Academic subject: Algebraic Geometry				
Degree Class: L-35-Scienze Matematiche		**Degree Course:** Mathematics	**Academic Year:** 2020/2021	
		Kind of class: Optional	**Year:** 3	**Period:** 2
			ECTS: 7 divided into **ECTS lessons:** 6.5 **ECTS exe/lab:** 0.5	
Time management, hours, in–class study hours, out–of–class study hours lesson: 52 exe/lab/tutor: 8 in–class study: 60 out–of–class study: 115				
Language: Italian	**Compulsory Attendance:** no			
Subject Teacher: Francesco Bastianelli Donatella Iacono	**Tel:** +39 080 5442664 **e–mail:** francesco.bastianelli@uniba.it donatella.iacono@uniba.it	**Office:** Department of Mathematics F.B.: floor II, room 18 D.I.: floor III, room 10	**Office days and hours:** See the webpages: https://sites.google.com/site/francescobastianelli/ http://galileo.dm.uniba.it/~iacono	
Prerequisites: Mathematical knowledge which is usually acquired during the first two years of a degree of L-35; in particular: linear algebra, affine geometry, projective geometry, topology.				
Educational objectives: Acquiring knowledge of basic notions in Algebraic Geometry, especially in the theory of curves and algebraic varieties.				
Expected learning outcomes (according to Dublin Descriptors)	**Knowledge and understanding:** Acquiring fundamental concepts in affine and projective Algebraic Geometry. Acquiring main proof techniques. **Applying knowledge and understanding:** The acquired theoretical knowledge is involved in large part of mathematics such as commutative algebra. **Making judgements:** Ability to choose suitable techniques and mathematical tools necessary to prove properties dealing with the program topics. **Communication:** Acquiring mathematical language and formalism necessary to read and understand textbooks. **Lifelong learning skills:** Acquiring suitable learning methods and relating the main concepts occurring in various courses.			
Course program **Projective spaces** Projective space and subspaces. Projective transformations and their properties. **Algebraic curves** Affine algebraic curves, rational curves, Fermat's curves. Relation between the theory of curves and the theory of fields. Rational and binational maps. Weierstrass normal form of a cubic. Singular and non-singular points and tangent line. Projective curves. Hessian curve. Birational maps between non-singular projective curves. Resultant of polynomials. Bezout's Theorem. **Algebraic preliminaries** Ring, ideal and properties. Notherian rings. Artinian rings. Ring of polynomials and ideals. Homogeneous ideals and properties.				

Algebraic varieties
Affine algebraic varieties. Zariski topology. Projective algebraic varieties. The ideal-variety correspondence. Hypersurfaces. Projective closure of affine varieties. Reducible and irreducible varieties. Regular and rational morphisms. Dimension.

Groebner bases and Nullstellensatz.
Groebner bases and properties. Hilbert's basis Theorem. Different formulations of Nullstellensatz and Projective Nullstellensatz.

Teaching methods:
Lectures and exercise sessions

Auxiliary teaching:

Assessment methods:
Oral exam about the topic of the course, to evaluate the understanding of the themes investigated.

Bibliography:

W. FULTON, Algebraic Curves, The Benjamin-Cummings, Publ. Comp., Menlo Park, 1969.D. COX Ideals, varieties and algorithms. Springer 1990

D. MUMFORD, Algebraic Geometry I, Complex Projective Varieties, Springer Verlag, Berlin 1976

M. NAMBA, Geometry of Projective Algebraic Curves, Marcel Dekker, Inc., New York, 1984.

I.R. SHAFAREVICH, Basic Algebraic Geometry 1: Varieties in Projective Space, Springer-Verlag 1994.