General information		
Academic subject	**ALGEBRAIC GEOMETRY**	
Degree course	Mathematics	
Academic Year	*III year*	
European Credit Transfer and Accumulation System (ECTS)		7
Language	*Italian*	
Academic calendar (starting and ending date)	*II semester*	
Attendance	*No (but recommended)*	

Professor/ Lecturer	
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Syllabus	
Learning Objectives	Acquiring knowledge of basic notions in Algebraic Geometry, especially in the theory of curves and algebraic varieties.
Course 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.

Contents	**Preliminaries** Projective space and subspaces. Ring, integral domain, unique factorisation domain, ideals, properties, radical, maximal and prime ideals. **Algebraic affine curves** Affine algebraic curves. Irreducible components of a curve and their multiplicities. Invariants for affine transformations. Regular points, singular points and tangents lines of a curve. **Algebraic projective curves** Projective algebraic curves. Relations between affine and projective algebraic curves. Invariants for projective transformations. Resultant of polynomials. Multiplicity of intersections and Bezout's Theorem. Flexes and Hessian curve. Real graph of affine algebraic curves. Linear systems of projective algebraic curves. **Affine algebraic varieties** Noetherian rings. Artinian rings. Hilbert's basis Theorem. Affine algebraic varieties. Zariski topology. Hypersurfaces. Relation between varieties and ideals. Different formulations of Hilbert's Zero locus Theorem (Nullstellensatz). Irreducible algebraic varieties. Dimension. Regular and rational functions; regular and rational morphisms and isomorphism. Regular functions ring. Zariski tangent space. Groebner bases (mention). **Projective algebraic varieties** Homogeneous ideals and properties. Projective algebraic varieties. Closure of affine varieties and properties. Projective Hilbert's Zero locus Theorem. Homogeneous coordinates ring and field of rational functions. Regular and rational functions; regular and rational morphisms and isomorphism.
Books and bibliography	W. FULTON, Algebraic Curves, The Benjamin-Cummings, Publ. Comp., Menlo Park, 1969. M. REID, Undergraduate Algebraic Geometry. Cambridge University Press 1988. E. SERNESI, Geometria 1, Bollati Boringhieri, 2000.

Additional materials	*More information will be available at:* *https://www.donatellaiacono.it/geo_alg_22.html*

Work schedule			
Total	Lectures	Hands on (Laboratory, working groups, seminars, field trips)	Out-of-class study hours/ Self-study hours
Hours			
175	*60 (52 Lectures+8 exercise classes)*		*115*
ECTS			
7 (6,5+0,5)			

Teaching strategy	
	Lectures and exercise classes.
Expected learning outcomes	
Knowledge and understanding on:	Acquiring fundamental concepts in affine and projective Algebraic Geometry. Acquiring main proof techniques.
Applying knowledge and understanding on:	The acquired theoretical knowledge is involved in large part of mathematics such as commutative algebra.
Soft skills	• *Making informed judgments and choices* Ability to choose suitable techniques and mathematical tools necessary to prove properties dealing with the program topics. • *Communicating knowledge and understanding* Acquiring mathematical language and formalism necessary to read and understand textbooks. • *Capacities to continue learning* Acquiring suitable learning methods and relating the main concepts occurring in various courses.

Assessment and feedback	

Methods of assessment	Oral exam about the topic of the course, to evaluate the understanding of the themes investigated.
Evaluation criteria	• *Knowledge and understanding* ○ Quality and accuracy of the techniques and proofs used and abstract reasoning. • *Applying knowledge and understanding* ○ Accuracy and precision of reasoning • *Autonomy of judgment* ○ Quality and precision of the proofs and techniques used. • *Communicating knowledge and understanding* ○ Quality and accuracy of the acquired knowledge • *Communication skills* ○ Property and accuracy of the exposition
Criteria for assessment and attribution of the final mark	The final assessment is given in the range 18/30 e lode. The exam is passed if the assessment is greater or equal to 18. It depends on the quality, accuracy and precision showed during the exams.
Additional information	