

## CS500 – Fundamentals of Databases

### **Instructor:**

Dr. Sean Grimes

[spg63@drexel.edu](mailto:spg63@drexel.edu)

Office: 3675 Market Street, Rm 1161

Lecture: Thursdays 6pm – 8:50pm on Zoom: --

Office Hours:

Tuesdays 12pm – 2pm (Rm 1161)

Tuesdays 730pm – 830pm (Zoom: --)

By appointment, as needed.

### **Teaching Assistant:**

--

### **Textbook:**

None

### **Course Objectives:**

1. To understand how to organize data for a relational database in a normalized fashion.
2. To understand, deeply, the nuances of creating a database and performing operations on it (selection, updating, deleting, inserting) with an emphasis on sub-queries.
3. You should walk out of this class with the ability to create and work with production-ready databases comfortably.

### **Pre-requisites:**

CS504 [Min Grade: C]

### **Grades & Grading:**

Grading is based 100% on homework assignments, 5 or 6 of them.

### **Incomplete Grade Policy:**

A grade of incomplete (INC) may be considered by the instructor if exceptional circumstances warrant such a course of action. In order to be eligible, you must have successfully completed:

1. All but the final assignment

The full university policy can be found here: [https://drexel.edu/provost/policies-calendars/policies/incomplete\\_grades/](https://drexel.edu/provost/policies-calendars/policies/incomplete_grades/)

### **Handing in Assignments:**

Assignments will be made available on Blackboard and will be due as described in the assignment description. You will never have less than a week to work on an assignment,

and some you will have additional time. The programming assignments **must** be done using SQLite and DBVisualizer.

SQL queries must execute. Queries that do not execute and cannot be tested will receive little to no partial credit.

All submissions must be made through Blackboard, do not send me assignments over email / Discord. All submissions are final, do not submit checkpoints along the way. Multiple submissions will not be allowed.

**Assignment Late Policy:**

Listed individually on each assignment and may differ per assignment depending on if that assignment is built upon by a future assignment or not.

**Academic Honesty:**

The university's Academic Honesty policy is in effect for this course. You can find the policy at <https://drexel.edu/provost/policies-calendars/policies/academic-integrity/>

You must be the sole original author of all assignments and examination solutions in their entirety, unless the instructor explicitly gives you permission to do otherwise in written directions on an assignment or exam. Design and implementation problems should be discussed with the instructor or the teaching assistants only. This means that you should have an implementation plan that leaves enough time for such consultation. As the university's policy explains, penalties up to and including receiving a failing grade for the course with no opportunity to withdraw will be given for first time offenses of plagiarism, fabrication, cheating, or other forms of academic dishonesty. Allowing another student to copy from your work (i.e., helping another student to cheat) is also a violation of the policy on academic dishonesty.

The standards for originality in a program are similar to those of other written works. Programs by different authors show clear and substantial differences as judged by most criteria, including but not limited to choice of variable and procedure names, line spacing and indentation, choice of program structure, choice of algorithms, ordering of modules, style and content of documentation, module design, and ordering and choice of instructions. The original author of an assignment can explain each detail and how they came to create it on their own. Whenever you use references or sources (i.e., the Internet) for “inspiration” in your programs and designs, you must give a complete and proper citation of the source. Copying or close paraphrasing from other sources and claiming it is your own original work is a violation of the academic honesty policy.

It is your responsibility to avoid violating the university's policy. If you are unclear as to what the policy means in a particular situation, ask the instructor for clarification before you hand anything in.

In addition, be clear that if you electronically copy another person's work and submit it as your own you are in violation of this policy and could be failed for the course on the first occurrence. If you solicit and/or hire someone to do your work, even if the work is not complete, you are in a violation of this policy and could be failed for the course on the first occurrence. Any violation of this policy may also result in the matter being handed over to an external judiciary panel. Do not let this happen to you.

ChatGPT and other generative AI (or related) tools are **not** allowed for use in this course.

### **Student Accommodations:**

In compliance with the Americans with Disabilities Act of 1990, Section 504 of the Rehabilitation Act of 1973, and Drexel University's policies and procedures, the University is committed to the non-discrimination of students with disabilities.

Students requesting accommodations due to a disability at Drexel University need to request a current Accommodations Verification Letter (AVL) in the ClockWork database before accommodations can be made. These requests are received by Disability Resources (DR), who then issues the AVL to the appropriate contacts. For additional information, visit the DR website at <https://drexel.edu/disability-resources/supportaccommodations/student-family-resources/> or contact DR for more information by phone at 215-895-1401, or by email at [disability@drexel.edu](mailto:disability@drexel.edu)

### **Other Important Academic Policies:**

In addition to the course policies listed on this syllabus, the following University policies are in effect in this course:

- Academic Integrity: <https://drexel.edu/studentlife/community-standards/code-ofconduct/academic-integrity-policy/>
- Official Final Exam Schedule: <http://www.drexel.edu/registrar/scheduling/exams/>
- Course Drop Policy: <http://www.drexel.edu/provost/policies/course-add-drop/>
- Course Withdrawal Policy:  
<https://drexel.edu/provost/policiescalendars/policies/course-coop-withdrawal/>
- Absence from class due to University sponsored activities:  
<https://drexel.edu/provost/policies-calendars/policies/absence/>
- Student athletes who will miss class due to an athletic event (game, tournament trip, etc.) must provide the course instructor with an official letter from the Drexel Department of Athletics that outlines the dates and times of their absence due to the sporting event(s).
- Drexel Student Learning Priorities:  
<https://drexel.edu/institutionalresearch/assessment/outcomes/dslp/>

### **Attendance:**

The Higher Education Act of 1965 requires institutions of higher education to verify that students receiving financial aid have begun Initial Course Participation (ICP). ICP refers to the students' attendance in class during the term for which they are receiving financial aid.

Class attendance is critical to your success as a student. Missing classes may impact your class success and federal financial aid.

**Content:**

Week 1 – Set Theory (June 27<sup>th</sup>)

1. Relations
2. Domains
3. Tuple Notation
4. Query Language

**Homework Assignment #1, Due Thursday July 4<sup>th</sup>, 6pm**

Week 2 – No Class (July 4<sup>th</sup>) [Independence Day]

**Note: HW1 is still due by 6pm!**

Week 3 – Normalization & DB Creation (July 11<sup>th</sup>)

1. Discuss HW1
2. 1<sup>st</sup> normal form
3. 2<sup>nd</sup> normal form
4. 3<sup>rd</sup> normal form
5. Additional comments on normal form
6. Real world creation of a data model
  - a. Primary keys
  - b. Foreign keys
7. DB Visualizer
  - a. Creating a DB connection
  - b. Creating tables via a GUI
  - c. Primary keys
  - d. Foreign keys
  - e. References
8. Creating tables via code
9. Inserting data via GUI
10. Importing data via GUI
11. Inserting data via code
12. Creating tables from external data sources
13. ALTER
14. AUTOINCREMENT
15. Viewing data in DB Visualizer

**Homework Assignment #2, Due Sunday July 21<sup>st</sup>, 11:59pm**

Week 4 – Introduction to SQL (July 18<sup>th</sup>)

1. Database terminology
2. Versions of SQL – compatibility and related issues
3. SELECT

- a. Field Lists, \*
  - b. DISTINCT
  - c. WHERE clause
  - d. =, ==, !=, <>, >, <, >=, <=, !<, !>
  - e. IS NULL, IS NOT NULL
  - f. AND, BETWEEN, EXISTS, IN, NOT IN, LIKE, GLOB, NOT, OR
  - g. Wildcards
4. ORDER BY
  5. LIMIT
  6. INNER JOIN, NATURAL JOIN, FULL OUTER JOIN, LEFT JOIN, RIGHT JOIN
  7. ALIASES
  8. COALESCE
  9. Arithmetic functions: +, -, /, \*, round, random
  10. CASE WHEN THEN ELSE
  11. Handling dates: e.g. julianday()

#### Week 5 – Building a Custom Data Model (July 25<sup>th</sup>)

1. Category / Subcategory example
2. Select a domain
3. Start on development of domain

**Homework Assignment #3, Due August 4<sup>th</sup>, 11:59pm**

#### Week 6 – SQL Part 2 (August 1<sup>st</sup>)

1. Aggregate functions
2. GROUP BY
3. HAVING
4. DELETE
5. UPDATE

**Homework Assignment #4, Due August 11<sup>th</sup>, 11:59pm**

#### Week 7 – Sub Queries (August 8<sup>th</sup>)

1. IN
2. Use of aliases in sub-queries
3. Transposing rows and columns
4. Insert from another table
5. EXISTS, NOT EXISTS
6. ROWID and RANDOM for selecting rows
7. CREATE TABLE from another table
8. DELETE
9. UNION
10. EXCEPT
11. Reviewing custom data model

**Homework Assignment #5, Due August 28<sup>th</sup>, 11:59pm**

**NO LATE SUBMISSIONS ACCEPTED!!**

Week 8 – Miscellaneous Topics (August 15<sup>th</sup>)

1. Indices
2. Vacuum
3. Truncate
4. Views
5. String functions
6. ACID
7. Transactions
8. Additional sub-query practice
9. Review HW #4

Week 9 – TBD (August 22<sup>nd</sup>)

Week 10 – Review HW#5 (August 29<sup>th</sup>)

**NO FINAL EXAM!**