CSC315 Database System Syllabus

Instructor Information

Instructor Email Office Location & Hours

Jun Rao Jun.Rao@csi.cuny.edu 5N-220 Mo & We 1:20PM-3:200PM

Description

This course is on the design and implementation of database management systems. Topics include data models (relational, document, key/value), storage models (n-ARY, decomposition), query languages (SQL, stored procedures), storage architectures (heaps, log-structured), indexing (order preserving trees, hash tables), transaction processing (ACID, concurrency control), recovery (logging, checkpoints), query processing (joins, sorting, aggregation, optimization), and parallel architectures (multi-core, distributed). Case studies on open-source and commercial database systems are used to illustrate these techniques and tradeoffs. The course is appropriate for students that are prepared to flex their strong systems programming skills.

Expectations and Goals

This is an upper-level course on the internals of database management systems. This course has a heavy emphasis on programming projects. There are also readings assigned for each class, homework, and two exams. Upon successful completion of this course, the student should be able to:

- Use relational algebra to express database queries.
- Use SQL to interact with database management systems.
- Design appropriate database tables, using functional dependencies and normal forms.
- Implement a disk-oriented database storage manager with table heaps and indexes.
- Understand, compare, and implement the fundamental concurrency control algorithms.
- Implement database recovery algorithms and verify their correctness.

- Identify trade-offs among database systems techniques and contrast distributed/parallel alternatives for both on-line transaction processing and on-line analytical workloads.
- Interpret and comparatively criticize database system architectures.

Textbook

Database System Concepts ISBN 9780078022159



Required Materials

- You must know the C programming language
- It is wise have some basic knowledge in assembly language
- You should have a Linux operating system, free to install from the internet

Additional Information and Resources

Grading Policy:

The Grade in this course will be based on a mid-term exam, a final exam, discussion, and class participation. No extra credit.

Discussion: 20% & Homework: 20%

• Class Participation: 10%

Midterm: 20%Final: 30%

Grades will be assigned using the weighted sum described above using this scale:

 $A \ge 90\%$, $B \ge 80\%$, $C \ge 70\%$, $D \ge 60\%$

CSI's policy on plagiarism

https://csicuny.smartcatalogiq.com/en/current/Undergraduate-Catalog/Academic-Policies-andProcedures/Academic-Integrity-Plagiarism-and-Cheating

Class Schedule

Depending on how quickly we're able to cover various topics, we may proceed more quickly or more slowly than the syllabus indicates

Date Topics O1/25 Wednesday Introduction (R&G Chapter 1) O1/30 Monday The Entity-Relationship Model (R&G Chapter 2) O2/01 Wednesday Relational Model (R&G Chapter 3) O2/06 Monday Relational Algebra (R&G Chapter 4) O2/08 Wednesday Relational Calculus (R&G Chapter 4) O2/13 Monday College Closed O2/15 Wednesday Discussion1: ER + Formal Q.L. O2/20 Monday College Closed O2/21 Tuesday No Class O2/22 Wednesday SQL (Part 1) (R&G Chapter 5) O2/27 Monday SQL (Part 2) (R&G Chapter 5-6) O3/01 Wednesday Discussion2:SQL O3/06 Monday Storing Data - Disks, Buffers, and Files (R&G Chapter 9) O3/08 Wednesday Tree-Structured Indexes (R&G Chapter 10) O3/13 Monday Discussion3: Indexing O3/20 Monday Discussion4: Review1 O3/21 Monday Explain the Question on Exam1 O3/27 Monday Explain the Question on Exam1 O3/29 Wednesday Hashing (R&G Chapter 11) O4/03 Monday Relational Operators (R&G Chapter 12/14) O4/17 Monday Relational Operators (R&G Chapter 12/14) O4/19 Wednesday Discussion5: Query Processing O4/24 Monday Query Optimization O5/01 Monday Discussion: Final Review1 O5/03 Wednesday Discussion: Final Review1 O5/10 Wednesday Discussion: Final Review2	more quickly or more slowly than the syllabus indicates							
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