

ECE-569 Database

- 2023 Fall
- **Instructor:** Dov Kruger
- ****Meeting Times and Office hours**
- **Resources**
- **Course Web Address** **** Prerequisites****
 - Required basic C++, Java, Python, Rust, ??? in order to write clients to DB
 - * Your code is your business. If you use python or any language I don't know well, I can't help much

Hardware and Software Setup

See Preparing.md

COURSE DESCRIPTION

This course covers databases

- The goal of databases
- ACID properties
- Database and schema design
- Schema normalization and integrity constraints
- Indices
- Query processing
- Query optimization and cost estimation
- Transactions
- Stored Procedures
- Recovery
- Concurrency control
- Isolation and consistency;
- Canonical forms
- SQL commands
- Weaknesses of the SQL standard
- Query Optimization
- Programming applications with databases (in C++, Java, or potentially a language of your choice)
- Data interchange languages: XML, JSON
- Binary data interchange
- NoSQL databases (MongoDB)
- Scientific structured data (NetCDF, HDF5)
- Blockchain (distributed, cryptographically secured databases)

Course Outcomes

After completion of this course, students will be able to

- * Design databases with efficient structure and guaranteed consistency
- * Write queries with transactional integrity
- * Use data interchange standards to import and export data
- * Understand the performance issues of ASCII data transport
- * Identify APIs for binary data transport
- * Use scientific databases to store and retrieve multidimensional data at high speed.
- * Use a programming language to interact with an SQL database
- * Implement a complete database project

FORMAT AND STRUCTURE

- Classes include slides and live coding. You are encouraged to actively participate.
- There will be paper exercises to be collected, primarily to record attendance. A small number of points will be affected, but
- Classes will be recorded and the recordings made public each class. You are expected to attend.

COURSE MATERIALS

- SQL Standard
- MariaDB
 - MariaDB user manual
 - MariaDB tutorial
 - programming API for MariaDB
 - Query Optimization
 - Debugging MariaDB is optional for c++ projects that attempt to fundamentally change the engine itself
- PostGRES
 - PostGRES tutorial
 - PostGRES C++ API
- MySQL user manual
- The XML standard
 - XSL for displaying XML in web pages
- The JSON standard
- Binary transport using Google protobuf
- MongoDB nosql database
 - MongoDB tutorial
 - MongoDB C++ driver
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- Other Readings: Papers available in ref directory of repo

COURSE REQUIREMENTS

- **Software Installation**
 - MariaDB server
 - MySQL Workbench
- **Attendance:** Attendance is crucial for an effective learning but will only count for the small in-class credits. Your work will speak for itself.
- **Homework:** Coding assignments will be submitted via canvas for individual single files, or via github.

GRADING PROCEDURES

Grades will be based on: * Homework problem sets (5%) * Group Programming Homeworks (15%) * Midterm (40%) * Final (40%)

[Grading Policies] (<https://github.com/RU-ECE/DovKrugerCourses/grading.md>)

[Academic Honesty and Discipline] (<https://github.com/RU-ECE/DovKrugerCourses/academichonesty.md>)

IMPORTANT DATES

- Midterm ** Mar 20, 2024 **
- Final ** 2024-TBD **