

# MATH 247: Graph Theory

## Course Description

### Fall 2019

**Instructor:** John Schmitt

**Office:** Warner 311, Ext. 5952

**E-mail:** jschmitt@middlebury.edu

**Office Hours:** Wednesday 11:15 am – 12:15 pm, Thursday 9-10:30am, Friday 11:15 am – 12:15 pm, , when my office door is open and by arrangement

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

#### **Meeting Times:**

Section A, MWF, 1:45–2:35pm, Warner Hall 203

**Textbook:** *The Fascinating World of Graph Theory* by Art Benjamin, Gary Chartrand and Ping Zhang. A copy of the text is on reserve in the Davis Family Library. This is my first time using this text. I hope we can read all of it. Your feedback is welcome.

#### **Supplemental Texts available in the library:**

- *Introduction to Graph Theory, Second Edition* by Doug West, Prentice Hall, NJ, 2001
- *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.

Students who have Letters of Accommodation in this class are encouraged to contact me as early in the semester as possible to ensure that such accommodations are implemented in a timely fashion. For those without Letters of Accommodation, assistance is available to eligible students through Student Accessibility Services. Please contact Jodi Litchfield or Courtney Cioffredi, the ADA Coordinators, for more information: Michelle Audette can be reached at [maudette@middlebury.edu](mailto:maudette@middlebury.edu) or 802-443-2169 and Jodi Litchfield can be reached at [litchfie@middlebury.edu](mailto:litchfie@middlebury.edu) or 802-443-5936. All discussions will remain confidential.

**Etiquette:** Beyond basic etiquette, I ask that students not use electronic media devices once in the classroom – this includes cell-phones, laptops, and more. **I wish for our time together to be our time together.**

**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 determined at the end of the semester.

**Midterm Exams:**

Schedule:

Midterm 1: October 10th at 7:30pm

Midterm 2: (in-class) November 11 AND November 13

**Final Exam:**

Saturday, December 14th, 2–5pm.

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.

**My travel schedule:** During the week of November 10th, I will be attending a combinatorics conference at Casa Matemática in Oaxaca, Mexico. The topic of the conference is zero-sum theory. You can read more about it here, <https://www.birs.ca/events/2019/5-day-workshops/19w5132> . During the Monday and Wednesday class periods of this week, there will be an exam.

**Honor Code:** The Honor Code will be observed throughout this class, for all examinations and for all homework problems. If you have a question about how the Honor Code applies to this class please ask; please see my *Thoughts on Homework* for more details.

**Electronic recording:** The use of audio and video recording is prohibited without prior permission.

**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 this list, [http://www.openproblemgarden.org/category/graph\\_theory](http://www.openproblemgarden.org/category/graph_theory).

## Outline of Topics

1. Introduction, basic terminology and motivational problems
2. Distance in graphs
3. Trees
4. Eulerian graphs
5. Hamiltonian graphs
6. Graph factorization
7. Graph decomposition
8. Oriented graphs
9. Graph drawing
10. Graph coloring

### 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.