CS 19 – Winter 2008

Discrete Mathematics for Computer Science

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Administrivia

Lectures Sudikoff 115 | 10 hour | MWF 10:00-11:05, X-hr Th 12:00-12:50

Instructor Afra Zomorodian | Sudikoff 163 | 6-8744 | Office hours: Announced each week

Teaching Assistant Ranganath Kondapally | Sudikoff 112 | 6-0569 | Office hours: Announced each week

Textbook *Discrete Mathematics and Its Applications.* 6th Edition. Kenneth H. Rosen. ISBN 0072880082.

Prerequisites CS 5 or equivalent
CS 18 or 8 (corequisite)
MATH 8 or equivalent is very strongly recommended

Official Name COSC 19 / ENGS 66 – Equivalent to MATH 19

Readings This is a tentative plan and may change during the quarter. Below, the number in parentheses indicates number of lectures. CLRS is another textbook that we may use:
(3) Logic and Proof Techniques – Rosen 1
(2) Induction – Rosen 4-{4.5}
(3) Set Theory – Rosen 2.1, 2.2, 8.1, 8.5, 2.3
(3) Counting – Rosen 5-{5.6}
(2) Asymptotics – Rosen 3.1, 3.2, 2.4, 3.3
(6) Discrete Probability – Rosen 6, 7.5, 7.6 + CLRS 7, 8.4
(2) Hashing – CLRS 11.2, 11.3, Rosen 205-206, 410-411
(6) Graphs and Trees – Rosen 9.1-9.4, 9.6, 10.1-10.3

Grading Final grades will be based on the following:

Class Participation	10%
8 Homeworks	30%
2 Midterms	30%
Final	30%

Honor Code You may discuss homeworks with other students at a general level, but you must write up your homework on your own. A good rule of thumb is that you should never *look* at another student's solutions or allow another student to see your writeup. You *must* also credit other students you talked with as well as any other sources that you used (such as books and websites.)

As a student of Dartmouth College, you are bound by the Academic Honor Code. Cheating during exams, plagiarism

(copying or not crediting work that is not your own), and unauthorized collaboration violates the honor code and is "subject to disciplinary actions, up to and including suspension or separation." Don't do it. If we find violations, we have to report you, and we will.

Homework Policy All homeworks will be due at the *beginning* of class on their due date. You may submit a homework late up to one *class day* with a 10% penality, where a class day is the next day we have a lecture. You get *two free late days* that you may use any time during the quarter (except the last homework). Don't use them early as you will not get any more!

Regrades If you believe that you were mistakenly not given credit for a correct solution, you may talk to the TA and present your argument. If the TA still decides not to give you any more credit, his decision is *final*.

Absences There are no automatically excused absences from class. If you have a conflict (due to athletics, religious observances, etc.), please meet with me before the end of the second week of the term to discuss appropriate accomodations.

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Date	Day	#	Lecture Topic	Reading	Story Time	I/O
01/07	M	1	Overview. Propositional Logic	1.1, 1.2	Leibniz – On Computers Mechanical Calculators	
01/09	W	2	Propositional Logic; Predicate Logic	1.3, 1.4	Sir Belvedere's Logic	
01/11	F	3	Quantifiers; Inference rules	1.5, 1.6	Gödel's Proof – Outline Book	Homework One
01/14	M	4	Proofs	1.7, 2.1	Riemann Hypothesis ζ Function – Clay	
01/16	W	5	Set Theory	8.1, 2.2	Banach-Tarski Paradox	
01/18	F	6	Relations; Functions	2.3, 2.4	Russell's Paradox (Also)	Homework One Due Homework Two
01/21	M		*MLK Holiday* – No Class			
01/23	W	7	Bijections; Sequences; Sums	4.1,4.2	Cantor's Diagonalization	
01/24	θ	8	*MLK x-hour* – Induction	5.1, 5.2	Hilbert's Grand Hotel	
01/25	F	9	Strong Induction; Well-ordering	5.3, 5.4	Unexpected Hanging Paradox – Analysis	Homework Two Due Homework Three
01/28	M	10	Counting: Sum; Product; Inclusion-Exclusion; Permutations	7.5	Fifteen Puzzle – History	
01/30	W	11	Combinations; Double Counting; Binomial Theorem	5.5	Gauss – Topics named after Gauss	
02/01	F	12	Repetitions; The Pigeonhole	3.1, 3.2	Poincaré Series 1: Topology	Homework Three Due

Date	Day	#	Lecture Topic	Reading	Story Time	I/O
			Principle		Deforming a Donut to a Mug	Homework Four
02/04	M	13	Algorithm; Big-O; Logarithm	3.3	Napier's Logs Slide Rules – Use One!	**1st Midterm: Moore B03, 7 – 9 PM**
02/06	W	14	Big-Omega & Theta; Binary Search; Insertion Sort	4.4	The Halting Problem	
02/07	θ	15	*Carnival x-hour* – Recursive Algorithms; Recurrences; Merge Sort	6.1, 6.2	Turing Machines – Church-Turing Thesis	Homework Four Due Homework Five
02/08	F		*Carnival Holiday* – No Class			
02/11	M	16	Quick-Sort; Probability Theory	7.1	P vs. NP – Clay– 36 "Solutions"!	
02/13	W	17	Inclusion-Exclusion; Random Variables; Conditional Probability	6.3	Bertrand's Paradox	MIF Results & Feedback
02/15	F	18	Expectation; Bernoulli trials; Geometric & Binomial distributions	6.4	Monty Hall Problem – Afra's Report	Homework Five Due Homework Six
02/18	M	19	Properties of Expectation; Variance		Poincaré Series 2: Manifolds	
02/20	W	20	Chebyshev's Inequality; Bayes's Rule; Average Case Complexity		St. Petersburg Paradox – Philosophical Responses	
02/22	F	21	Hashing	9.1, 9.2	Pseudo-Random Numbers – Get some random numbers!	Homework Six Due Homework Seven

Date	Day	#	Lecture Topic	Reading	Story Time	I/O
02/25	M	22	Graph Theory	9.3, 9.4	Paul Erdös – Erdös Number Project	**2nd Midterm: Moore B03, 7 – 9 PM**
02/27	W	23	Graphs: Representations; Isomorphism; Invariants	9.6, 10.1	Seven Bridges of Konigsberg – E53 in Dartmouth's Euler Archive	
02/29	F	24	Connectivity; Weighted Graphs; Dijkstra's Algorithm	10.2, 10.3	Four Color Theorem (Also) – Proof	Homework Seven Due Homework Eight
03/03	M	25	Trees; Structural Induction	4.3	Poincaré Series 3: The Conjecture – Clay	
03/05	W	26	Decision trees & Lower Bounds on Sorting; Prefix Coding & Huffman		Poincaré Series 4: Thurston's Geometrization Conjecture	
03/07	F	27	Binary Search Trees; Walks on Trees; Reverse Polish Notation		Poincaré Series 5: Coverage in Science – AMS Article (pdf)	Homework Eight Due
03/10	M		**Final 3 – 6 PM in Kemeny 007**			


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