

Geometry of Schemes

Academic Year 2018-2019

Syllabus:

October 1, 2018

Spectrum of a ring and Zarisky topology. Morphisms induced by ring morphisms. Examples.

October 2, 2018

Algebraic sets and closed points in the spectrum of a finite algebra over a field. Presheaves and sheaves.

October 8, 2018

Stalks of (pre)sheaves. Morphisms of (pre)sheaves and morphisms induced on stalks. Injectivity, surjectivity and isomorphisms.

October 9, 2018

Sheafification and examples: quotients, kernels, images, direct image of a sheaf and locally constant sheaf. Inverse image of a sheaf.

October 15, 2018

Ringed topological spaces. Morphisms of ringed topological spaces. Open and closed immersions.

October 16, 2018

More on closed immersions. The structure sheaf for $\text{Spec}(A)$, where A is a commutative ring.

October 22, 2018

Morphisms of schemes. First properties.

October 23, 2018

Morphisms of schemes (the affine and non-affine case).

November 5, 2018

k -rational points. First properties of $\text{Proj}(B)$, where B is a graded A -algebra.

November 6, 2018

The schematic structure on Proj . The projective space.

November 12, 2018

The projective space. Noetherian schemes and algebraic varieties.

November 13, 2018

Reduced schemes. Introduction to irreducible schemes.

November 19, 2018

Irreducible schemes: the affine case, the noetherian case and generic points.

November 20, 2018

Integral schemes. The Krull dimension of schemes and rings.

November 26, 2018

Dimension of integral algebraic varieties. The fiber product in the affine case.

December 3, 2018

Fiber over a point. Definition of morphisms of finite type.

December 4, 2018

Morphisms of finite type. Properties and examples.

December 10, 2018

Separated and proper morphisms.

December 11, 2018

Normal schemes and normalizations. Regular schemes (brief introduction).

December 17, 2018

Flat, étale and smooth morphisms. Quasi-coherent and coherent sheaves.