Vladimir Zhgoon

Algebraic Geometry: A First Geometric Look

Fall 2018

**Consultation Saturday 10:30**

1. Integer elements in ring extensions, finitely generated algebras over a field,
2. Transcendence generators, Noether normalization lemma.
3. Hilbert's  theorems on basis and on the set of zeros.
4. Affine Algebraic Geometry from the viewpoint of Commutative Algebra. Maximal and prime spectrum, pullback morphisms, Zariski topology, geometry of the ring homomorphisms.
5. Complement to the hypersurface in the affine variety is affine.
6. Finite morphisms and their properties. Projection as the example of finite morphism.
7. Algebraic varieties, separateness. Graph and its properties for separable varieties. Example of non-separable varieties.
8. Equations for diagonal and graph.
9. Projective varieties, properness (complete). General properties of proper varieties. Properness of projective space.
10. Rational functions and maps.
11. Dimension (two equivalent definitions over algebraically closed field). Dimensions of subvarieties and fibers of regular maps.
12. Dimension of affine space. Theorem on the dimension of fibers of morphism. Semi-continuity of dimension.
13. Krull theorem on the dimension of hypersurface.
14. Intersection of varieties of complementary dimension in a projective space.
15. Linear spaces on quadrics.

TEXTBOOKS

1. A.L.Gorodentsev, Algebra II. Textbook for Students of Mathematics.

Springer, Ch. 1, 2, 10, 11, 12

1. A.L.Gorodentsev, Algebraic Geometry Start Up Course, MCCME.
2. J.Harris, Algebraic Geometry. A First Course, Springer.
3. D.Mumford, Red book of varieties and schemes, Springer LNM 1358.

Grading policy: ½ in class written exam based on problem sheets+ ½ oral exam on the theoretical part.