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
  –
• 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%)

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

IMPORTANT DATES

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