Proposition du cours de base M2 Mat RI 2022/23

Introduction to differential and algebraic topology

We will study differential and algebraic topology of manifolds with special attention to low-dimensional manifolds. We will introduce some basic technics but we will underline their geometric origins.

1. Cellular structure of manifolds. Morse complex. Milnor-Smale handle decomposition.
2. Homotopy theory. Stable homotopy groups of spheres for the codimensions 0, 1 and 2 and their geometric interpretations.
3. Homology theory. Cellular homology. Poincaré duality. Intersection form.
4. Cobordism theory. Pontrjagin-Thom construction. Signatures. Characteristic classes.
5. Group actions on manifolds. Lefschetz fixe point theorem. Equivariant signatures and the Atiyah-Bott-Singer-Hirzebruch formula for the action of Z/2Z. Smith theory.

Prerequisites : basic notions as topological spaces and differential maps, diffeomorphism, groups and morphisms of groups.

References : A. Hatcher « Algebraic topology » (on his web-page)
R. Kirby « The topology of 4-manifolds » LNM 1374
J. Milnor « h-cobordism theorem »