

## Math 114 (cross-listed with Math 74) - Algebraic Topology

3-4 weeks on the fundamental group and covering spaces.

6-7 weeks on homology theory

### **The Fundamental Groups and Covering Spaces**

1. Homotopy, definition of  $\pi_1$  and its basic properties, van Kampen Theorem
2. Covering spaces: lifting properties, the Galois correspondance, deck transformations, the universal cover
3. Applications and examples

### **Homology Theory**

1. Basic homological algebra: chain complexes, exact sequences, chain maps, chain homotopy
2. Construction of the singular homology of a pair of spaces
3. Eilenberg-Steenrod axioms: excision, exactness, homotopy
4. Computational techniques (Mayer-Vietoris sequence,.. )
5. Applications (Brouwer fixed point theorem, hairy ball theorem, ..)