CECS 228 Syllabus

Darin Goldstein

1 Contact info

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- Office hours: 12:30-2:00 TTh
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- Term: Fall 2017
- Class Meeting Times: Lecture 2:00-3:00, Lab 3:00-4:15 MW (though lecture will be given during the lab time)
- Class Location: Lecture VEC 519, Lab VEC 519
- Textbook: Discrete Mathematics and Its Applications (7th edition) by Kenneth Rosen. Lecture notes are available for free online.

1.1 Course Objectives

(credit for this course, topics and lectures, goes to Todd Ebert)

- An ability to: model statements and systems using propositional and predicate logic; translate between English sentences and propositional/predicate logic; determine the consistency of a set of logical statements; solve logic puzzles from a set of given statements

- An ability to: define a set and perform set operations; find the Cartesian product of sets, and the power set of a given set; represent a set as a binary vector, and define vector/set operations; recognize well-known set identities, and determine the relationship between two sets (equal, subset, etc.); identify when a relationship between two sets represents a function; find the domain and range of a function, and determine whether or not it is 1-1, onto, or both; describe the growth of a function using big-O notation; find composite and inverse functions; use special functions including the floor and ceiling functions; understand and write recursive definitions and
algorithms; determine the cardinality of a set using the sum rule, product rule, principle of inclusion-exclusion, generalized pigeonhole principle, permutations, and combinations; solve linear recurrence relations; represent a binary relation using set notation (ordered pairs), a directed graph, and a matrix; understand n-ary relations and their applications; determine if a given relation is reflexive, irreflexive, symmetric, anti-symmetric, asymmetric, and transitive; determine if a relation on a given set is an equivalence relation; determine if a relation on a given set is a partial ordering; apply equivalence relations and partial orderings to some common problems; represent a graph using an adjacency list, an adjacency matrix, and an incidence matrix; recognize some special graphs including: complete graphs, cycles, wheels, n-cubes, bipartite graphs; use simple properties to rule out two graphs being isomorphic; determine the connectivity of a given graph; recognize a tree, and compute various properties of a tree including internal vertices, leaves, and height

• An ability to: apply a rule of inference in an argument; construct an argument using rules of inference to show the conclusion is valid; find all possible conclusions one can deduce from a set of statements using rules of inference; identify fallacies in an argument; construct a mathematical proof using mathematical induction, cases, the direct method, the indirect method, and proof by contradiction; prove the correctness of recursive algorithms and definitions using mathematical induction

1.2 Topics

• Foundations: Logic; Propositional equivalences; Predicates and quantifiers; Sets; Functions; Algorithms; Growth of functions and big-O notation

• Mathematical Reasoning: rules of inference and fallacies; recursive definitions; recursive algorithms; mathematical induction with application to correctness proof of recursive algorithms and definitions; mathematical proof techniques; counting techniques; recurrence relations

• Basic Discrete Structures: relations, applications and representations; equivalence relations; partial orderings; graphs, terminology and applications; representing graphs; connectivity in graphs; trees, terminology and applications

2 Lectures

Some good news for this course is that you will never be explicitly penalized for missing a lecture. I will never give any pop-quizzes. All graded material is mentioned explicitly somewhere in this syllabus. The final exam date for this course is set by the University (totally independently of me and over which I have absolutely no control) and should be available via the University website.
On the other hand, this is definitely a lecture-based course. If you choose to miss a lecture, I will not penalize you for it or hold it against you in any way, but you are fully responsible for any material that I go over. If I mention something in lecture that is not in the book, YOU ARE STILL RESPONSIBLE FOR KNOWING IT. I will not redo a lecture for people that missed it the first time. It is your responsibility to get the notes/information. If you miss any kind of instructions about assignments that are given during lecture (including but not limited to due dates, methods for submission for assignments, etc.), it is STILL your responsibility to be aware of what occurred in lecture.

3 Exams

The final exam is at a date and time assigned by the University over which I have absolutely no control. You may not leave the room during an exam. During exams, you may not communicate with anyone other than me. You may not use any communication device (cell phones, etc.) during an exam. In particular, all cell phones are required to be turned off during an exam. Failure to observe these rules will result in an F in the course.

The policies I will follow in terms of exam grading are as follows.

- Partial credit will only be given out for steps LEADING TO THE CORRECT ANSWER. The answer itself is meaningless without clear reasoning. This means that if your reasoning is incorrect or not explicitly on the page, the ANSWER BY ITSELF WILL NOT BE COUNTED AS CORRECT.

- Write out every step of your reasoning. If it is not on the page, you will not get credit for it.

- Clearly mark out anything you don’t want graded. If it is on your page and not crossed out, it will be graded as if it’s part of your answer. If there is more than one answer on your page, I WILL GRADE THE INCORRECT ANSWER. Points may be deducted for anything incorrect written on the page that is not crossed out even if the final answer is correct.

- Exam questions are not required to look anything like the homework questions. Exams will be given to test whether you are able to APPLY the knowledge that you have learned.

It is the student’s responsibility to notify the instructor in advance of any need for accommodation of a disability that has been verified by the University.

Your grades will be available on Beachboard as soon as possible after grading has been completed.
4 Grading

Exam/quiz questions are not required to look anything like the homework questions. Exams/quizzes will be given to test whether you are able to APPLY the knowledge that you have learned.

The policies I follow in terms of grading short answer questions are as follows.

- Partial credit will only be given out for steps LEADING TO THE CORRECT ANSWER. The answer itself is meaningless without clear reasoning. This means that if your reasoning is incorrect or not explicitly on the page, the ANSWER BY ITSELF WILL NOT BE COUNTED AS CORRECT.
- Write out every step of your reasoning. If it is not on the page, you will not get credit for it.
- Clearly mark out anything you don’t want graded. If it is on your page and not crossed out, it will be graded as if it’s part of your answer. If there is more than one answer on your page, I WILL GRADE THE INCORRECT ANSWER. Points will be deducted for anything incorrect written on the page that is not crossed out even if the final answer is correct.

For multiple choice questions, you are required to get the answer entirely correct. (In other words, if the answer is B and D and you choose only B or B,C,D or anything other than B,D, then your answer is incorrect.) No partial credit is given for multiple choice questions.

5 Homework, Quizzes, Exams, Programming Assignments

Homework will not be turned in. However, I highly recommend doing it if you want to do well on the exams. If you choose not to do the homework, you will not be explicitly penalized, but you should plan on not doing well in the course.

The homework assignments are as follows:

1. Propositional Logic: Section 1.1-1.3 1.1 # 1,9,11,13,17,23,27,33 1.2 # 17-31 (odd), 35 1.3 # 17-27 (odd)
2. Predicate Logic: Section 1.4-1.5 1.4 # 11-19 (odd), 35, 53 1.5 # 7-13 (odd), 23, 25, 27, 39
3. Sets: Section 2.1-2.2 (1 lecture) 2.1 # 1,9,11,19,21,23,35,41 2.2 # 29,47-51 (odd)
4. Functions: Section 2.3 #9,15,23,31,33,43
5. Review of Integers: Section 4.3 # 3,25,33
6. Midterm #1

7. Modular Arithmetic: Section 4.1-4.2 pg. 244 # 29, 37 pg. 255 # 3, 7, 31, 33

8. Logical Reasoning: Section 1.6 pg. 78 # 13, 15, 23, 27, 31

9. Proofs: Section 1.7-1.8 pg. 91 # 7, 9, 11, 25, 33, 39 pg. 108 # 13, 19, 29, 31, 35

10. Mathematical Induction: Section 5.1-5.2 pg. 329 # 5, 7, 13, 21, 31, 33, 41 pg. 341 # 5, 7, 11

11. Recursion: Section 5.3, 5.4 (1 lecture) pg. 357 # 7, 13, 19, 27, 39 pg. 370 # 13, 45

12. Midterm #2

13. Basics of Counting: Section 6.1-6.2 pg. 396 # 23,25,31,33,37,45,47,49 pg. 405 # 3,9,13,15,27(use the result of the previous problem), 35, 41

14. Permutations and Combinations: Section 6.3-6.4 pg. 413 # 11, 15, 19, 21, 25, 31, 33, 35 pg. 421 # 7,9,15,23,25,33

15. Introduction to Graphs: Section 10.1-10.3 pg. 665 # 5,35,41,53 pg. 675 # 15, 17, 23, 35,37,39,41,43,57,61,63

16. Trees: Section 11.1 (1 lecture) pg. 755 # 1,3,17,19

17. Relations: Section 9.1 pg. 581 # 1,3,7,43,45

18. More on Relations: Section 9.2, 9.5 pg. 615 # 1,3,11,15,21,23,25,41,43,45,47,55

19. Midterm #3

The tentative breakdown for grading is as follows:

1. Midterm # 1: 1/3

2. Midterm # 2: 1/3

3. Final Exam: 1/3

The class will be graded on a curve. Independent of the curve, if you get 90% of the total points or above, you get an automatic A; 80% of the total points or above, you get an automatic B; and so on. (I do not round points.) The curve can only help your grade. Usually, independent of the actual score, the top person/people get A’s. I then go down the grades and determine where the first big break in the grades is and, after the first big break, we start the B’s. This continues all the way down.

Generally speaking, office hours are pretty crowded the day before exams. I was a college student once and am very familiar with the concept of cramming
for an exam. During office hours, I will try to help as many people as I can. However, the chances are pretty good that if you leave all of your questions for the last minute, they may go unanswered. Please take this into account when you start your studying.

6 Cheating

Cheating on any graded material in the course will lead to an automatic grade of F in the course. I don’t give warnings.

7 The final word

If there is anything on this page that you have a question or comment about, it is very important to let me know about it on the FIRST DAY OF CLASSES. After the first day of classes, I will assume that you are aware of the grading policies. Any grading misunderstandings you have after the first day of classes are your responsibility. Good luck.