CAS CS 460: Introduction to Database Systems  
Boston University, Spring 2019  

Syllabus

Description
This course covers the fundamental concepts of database systems. Topics include data models (ER, relational, and others); query languages (relational algebra, SQL, and others); implementation techniques of database management systems (index structures, concurrency control, recovery, and query processing); management of semistructured and complex data; distributed and noSQL databases.

Prerequisites
CAS CS 112, or the equivalent

Instructor
David G. Sullivan, Ph.D. (dgs@cs.bu.edu, PSY 228D, 64 Cummington Mall)  
See the course website for the schedule of instructor, TF and CA office hours.

Teaching Fellow
Craig Einstein (einstein@bu.edu)

Meeting Times and Places
lecture: MWF, 1:25-2:15 pm, KCB 101  
lab: a weekly, one-hour session; see your schedule for the time and location

Course Website:  [http://www.cs.bu.edu/courses/cs460](http://www.cs.bu.edu/courses/cs460)

Requirements and Grading
1. Five problem sets, including a combination of written exercises and programming problems (25% of the final grade)  
2. Midterm exam (25%) and a final exam (40%)  
3. Preparation and participation (10%)

To pass the course, you must earn a passing grade for each of these three components.

Course Materials

In-class software: We will be using Piazza for in-class activities and attendance; it will also be used as our course discussion site. More detail will be provided in class.
Collaboration Policy
You are strongly encouraged to collaborate with one another in studying the lecture materials and preparing for quizzes and exams.

Problem sets will primarily involve individual-only problems that you must complete on your own. We may occasionally include a pair-optional problem that you may complete either alone or with a partner.

For both types of problems, you may discuss ideas and approaches with others (provided that you acknowledge this in your solution), but such discussions should be kept at a high level, and should not involve actual details of the code or of other types of answers. You must complete the actual solutions on your own (or, in the case of a pair-optional problem, with your partner if you choose to use one).

Rules for working with a partner on pair-optional problems:
- You may not work with more than one partner on a given assignment. (However, you are welcome to switch partners between assignments.)
- You may not split up the work and complete it separately.
- You must work together at the same computer for every problem that you complete as a pair. While you are working, the screen should be visible to both of you. One person should type, while the other person observes, critiques, and plans what to do next. You should switch roles periodically, and your solution should be a true collaborative effort.
- You must both submit the same solution to each problem that you did as a pair, and you must clearly indicate that you worked on the problem as a pair by putting your partner's name at the top of the file.

Academic Misconduct
We will assume that you understand BU’s Academic Conduct Code: http://www.bu.edu/academics/policies/academic-conduct-code

Prohibited behaviors include:
- copying all or part of someone else's work, even if you subsequently modify it; this includes cases in which someone tells you what you should write for your solution
- viewing all or part of someone else's work (with the exception of work that you and your partner do together on a pair-optional problem)
- showing all or part of your work to another student (with the exception of work that you and your partner do together on a pair-optional problem)
- consulting solutions from past semesters, or those found online or in books
- posting your work where others can view it (e.g., online).

Incidents of academic misconduct will be reported to the Academic Conduct Committee (ACC). The ACC may suspend/expel students found guilty of misconduct. At a minimum, students who engage in misconduct will have their final grade reduced by one letter grade (e.g., from a B to a C).
Other Policies

Laptops: Students taking CS courses are expected to have a laptop capable of running a currently supported version of Microsoft Windows, Mac OS X, or Linux. See this page for more info: https://www.bu.edu/cs/undergraduate/undergraduate-life/laptops

Late problem sets: Problem sets must be submitted by the date and time listed on the assignment (typically by 11:59 p.m.). There will be a 10% deduction for submissions up to 24 hours late. We will not accept any homework that is more than 24 hours late. Plan your time carefully, and don’t wait until the last minute so you will have ample time to ask questions and obtain assistance from the course staff.

Pre-lecture preparation: To help you prepare for lecture, you will often be required to read or review some online materials. You may also be required to complete an online quiz to demonstrate that you have completed the preparation. Your work on these quizzes will not typically be graded for correctness, but it should demonstrate that you have adequately prepared for lecture. The pre-lecture tasks must be submitted by the specified date and time. Late pre-lecture work will not be accepted.

The attendance/participation portion of your grade will be based on your consistent attendance at the lectures and lab sessions, and on your participation in the activities for each class. In particular, you must participate in small-group activities during lecture in which you will discuss questions with other students and "vote" on the answers. These activities are designed to deepen your understanding of the material, and you will be graded on your participation, not on the correctness of your answers. To accommodate unavoidable absences or lateness, you will receive full credit for attendance as long as you make at least 85% of the votes (pre-lecture and post-lecture combined) over the course of the semester. Voting from outside the classroom or voting for someone else is not allowed, and will result in a lowering of the participation grade of the students involved.

The final exam will replace your lowest problem-set grade if doing so helps your final grade. The final exam can also replace your midterm-exam grade if doing so helps your final grade.

The final grades are not curved. The performance of the class as a whole is taken into account in assigning letter grades, but this can only improve your grade, not harm it.

Extensions and makeup exams will only be given in documented cases of serious illness or other emergencies.

You cannot redo or complete extra work to improve your grade.

Incompletes will not be given except in extraordinary circumstances.
## Schedule (tentative)

<table>
<thead>
<tr>
<th>week</th>
<th>lecture dates</th>
<th>topics, exams, assignments, and special dates</th>
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| 0    | 1/23, 1/25    | Course overview and introduction  
No labs this week.  
Database design and ER diagrams |
| 1    | 1/28, 1/30, 2/1 | The relational model  
Relational algebra and SQL |
| 2    | 2/4, 2/6, 2/8 | SQL (cont.)  
2/4: last day to add a class  
Problem Set 1, part I due on 2/6 |
| 3    | 2/11, 2/13, 2/15 | Storage and indexing  
Problem Set 1, part II due on 2/13 |
| 4    | 2/19, 2/20, 2/22 | Implementing a logical-to-physical mapping  
Query processing  
No lecture on 2/18 (Presidents' Day)  
Lecture on 2/19 (Mon. schedule) |
| 5    | 2/25, 2/27, 3/1 | Transactions and concurrency control  
2/26: last day to drop without a 'W'  
Problem Set 2, part I due on 2/27 |
| 6    | 3/4, 3/6, 3/8 | Transactions and concurrency control (cont.)  
Problem Set 2, part II due on 3/6  
Spring break |
| 7    | 3/18, 3/20, 3/22 | Semi-structured data and XML  
Problem Set 3, part I due on 3/20 |
| 8    | 3/25, 3/27, 3/29 | Distributed databases and replication  
Midterm exam on 3/27 |
| 9    | 4/1, 4/3, 4/5 | Distributed databases (cont.): map-reduce  
4/5: last day to drop a class with a 'W'  
Problem Set 3, part II due on 4/3 |
| 10   | 4/8, 4/10, 4/12 | Object-oriented and object-relational databases  
NoSQL |
| 11   | 4/17, 4/19 | NoSQL (cont.)  
No lecture on 4/15 (Patriots' Day)  
No labs this week; Wed. is a Monday schedule  
Problem Set 4 (all) due on 4/17 |
| 12   | 4/22, 4/24, 4/26 | Recovery and logging |
| 13   | 4/29, 5/1 | Performance tuning  
Wrap-up and review  
Problem Set 5 (all) due on 5/1  
5/3-5/6: Study period |
| 14   | | Final exam: Saturday, May 11, 12:30-2:30 p.m.  
The exam must be taken at this time, so please plan your travel accordingly! |