

Course: Matroid Theory 1 (Math 771, or Math 793)

Instructor: Hong-Jian Lai

Office Hours:

Office: 320 Arm

Course description: This is the first course of a sequence. In the first semester, we will introduce the basics of matroid axioms, connectivity, matroid minors, matroid excluded minor characterizations, graphic matroids, matroids representable over a field, matroids over all fields, binary matroids, matroid unions and intersections. The discussion will be associated with research problems for possible PhD dissertation topics, including

- (1) cyclic base ordering conjecture and uniformly dense networks and matroids.
- (2) extremal problems in matroid cycles covers.
- (3) graphical properties of graphs arose from matroids (considered as the "derivatives of matroids") and their relationship with matroidal properties of matroids.
- (4) supereulerian binary matroids.

The second semester will be focused on the research topics listed above.

Text:

- (1) Matroid Theory, by James Oxley, 2nd edition or any edition.
- (2) Notes from Hong-Jian Lai
- (3) research papers as appropriate.

Prerequisite (informal) : Students are expected to have a level of mathematical maturity that a PhD student should have. Students having basic knowledge in linear algebra, graph theory and finite fields would find the materials easy to absorb. Reading assignment on these topics in the first two weeks will be given.

Course grade: student's performance will be measured by their (biweekly) homework plus a midterm and a comprehensive final. Some of the homework assignments will be in the form of in class presentations.

Students performed 80 percent or better will receive an A for the course.

---