Faculty of Science

Department of Computer Science

Course Outline (Fall 2025)

CPS510 - Database Systems I

Instructors/TAs

Dr. A. Abhari [aabhari@torontomu.ca]
Office: Eng 244, Tel: 416-979-5000, ext. 557058, Research Lab: DSMP Eng234
Sections: 01-05
Lectures:Tuesdays, 11:00am – 1:00pm Fridays 12:00 – 1:00pm both at **DCC208**
Office Hours: Tuesdays (2-4 pm) & Fri. (by appointment after 1:00 pm) Eng244
https://www.torontomu.ca/cs/our-people/abdolreza-abhari/ Lab: dsmp.ryerson.ca

Other instructors: Dr.Glaucia Melo Sections 6-10 & Dr. Soheila Bashardoust Tajali Sections: 11-14

COURSE CODE	ININSTRUCTOR	*SECTION #*	LAB	ROOM	TA/GA
CPS510	Abdolreza Abhari	*1*	Mo 12:00 - 13:00	ENG205	Wael Shabana
	Tu 11:00 - 13:00 - DCC208 (225) / Fr 12:00 - 13:00 - DCC208 (225)	*2*	Tu 16:00 - 17:00	ENG201	Jorge Lopez
		3	Th 10:00 - 11:00	ENG201	Wael Shabana
		4	Mo 11:00 - 12:00	ENG201	Wael Shabana
		5	We 11:00 - 12:00	ENG203	Jorge Lopez
	Glaucia Melo Dos Santos	*6*	Th 15:00 - 16:00	ENG203	Anna Briskina
	Fr 08:00 - 10:00 - DCC204 (225)/ Tu 12:00 - 13:00 - DCC204 (225)	*7*	Mo 12:00 - 13:00	ENG202	Jorge Lopez
		8	Tu 14:00 - 15:00	ENG203	Anjani Sirivella
		9	Tu 13:00 - 14:00	ENG203	Anjani Sirivella
		10	Tu 10:00 - 11:00	ENG202	Jorge Lopez
	Soheila Bashardoust Tajali	*11*	We 13:00 - 14:00	ENG201	Anna Briskina
	Fr 08:00 - 10:00 - DSQ12 (285)/ Tu 12:00 - 13:00 - DSQ24 (225)	*12*	We 11:00 - 12:00	ENG205	Sima Naderi Mighan
		13	We 10:00 - 11:00	ENG201	Sima Naderi Mighan
		14	Tu 16:00 - 17:00	ENG205	Anjani Sirivella

	 Mr. Wael Shabana Email: wael.shabana@torontomu.ca :Eng234  Mr. George Lopez Email: jlopez@torontomu.ca: Eng234
Prerequisites	CPS 305 Data Structures and Algorithms, or (COE 428 and COE 528). Antirequisite: ITM 500
Calendar Description	Advanced file management techniques involving fundamentals of database organization, design and management. Emphasis is given to Relational Database Management Systems including relational algebra, normal Forms, physical Database Structures and their implementation, and Relational Database Languages. Other types of Database Management are also discussed such as Hierarchical, Network and Inverted Files.
Compulsory Textbook	Fundamentals of Database Systems (7th Edition) - 2016 Authors: Ramez Elmasri, Shamkant Navathe Publisher: Addison -Wesley – Pearson – Price $220 ISBN-13: 978-0-13-397077-7
Additional References	1-An Introduction to Database Systems by C.J. Date, 8th edition- Price $837 2- First chapter of the following book as an example of the practical project: Topics in Data Science with Practical Examples" By Abdolreza Abhari, 2018. Available by Amazon at following link (Price: $65 , Kindle version: $29) https://www.amazon.ca/Topics-Data-Science-Practical-Examples-ebook/dp/B07J1J7HLN
Course Organization	This is the first course on database management systems. Lecture notes are available for students through D2L, which should be used together with the main textbook. We will use Oracle for the implementation of a database project. The course will cover the following topics: • An overview of database and DBMS, Database System Architecture (Conceptual, Internal and External schema) (weeks 1-2) • Data modeling and ER model (weeks 2-3) • Relational Databases and Normalization (weeks 3-4) • Relational Model Query Languages such (RA, RC, QBE, SQL) (weeks 5 -7) • **MidTerm Test:** During the week of Oct 18. Please mark **Saturday Oct 25** XXXXXXXXX Oct 18 • More on Logical Database Design FDs, Normal Forms and BCNF (weeks 8-10) • Physical Database Organization & File Management Techniques (weeks 10-12) • UI design and Other Types of Databases, depending on time (weeks 11-12)
Learning Objectives	At the end of the course, a successful student will be able to: 1. Understand the concepts and design of data management, storage and different types of database systems 2. Make accurate use of technical literature and other information sources to design and normalize a data model and implement a relational database system relevant to the problem situation and information 3. Demonstrate the ability to use data languages such as SQL and professional relational database management systems such as Oracle 4. Learn required teamwork and communication skills to implement a large project

<table>
<tr><td>Evaluation & Feedback</td><td>The project is the central part of course evaluation. Each group will take a unique project and will be evaluated separately. An oral evaluation for each group member will be done during the labs.
<table>
<tr><td>Assignments/Labs/Project</td><td>30%</td></tr>
<tr><td>Midterm Test*</td><td>30%</td></tr>
<tr><td>Final Exam Test*</td><td>40%</td></tr>
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*means individual works.
Ten assignments which are parts of the project are explained below, in total worth %30 of the final grade. Lab or assignments (or project) mark including the individual assessment that will be done in the lab. The marking schema shows the weight of each assignment and its individual assessment. Approximately 30% of each assignment mark will be oral evaluation in the labs assessed by the TAs.
Project is a team-based work; the results for the individual midterm and final tests will be returned within 3 weeks of the due date.</td></tr>
<tr><td>Grading requirements</td><td>To pass the course, you have to get at least 50% of the (midterm and final) marks and 50% of the labs/assignments marks.</td></tr>
<tr><td>Labs</td><td>The course has three hours of lecture and one-hour lab per week (for each section).
Labs will be used to demonstrate and mark the assignments, which will form different parts of the project, as explained in the project description below.
Oracle will be used for implementation and your credentials should never be posted on public sites because of being hacked and compromising our network.
Please make sure your Oracle server’s user-name and password are safe and only are accessible to you.
Labs will be used for marking of your assignments, and is your responsibility to get in touch with the TA of your lab.</td></tr>
<tr><td>Information Technology and Electronic Devices</td><td>The grades will be posted electronically in D2L.
Oracle 11 g+ and JDBC will be used for programming. Oracle 12 can be used as a backup in case of traffic to the oracle server during assignments’ dues.
It is recommended to use Oracle software as it will be instructed through the lectures and will be used for your team-based project during the labs. However, for any valid reasons, such as problems with the school’s Oracle database or inability to download Oracle on your own laptops, any other SQL database such as MySql can be used as an alternative. In case of not use Oracle, you should inform your TA in this regard.</td></tr>
<tr><td>Evaluation Guidelines</td><td>Midterm and final tests will be multiple-choice questions. Also, it is possible to have a question/answer type and design problem questions in tests.
There may be some bonus questions or assignments which will be discussed later during class hours.
For doing the project, students should work within a team of a maximum of three. The marking of the project, which is made up of the assignments, will be done based on both submitted reports and oral evaluation.</td></tr>
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	Project information: You should check the updated information for the project details in the assignment section on D2L, during the term. Your project has three phases consisting of 10 assignments. The completion dates for each assignment are listed in the assignment section and through the information below. As a group, each of you need to submit one single report after completing each assignment. Reports must be submitted through D2L before the lab hours. Marks and deadlines for each assignment will also be in the project information.
Missed Evaluations	Students must submit ACR to the department and get verification from them for any missing evaluation. Please note the maximum number of ACRs the student can submit is three and after that they should contact the department. After receiving verification they should inform their instructors if missing the tests and TAs if missing the labs. In general for any situation that arises during the semester that may adversely affect their academic performance, student should inform in advance and must request ACR or any considerations and accommodations required according to the relevant policies for the following criterias. Failure to do so will jeopardize any academic appeals. ● *Medical certificates* – If a student misses the deadline for submitting an assignment, or the date of an exam or other evaluation component because of illness, he or she must submit a Ryerson Student Medical Certificate AND an Academic Consideration form within 3 working days of the missed date. Both documents are available at www.ryerson.ca/senate/forms/medical.pdf. If you are a full-time or part-time degree student, then you submit your forms to your own program department or school. If you are a certificate or non-certificate student, then you submit your forms to the staff at the front desk of the Chang School. ● *Religious observance* – If a student needs an accommodation because of religious observance, he or she must submit a Request for Accommodation of Student Religious, Aboriginal and Spiritual Observance AND an Academic Consideration form within the first 2 weeks of the class or, for a final examination, within 2 weeks of the posting of the examination schedule. If the required absence occurs within the first 2 weeks of classes, or the dates are not known well in advance as they are linked to other conditions, these forms should be submitted with as much lead time as possible in advance of the required absence. Both documents are available at http://www.ryerson.ca/senate/forms/relobservforminstr.pdf. If you are a full-time or part-time degree student, submit the forms to your program department or school. If you are a certificate or non-certificate student, then you submit the forms to the staff at the front desk of the Chang School. ● *Students who need academic accommodation support* , should register with the Academic Accommodation Support office (formerly called the Access Centre). Before the first graded work is due, registered students should inform their instructors through an "Accommodation Form for Professors" that they are registered with Academic Accommodation Support and what accommodations are required.

Communication with Students	Ryerson's email policy http://www.ryerson.ca/content/dam/senate/policies/pol157.pdf states that only Ryerson e-mail accounts are to be used for communication with students. All students, including continuing education students, have access to Ryerson email through their my.ryerson.ca site, which is the official way they receive communication. All students are required to register for and maintain this account. ***Emails sent from other accounts may not be answered!***
Course Content	The content of the course will be covered from the text book based on the above syllabuses. Each lecture will be practiced during the labs in the following tentative dates: Your project consists of three DBMS development phases broken down into 10 assignments. Here is a list and completion dates for each assignment. As a group, you need to submit one single report after completing each assignment. Your report must be submitted to the assigned TA during the lab hours. Project Report format and Marking Scheme: ********** **Database application:** Select an application from the list provided and try to create a minimum of 5-10 entities and 5-10 interesting relationships among the entities from the description you will provide in A1. You should be familiar with the data requirements of the selected application. Designing more entities and relationships among them will show more benefits of DBMS. The guideline used as a sample of DBMS design will be discussed in class and explained in lecture notes on the university database system. **Assignment marks and submission schedule:** You have to submit each assignment in the week shown below before your lab hours to be evaluated and marked by the TA during your lab time. Also during each lab, you may try working on the next assignment**.** **Group information**: Week of Sep1 Inform the lab TA about your group members and the name of the interested application from the list. **Start of Logical Database Design/ Phase I** **Assignment 1:** Week of Sep8 **Application Description**: Finalize the application in consultation with the lab TA. Prepare a report to clearly describe about the application, its functions and information you expect from it, at the level of a technical report, and submit it to the TA (6 Marks) **Assignment 2:** Week of Sept15 **ER model**: Prepare the ER model (12 Marks) **Assignment 3:** Week of Sept22 **Schema design**: Use Oracle to create the tables derived from ER/EER diagram as discussed in the class and submit the source code, **End of Phase I/** (6 Marks)

Start of Implementation Phase/ Phase II

Database construction: Populate the tables of the database and create simple queries: use SQL- Oracle as discussed in the class and follow the examples of lecture notes

Assignment 4: Week of Sep29 (Part1) and Week of Oct6 (Part2)

Demo of Designing Views/ Simple Quarries: Assignment-4 has two parts:

A4- Part1) for the first part (due on Week of Sep29) design at least 7-8 simple queries at least one for each table,

A4- Part2) in the second part (due Week of Oct6) create at least two VIEWs and more queries and show the snapshots of their results to the TA.

In general, use the necessary keywords such as DISTINCT, and grouping/sorting commands to produce professional report results for queries. The query results should show records in tables with meaningful titles and proper format similar to queries 1-8 for both parts one and two. For each part submit the source code during the week of the lab.

Complete assignmet4 by adding VIEWs and Join queries (Q9) and advanced queries as much as possible. In Assignment 5, your completed queries should be executed at Unix Shell menu commands, so use study week to work on Unix Shell menu.

(12 Marks in Total)

Reading week: Week of Oct13 – no formal lab

Assignment 5: Week of Oct20

Demonstration of Advanced Queries by Unix shell Implementation: For Assignment 5, hand-in the snapshots of advanced query results. Prepare at least 5 interesting advanced queries similar to the queries 9 to 23 of the lecture notes including join and set operations, statistical and aggregation functions, and grouping queries. All queries should have clear and nice formatted results. For assignment 5 you do Application Development with shell scripts: design menus to perform the functions of application by executing related Oracle SQL commands. For UI, it is expected to use Unix shell programming and command line. In the next stages, you will develop a nice GUI interface at the frontend using Java or other Web/Windows-based tools in order to communicate with database engine at the backend (Oracle running under Linux). For assignment 5 you only need to demo Unix Shell scripts and text-based menus for creating and populating database and showing queries' results of your application as will be shown in class. (6 Marks)

Midterm Test : ~~Oct 25 (to be confirmed)~~ Oct 18

Tuesday Lecture on October 28 from 11:00 a.m. to 1:00 p.m. will be online due toTMU AI SUMMIT Conference

Assignment 6: Week of Oct. 27

Normalization of the database/ Functional Dependencies: During assignments 6, 7 and 8 you should normalize all tables to be in 3NF or BCNF. Then you should create dummy data, test and validate your application and try to optimize it. For assignment 6 you should only show Functional dependencies (4 marks)

Assignment 7: Week of Nov. 3
Normalization / 3NF: For assignment 7 verify all tables being in 3NF. You can use diagram (shown in the class) or explain why your tables are 3NF. If there is any table which is not in 3NF (normalized), decompose it to 3NF tables. There will be bonus mark if you use an algorithm for making a 3NF table. (4 marks)

Assignment 8: Week of Nov. 10
Normalization/ BCNF: For assignment 8 verify all tables to see whether or not they are BCNF as shown in class. You can explain why each table is BCNF by showing FDs. If you use an algorithm for making a BCNF table as shown in class, there will be 0.5 bonus marks. Note that during assignments 7 and 8 if you change any table to make it 3NF or BCNF, again you should add data in the modified tables. For assignments 7 and 8 if you want to use algorithms and get the bonus mark, you can submit the bonus parts during labs of assignments 9 or 10.
It is recommended to start creating Java/Python/web based UI application and menus during assignments 7 and 8. (4 marks)

Assignment 9: Week of Nov 17- Project Demo
Demonstration of the application using Java/Python/web-based UI and Individual Evaluation of the Project: The DB application should be in 3NF/BCNF and contain dummy records and brief comments in the code about any special cases and advanced reports. There will be 3 extra bonus marks for creating either JAVA (or Python) UI or web application implementation. You can make web application by Oracle Express or any other method connecting to Oracle DB on your laptop or school DB. There is a separate section showing the bonus mark of assignment 9, which can be shown and submitted during the lab for assignment 10. In this stage, you will submit a soft copy of the executable application as well as the source code through D2L according to the instructions provided in the class. (3 marks) **End of Phase II/**

Start of Documentation Phase/ Phase III
Assignment 10: (Nov 24 – Project Demo) -last lab
Submission of the Final Documentations: The Relational Algebra (RA) notation should be added to describe your SQL queries. Writing Report should be done while working on the project rather than waiting until its completion. When you get a feedback from each part of the project, try to modify the related reports and keep them in the project's documentation that will be submitted at the end. To verify your database being 3NF or BCNF, add concluding remarks about your design experience. Finally collect all the documents in a binder/booklet format beginning with a table of contents and submit it to your TA in the last lab. (3 marks)

Total: 60 marks (30% of the course mark) including report marks and individual assessment

Academic Policies	*a. Ryerson Policies of Interest* Ryerson Senate Policies - http://www.ryerson.ca/senate/policies/ Ryerson Academic Integrity - http://www.ryerson.ca/academicintegrity/ Policy 46 - Undergraduate Grading, Promotion and Academic Standing Policy 60 - Student Code of Academic Conduct Policy 61 - Student Code of Non-academic Conduct Policy 134 - Undergraduate Academic Consideration and Appeals Policy 135 - Examination Policy Policy 150 - Accommodation of Student Religious Observance Obligations Policy 157 - Student Email Accounts for Official University Communication *b. Obligations* – Students need to inform faculty of any situation arising during the semester which may have an adverse effect upon their academic performance; they must request any necessary considerations (e.g. medical or compassionate), or accommodations [e.g. religious observance, disability (should be registered with the Access Centre), etc.] according to policies and well in advance. Failure to do so will jeopardize any academic appeals. *c. Re-grading and Re-calculation* – Must be requested within 10 working days of the return of the graded assignment to the class.
Academic Conduct	http://www.ryerson.ca/academicintegrity/ In order to create an environment conducive to learning and respectful of others' rights, phones and pagers must be silenced during lectures, lab sessions and evaluations. Students should refrain from disrupting the lectures by arriving late and/or leaving the classroom before the lecture is finished.
Academic Misconduct	Ryerson policy 60: http://www.ryerson.ca/content/dam/senate/policies/pol60.pdf), academic misconduct includes, but is not limited to:Plagiarism which is the claiming of words, ideas, artistry, drawings or data of another person. This also includes submitting your own work in whole or in part for credit in two or more courses. ▪ Cheating ▪ Misrepresentation of personal identity or performance ▪ Submission of false information ▪ Contributing to academic misconduct ▪ Damaging, tampering, or interfering with the scholarly environment ▪ Unauthorized copying or use of copyrighted materials ▪ Violations of departmental policies or professional behavior ▪ Violations of specific departmental or course requirements Committing academic misconduct will trigger academic penalties, including: • A course-grade reduction that may be more severe than assigning a grade of "zero" (0) on course work; failing grades, suspension and possibly expulsion from the University. As a Ryerson student, you are responsible for familiarizing yourself with Ryerson conduct policies.
Automatic Plagiarism Detection	In some cases, it is possible to use plagiarism detection service that retains a copy of the submitted work in its database: So the students who do not want their work submitted to this plagiarism detection service must, by the end of the second week of class, consult with the instructor to make alternate arrangements.

Non-Academic Conduct	Ryerson's Student Code of Non-academic Conduct is described in Senate Policy 61: http://www.ryerson.ca/content/dam/senate/policies/pol61.pdf Among many other infractions, the code specifically refers to the following as a violation: "Disruption of Learning and Teaching - Students shall not behave in disruptive ways that obstruct the learning and teaching environment".
Use of Lecture Notes and Recording of Remote Teaching Classes	Lecture notes and examples available on D2L can be used for your self-study materials as an additional resource to the course main textbook. Please note that the lecture notes on D2L and any video played during any possible remote teaching are provided only for the CPS510 database course. There are no record or remote teaching classes, and even in the case of remote teaching that were recorded, they cannot be distributed. So please note that there is no distribution or delivery of the recorded in form of lecture notes or remote lecture videos in any format. It is strictly forbidden to make a copy, redistribute lecture notes, or record the teaching during the class. It is also forbidden to use any technical material found on the course web page or shown during remote teaching for purposes other than learning and teaching this course. Individuals found doing so will be charged with academic misconduct and could be prosecuted for copyright violations under the Copyright Act of Canada.
Diversity and Inclusion Statement	In this course I would like to create a learning environment that supports a diversity of thoughts, perspectives and experiences and honors your identities (including race, gender, class, sexuality, religion, ability, etc.) For more information about our University's resources and services on Equity, Diversity, and Inclusion please visit https://www.ryerson.ca/equity/