Prof. Paul Biran
ETH Zürich

Syllabus[1]

Week 1 (Sep 16-20, 2013)

Homotopy, mapping cone and mapping cylinder. Singular homology.

Week 2 (Sep 23-27, 2013)

Singular homology. The Hurewicz theorem for H_1.

Week 3 (Sep 30 - Oct 4, 2013)

Basic homological algebra. Chain complexes, exact sequences. The long exact sequence in homology associated to a short exact sequence of chain complexes. Axioms for homology.

Week 4 (Oct 7-11, 2013)

Homology with coefficients. Reduced homology in the context of a homology theory. The homology of spheres and of the pair (B^n, S^{n-1}). Applications: Brouwer's fixed point theorem, vector fields on the sphere. Degree of maps $S^n \to S^n$.

Week 5 (Oct 14-18, 2013)

CW complexes.

Week 6 (Oct 21-25, 2013)

CW complexes. Cellular homology.

Week 7 (Oct 28 - Nov 1, 2013)

Cellular homology. Crash course on categories and functors.

Week 8 (Nov 4-8, 2013)

Cellular maps, cellular approximation.

Week 9 (Nov 11-15, 2013)

Cellular homotopies. Compact subsets of CW complexes. Crash course on categories and functors continued.

Week 10 (Nov 18-22)

Products of CW complexes. Euler characteristic.

[1] This will be updated regularly.

Week 11 (Nov 25-29)

Chain homotopies. Proof of the homotopy axiom. Proof of the excision theorem.

Week 12 (Dec 2-6)

Proof of the excision theorem (continued). The Mayer-Vietoris exact sequence.