CS 4332: Introduction to Databases

Michael Ekstrand

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Introduction to database concepts, data models, file structures, query languages, database management systems.

Topics we will cover include:

- Modeling data so it can be stored and used effectively
- The relational model and algebra
- Creating databases based on these data models
- Storing, updating, and querying data in a relational database
- Structured Query Language, the standard mechanism for working with relational databases
- Accessing the database from applications
- Transactions and data integrity
- Current directions in databases (NoSQL, distributed storage, key-value stores)

1 Logistics

Credits 3
Prerequisites CS 3358 (Data Structures)
Lectures Thursdays 6:30–9:20 PM in Alkek 147 (San Marcos) and Avery 366 (Round Rock)
Web site

- `http://cs.txstate.edu/~m_e114/f14/cs4332/`
- TRACS

2 Instructor

Michael Ekstrand

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    Avery 464-X (Round Rock)
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Phone 512-245-7523 office, `mdekstrand` Skype
Office Hours

- MW 3–4PM

- Tu 10–11AM
- Th 4–6PM (on days I lecture in Round Rock, these office hours will be at the Round Rock campus; see the class schedule).

- Other times by appointment (in-person or via Lync or Skype)

3   Textbook and Resources

Required Textbook *Concepts of Database Management*, 7th Edition, by Pratt and Adamski (ISBN 978-1-111-82591-1)

Online Resources
- PostgreSQL Reference Manual
- Python-related documentation (for the project):
  - Python and its standard library
  - PsycoPG2 database adapater
  - Flask web framework
- Online Q&A sites - StackOverflow for programming and DBA.SE for database modeling and
administration.

Suggested Reading *Mastering Data Modeling* by Carlis and Maguire

4   Grading

Grading for this class will be as follows:

Component	Count	Contribution
Homework Assignments	5	30%
Group Project	1	30%
Midterm	1	20%
Final Exam	1	20%

Final grades will be no worse than those that would arise from a standard 70-80-90 scale: if you have a total weighted grade of 90/100 points, your grade will be no worse than an A-; likewise, 80 points guarantees you at least a B-.

4.1   Homeworks

There will be 5 homework assignments. These assignments must be completed individually and submitted via TRACS. Please only submit PDF files.

Each homework is due **before lecture** the week it is due (6:30 PM on Thursday).

4.2 Project

There will be a substantial project running for the bulk of the semester. More details will be available by the fourth week of class.

This project will be a group project, with the groups pre-assigned. By default, all members of a group will receive the same project grade; individual grades may be adjusted if there is clear evidence of imbalanced contributions from the members of a team.

4.3 Exams

There will be two exams: a midterm and a final. The final will be comprehensive, but more than half of the exam material will be presented before the midterm.

For exams, you may have a single 8½×11 inch sheet of hand-written notes (two sides).

5 Schedule

Topics in this schedule are tentative. At a high level, we will be focusing on conceptual matters at the beginning of the semester, and increasing the balance towards technical programming as the semester progresses.

The textbook readings are front-loaded into the first half or so of the semester. This will give you more time to work on the project in the later portion of the semester.

I will attempt to keep the online schedule up-to-date as the course progresses.

Week	Lec. Date	Topic	Reading	Due	Site
1	8/28	Intro, History, DB Goals, Data Layout	1, 2		SM
2	9/4	Relational Algebra, Introducing SQL	2,3		RR
3	9/11	SQL Review, Data Design and Normalization	5,6	H1	SM
4	9/18	Design Methodology, Project Introduction			RR
5	9/25	Defining and Creating Data	3,4	H2	SM
6	10/2	Constraints, Integrity, Indexes	4		RR
7	10/9	**Project: Design Review**		P: Design	out
8	10/16	**Midterm**; DBs, Python & the Web			SM
9	10/23			H3	RR
10	10/30	Transactions			SM
11	11/6			H4	RR
12	11/13				SM
13	11/20	Distributed and Trending DBMSes		H5	RR
14	11/27	*Thanksgiving*			
15	12/4	**Project: Presentations**		P: Final	SM
F	12/11	**Final Exam**			

The **Site** column indicates which site I will be lecturing from; I will try to teach from San Marcos and Round Rock about the same number of times. When I am teaching from Round Rock, my Thursday office hours will be in Round Rock.

6 Course Policies

6.1 Attendance

I strongly encourage you to attend all class sessions, but ordinary lecture attendance will not affect your grade. You do need to be present for all exams as well as the project design review and final presentation days.

6.2 Late Work

For the **written assignments**, you have 3 'late days' that you may use throughout the semester at your discretion. Notify the instructor before the assignment's due date if you intend to take a late day; if an emergency arises so that you cannot do so, notify the instructor at your earliest opportunity. Late assignments without late days remaining will receive no credit.

For the **project deliverables**, each deliverable must be submitted on time. Deliverables will be accepted up to 24 hours late with a 25% grade penalty.

The mid-term and final exams will be at the published times. Makeup exams will only be given in exceptional circumstances.

6.3 Cheating and Academic Integrity

As both a programmer and a student, you are expected to do your own work, attribute sources, and respect the legal and moral rights of others with respect to their work; as a student, you are also required to abide by the University honor Code. While I aim to allow you to make reasonable use of resources, cheating (including copying code, using unauthorized resources during tests, etc.) will not be tolerated. If you are found to be cheating, the penalty may range from an F on the assignment to an F on the course, and will also be reported to the university.

6.4 External Resources

You may consult external resources such as other books and web sites for understanding how to solve homework problems or portions of the project. In your assignment solution, list all external resources you used; if they are available online, provide the URL. You do not need to cite the textbook, or the official documentation for the software we are using.

Besides the course forum, you may ask questions related to completing the project on publicly accessible discussion forums such as Stack Overflow, newsgroups, or publicly-archived mailing lists[1]. Provide URLs to the forum discussion on the relevant web site or archive (Google Groups works well for newsgroup archives) with your project deliverable submission. When you ask your question, mention that it is for a course project and

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[1]Sites that require registration, login, and/or payment to view answers, such as Experts Exchange or Quora, do not qualify as publicly-available.

that your instructor permits you to make reasonable use of discussion forums. You may provide a link back to the Course Policies page on the course web site.

Restrict your questions to questions about how to go about a particular sub-portion of the problem, how something works, why something you are trying doesn't work, or other specific difficulties. Do not ask "how do I solve <the problem description>?", or similarly direct translations of the project requirements, or for specific code. Questions should be written to fill in a gap in your understanding that will then enable you to continue your work, not to get a solution to the assignment.

Internet discussion forums other than the TRACS forum are not permitted for homework assignments. If you consult with other students in the class on a homework assignment, list those students' names in your submission.

6.5   Conduct

You are expected to behave in a civil, respectful manner in all class interactions, both in official meetings such as lectures and out-of-classroom activities such as project group meetings and study sessions, and to contribute to a constructive learning environment.

Texas State policy (PPS 4.02) describes general behaviors that are disruptive. In addition, the Hacker School Social Rules are a good source of guidance on how to maintain a constructive and educational environment.

If you experience or witness harassment of any form, please let me know.

6.6   Disability Accommodations

If you need particular accommodations to be able to fully participate in this course, please talk with me as soon as possible. I may ask that you provide documentation from the Office of Disability Services, so if you have such documentation please bring it.