SYLLABUS FOR MATH 592: ALGEBRAIC TOPOLOGY

(1) Fundamental groups: definition via paths, functoriality, calculation techniques (especially the Seifert-Van Kampen Theorem), covering space theory (including the Galois correspondence describing subgroups of π_1), graphs and free groups.

(2) Combinatorial constructions of spaces: cell complexes (aka CW complexes), simplicial complexes, Δ-complexes, approximation theorems.

(3) Homology: simplicial homology, singular homology, basic notions (functoriality, relative homology, excision, Mayer-Vietoris sequences, Euler characteristics, degrees of maps between spheres via homology).

(4) Theorems on homology: Hurewicz's theorem for H_1, Eilenberg-Steenrod axioms, Brouwer and Lefschetz fixed point theorem with applications.

Suitable references include:

- Hatcher's *Algebraic Topology*: chapters 0,1 and 2.
- Bredon's *Topology and Geometry*: chapters III and IV.

It is strongly recommended that the students are comfortable with the material in Math 593 (or equivalent) *before* taking Math 592.