TOPICS FOR MATHEMATICS 205C, SPRING 2011

The topics correspond to Sections III.5 – III.9, IV.1 – IV.10, IV.13, IV.15, IV.17 – IV.19 and IV.21 of Bredon, *Geometry and Topology*.

Fundamental groups and covering spaces. Covering space transformations, spaces with finite fundamental groups, classification of covering spaces, universal covering spaces, smoothability theorems, free products of groups, the Seifert-van Kampen Theorem, computational applications, fundamental groups of graphs.

Homology theory for simplicial complexes. Simplicial complexes, chain complexes, simplicial homology groups, exact sequences, elementary properties of simplicial homology, algebraic input.

Axiomatic singular homology theory. Objectives of singular homology, statements of axioms, uniqueness properties, simple computations. Classical applications to theorems of Jordan and Brouwer, degree theory, and nonplanar graphs. Regular cell complexes and celluar chain complexes for computing homology, application to the Descartes-Euler Formula.

Existence of singular homology theory (*to the extent that time permits*). Definition of singular chain and homology groups, elementary properties, chain homotopies and homotopy invariance. Barycentric subdivision, excision, and Mayer-Vietoris sequences.