90-838: Database Management for Policy Analytics
Fall 2024

Course Syllabus (Last Updated: August 25, 2024)

Teaching Team

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Office Hours will be posted to course website by end of first week.

Lecture Times and Locations

Mondays & Wednesdays:
11:00AM – 12:20PM @ HBH 1005 (Section A)
3:30PM – 4:50PM @ HBH 1006 (Section B)

Course Website

canvas.cmu.edu

Course Schedule

Please refer to the separate document titled Course Schedule (posted to Course Website) for weekly lecture topics, due dates of various assessment components, and exam dates.

Textbooks

Required Textbook
- **Casteel, J., "Oracle 12c: SQL," Cengage Learning, 2016**
  - You do need to get hold of a copy of this book mainly for prep work readings. It has been around for quite a few years, so you should be able to find some low-cost copies.
  - Although this book is written for Oracle 12c, the majority of the contents is transferrable to other flavors of SQL, including PostgreSQL we use in our course.

I will highlight in class and/or assignment instructions places where the SQL in Oracle and PostgreSQL differs.

- Additional material from other sources will be provided by the instructor.

Additional References

In addition to the required text, the following references are recommended. Students may find it useful to own a personal copy of one or two of the texts below.

- Connolly, T. and C. Begg, "Database Systems: A Practical Approach to Design, Implementation, and Management," 6th edition, Addison-Wesley, 2015
- Coronel, C. and S. Morris, "Database Systems: Design, Implementation, & Management," 12th edition, Cengage Learning, 2017
- Hoffer, J. A., R. Venkataraman, and Heikki Topi, "Modern Database Management," 11th edition, Prentice Hall, 2012
- Price, J., "Oracle Database 12c: SQL," McGraw Hill, 2014
- DeBarros, A., "Practical SQL: A Beginner's Guide to Storytelling with Data (First Edition)," No Starch Press, 2018

Helpful Resources

There are many resources online that may help you with various parts of the class. Most importantly:

- [PostgreSQL 16.4 Documentation](#)
- [PostgreSQL Tutorial](#)
- [SQL Style Guide](#)

Course Rationale: *Why it matters (besides it just being a core course)*

This course on database management systems provides students in public policy and healthcare analytics with valuable, marketable skills for efficiently managing and analyzing data. Mastery of database systems is essential for transforming raw data into actionable insights, whether it is for driving public policy decisions or improving healthcare outcomes. By focusing on practical, hands-on experience with relational databases, this course ensures that students develop the expertise needed to excel in data-driven environments, making them more competitive in their respective fields.

Learning Objectives: *What you'll gain (beyond 12 academic units)*

[TL;DR](#): You'll learn to install and configure database systems, interpret the relational model and understand how business needs influence its design. You will also learn to write SQL queries (from basic to advanced), navigate through the stages of database design (conceptual, logical, physical), and develop user-defined functions and triggers. Additionally, you will differentiate between relational and non-relational databases, and create simple queries using the MongoDB Aggregation Pipeline.

By the end of the course, students should be able to:

1. Perform basic installation and configuration of database systems following step-by-step instructions.
2. Describe the fundamental principles of the relational model and identify their applications in real-world data management context.
3. Interpret the Entity-Relationship Diagram (ERD) of an existing relational database depicted in Unified Modeling Language (UML)
4. Explain how business rules translate into an existing relational database design in a given real-world context and discuss its implications in the physical implementation of the database.
5. Analyze a given data retrieval task in a given database and fulfill it by formulating database queries using appropriate Structured Query Language (SQL) constructs, including but not limited to:
   5.1. Logical operators
   5.2. Built-in functions (including analytic functions)
   5.3. Inner and outer joins
   5.4. Grouping and aggregation
   5.5. Subqueries
6. Design conceptual database models using UML diagramming notation, translate conceptual models into logical models, and implement physical database designs with SQL.
7. Develop user-defined functions and triggers in an RDBMS.
8. Differentiate between relational and non-relational databases based on their intended purposes and design principles.
9. Create simple queries using the MongoDB Aggregation Pipeline.

Student Evaluation

Your work will be evaluated on a combination of the following components:

Assessment Component	Description	Weight
9 Prep Works	Preliminary work that prepares you for the upcoming lecture materials. Typical in the form of reading + online quiz consisting of question types such as multiple-answer and fill-in-the-blank.	8% (with one lowest-scored prep work dropped)
9 Assignments	Hands-on exercises that reinforce lecture content and occasionally introduce more challenging tasks to enhance understanding. Assignment 1 will consist of mainly short-answer questions on interpreting relational models. Most of the other assignments will typically consist of multiple query questions: writing queries to extract, present, and/or manipulate data based on requirements given.	22.5%

3 In-class Exams	Checkpoints interspersed throughout the semester that assess your understanding of the materials covered up to that point. These exams help you identify areas of strength and those needing improvement, ensuring you are developing the necessary knowledge and skills to apply effectively as the course progresses. A practice exam will be provided before each exam to familiarize you with the format and types of questions you can expect. The exams are closed-book, closed-notes.	3×22.5%= 67.5%
1 Syllabus Quiz	A low-stake quiz consisting of multiple-choice and multiple-answer questions with the purpose of incentivizing you to read through the course syllabus (this document) and the course schedule carefully.	1%
Attendance	See details below in "Attendance and Participation" section	1%
Participation Bonus	See details below in "Attendance and Participation" section	1 bonus point

Final letter grades are assigned according to the following scale:

A+ $x \geq 99$ Truly Exceptional
A $x \geq 93$ Excellent
A- $90 \leq x < 93$ Very Good
B+ $87 \leq x < 90$ Good
B $83 \leq x < 87$ Acceptable
B- $80 \leq x < 83$ Fair
C+ $77 \leq x < 80$ Poor
C $73 \leq x < 77$ Very Poor
C- $70 \leq x < 73$ Minimal Passing
R $x < 70$ Failing

where x represents your final course score ranging between 0 and 100.

Attendance and Participation

We recognize that each student has their own preferred learning style, and we respect your choice. However, **we strongly encourage attending lectures in person**, as we've noticed a positive correlation between regular class attendance and better course performance. While I can't definitively claim the causality between attendance and improved performance, I believe the following factors might contribute to this correlation:

- **Physical presence in class usually leads to higher mental engagement**. Your focus on the material is likely to increase, and our interactive class activities, best experienced in person, further boost this engagement.

- **Attending in person allows you to ask questions and receive immediate answers during lectures**. I am committed to answering every question you raise, and I consider this interactive Q&A the greatest value I offer: there are gazillions of YouTube videos teaching databases better than I do, but I can provide immediate, detailed, and tailored responses to *your specific questions*, a benefit you can't get from pre-recorded videos.
- **Committing to in-person class attendance helps you develop a professional mindset, which is more valuable for your long-term career than any specific subjects or skills**. As professionals are expected to fulfill their duties, your duty as a student includes class attendance. Moreover, **if you are unable to attend due to circumstance like medical reasons or schedule conflicts, please notify the teaching team via email as soon as possible**. This is again an exercise in professionalism, demonstrating respect and responsibility towards your commitments.

During many lectures, we will do in-class exercises using PollEverywhere, a platform for live polling. Your response records in these live polls will serve as a **proxy for attendance**. At the end of the semester, those who have records for at least 90% of the lectures with polls will earn full attendance points (1%). Those with records between 70% and less than 90% will earn half attendance points (0.5%), and those below 70% will receive no attendance points (0%).

You will also have the opportunity to earn **up to 1 Participation Bonus point** on your final course score through a variety of participation opportunities including:

- Regular participation during lectures and/or office hours, asking and/or answering questions
- Regular participation on Canvas discussion boards
- Prompt response to ad-hoc surveys / discussions (if any; to be announced by the instructor)

The Participation Bonus point may help you achieve a better letter grade if your final course score from the other assessment components is marginally below the threshold of a higher grade. For example, if you receive a final course score of 89.5, a participation bonus of 0.8 would increase your course score to 90.3, thereby helping you achieve an A- instead of a B+. However, if your score remains below a certain threshold even after applying the Participation Bonus, I am sorry but I cannot help you further boost your score.

Regrade Policy

If you believe that your grade is inaccurate, you may request a regrade. Please refer to the following guidelines to determine if a regrade request is necessary / appropriate:
- Regrade requests must be **submitted within one week** of the date when the grade was returned.
- Regrade requests must be in writing (via email to the instructor and all TAs) and must include a copy of the original submission.
- Regrade requests must specify in detail the reasons you deserve a higher grade. These will typically be that (1) we added your scores incorrectly, or (2) the grader misread or

misunderstood your answer or did not take something into account that they should have. For this, you should use the feedback comments as your reference point.

- Our top priority when grading is to maintain a **consistent rubric for the same question**, which means (1) all students having the same type of error will receive the same deduction, and (2) for a specific type of error, we cannot negotiate the rubric and make any exception for any individual student to deduct fewer points.
- Different questions focus on different parts of the course material and/or evaluate different skillsets, so their rubrics will almost certainly be different. Therefore, **it is not relevant to base your regrade request of one question on the rubric applied to a different question**.
- **Referencing another student's grade is inappropriate and irrelevant.** While we do our best to apply an even standard across students, we cannot discuss anyone else's grade with you because it is against the [regulations](#), so we need to deal with the merits of your particular case.
- We reserve the right to regrade the entire assignment and thus your grade may go up or down.
- The Participation Bonus is inherently subjective and therefore is not eligible for regrade requests.

Late Submission Policy

Policy on Assignments: Late Penalties & Late Passes

[TL;DR](#): The late pass mechanism is designed to help you manage submission deadlines when juggling other commitments, allowing you to avoid late penalties. Please ensure you read and understand the policy below thoroughly to use it effectively.

To ensure that you keep pace with the course and avoid accumulating backlogs, it's important to **submit assignments on time**. Assignments submitted within 48 hours after the original deadline will incur a **late penalty of 20% for every 24 hours**.

We understand that unexpected situations can arise, be it a heavy workload, family emergencies, medical conditions, or scheduling conflicts. To accommodate these challenges, we've implemented the late pass mechanism which allows you to stagger deadlines and manage your time more flexibly. You have **a total of 72 hours of late passes available** for your assignments, which you can use in either of the following ways:

- Divide it into **THREE** 24-hour late passes for three different assignments, allowing submission of each up to 24 hours after the deadline without penalty.
- Divide it into **ONE** 48-hour late pass and **ONE** 24-hour late pass for two different assignments, allowing submission of one up to 24 hours and the other up to 48 hours after the deadline without penalty.

Late passes are NOT applied automatically. To use a late pass, you must **email the teaching team** (instructor and all TAs) about the type of pass you are using (24- or 48-hour

pass) **before the assignment deadline**. **We cannot accept late pass requests after an assignment's deadline.**

If you face extenuating circumstances after exhausting your late passes, please inform us **as soon as possible**. We will do our best to assist you while ensuring fairness and consistency in our submission policy for all students. Our experience shows that alerting us about potential issues at the earliest possible time allows us to explore more options. On the other hand, options for situations communicated just before or after a deadline are significantly limited, so timely communication is essential.

Assignment submissions will not be accepted more than 48 hours after the original deadline (regardless of late passes) unless you have obtained prior approval from the instructor. This ensures timely progress and fairness in the evaluation process, preventing prolonged delays that could disrupt your learning pace.

Policy on Other Assessment Components (Prep Works, Quizzes, and Exams): No Late Submissions

For other types of assessment components, including but not limited to **prep works, quizzes, and exams**, **late submissions are not accepted** unless the instructor makes a specific announcement. This policy is in place because prep works need to be done before their corresponding lectures, quizzes require immediate completion for subsequent assignments, and exams, as high-stake assessments, require consistent submission timing for fairness and uniformity. Consequently, **late passes cannot be used towards these assessment components**.

In case you think you may miss any of these assessment components due to extenuating circumstances, it is essential that you inform us **immediately** so that we may find an appropriate solution to address your special needs while ensuring fairness and consistency for all students. Again, the sooner you let us know, typically the more options we can explore.

Policy on Collaboration and Cheating

*[TL;DR](): **Do not show your work (queries, codes, written responses, etc.) to anyone else nor look at the work of anyone else unless the person is a teaching team member.***

Unless otherwise announced by the teaching team, all the work you submit should reflect **individual effort**. You are encouraged to discuss the high-level concepts related to the assignment questions with fellow students (with the exception of quizzes and exams), but **the final work product must reflect *your* knowledge and effort, not your classmates'**.

You must acknowledge in your submission any help received on your assignments. That is, you must include a comment in your homework submission that clearly states the name of the book(s) and/or online source(s) from which you received assistance. Under circumstances

announced by the teaching team that collaboration is allowed, you must also state the name of the student you collaborated with and/or the person(s) from which you received assistance.

Cheating includes but is not necessarily limited to:

1. Submission of work that is not your own for papers, assignments, lab exercises, or exams.
2. Submission or use of falsified data.
3. Theft of or unauthorized access to an exam, current or previous.
4. Use of an alternate, stand-in or proxy during an examination.
5. Use of unauthorized material including textbooks, internet material, notes, or computer programs (including generative AI tools) in the preparation of an assignment or during an examination, unless otherwise indicated.
6. Supplying or communicating in any way unauthorized information to another student for the preparation of an assignment or during an examination.
7. Collaboration in the preparation of a solution to a problem unless expressly allowed by the assignment.
8. Plagiarism which includes, but is not limited to, failure to indicate the source with quotation marks or footnotes where appropriate if any of the following are reproduced in the work submitted by a student:
   a. A graphic element.
   b. A proof.
   c. A phrase, written or musical
   d. Specific language.
   e. An idea derived from the work, published or unpublished, of another person.
   f. Program code or algorithms.

If you are unsure about what is acceptable, you should consult with the instructor.

Penalties for Cheating

Penalties imposed are at the instructor's discretion. In this class, the penalty imposed can be any of the following depending on the violation:
- zero on the assignment
- a letter reduction on final course grade (e.g., final grade of B+ becomes C+)
- a failing grade in the course

Regardless of the penalty imposed, all incidents of cheating are reported to the Associate Dean. Additional penalties may be imposed.

Recording of Class

All lectures will be recorded so that students in this course (and only students in this course) can re-watch past class sessions. The recordings will be made available on Canvas typically by the

end of the day on which the lecture takes place. Recordings of class sessions are covered under the **Family Educational Rights and Privacy Act (FERPA)** and **must not be shared with anyone outside your course-section**.

No student may record any classroom activity without express written consent from the instructor. If you have (or think you may have) a disability such that you need to record or tape classroom activities, you should contact the Office of Disability Resources to request appropriate accommodation.

Disability Accommodations

If you have a disability and are registered with the Office of Disability Resources, you must notify me of your accommodations and **discuss your needs with me as early in the semester as possible**. I will work with you to ensure that accommodations are provided as appropriate. Please note that some accommodations (such as flexibility in attendance and flexibility in assignments) cannot be implemented into the course **unless you discuss** it with the faculty member and develop a **written agreement** (consult the Office of Disability Resources for further detail). If you feel that you may have a disability and would benefit from accommodations but are not yet registered with the Office of Disability Resources, I encourage you to contact them at access@andrew.cmu.edu.

Diversity Statement

We must treat every individual with respect. We are diverse in many ways, and this diversity is fundamental to building and maintaining an equitable and inclusive campus community. Diversity can refer to multiple ways that we identify ourselves, including but not limited to race, color, national origin, language, sex, disability, age, sexual orientation, gender identity, religion, creed, ancestry, belief, veteran status, or genetic information. Each of these diverse identities, along with many others not mentioned here, shape the perspectives our students, faculty, and staff bring to our campus. We, at CMU, will work to promote diversity, equity and inclusion not only because diversity fuels excellence and innovation, but because we want to pursue justice. We acknowledge our imperfections while we also fully commit to the work, inside and outside of our classrooms, of building and sustaining a campus community that increasingly embraces these core values.

Each of us is responsible for creating a safer, more inclusive environment.

Unfortunately, incidents of bias or discrimination do occur, whether intentional or unintentional. They contribute to creating an unwelcoming environment for individuals and groups at the university. Therefore, the university encourages anyone who experiences or observes unfair or hostile treatment on the basis of identity to speak out for justice and support, within the moment of the incident or after the incident has passed. Anyone can share these experiences using the following resources:

- **Center for Student Diversity and Inclusion:** csdi@andrew.cmu.edu, (412) 268-2150
- **Ethics Reporting Hotline**. Students, faculty, and staff can anonymously file a report by calling **844-587-0793** or visiting **cmu.ethicspoint.com**.

All reports will be documented and deliberated to determine if there should be any following actions. Regardless of incident type, the university will use all shared experiences to transform our campus climate to be more equitable and just.

Managing Stress and Obtaining Support

Take care of yourself. Do your best to maintain a healthy lifestyle this semester by eating well, exercising, avoiding drugs and alcohol, **getting enough sleep**, and taking some time to relax. This will help you achieve your goals and cope with stress.

If you experience any academic stress, difficult life events, or feelings like anxiety or depression, we strongly encourage you to seek support. *Consider reaching out to a friend, faculty, or family member you trust for help getting connected to the support that can help*.
On campus, Counseling and Psychological Services (CaPS) is here to help. Contact them at: *412-268-2922; or* http://www.cmu.edu/counseling/

If you or someone you know is feeling suicidal or in danger of self-harm, talk to someone immediately, day or night:

CaPS: 412-268-2922; http://www.cmu.edu/counseling/
TimelyCare at CMU: https://www.cmu.edu/wellbeing/resources/timely-care.html
Resolve Crisis Network: 1-888-796-8226 (1-888-7 YOU CAN)

If the situation is life threatening, call the police:

On campus: CMU Police: 412-268-2323
Off campus: 911