

MATH 7490 MATROID THEORY

Fall, 2006

TuTh 9:10 – 10:30 Lockett 381

Teacher: James Oxley, Lockett 370

Office Hours: TuTh 10:40 – 12:00 and by appointment.

Text: *Matroid Theory*, James G. Oxley, Oxford University Press, New York, 2006. The book is a paperback reprint (with corrections) of the original 1992 hardback edition of the book. The differences between the two versions are not dramatic and, if you have a hardback copy, it will certainly suffice. In particular, the page numbers on the two versions do match up.

Syllabus: What is the essence of the similarity between forests in a graph and linearly independent sets of columns in a matrix? Why does the greedy algorithm produce a spanning tree of minimum weight in a connected graph? Can one test in polynomial time whether a matrix is totally unimodular? Matroid theory examines and answers questions like these.

This course will provide a comprehensive introduction to the basic theory of matroids. This will include discussions of the basic definitions and examples, duality theory, and certain fundamental substructures of matroids. Particular emphasis will be given to matroids that arise from graphs and from matrices.

The core of the course is contained in Chapters 1–6 of the book. Some additional material from later in the book may also be included. The book will be followed fairly closely although some sections will be omitted. Class notes will assume that students have access to the book. The topics covered in Chapters 1–6 are the following:

1. Basic definitions and examples
2. Duality
3. Minors
4. Connectivity
5. Graphic matroids
6. Representable matroids

Assessment: There will be about six homework sets that will usually be taken from the problems at the end of the sections of the book. These will be due every two weeks. Altogether these homework sets will count 60% of the grade. There will be a final exam that will count for 30%. The remaining 10% of the grade will be based on classroom participation and attendance.