

47-835: Graph Theory

Mini-1, Fall 2016

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Classes meet Tue-Thu, 10.30 - 12.20 pm in Room 147, Posner Hall (new Tepper Building).
Office hours: Email for appointment.

Outline

This is a graduate-level course on introductory graph theory. The theory of graphs has found wide applicability in a variety of areas ranging from Engineering to Molecular Biology. The objective of the course is to introduce basic concepts in graph theory and develop problem-solving ability and mathematical maturity in this area.

The topics covered will follow the progression in the text below and include: Basic terminology, Trees, Shortest paths, Maximum flow and Minimum cut with applications, Eulerian and Hamiltonian graphs, Vertex and Edge colorings, Planarity, and an introduction to Matchings, Independent Sets and Covers in graphs. (A follow-up course in the next mini will cover more advanced topics such as Branchings, Minimum cost flow, Gomory-Hu trees, Maximum matchings via blossoms, T-Joins and postman problems, and Matroids).

We will assume some knowledge of elementary linear algebra and familiarity with basic proof techniques such as mathematical induction and proof by contradiction. The course may be taken without this background but at the cost of increased effort.

Six homeworks will be assigned (five to ten problems each), and will be due at the beginning of the Thursday class the following week, and each will make up 10 % of the grade. A take-home final exam will determine the remaining 40 % of the grade.

Being an introductory course, doing the homework on your own is invaluable in understanding the material. Therefore, no collaboration is allowed in the homeworks or the take-home exam.

Text

We will follow the sequence of topics in the old book “Graph Theory with Applications” by Bondy and Murthy. While this book is out of print, it is available for free download from the web (just search for “bondy murty book”). If you like the book, you can purchase a copy of the recent revised version titled “Graph Theory” (Springer Graduate Texts in Mathematics no. 244 (2008)).

Another recommended text for a good collection of problems is “Introduction to Graph Theory”, by Douglas B. West, Prentice-Hall (2nd ed, 2001).