

Instructor: Louis M. Friedler

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Office Hours: As posted

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Course web page: http://gargoyle.arcadia.edu/mathcs/syllabi/MA_330.pdf

Text: Alan Tucker, *Applied Combinatorics*, 5th Edition, Wiley Pub. (2007).

Help: A student who needs help should see the instructor during posted office hours. If those hours are not possible for the student, the instructor will make every effort to find a mutually convenient time.

Overview of the course: The student will become familiar with the major problem-solving techniques for graph theory and combinatorics. The unifying themes of the course will be algorithms and mathematical induction. To solve a problem, we will either develop an algorithm or hypothesize a solution (often by drawing a picture) and then prove it is correct (often using an inductive proof.) We will observe that the line between problem-solving and proving theorems will be (purposely) blurred in this course.

Approximately 60% of the course time will be spent on graph theory with the remainder devoted to combinatorics. A large percentage of class time will be spent on homework and group exercises. The instructor will outline the material, but the student will master graph theory and combinatorics by solving problems. Each student will be responsible for his/her own learning.

Undergraduate students who plan to satisfy their Senior Capstone requirement with this course will present a final project instead of taking a final exam. Details of the expectations for this project will be distributed separately. Graduate students must also present a final project instead of taking a final exam. Other undergraduate students have the option of doing a project comparable to the Senior Capstone or doing a smaller assigned projects and also taking a final exam. All students not registered for MA490 should notify the instructor in writing by October 15th of their preference.

Graph theory and combinatorics are fun. I hope students will enjoy this new adventure.

Grading: Grades will be based on two one-hour exams (20% each); quizzes and problem-sets (20%); and the final project or final exam and assigned project (40%).

Academic Honesty. The instructor takes academic honesty very seriously. On tests or quizzes, the first infraction will result in a zero on the quiz, problem set or exam; the second will result in an F for the course. On the final project, plagiarism in any degree will result in a zero on the project. A student who is uncertain about what constitutes plagiarism, should consult both the student handbook and the instructor.

Attendance Policy: Students are expected to attend every class. Students who have more than three unexcused absences will have their grades substantially reduced. Student athletes will be excused from class, but not from final exams, for games.

Jewish Holiday: There will be no class on Monday, September 28th.

MA330/430 Graph Theory and Combinatorics
Fall 2009 Assignments

Instructor: Louis Friedler

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Appendix A2: Mathematical Induction	1 class
A2: 1,4,12,16,19. Also:	
(a) Show that $n^2 + n$ is divisible by 2.	
(b) Show $a^n - b^n$ is divisible by $a-b$.	
Chapter 1. Elements of Graph Theory	5 classes
1.1: 2,3,13,16a,23a	
1.2: 1, 2, 5a-d,6a-c,7,11,14	
1.3: 1,2a-c,4,8,10,14	
1.4: 3abc,5,9,10ad,12,19	
Supplementary Problems: 2,3,15,16,25,30,35.	
Chapter 2. Covering Circuits and Graph Coloring	5 classes
2.1: 1,2,3,16,17a	
2.2: 1,2,4abch,7a,9,13,18,20,22	
2.3: 1abcd,6,8,9,11.	
2.4: 1,4,9,11b,14,18	
Chapter 3. Trees and Searching	4 classes
3.1: 1a,2,4,5,16,21,22,24,27	
3.2: 1ab,2ab,4,7,19,20,25,26	
Chapter 4. Network Algorithms	2 classes
4.1: 1, 3abc,5a,11	
4.2: 1ad,2,3	
Chapter 5. General Counting Methods	7 classes
5.1: 1,2,4,5,6,9,14,20,23,32,35,40,45	
5.2: 3,7,8,9,13,15,17,24,26,28,45,62,67,69	
5.3: 2,3,5,9,13,15,31,32	
5.4: 1,2,5,9a,12,16,19,38,45	
5.5: 1b,3bd,4b,7,14abe,19,24	
Review: 5.1: 7,8,10. 5.2: 5,9. 5.3:11. 5.4:4,13,43. 5.5:3ace,9a,11a,26.	
Chapter 6 Generating Functions	2 classes
6.1: 2abc,3ab,4,10,13,15,23	
Chapter 7 Recurrence Relations	3 classes
7.1: 2,3,4,9,15,23,25,28,35	
7.1: 6,12	
7.3: 3,5,6,10	
Chapter 8 Inclusion-Exclusion	2 classes
8.1: 1,3,16,20,25,33,36.	
8.2: 1,2,7,10a,17,23,	
A4: Pigeonhole Principle	1 class
1,2,3,7,22	
Exams	2 classes
Preparation for projects/presentation of small projects	4 classes

Bibliography for MA330/430

Graph Theory:

1. F. Buckley and M. Lewinter, *A Friendly Introduction to Graph Theory*,
2. R. Diestel, *Graph Theory*, 3ed Edition, online: <http://diestel-graph-theory.com/GrTh.html>
3. D. West, *Graph Theory*, 2nd Edition, 2001

Graph Theory and Combinatorics

1. F. Roberts and B. Tesman, *Applied Combinatorics*, 2003
2. M. Bona, *A Walk Through Combinatorics*, 2006

Combinatorics

1. K. Bogart, *Combinatorics*
2. K. Bogart, *Combinatorics Through Guided Discovery*, 2005 online: http://www.math.dartmouth.edu/archive/kpbogart/public_html/
3. R.A. Brualdi, *Intro to Combinatorics*, 5th Edition, 2009

Combinatorial Algorithms

1. H Wilf, East Side West Side, online: <http://www.math.upenn.edu/~wilf/lecnotes.html>

Algorithms

1. H.Wilf, Algorithms and Complexity, online: <http://www.math.upenn.edu/~wilf/AlgComp3.html>

Discrete Mathematics

1. K. Rosen, *Discrete Mathematics and its Applications*, 6th Edition
2. E. Goodaire and M. Parmenter, *Discrete Mathematics with Graph Theory*, 3ed Edition
3. R. Johnsonbaugh, *Discrete Mathematics*, 7th Edition

Graph Theory and Combinatorics Journals available through Landman Library

1. *Journal of Graph Theory*. Online
2. *Ars Combinatoria*. Print only.
3. *Dissertationes Mathematicae*. Online. (Currently some access problems)
4. *Electronic Journal of Combinatorics*. Online

Mathematics Databases

1. MathSci Net (Reviews)
2. ArXiv.org (Abstracts)