

Sheaves and cohomology: an introduction

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Abstract:

The goal of this course is to propose an introduction on one side to the theory of sheaves (on topological spaces) and on the other side to their cohomologies. We will focus on examples and applications originating from topology, geometry but also from commutative algebra. This course is intended for students willing to obtain a general culture on sheaves, very useful both in topology and in algebraic geometry.

- Definition of sheaves: sheaves of sets, of groups, of rings on topological spaces. Exact sequences of sheaves. Examples of exact sequences, the exact sequence of the exponential, non locally constant sheaves.
- Notions in homological algebra: abelian categories, injective and projective objects, resolutions.
- Cohomologies: injective resolutions, Čech cohomology, Mayer-Vietoris exact sequence. Long exact sequence in cohomology. Examples of computations of cohomologies (e.g. cohomology of the spheres).

References:

1. R. GODEMENT, *Topologie algébrique et théorie des faisceaux*, (French) Actualités Sci. Ind. No. 1252. Publ. Math. Univ. Strasbourg. No. 13 Hermann, Paris 1958 viii+283 pp.
2. J.P. LAFON, *Les formalismes fondamentaux de l'algèbre commutative*, (French) Collection Enseignement des Sciences, No. 20. Hermann, Paris, 1974. xii+260 pp.