Course Introduction

COSC 304 – Introduction to Database Systems

Introductions – Dr. Ramon Lawrence

Professor of Computer Science and CMPS Department Head

Research area: database systems, Internet of Things, software development

Teaching experience:

- 2020 Killam Teaching Prize (top teaching award at UBCO – one per year)
- 2017 UBCO Teaching Excellence Award Winner (two per year)
- 9-time member of teaching honour roll (top 10% instructors)

Industry experience: GE Big Data, UnityJDBC company/consulting

Note: May address me as "Dr. Lawrence", "Professor", or "Ramon" (pronounced RAY-MUN).

The Essence of the Course

The overall goal of this course is for you to:

Create, query, and program with databases to develop applications, web sites, and perform data analysis.

Course covers database techniques and software including relational and NoSQL databases, SQL, JSON, and XML.

This is an important, ***required*** course as almost all systems require a database. Developers and data analysts must have fluency in SQL to process data, and the ability to integrate databases into their development.

My Course Goals

1) Provide the information in an effective way for learning.
2) Inspire and motivate students to learn and appreciate the benefits of the course.
3) Strive for ***all*** students to understand the material and excel.
4) Be available for questions during scheduled times, office hours, and at other times as needed.
5) Teach students how to be a sophisticated database user (by understanding SQL), a database application programmer, and a database designer.
6) ***Demonstrate and integrate AI techniques with database systems.***

Course Objectives

1) Understand the use case for databases and the relational model for data storage.
2) Fluency in SQL including SQL DDL (`CREATE`, `DROP`, `INSERT`, `UPDATE`, `DELETE`) and SQL queries using `SELECT`.
3) Read existing database designs, design new databases using ER/UML modeling, and convert to the relational model.
4) Construct programs that access a database to read data, perform analysis, and output results.
5) Exposure to database technologies like NoSQL, JSON, XML, and cloud databases.
6) Use AI to assist with SQL and database code generation and critically evaluate AI outputs.

Academic Dishonesty

Cheating is strictly prohibited and is taken very seriously by UBC.

A guideline to what constitutes cheating:

- Labs
  - Submitting work produced by others that are outside of your group.
  - AI such as ChatGPT and GitHub Copilot should be used to aid learning not just complete the lab. Marks may be withheld if cannot demonstrate learning.
  - Discussing HOW to solve a particular question instead of WHAT the question involves.
- Exams
  - Only materials permitted by instructor should be used in an exam.

Academic dishonesty may result in a "F" for the course and further actions by the Dean's office.

How to Excel in This Course

Attend ***every*** class:

- Read notes ***before*** class as preparation and complete the questions.
- Participate in class exercises and questions.

Complete all lab assignments:

- Labs practice the fundamental employable skills as well as being for marks.

Practice on your own. Practice makes perfect.

- Do more questions than in the labs. AI can generate similar questions.
- Read the additional reference material and perform practice questions.

The Database Projects

Two database project paths for different skill sets and interests:

- Development Stream: Build an e-commerce web site
- Analysis Stream: Perform analysis, reporting, data visualization

Key skill sets used:

- Database/web programming, database design using ER/UML
- SQL, Excel, visualization and reporting
- AI assistance for SQL and code development

Features:

- Project is integrated in the assignments and is a significant part of the mark.
- Students select one stream to do for marks but have access to all materials for both streams. Project assignments start at lab 7.
- Project assignments are done in groups of two.

The Lab Assignments

The lab assignments are critical to learning the material and are designed to build up your skills and prepare you for the exams.

The weekly lab assignments are worth ***20%*** of your overall grade.

You have until the week after the lab is assigned to complete it.

- No late assignments will be accepted.
- An assignment may be handed in any time before the due date and may be marked immediately by the TA.
- Lab assignments may take between 2 and 10 hours depending on the lab.

Lab assignments are done in ***pairs***.

There is no scheduled lab time. TA help desk hours are posted.

Quiz and Practice Questions

To promote understanding, 10% of your overall grade is allocated to answering questions during class. These questions may be multiple choice, short answer, or programming questions.

- Questions will be answered both asynchronously (outside of class time) and synchronously (during class time).
- **No make-ups for forgetting to answer questions. Questions will have posted deadlines for when they must be completed.**
- Canvas quizzes will be used as well as real-time iClicker polling questions.

Grading scheme:

- (Canvas quiz mark + Clicker Mark + Live questions) / 200 * 10%.
- 200 total is: 84 from Canvas quizzes (80% of 105 questions) plus 60 iClicker questions and 56 points of live PrairieLearn questions
- There will be over 120 questions asked for live clickers.
- Maximum is 10%. It is not possible to be higher than 10% for the quiz component.

Systems and Tools

Course material, online quizzes, discussion forums and feedback, and marks are on Canvas.

The assignments use Docker to deploy databases on your machine. A laptop is required for development and exams.

All software used will be open source or free to install on your computer. You do not need to access hardware/software at UBCO.

Get help at https://coursehelp.ubc.ca.

My Expectations

My goal is for you to learn the material and walk out of this course confident in your abilities:

- To query and update an existing database
- Write database code to build standalone and web-based applications
- To design and model a database using UML
- To experience how AI may assist you in these tasks

I have high standards on the amount and difficulty of material that we cover. I expect a strong, continual effort in keeping up with readings, doing assignments, and working on projects.

The course is straightforward – if you do the work, you will do well.

Your mark is 80% perspiration and 20% inspiration.

Why are you here?

A) It is a required course for the COSC/DATA major.

B) This is an optional elective for my program.

C) Engineering Major taking a minor in Computer Science.

D) Taking a minor in Data Science.

E) Other

What Topic are You Most Interested In?

A) What is a database and how do you use them?

B) Querying using SQL

C) Designing databases

D) Using databases with programs (stand-alone, web, mobile)

E) None of the above

Database Survey Question

Question: Have you used any of these database systems?

A) MySQL

B) Microsoft Access or SQL Server

C) PostgreSQL

D) Used more than two different databases

E) Used no databases

What Grade are You Expecting to Get?

A) A

B) B

C) C

D) D

F) F

The Essence of the Course

Essence of the course is to appreciate that:

Databases are the best way for storing and manipulating *persistent* information. You will learn the skills to exploit the full power of database systems.

The skills you will acquire are in high demand for many software development jobs. Database skills make you more marketable and allow you to construct more sophisticated systems.

- Note: This is a course on how to use/program with databases. It is a very applied course with specific skills.
- If you want to learn how to build database systems and what is "inside the box", that is the subject of COSC 404!


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