New York University Tandon School of Engineering
Computer Science and Engineering Department
Course Outline

CS-UY 3083 Introduction to Database Systems

Spring 2020

Mon/Wed 9:00 to 10:20am, JAB 475

Professor Frankl
370 Jay Street, Room 859
Phone: 646-997-3870
To contact professor:
post questions to course Piazza page
or: mailto: pfrankl@nyu.edu
(If you e-mail include CS-3083 in the subject line!!!)

Office hours: TBD; other times by appointment.
To make an appointment, send e-mail, including a few times when you're available. **Remember to include your name. Please put "CS 3083" in the subject line.** Or, just drop by my office; if I'm free I'll meet with you on the spot.
TAs: TBD
TA office hours : TBD

Course Pre-requisites : CS 1134 (Data Structures and Algorithms), C- or better; CS 2124 (Object Oriented Programming), C- or better; and MA 2314 (Discrete math).

Course Description This course introduces database systems and their approach as a mechanism to model the real world. The course covers data models (relational, entity-relationship), database design, query languages, indexing, query processing, and transaction management techniques.

Course Objectives :
1. Gain understanding of data modeling techniques and ability to design relational databases
2. Learn to use SQL to create database tables, modify their contents, and execute queries.
3. Develop ability to design and implement a moderately complex web-based database application program.
4. Understand how database management systems work, including indexing techniques, query processing algorithms, and transaction management techniques.

Course Structure
Most of the material will be presented in lectures. Reading assignments from the text book and weekly or bi-weekly homework assignments will reinforce this material. Students will be required to learn to use a database management system and to write web application code through self-study; pointers to resources and some basic instruction for this will be provided. *Lecture notes and announcements will be posted on NYU-Classes or Piazza. Please check frequently for updates. Homework assignments will be posted on GradeScope.*

Readings
The recommended text for the course is:
Database System Concepts
Seventh Edition

Avi Silberschatz, Henry F. Korth , S. Sudarshan
McGraw-Hill
ISBN 9780078022159
http://www.db-book.com/
Copies are on reserve in the library.
The vast majority of the material covered in the course is also in the 6th edition
ISBN 0-07-352332-1

Please refer to the tentative schedule below and updates, thereof, and read the referenced sections of the text book before and/or after the corresponding lectures. There is some material that is covered in those textbook sections that will not be covered in the lectures. Exam questions will be drawn from topics covered in the lectures or the assignments; when reading the textbook after lectures, you may skim or skip topics that were not addressed in lectures, unless otherwise noted.

Course requirements

Tests: There will two midterm exams and a cumulative final exam.

Course project: A programming project involving design and implementation of a web database application. This will require substantial effort. The project will include design, implementation, and testing of application code for business logic and user interface. Implementation in Python, PHP, C#, or Java with MySQL or Oracle. (Other host languages or DBMS may be allowed, but please check with me first.)

You will be responsible for mastering enough SQL, HTML, and Python/Flask (or other acceptable host language) to allow you to do this project. An overview of Python Web/Database modules will be presented in online lectures, but self-study will also be expected. You may do the project alone or with one or two classmates.

The project will be done in four parts through the semester and will be based on specifications provided. In some cases you will use solutions provided for earlier parts as the basis for later parts.

Homework assignments will reinforce the material covered in the lectures and in the text book. Some will be "paper and pencil" exercises and some will involve programming in SQL. *Although these count directly for only a small percentage of your grade, it is essential that you do them and understand the solutions.* You may work with on some of the homework assignments (to be specified), but be sure that you understand all the material. *It is unlikely that you will do well on the exams and the project if you do not understand how to solve problems like the homework exercises. Many of the exam questions will be based concepts from the homework assignments.*

Grading: Your grade will be based primarily on your scores on the exams and the course project.

Grades will be computed roughly as follows:

- Exam grade = weighted average of three exams with weights 0.38, 0.34, 0.28 for your best, middle, and worst exams, respectively.
- Final score = max((0.25*project + 0.65*(exam grade) + 0.10*homework, 0.05*(attendance)+ 0.25*project + 0.60*(exam grade) + 0.10*homework)

The cut-offs for A-, B-, and C- will be at least 90, 80, and 70, respectively; they may be lower; in other words if you get 90% you will get at least an A-, etc.

Tentative Schedule

lecture num	date	topic	textbook readings (6th edition)	textbook readings (7th edition)	assignment due (tentative)
1	Mon Jan 27	Intro	chapter 1	chapter 1	
2	Wed Jan 29	Entity-Relationship Model	7.1 to 7.5	6.1 to 6.6	
3	Mon Feb 3	ER continued	"	"	
4	Wed Feb 5	Relational Model	chapter 2	chapter 2	HW0
5	Mon Feb 10	ER to relational	7.6 to end of chapter 7	6.7 to end of chapter 6	
6	Wed Feb 12	SQL intro, including joins	chapter 3	3.1 to 3.4, 4.1	HW1: ER designs
	Mon Feb 17	PRESIDENTS DAY	NO CLASS		
7	Wed Feb 19	SQL,: joins, views, set operations, aggregation	4.2, 3.5 to 3.7	4.2, 3.5 to 3.7	HW2 : relational algebra and elementary SQL
8	Mon Feb 24	SQL more complex subqueries	3.8, 3.9	3.8, 3.9	
9	Wed Feb 26	SQL database modifications, transactions	3.9, 4.3	3.9, 4.3	project 1
10	Mon Mar 2	REVIEW / Q&A			HW 3: SQL incl joins and aggregation
11	Wed Mar 4	**Midterm 1**	covers chapters 7, 2, and part of 3; HWs 1 -- 3	covers chapters 6, 2, and part of 3; HWs 1 -- 3	
12	Mon March 9	application development	5.1, 9.1, 9.2, 9.3	5.1, 9.1, 9.2, 9.3	project 2
13	Wed Mar 11	Web application development with Flask	online example + videos		
	Mon Mar 16	**Spring Break**	No class		
	Wed Mar 18	**Spring Break**	No class		

14	Mon Mar 23	Relationl DB design, normalization	corresponding parts of chapter 8.1, 8.3, 8.5, 8.8 : note that order is a bit different than in 7th ed.	7.1 -- 7.3.1, 7.5.1	
15	**Wed Mar 25**	Relationl DB design, normalization		7.8, 7.9, 7.3.4	HW 4 : SQL incl subqueries
16	Mon Mar 30	TBD			
17	Wed Apr 1	Review/ Q&A			HW 5: normalization
	Fri Apr 3	**midterm grades due**	**last day to withdraw with W grade'**		Project 3 (milestone)
19	Mon Apr 6	**Midterm 2**	covers material through HW 5		
20	Wed Apr 8	storage	chapter 10 (overview)	chapter 12 (overview)	Update Project Progress Report
21	Mon Apr 13	indexing	11.1, 11.2, 11.3, 11.6,.11.8		
22	Wed Apr 15	indexing	11.1, 11.2, 11.3, 11.6,.11.8		Update Project Progress Report
23	Mon Apr 20	query processing	12.1 - 12.3	15.1 to 15.3	
24	**Wed Apr 22**	transactions	14.1 to 14.7, 14.10	17.1 to 17.7, 17.10	Final Project Due **Sunday April 26**
	Mon Apr 27	concurrency	15.1, 15.2, 15.4	18.1, 18.2, 18.5	project demos/testing sessions by apointment, April 27 -- May 8
25	Wed Apr 29	concurrency, continued	15.1, 15.2, 15.4	18.1, 18.2, 18.5	HW 6: indexing and query processing
26	Mon May 4	misc SQL or TBD	4.4 to end of chapter 4	4.4 to end of chapter 4	
27	Wed May 6	misc SQL or TBD	more of chapter 5 if time permits	more of chapter 5 if time permits	HW 7: concurrency
28	Mon May 11	review			
	Tues May 12	**Reading Day**			
	Wed May 13 - Tues May 18	**Final Exam -- Date tbd**	**covers whole semester**		

Moses Center Statement of Disability
If you are student with a disability who is requesting accommodations, please contact New York University's Moses Center for Students with Disabilities at 212-998-4980 or mosescsd@nyu.edu. You must be registered with CSD to receive accommodations. Information about the Moses Center can be found at www.nyu.edu/csd. The Moses Center is located at 726 Broadway on the 2nd floor. *Please do this at the start of the semester.*

Policy on Academic Dishonesty:
Please review the NYU School of Engineering Policy on Academic Dishonesty
https://engineering.nyu.edu/sites/default/files/2018-06/code-conduct2-2-16.pdf
as well as other policies, including the procedure for excusing an absence due to medical problems: https://engineering.nyu.edu/campus-and-community/student-life/office-student-affairs/procedures-policies-and-forms

In this class, you *may* work on homework assignments with groups of up to 3 students, unless the assignment explicitly states another policy. If you do so, the names of all members of the group should be included at the top of each file you hand in and work should be handed in using GradeScope's group handin option. Only one copy per group should be handed in. You may work on the course project with a partner or a three person team, but each person on the team must demonstrate that they've done a substantial part of the implementation. The project grade will be a combination of a team grade and an individual grade. You may use or adapt publicly available code in your project (such as templates for generating html or sample code distributed to the class), but you may **NOT** copy from other students, copy from previous years' course projects, or outsource any of the assigned course work to a third party.

NYU School of Engineering Policies and Procedures on Academic Misconduct
A. Introduction: The School of Engineering encourages academic excellence in an environment that promotes honesty, integrity, and fairness, and students at the School of Engineering are expected to exhibit those qualities in their academic work. It is through the process of submitting their own work and receiving honest feedback on that work that students may progress academically. Any act of academic dishonesty is seen as an attack upon the School and will not be tolerated. Furthermore, those who breach the School's rules on academic integrity will be sanctioned under this Policy. Students are responsible for familiarizing themselves with the School's Policy on Academic Misconduct.

B. Definition: Academic dishonesty may include misrepresentation, deception, dishonesty, or any act of falsification committed by a student to influence a grade or other academic evaluation. Academic dishonesty also includes intentionally damaging the academic work of others or assisting other students in acts of dishonesty. Common examples of academically dishonest behavior include, but are not limited to, the following:
1. Cheating: intentionally using or attempting to use unauthorized notes, books, electronic media, or electronic communications in an exam; talking with fellow students or looking at another person's work during an exam; submitting work prepared in advance for an in-class examination; having someone take an exam for you or taking an exam

for someone else; violating other rules governing the administration of examinations.
2. Fabrication: including but not limited to, falsifying experimental data and/or citations.
3. Plagiarism: intentionally or knowingly representing the words or ideas of another as one's own in any academic exercise; failure to attribute direct quotations, paraphrases, or borrowed facts or information.
4. Unauthorized collaboration: working together on work that was meant to be done individually.
5. Duplicating work: presenting for grading the same work for more than one project or in more than one class, unless express and prior permission has been received from the course instructor(s) or research adviser involved.
6. Forgery: altering any academic document, including, but not limited to, academic records, admissions materials, or medical excuses.