

Elements of Algebraic Topology (Elementi di Topologia Algebrica)

Teacher: Mario Salvetti

2025/2026 – 1° semester

Introduction

Broadly speaking the goal of algebraic topology is to apply algebraic techniques to study topological spaces and associated invariants. This course is a first introduction to the two most common invariants of topological space: homology (and cohomology) and homotopy, focusing on some of their interactions. A special role will be played by model spaces of CW complexes.

Content

Topics covered in this course will include the following:

- singular homology: construction, basic properties and applications;
- CW-complexes and cellular homology; simplicial complexes and simplicial homology;
- cohomology ring, cup product and Poincaré duality;
- homotopy groups: construction and basic properties; cellular approximation;
- interplay between homology and homotopy groups: Hurewicz theorem;
- suspension homomorphism in homotopy; first results about homotopy groups of spheres.

Practical information

The course duration is 48 hours, and it will take place in the first semester. Exercises will be assigned during the course. There will be an oral examination.

Prerequisites

Basic notions of Geometry 2 and Algebra 1 are needed. The knowledge of part of the course Algebra 2, in particular modules over PID and tensor products, is warmly recommended, but not mandatory.

For more information please contact us via e-mail: mario.salvetti@unipi.it.