NYU – TANDON SCHOOL OF ENGINEERING
CS-GY 6083 - B, Fall 2021

Principles of Database Systems

Course Prerequisites: **Good programming skills, familiarity with basics of operating systems (incl. file systems, caching, locking, and concurrency), and knowledge of basic algorithms and data structures (incl. sorting, heaps, search trees, and hashing). Formally, you need to have taken a course on data structures or algorithms, and a course on operating systems, at the graduate or undergraduate level, or have permission from the instructor.**

Instructor: **Prof. Amit Patel (asp13@nyu.edu)**

Instruction Mode: **In-Person**

Class location: **NYU – JAB (Jacob Academic Bldg.), Room# 475,**
6 Metro Tech Center, Brooklyn, NY

Class Schedule: **09/11/2021 to 12/18/2021 (Saturdays),**
Time: 11:00AM to 1:30PM

Course Textbook: **Database System Concepts,**
A. Silberschatz, H. Korth, S. Sudarshan
McGraw-Hill, 2010.
ISBN-10:0073523321
ISBN-13: 9780073523323
(You may also use the 4th or 5th edition if those are cheaper or easier to get.)

Grading Policy: **Four Problem sets (each 5%): 20%. Project: 30%. Midterm exam: 20%. Final exam: 30%.**

General Information: **The course aims to give a broad introduction to relational database systems, including the relational data model, query languages, index and file structures, query processing and optimization,**

concurrency and recovery, transaction management, and database design, plus optional material if time permits. The workload of the course is expected to be above average, and class attendance is strongly recommended.

Policy on Academic Dishonesty:

Please see the schools policy on academic dishonesty on our schools website at,

https://engineering.nyu.edu/sites/default/files/2018-06/code-conduct2-2-16.pdf

Common examples of misconduct include cheating, fabrication, plagiarism, and/ or unauthorized collaboration. Students are expected to work on their own, with the possible exception of group projects if allowed by the Professor. Students may discuss work with other individuals either in the class or outside the class, but they may not reuse code, results, or text received or retrieved from any source unless clearly disclosed in their submissions. Any student who is found to be violating this policy will be given a failing grade for the work and will be reported to the authorities, including the CSE department's student records, as described in the University's Student Code.

Moses Center Statement of Disability:

If you are a student with a disability who is requesting accommodations, please contact New York University's Moses Center for Students with Disabilities (CSD) at 212-998-4980 or mosescsd@nyu. edu. You must be registered with CSD to receive accommodations. See http://www.nyu.edu/students/communities-and-groups/students-with-disabilities.html for information about the Moses Center. The Moses Center is located at 726 Broadway on the 2nd and 3rd floors.

Programming Assignments:

In addition to written problems, there will also be one or two programming assignments as part of the homework, plus a two-part project using a database system of your choice:

1. Programming Assignments: How to use a DBMS, create schemas, pose queries, implement indexes, and manage recovery

2. Project Part I: Designing a complex schema and queries for the given business case

3. Project Part II: implementing a web-based application based upon the schema and scenario from Part1 using relational database systems such as MySQL, Oracle, or any other relational database systems, typically with PHP (recommended, but student can use any other web-based application that can be interfaced with relational database systems.)

Students can perform the course project individually or in group of maximum two students.

Assignment guidelines: **All assignments (whether graded or ungraded) are mandatory. Students are required to participate in discussion forums for collaborative and peer-to-peer learning. Student will have opportunity to earn 5% of extra credit for their effective course participation towards class sessions, and ungraded assignments. Earned credit will be applied towards final exam.**

All assignments must be submitted to NYU Brightspace Course website as instructed, on or before assignment deadlines. NO assignment submission will be accepted by email.

For each day in assignment submission delay beyond the deadline, there will be 10% of score deduction penalty.

Course Outline (tentative)

1. Introduction and Basics (Chapters 1 to 2 and 6) (weeks 1-2-3)

- **(a) Overview**
- **(b) Rationale for Database Systems**
- **(b) Relational Model**
- **(c) Relational Algebra**
- **(d) Relational Calculus**

2. Database and Application Design (Chapters 7 to 9) (weeks 4-5-6)

- **(a) Intro to the ER Model**
- **(b) Relational Design and Normal Forms**
- **(c) Application Development**

3. Relational Queries (Chapters 3 to 5) (weeks 7-8-10)

- **(a) Basic SQL**
- **(b) Advanced SQL**
- **(c) Integrity Constraints**

Midterm Exam: (Tentative: Sat., Nov. 6th^{th,} 2021) (at Week 9)

4. Storage and Indexing (Chapters 10 and 11) (weeks 11)

- **(a) Disk Models**
- **(b) External Sorting**
- **(c) Disk and File Organization (d) Indexing**

5. Query Processing (Chapters 12 and 13) (week 12)

- **(a) Query Evaluation**
- **(b) Query Optimization**

6. Transaction Management (Chapters 14 to 16) (weeks 13-14)

- **(a) Transactions**
- **(b) Concurrency Control**
- **(c) Recovery**

Group Project Demo: Week of 11th Dec., 2021

Final Exam: (Cumulative Exam, Tentative: Sat., Dec 18th, 2021)