CSCI 455: Database Systems
Course Syllabus – Fall 2016

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Office Hours: TBD, open door or by appointment

Meeting Times: MWF 15:00 - 15:50 in TH 409  
Course Page: http://cs.pugetsound.edu/~dchiu/cs455  
Slack: http://univpugetsound.slack.com (signup with your pugetsound.edu address)  
Moodle: http://moodle.pugetsound.edu

1 Course Information

The management of data is one of the classical problems in computer science. This course is centered around the relational model, which is seminal in addressing the numerous issues that plague data management, including data independence, access, consistency, and information loss. Topics include the relational model, database languages (such as relational algebra and SQL), relational database theory and normalization (a systematic approach for database design), and considerations that influence database system performance. Students gain experience by implementing important data structures and algorithms that are commonly used in modern database systems, as well as writing programs that require database integration.

Prerequisites

A grade of C- and above in the following courses is required:
- CSCI 261 - Computer Science II
- MATH 210 - Introduction to Mathematics of Computer Science

Textbook

Required: Silberschatz, Korth, and Sudarshan, Database System Concepts. 6th Ed.

Course Topics

- Relational Model
- Relational Algebra
- Structured Query Language (SQL)
- Dynamic Web Programming
- Relational Database Theory and Normalization
- Disk Performance Analysis
- File Organization
- Hashing and Indexing
2 Course Outcomes

Students taking this course will:

- Analyze system/user requirements to prepare relational schema.
- Use normal forms and perform normalization in the design and implementation of a relational database.
- Analyze and solve problems related to external memory data structures and algorithms using suitable mathematics.
- Evaluate the merits among various file organization and indexing designs, with respect to space and time complexity.
- Design, code, test and debug programs which perform query and update transactions on a database in a team-based environment.

3 Grading

The following grade cutoffs are upper bounds - they might come down, but will not be set higher: A = 95, A- = 90, B+ = 87, B = 83, B- = 80, C+ = 77, C = 73, C- = 70, D+ = 67, D = 64, D- = 60, F = < 60. Your overall grade will be composed as follows:

<table>
<thead>
<tr>
<th>Component</th>
<th>% Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Discretionary</td>
<td>5</td>
</tr>
<tr>
<td>Homework</td>
<td>30</td>
</tr>
<tr>
<td>Team Project</td>
<td>25</td>
</tr>
<tr>
<td>Midterm I</td>
<td>10</td>
</tr>
<tr>
<td>Midterm II</td>
<td>13</td>
</tr>
<tr>
<td>Final Exam</td>
<td>17</td>
</tr>
</tbody>
</table>

Table 1: Breakdown of Grades

Assignments

- **Homework Assignments (Work Alone!)** – You will work alone on all homework assignments. Collaboration among students is encouraged for problem interpretation, brainstorming, etc., but in general, I expect every student to submit their own work. **Do not help write or share each other’s answers or code!** Duplications are easy to catch, even at this level, and the penalty for cheating is harsh: course failure.

- **Team Projects** – There will be four projects, starting with basic SQL usage to building a robust database-driven website. Project descriptions can be downloaded from the course page.

- **Late Work** – For each day either a homework or project assignment is late (includes weekends), a 10% deduction will be assessed, and no late work will be accepted one week after the due date.

Exams

There will be two midterms and a final exam, which are all cumulative. They will cover material discussed in the lectures, readings, and assignments.
Discretionary Points

Discretionary points will be given based on your...

- Attendance
- Class participation
- Turning in all assignments on time
- Refrain from activities that can disrupt others, e.g., texting, playing games on your laptop, etc.

4 Policies

Class Disruptions

I understand the student’s need to have their phone on them to answer the occasional important call. I do ask that you please have your phones on vibrate and take the call outside the classroom out of respect for your fellow students.

Academic Integrity

You should be aware of the Student Integrity Code at the university. Any suspected cheating (e.g., plagiarizing code, copying homework solutions, etc.) will be reported to the Registrar, which may result in possible suspension/expulsion. See this link for more info:

Student Accessibility and Accommodation

If you have a physical, psychological, medical or learning disability that may impact your course work, please contact Peggy Perno, Director of the Office of Accessibility and Accommodation, 105 Howarth, 253.879.3395. She will determine with you what accommodations are necessary and appropriate. All information and documentation is confidential.

Classroom Emergency Response Guidance

Please review university emergency preparedness and response procedures posted at . There is a link on the university home page. Familiarize yourself with hall exit doors and the designated gathering area for your class and laboratory buildings.

If building evacuation becomes necessary (e.g. earthquake), meet your instructor at the designated gathering area so she/he can account for your presence. Then wait for further instructions. Do not return to the building or classroom until advised by a university emergency response representative.

If confronted by an act of violence, be prepared to make quick decisions to protect your safety. Flee the area by running away from the source of danger if you can safely do so. If this is not possible, shelter in place by securing classroom or lab doors and windows, closing blinds, and turning off room lights. Lie on the floor out of sight and away from windows and doors. Place cell phones or pagers on vibrate so that you can receive messages quietly. Wait for further instructions.
Student Bereavement Policy

The University of Puget Sound recognizes that a time of bereavement can be difficult for a student. Therefore, the university provides a Student Bereavement Policy for students facing the loss of a family member. Students are normally eligible for, and faculty members are expected to grant, three consecutive weekdays of excused absences, without penalty, for the death of a family member, including parent, grandparent, sibling, or persons living in the same household. Should the student feel that additional days are necessary, the student must request additional bereavement leave from the Dean of Students or the Dean’s designee. In the event of the death of another family member or friend not explicitly included within this policy, a bereaved student may petition for grief absence through the Dean of Students office for approval.

5 Course Schedule

The following course schedule is tentative and subject to change.

<table>
<thead>
<tr>
<th>Week</th>
<th>Topics</th>
<th>Reading</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Course overview, the relational model, set theory</td>
<td>Silberschatz, et al.: Chap 1</td>
</tr>
<tr>
<td>2</td>
<td>Relational model (cont.), start relational algebra</td>
<td>Silberschatz, et al.: Chap 2</td>
</tr>
<tr>
<td>3</td>
<td>Relational algebra</td>
<td>Silberschatz, et al.: Chap 6.1</td>
</tr>
<tr>
<td>4</td>
<td>SQL</td>
<td>Silberschatz, et al.: Chap 3</td>
</tr>
<tr>
<td>5</td>
<td>SQL (cont.), start web programming</td>
<td>Silberschatz, et al.: Chap 3</td>
</tr>
<tr>
<td>6</td>
<td>Review and Midterm I</td>
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<tr>
<td>7</td>
<td>Web programming</td>
<td>Notes provided</td>
</tr>
<tr>
<td>8</td>
<td>Fall break; relational database theory</td>
<td>Silberschatz, et al.: Chap 8</td>
</tr>
<tr>
<td>9</td>
<td>Theory (cont.), start disk performance analysis</td>
<td>Silberschatz, et al.: Chap 8</td>
</tr>
<tr>
<td>10</td>
<td>File organization, start indexing</td>
<td>Silberschatz, et al.: Chap 10.1 - 10.6</td>
</tr>
<tr>
<td>11</td>
<td>Review and Midterm II</td>
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<tr>
<td>12</td>
<td>Indexing: B⁺Trees, start bitmaps</td>
<td>Silberschatz, et al.: Chap 11</td>
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<tr>
<td>13</td>
<td>Indexing: Bitmaps; Thanksgiving Break</td>
<td>—</td>
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<tr>
<td>14</td>
<td>Hashing: static and dynamic</td>
<td>Silberschatz, et al.: Chap 11</td>
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<tr>
<td>15</td>
<td>Review and reading period</td>
<td>—</td>
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