GE410 ALGEBRAIC GEOMETRY 1

A.Y. 2016/2017

Prof. Angelo Felice Lopez

1. Affine Spaces

Zariski topology. Affine closed subsets and radical ideals. Theorem of the zeros of Hilbert. Correspondence between closed subsets and radical ideals. Noetherian topological spaces. Irreducible closed subsets, irreducible components. Regular functions of affine closed subsets. Regular maps, isomorphisms. Principal open subsets. Examples. Projections are open. Finite morphisms.

2. Varieties

Projective spaces and their Zariski topology. Quasi-projective varieties. Rational and regular maps. Projective hypersurfaces. Birational equivalence. Principal open subsets and affine closed subsets. Affine varieties. Dimension of quasi-projective varieties. Finite and generically finite morphisms. Characterizations of birational equivalence. Characterization of generically finite morphisms. Costructible sets, Chevalley's theorem. Every variety is birational to a hypersurface.

3. Seminar activities

Upper semicontinuity of dimension of the fibers of morphisms. Local ring of a variety in a point. Zariski cotangent space. Zarisk tangent space, extrinsic and intrinsic definition. Singular and non singular points. Hypersurfaces. Local parameters. Exact sequence of the differential of a morphism and characterization of non-singular points. Locallly factorial varieites. Normal varieties and normalization. Bertini's theorem. Weil and Cartier divisors, linear systems and morphisms of projective varieties.

Suggested textbooks

[1] L. Caporaso, *Introduzione alla geometria algebrica*. Notes of the course,
[2] I Shafarevich, *Basic Algebraic geometry* . Springer-Verlag, Berlin, 1994,
[3] R. Hartshorne, Algebraic geometry. Graduate Texts in Math. No. 52. Springer-Verlag, New York-Heidelberg, 1977,

Exam

- midterms		☐ yes	■ no
- final exam	written	☐ yes	■ no
	oral	■ yes	☐ no
- other evaluations (described below)		■ yes	☐ no

The exam is in a seminar fashion. It consists in explaining a topic agreed with the professor in front of the other students.