditation Board (CEAB).

Course Organization	3.0 hours of lecture per week for 13 weeks 1.0 hours of lab per week for 12 weeks 0.0 hours of tutorial per week for 12 weeks
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Teaching Assistants	1. Esraa Alaa Aldeen (esraa.alaaaldeen@torontomu.ca) 2. Nujaimah Ahmed (nujaimah.ahmed@torontomu.ca)
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Course Evaluation	<table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <th colspan="2" style="text-align: left;">Theory</th> </tr> <tr> <td>Midterm Exam</td> <td style="text-align: right;">30 %</td> </tr> <tr> <td>Final Exam</td> <td style="text-align: right;">35 %</td> </tr> <tr> <td>Quiz (Extra Marks)</td> <td style="text-align: right;">5 %</td> </tr> <tr> <th colspan="2" style="text-align: left;">Laboratory</th> </tr> <tr> <td>Lab Reports and Final Project</td> <td style="text-align: right;">35 %</td> </tr> <tr> <td>TOTAL:</td> <td style="text-align: right;">100 %</td> </tr> </table> <p>Note: In order for a student to pass a course, a minimum overall course mark of 50% must be obtained. In addition, for courses that have both "Theory and Laboratory" components, the student must pass the Laboratory and Theory portions separately by achieving a minimum of 50% in the combined Laboratory components and 50% in the combined Theory components. Please refer to the "Course Evaluation" section above for details on the Theory and Laboratory components (if applicable).</p>	Theory		Midterm Exam	30 %	Final Exam	35 %	Quiz (Extra Marks)	5 %	Laboratory		Lab Reports and Final Project	35 %	TOTAL:	100 %
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TOTAL:	100 %														

Examinations	Midterm exam on Feb 24 (tentatively), in person, closed book (covers Weeks 1-6). Final exam, during exam period, in-person, closed-book (covers Weeks 1-13).
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Other Evaluation Information	<p>The written reports will be assessed not only on their academic merit, but also on the communication skills of the author as exhibited through the reports. In order to achieve a passing grade in this course, the student must achieve an average of at least 50% in both theoretical and laboratory components.</p> <p>Lab assignments should be submitted on D2L before 11:59 pm the day before the scheduled next lab. The penalty for up to 8 hours delay in submission is 20% of the lab mark. More than 8-hours late lab assignments will not be accepted and will receive a mark of 0.</p> <p>For any missed work, Academic Consideration Request (ACR) should be submitted and verified by the department.</p> <p>Students may use Generative AI (e.g. ChatGPT, Grammarly, Perplexity, DeepL Translator) in this course. However, If you misrepresent source material (as AI often does), that will be considered a breach of Policy 60. If your citations are not genuine (AI often makes up references), that will be considered a breach of Policy 60. Students are required to write a clear declarative statement describing how AI tools were used and the extent of its contribution to the final submission.</p>
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Teaching Methods	1. In-person lectures with slides and examples during the class. 2. Notes/slides from the lectures will be posted on D2L.
Other Information	To inquire about the anti-requisites for this course, kindly reach out to the department.

Course Content

Week	Hours	Chapters / Section	Topic, description
1	3		Introduction to relational Database Systems
2-3	6		Entity-Relationship (E/R) Data Model
4	3		Relational Database Model Subclass Structures to Relations
5	3		Algebra of Relational Operations
6	3		Structured Query Language (SQL)
7	3		Midterm
8	3		Database Connectivity- Database Modifications Views OOP Access to RDBMS
9	3		Database Normalization
10	3		Data Access and Integrity Models-Database Indices
11	3		Semi-structured Data Representation (XML, XML Schema, DTD)

12	3		NoSQL Databases
13	3		Course Review.

Laboratory(L)/Tutorials(T)/Activity(A) Schedule

Week	L/T/A	Description
2	-	Project Scope Definition and Project Specification Document Development
3-4	-	E/R Diagram Design
5-6	-	Database Design
7-8	-	Manipulating Data
9-10	-	Database Programming
11-13	-	Semi-Structured Data

University Policies & Important Information

Students are reminded that they are required to adhere to all relevant university policies found in their online course shell in D2L and/or on [the Senate website](#)

Refer to the [Departmental FAQ page](#) for further information on common questions.

Important Resources Available at Toronto Metropolitan University

- [The University Libraries](#) provide research [workshops](#) and individual consultation appointments. There is a drop-in Research Help desk on the second floor of the library, and students can use the [Library's virtual research help service](#) to speak with a librarian, or [book an appointment](#) to meet in person or online.

- [Student Life and Learning Support](#) offers group-based and individual help with writing, math, study skills, and transition support, as well as [resources and checklists to support students as online learners](#).
- You can submit an [Academic Consideration Request](#) when an extenuating circumstance has occurred that has significantly impacted your ability to fulfill an academic requirement. You may always visit the [Senate website](#) and select the blue radio button on the top right hand side entitled: Academic Consideration Request (ACR) to submit this request.

For Extenuating Circumstances, [Policy 167: Academic Consideration](#) allows for a once per semester ACR request without supporting documentation if the absence is less than 3 days in duration and is not for a final exam/final assessment. Absences more than 3 days in duration and those that involve a final exam/final assessment, always require documentation. Students must notify their faculty/contract lecturer once a request for academic consideration is submitted. See Senate [Policy 167: Academic Consideration](#).

Longer absences are not addressed through Policy 167 and should be discussed with your Chair/Director/Program to be advised on next steps.

- [FAQs Academic Considerations and Appeals](#)
- Information on Copyright for [Faculty/Contract Lecturers](#) and [students](#).

Lab Safety (if applicable)

Students are to strictly adhere and follow:

- a. The Lab Safety information/guidelines posted in the respective labs,
- b. provided in their respective lab handouts, and
- c. instructions provided by the Teaching Assistants/Course instructors/Technical Staff.

During the lab sessions, to avoid tripping hazards, the area around the lab stations should not be surrounded by bags, backpacks etc, students should place their bags, backpacks etc against the walls of the labs and/or away from their lab stations in such a way that it avoids tripping hazards.

Accessibility

- Similar to an [accessibility statement](#), use this section to describe your commitment to making this course accessible to students with disabilities. Improving the accessibility of your course helps minimize the need for accommodation.
- Outline any technologies used in this course and any known accessibility features or barriers (if applicable).
- Describe how a student should contact you if they discover an accessibility barrier with any course materials or technologies.

Academic Accommodation Support

Academic Accommodation Support (AAS) is the university's disability services office. AAS works directly with incoming and returning students looking for help with their academic accommodations. AAS works with any student who requires academic accommodation regardless of program or course load.

- Learn more about [Academic Accommodation Support](#).
- Learn [how to register with AAS](#).
- Learn about [Policy 159: Academic Accommodation of Students with Disabilities](#)

Academic Accommodations (for students with disabilities) and Academic Consideration (for students faced with extenuating circumstances that can include short-term health issues) are governed by two different university policies. Learn more about [Academic Accommodations versus Academic Consideration and how to access each](#).

Wellbeing Support

At Toronto Metropolitan University, we recognize that things can come up throughout the term that may interfere with a student's ability to succeed in their coursework. These circumstances are outside of one's control and can have a serious impact on physical and mental well-being. Seeking help can be a challenge, especially in those times of crisis.

If you are experiencing a mental health crisis, please call 911 and go to the nearest hospital emergency room. You can also access these outside resources at anytime:

- **Distress Line:** 24/7 line for if you are in crisis, feeling suicidal or in need of emotional support (phone: 416-408-4357)
- **Good2Talk:** 24/7-hour line for postsecondary students (phone: 1-866-925-5454)
- **Keep.meSAFE:** 24/7 access to confidential support through counsellors via [My SSP app](#) or 1-844-451-9700

If non-crisis support is needed, you can access these campus resources:

- **Centre for Student Development and Counselling:** 416-979-5195 or email csdc@torontomu.ca
- **Consent Comes First - Office of Sexual Violence Support and Education:** 416-919-5000 ext 3596 or email osvse@torontomu.ca
- **Medical Centre:** call (416) 979-5070 to book an appointment

We encourage all Toronto Metropolitan University community members to access available resources to ensure support is reachable. You can find more resources available through the [Toronto Metropolitan University Mental Health and Wellbeing](#) website.