

Outline: Math 4022 (Fall 08) – Introduction to Graph Theory

Instructor : Prasad Tetali, office: Skiles 234, email: tetali@math.gatech.edu

Office Hours: Mon. Wed. 3:00-4:30pm (tentative)

Suggested Textbooks:

- (1) **Introduction to Graph Theory**, by Doug West (2nd edition, Prentice-Hall, 2001).
- (2) *Graph Theory with Applications*, by J.A. Bondy & U.S.R. Murty (North-Holland, 1976.): available for free download on the internet:
<http://www.ecp6.jussieu.fr/pageperso/bondy/books/gtwa/gtwa.html>

Syllabus: Based on material in Chapters 1 – 6 of the first textbook. Familiarity with basic material in Chapter 1 will be assumed. Some sections will be omitted (e.g. Sec. 3.3), and time permitting, a couple of sections from other chapters (e.g. Secs. 7.1 and 8.1) in the book will be covered. The emphasis will be on the following fundamental Theorems and Algorithms.

Theorems:

- The Matrix-tree theorem
- Hall's matching condition and Tutte's theorem
- Connectivity and Menger's theorems
- Max-flow Min-cut theorem
- Vertex coloring and Brooks' theorem
- Edge coloring and Vizing's theorem (Proof: time permitting)
- Planarity and Kuratowski's theorem (No proof)
- Intro to Extremal graph theory: Mendel, Turán, Ramsey theorems (Only some proofs)

Algorithms:

- Shortest paths algorithm (Brief review)
- Minimum spanning tree algorithms (Brief review)
- Bipartite Matching (The Hungarian algorithm)
- Ford-Fulkerson algorithm

Most topics will be discussed for about a week. Time permitting, rudiments of random graph theory will be covered.

Course Objective.

- To develop interest in graph theory and its many applications

General grading policy : Homeworks 20%, Tests 40%, Final exam 40%

Test 1: Sept. 22nd (Mon.) **Test 2: Oct. 31st** (Fri.)

Final exam: December 10th (Wed.) 11:30–2:20pm

No make-up tests will be allowed.

Homeworks will be assigned, collected and graded. You are strongly advised to solve all the homework problems; Late submission of HWs is discouraged with a penalty of 20%.