

MATH 247: Graph Theory

Course Description

Fall 2017

Instructor: John Schmitt

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Office Hours: Monday 1:30pm-2:30pm, Wednesday 1:30pm-2:30pm, Thursday 10:30am-12pm, Friday 10am-11am, when my office door is open and by arrangement

Course webpage: <http://community.middlebury.edu/~jschmitt/graphtheory.html>

Meeting Times:

Section A, MWF, 9:05pm–9:55, Warner Hall 207

Textbook: *Introduction to Graph Theory, Second Edition* by Doug West, Prentice Hall, NJ, 2001. A (slightly fragile) copy of the text is available on 2-hour reserve in the Davis Family Library.

Supplemental Texts available in the library

- *Graphs and Digraphs*, by G. Chartrand (my mathematical grandpa), L. Lesniak
- *Graph Theory*, by R. Diestel (he also has an on-line text available for free download)
- *Pearls in Graph Theory*, by N. Hartsfield, G. Ringel
- *Graph Theory*, by C. Berge
- There are many others.

Homework: Homework will be assigned on a weekly basis. The content of this course is best learned by *solving problems*. I **encourage you to work together**. However, the write-up of homework solutions *should be done on your own*. Please read my *Thoughts on Homework*.

Quizzes: I reserve the right to give quizzes. If given, they will be short in length and cover recent homework problems, assigned reading, or class discussion.

Special Needs: If you require special arrangements for class or during tests/exams, please talk to me as soon as possible to make such arrangements. If you are color-blind, please let me know as I like to use colored chalk.

Grading Percentages:

| | |
|-------------------|----|
| Homework/Quizzes | 25 |
| Midterm 1 | 25 |
| Midterm 2 | 25 |
| Midterm 3 (Final) | 25 |

Assignment of Grades:

The assignment of grades will follow the scheme below *at a minimum*.

| | |
|--------------|---|
| 90 and above | A |
| 80 - 89 | B |
| 70 - 79 | C |
| 60 -69 | D |
| below 60 | F |

Plus and minus will be assigned at my discretion.

Midterm Exams:

Schedule:

Midterm on Chapters 1 and 2: October 12th at 7:30pm

Midterm on Chapters 3 and 4: (tentatively) November 9th at 7:30pm

Final Exam:

Wednesday, December 13, 9am-12pm.

The final exam will be administered **at this time only**, please make plans accordingly.

Absences: Please see me as far in advance as possible for absences that will occur on the day of an exam. Any such absences, or unforeseen ones, must be documented in writing by the appropriate person.

Honor Code: The Honor Code will be observed throughout this class and for all examinations. If you have a question about how the Honor Code applies to this class please ask.

Research: Graph theory is an important component of my research agenda. Students who complete the course may have future opportunities to work with me in this direction. To demonstrate that there are many unsolved problems, you might consult one of these lists:

- http://garden.irmacs.sfu.ca/?q=category/graph_theory
- <http://www.emba.uvm.edu/~archdeac/problems/problems.html>

Outline of Topics

1. Fundamental Concepts
Basic definitions, paths, cycles, trails, degree, directed graphs
2. Trees and Distance
Basic properties, spanning trees and enumeration, optimization
3. Matchings and Factors
Matchings, covers, algorithms
4. Connectivity and Paths
Cuts, connectivity, k -connected graphs, network flow
5. Coloring of Graphs
Vertex colorings, structure of k -chromatic graphs, enumerative aspects
6. Planar Graphs
Embeddings and Euler's formula, characterizations and parameters of planarity

Some goals of the course are:

- gain an understanding of the fundamental concepts of graph theory,
- gain an understanding of when a graph is a useful mathematical tool to solve problems in mathematics, the sciences and the environment,
- develop the ability to write a logical and coherent proof, including proof by contradiction and induction,
- introduce topics related to my own research area and suitable for your possible future research participation, and
- develop a desire for further study in related areas, including combinatorics and computer science.