

# M621: Algebraic Topology I

Instructor: Jim Davis

MWF 10:10-11:00 RH104

**Text:** Davis and Kirk, *Lecture Notes in Algebraic Topology*, Graduate Studies in Mathematics 35, AMS

**Content:** We will cover the first 5 chapters and part of the sixth chapter of Davis-Kirk. The first chapter discusses homology and cohomology with coefficients and gives a quick review of CW complexes and the Eilenberg-Steenrod axioms. The second chapter covers basics of homological algebra, including Tor and Ext and the Universal Coefficient Theorems (UCT). The third chapter covers products: the Künneth Theorem and cup and cap products. The fourth chapter is geometric – it covers fiber bundles. The fifth chapter covers homology with local coefficients. The sixth chapter covers the basics of elementary homotopy theory: fibrations, cofibrations, and homotopy groups.

**Homework, etc.:** You should be ready to present all of the exercises in the text. At several (preannounced) times in the semester, we will have an exercise day, where eight students and problems are chosen at random, and the students will write the solutions to the problems on the board. In addition, there will (likely) be out-of-class projects sessions where the students will lecture to one another on specified projects from Davis-Kirk.

**Prerequisites:** Mastery of the contents of the course M522. One needs to know the fundamental group, covering spaces, and CW complexes, and especially, singular homology theory. The course will be taught at a high level, and, in particular, will emphasize categorical approaches when possible.