BZAN 6356: Advanced Database Management Tools for Business Analytics
University of Houston
Spring 2023
Revision 2023.01.10

Instructor: Dr. Mark Grimes
gmgrimes@bauer.uh.edu
Melcher 280D

Location: Synchronous Online

- **YouTube:** http://bit.ly/ProfessorMG
- **Blackboard:** https://elearning.uh.edu

Time: Tuesday 6:00 PM – 9:00 PM

Textbooks:
Seven Databases in Seven Weeks (Second Edition)
Authors: Perkins, Redmond, and Wilson
ISBN: 978-1680502534

Next Generation Databases
Author: Guy Harrison
ISBN: 978-1484213308

Office Hours FtF: Mon 11:00 - 12:00
Office Hours Zoom: Mon 12:00 - 1:00

Course Description

In this class we will cover seven database management systems representing the five dominant database genres: Relational, Column Family, Document, Graph, and Key-Value. These technologies are rapidly changing and many business analytics jobs will call for knowledge of multiple types of databases and data management paradigms. To this end, the goal is not to become an expert in any one of these databases, but rather to gain familiarity and hands-on experience that will allow you to identify when each type of database is appropriate and to adapt to any business needs you encounter.

These databases are naturally intertwined with cloud computing and other emerging technologies. Thus, we will also be discussing some cloud computing topics as well as general evolution of computing and data management to provide context as to how and why these systems are used.

This class uses a "flipped" classroom approach—that is, the core lecture material is provided in asynchronous online videos (YouTube) that you should watch before our normally scheduled class time. During our synchronous class time we will typically have a short lecture followed by labs, discussion, or presentations.

Learning Objectives

For each of the five types of databases we discuss in this course, you should be able to:

1. Describe the core principles, concepts, and applications of each DBMS
2. Match each type of DBMS to a business problem, discussing the pros and cons of using each type of database for a particular case
3. Be able to create, read, update, and delete data in each DBMS
4. Describe cloud computing concepts related to these types of systems

Grading

The goal of this class is to develop skills that will be useful for your career in data analytics. To this end, all of the course assessments are designed to help you develop and demonstrate mastery of these skills.

40% Lab Assignments (LA) Four @ 10% each (Note: There are five LAs, lowest is dropped)	We will often have in-class lab exercises demonstrating each DBMS. Five lab assignments will extend the work we do in class and are due by the time the next class period starts. Your lowest LA grade will be dropped. Unless otherwise stated, lab assignments can be completed individually or in small groups (2-4 students). If completed in a group, only one student should submit the assignment, including the PSID and full name of each member.
20% Case Project Two deliverables @ 10% each	Throughout the semester you will work with a group of 3-4 students to identify one or more big data sources, come up with a set of questions to answer using the data, import and analyze the data, then prepare an interim (10%) and final (10%) case report and presentation. Dr. Grimes will serve as a "consultant" for each group. Expect to meet once or twice during each phase of the project for guidance and direction.
10% In-Class Exercises (ICE)	During most class meetings we will complete an in-class exercise. ICEs may take the form of simple questions about the class, mini-quizzes, group activities, etc. Your lowest ICE grade will be dropped.
10% Exam Readiness Quizzes (ERQ) Two @ 5% each	As we complete major milestones in the course material, we will have two in-class Exam Readiness Quizzes, each worth 5% of your grade. ERQs will consist of questions directly from previous exams. If you miss an ERQ: Your score from the final exam will be applied to the ERQ (see the Day 1 slides for more details).
20% Final Exam	A final exam will be administered during the designated final exam period.

Grade Allocations: **A:** 90-100% **B:** 80-89% **C:** 70-79% **D:** 60-69% **F:** < 60%

Software

Poll Everywhere: Poll Everywhere is a student response system similar to clickers, but way better and more interactive (and importantly, free for you!). You can access poll everywhere using a web browser at or by using the free iOS or Android app.

PuTTY: Many of the databases we interact with will require connecting to Linux servers. While you can use any secure shell (SSH) client you would like, PuTTY is a popular choice and what I will be using in the class. Link: https://www.chiark.greenend.org.uk/~sgtatham/putty/latest.html

SQL Workbench: SQL Workbench will be used for interacting with PostgreSQL. Note this is different software than the similarly name "MySQL Workbench"! Link: https://www.sql-workbench.eu/

Others: In addition to the software mentioned above, we will use a variety of tools embedded in Windows and Linux, Microsoft Excel, Amazon AWS, and others as needed.

Schedule

As of January 10, 2023 - Schedule is subject to change!

Date	Topic	Notes
1: 1/17	Introduction: Evolution of databases	**Before class:** • Read Perkins Ch 1 (pp. 1-8) • Read Perkins Appendix 2 (pp. 315-318) • Read Harrison Ch 1 – 3 (pp. 3-51) **During class:** • Introduction Lecture **After class:** • --
2: 1/24	Relational databases revisited: PostgreSQL	**Before class:** • Read Perkins Ch 2 (pp. 9-52) • Watch videos 2.0 – 2.3 • **Optional:** Postgres install using RDS **During class:** • Mini Lecture • PostgreSQL lab **After class:** • **LA1: PostgreSQL Lab Assignment**
3: 1/31	Column Family Databases: HBase Part 1	**Before class:** • Watch Videos 4.0 – 4.2 • Read Perkins Ch 3 (pp. 53-91) • Read Harrison Ch 8 (105-126) • **Optional:** Install HBase using EMR **During class:** • Mini Lecture • Breakout groups **After class:** --
4: 2/7	Column Family Databases: HBase Part 2	**Before class:** • Watch videos 5.0 – 5.3 **During class:** • Mini Lecture • HBase Lab **After class:** **LA2: HBase Lab Assignment**

5: 2/14	Document Databases: MongoDB Part 1	**Before class:** • Read Harrison Ch 4 (pp. 53-64) • Read Perkins Ch 4 (pp. 93 – 133) • Watch videos 6.0 – 6.2 • **Optional:** MongoDB install using EC2 **During class:** • Mini Lecture **After class:** • --
6: 2/21	Document Databases: MongoDB Part 2	**Before class:** • Watch videos 7.0 – 7.3 **During class:** • Mini Lecture • MongoDB Lab **After class:** • **LA3: MongoDB Lab Assignment**
7: 2/28	Document Databases: CouchDB	**Before class:** • Read Perkins Ch 5 (pp. 136-175) • Watch videos 8.0 – 8.3 • **Optional:** CouchDB installation **During class:** • Mini Lecture • CouchDB Demo **After class:** • --
8: 3/7	**Interim case project presentations**	**Before class: No Videos this week!** **During class:** Case Presentations
9: 3/14	**Spring Break**	
10: 3/21	Graph Databases: Neo4j Part 1 **Exam Readiness Quiz #1**	**Before class:** • Read Perkins Ch 6 (pp. 178-209) • Read Harrison Ch 5 (pp. 65-74) • Watch videos 10.0 – 10.3 • **Optional:** Neo4j install using EC2 **During class:** • ERQ 1 • Mini Lecture • Breakout Groups **After class:** • --

11: 3/28	Graph Databases: Neo4j Part 2	**Before class:** • Watch video 11.0 **During class:** • Mini Lecture • Neo4j Lab **After class:** • **LA4: Neo4j Lab Assignment**
12: 4/4	Key-Value Databases: Redis	**Before class:** • Watch videos 12.0 – 12.3 • Read Perkins Ch 8 (pp. 259-304) • Read Harrison Ch 7 (pp. 88-102) • **Optional:** Redis config using Elasticache **During class:** • Mini Lecture • Breakout groups **After class:** • --
13: 4/12	Key-Value Databases: DynamoDB	**Before class:** • Read Perkins Ch 7 (211-257) • Watch videos 13.0 – 13.3 • **Optional:** DynamoDB Configuration **During class:** • Mini Lecture • KV Lab **After class:** • **LA5: KV Lab Assignment**
14: 4/18	Wrap up Polyglot Persistence Future of databases and computing **Exam Readiness Quiz #2**	**Before class:** • Read Harrison Ch 12 (pp. 191-216) • Read Perkins Ch 9 (pp 305-310) **During class:** • **ERQ 2** • Mini Lecture • Breakout groups **After class:** • --
15: 4/25	**Final Case Project Presentations** **NRDBMS Capstone**	**Before class: No Videos this week!** **During class:** Case Presentations **After class: --**
Tuesday 5/9	**Final exam during exam period** **Tuesday May 9, 5:00 – 7:00**	

Other Important Details

Classroom Behavior

The non-academic use of cell phones, laptops, tablets, hatchimals and the like are distracting to yourself and those around you - plus it is rude! Please silence or turn off your phone/hatchimal prior to entering the classroom. If you are causing a disruption you will be asked once to cease the activity. If the activity continues, you will be asked to leave the classroom.

Disruptive or threatening behaviors are strictly prohibited and will be dealt with in accordance with university policy.

Late Work

Assignments turned in late will be penalized 10% per calendar day for a maximum of five days, after which no credit will be given. Technology failure is not an excuse for late work, so do not wait until the last minute!

HARDWARE/SOFTWARE

Assignments will be completed digitally and submitted via Blackboard. The Bauer computer labs are available to complete assignments. In order to complete some of the assignments and SQL project, you will need access to a computer running a modern version of Windows or MacOS.

Poll Everywhere: For many in class exercises and various other activities throughout the semester, we will be using polleverywhere.com - this system is very much like "clickers" except way better and FREE for you. See details in the Day 1 slides. To use Poll Everywhere you will need an internet connected laptop, tablet, or smart phone (Android and iOS both work fine).

Please contact me ASAP if you do not have access to the required hardware so that special arrangements can be made.

UNIVERSITY OF HOUSTON SYLLABUS LANGUAGE: Spring 2023

Required Language for All Courses

COVID-19 Information
Students are encouraged to visit the University's COVID-19 website for important information including diagnosis and symptom protocols, testing, vaccine information, and post-exposure guidance. Please check the website throughout the semester for updates. Consult the (select: Undergraduate Excused Absence Policy or Graduate Excused Absence Policy) for information regarding excused absences due to medical reasons.

Reasonable Academic Adjustments/Auxiliary Aids
The University of Houston complies with Section 504 of the Rehabilitation Act of 1973 and the Americans with Disabilities Act of 1990, pertaining to the provision of reasonable academic adjustments/auxiliary aids for disabled students. In accordance with Section 504 and ADA guidelines, UH strives to provide reasonable academic adjustments/auxiliary aids to students who request and require them. If you believe that you have a disability requiring an academic

adjustments/auxiliary aid, please contact the Justin Dart Jr. Student Accessibility Center (formerly the Justin Dart, Jr. Center for Students with DisABILITIES).

Excused Absence Policy

Regular class attendance, participation, and engagement in coursework are important contributors to student success. Absences may be excused as provided in the University of Houston Undergraduate Excused Absence Policy and Graduate Excused Absence Policy for reasons including: medical illness of student or close relative, death of a close family member, legal or government proceeding that a student is obligated to attend, recognized professional and educational activities where the student is presenting, and University-sponsored activity or athletic competition. Under these policies, students with excused absences will be provided with an opportunity to make up any quiz, exam or other work that contributes to the course grade or a satisfactory alternative. Please read the full policy for details regarding reasons for excused absences, the approval process, and extended absences. Additional policies address absences related to military service, religious holy days, pregnancy and related conditions, and disability.

Recording of Class

Students may not record all or part of class, livestream all or part of class, or make/distribute screen captures, without advanced written consent of the instructor. If you have or think you may have a disability such that you need to record class-related activities, please contact the Justin Dart, Jr. Student Accessibility Center. If you have an accommodation to record class-related activities, those recordings may not be shared with any other student, whether in this course or not, or with any other person or on any other platform. Classes may be recorded by the instructor. Students may use instructor's recordings for their own studying and notetaking. Instructor's recordings are not authorized to be shared with *anyone* without the prior written approval of the instructor. Failure to comply with requirements regarding recordings will result in a disciplinary referral to the Dean of Students Office and may result in disciplinary action.

Resources for Online Learning

The University of Houston is committed to student success, and provides information to optimize the online learning experience through our Power-On website. Please visit this website for a comprehensive set of resources, tools, and tips including: obtaining access to the internet, AccessUH, Blackboard, and Canvas; using your smartphone as a webcam; and downloading Microsoft Office 365 at no cost. For questions or assistance contact UHOnline@uh.edu.

UH Email

Please check and use your Cougarnet email for communications related to this course. To access this email, login to your Microsoft 365 account with your Cougarnet credentials.

Webcams

Access to a webcam is required for students participating remotely in this course. Webcams must be turned on (*state when webcams are required to be on and the academic basis for requiring them to be on*). (*Example: Webcams must be turned on during exams to ensure the academic integrity of exam administration.*)

Academic Honesty Policy

High ethical standards are critical to the integrity of any institution, and bear directly on the ultimate value of conferred degrees. All UH community members are expected to contribute to an atmosphere of the highest possible ethical standards. Maintaining such an atmosphere requires that any instances of academic dishonesty be recognized and addressed.
The UH Academic Honesty Policy is designed to handle those instances with fairness to all parties involved: the students, the instructors, and the University itself. All students and faculty of the University of Houston are responsible for being familiar with this policy.

Syllabus Changes

Due to the changing nature of the COVID-19 pandemic, please note that the instructor may need to make modifications to the course syllabus and may do so at any time. Notice of such changes will be announced as quickly as possible via Blackboard.

Helpful Information

Coogs Care: https://uh.edu/dsa/coogscare/

Student Health Center: https://www.uh.edu/healthcenter/

GOOD LUCK!