

# **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 trade-offs. The course is appropriate for students that are prepared to flex their strong systems programming skills.

## **Expectations and Goals**

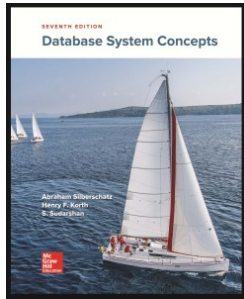
This is an upper-level course on the internals of database management systems. This course has a heavy emphasis on programming projects. There are also readings assigned for each class, homework, and two exams. Upon successful completion of this course, the student should be able to:

- 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  $\geq$  90%, B  $\geq$  80%, C  $\geq$  70%, D  $\geq$  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
01/25 Wednesday	Introduction (R&G Chapter 1)
01/30 Monday	The Entity-Relationship Model (R&G Chapter 2)
02/01 Wednesday	Relational Model (R&G Chapter 3)
02/06 Monday	Relational Algebra (R&G Chapter 4)
02/08 Wednesday	Relational Calculus (R&G Chapter 4)
02/13 Monday	<b>College Closed</b>
02/15 Wednesday	<b>Discussion1: ER + Formal Q.L.</b>
02/20 Monday	<b>College Closed</b>
02/21 Tuesday	<b>No Class</b>
02/22 Wednesday	SQL (Part 1) (R&G Chapter 5)
02/27 Monday	SQL (Part 2) (R&G Chapter 5-6)
03/01 Wednesday	<b>Discussion2:SQL</b>
03/06 Monday	Storing Data - Disks, Buffers, and Files (R&G Chapter 9)
03/08 Wednesday	Tree-Structured Indexes (R&G Chapter 10)
03/13 Monday	<b>Discussion3: Indexing</b>
03/15 Wednesday	File Organizations & Indexing (R&G Chapter 8)
03/20 Monday	<b>Discussion4: Review1</b>
03/23 Wednesday	<b>Mid-term Exam</b>
03/27 Monday	Explain the Question on Exam1
03/29 Wednesday	Hashing (R&G Chapter 11)
04/03 Monday	External Sorting & Query Evaluation
04/05-04/13	<b>Spring Break</b>
04/17 Monday	Relational Operators (R&G Chapter 12/14)
04/19 Wednesday	<b>Discussion5: Query Processing</b>
04/24 Monday	Query Optimization
04/26 Wednesday	Normalization
05/01 Monday	Normalization
05/03 Wednesday	<b>Discussion: Query Optimization</b>
05/08 Monday	<b>Discussion: Final Review1</b>
05/10 Wednesday	<b>Discussion: Final Review2</b>
05/15 Monday	<b>No Class</b>
05/17 Wednesday	<b>Final Exam</b>

