UNIVERSITÀ DEGLI STUDI DI PALERMO

DEPARTMENT	Matematica e Informatica
ACADEMIC YEAR	2016/2017
MASTER'S DEGREE (MSC)	MATHEMATICS
SUBJECT	ALGEBRAIC GEOMETRY
TYPE OF EDUCATIONAL ACTIVITY	B
AMBIT	50398-Formazione teorica avanzata
CODE	17205
SCIENTIFIC SECTOR(S)	MAT/03
HEAD PROFESSOR(S)	KANEV VASSIL Professore Ordinario Univ. di PALERMO
OTHER PROFESSOR(S)	
CREDITS	6
INDIVIDUAL STUDY (Hrs)	98
COURSE ACTIVITY (Hrs)	52
PROPAEDEUTICAL SUBJECTS	
MUTUALIZATION	
YEAR	2
TERM (SEMESTER)	1° semester
ATTENDANCE	Not mandatory
EVALUATION	Out of 30
TEACHER OFFICE HOURS	**KANEV VASSIL** Monday 14:00 16:00 Dipartimento di matematica e informatica Studio n.215, in presenza, e tramite TEAMS a distanza. Il codice di accesso e' wdprmip. Consultare https://sites.unipa.it/kanev/. Thursday 14:00 16:00 Dipartimento di matematica e informatica Studio n.215, in presenza, e tramite TEAMS a distanza. Il codice di accesso e' wdprmip. Consultare https://sites.unipa.it/kanev/.

DOCENTE: Prof. VASSIL KANEV

PREREQUISITES	The student should have a good knowledge of the following topics: 1. Algebra: commutative rings, ideals, homomorphisms. factor rings, prime ideals, maximal ideals, fields, fields of fractions of integral domains, the ring of polynomials. 2. Geometry: affine space, projective space, topological spaces, continuous maps, omeomorphisms.
LEARNING OUTCOMES	1. Knowledge and understanding. This is a first course in Algebraic geometry. It aims at giving the student the basic knowledge of affine and projective varieties (solutions of polynomial systems of equations) and the maps between them. The student acquires knowledge of these topics based on rigorous mathematical proofs, he/she learns to understand and apply some basic methods of this field. 2. Applying knowledge and understanding. Having successfully completed the course the student will be able to resolve problems of moderate difficulty and will be able to work out rigorous proofs of results similar to those exposed during the lectures. He/she will be able to read and understand more advanced texts as well as to follow the various applications of Algebraic geometry in other areas. 3. Making judgements. The student must develop critical thinking and independent judgement to solve problems such as those introduced during the course. The student must be able to distinguish correct from incorrect arguments in the proofs. 4. Communication skills. The student must be able to communicate effectively and rigorously the concepts learned during the course to both specialists and non-specialists. 5. Lifelong learning skills. The obtained knowledge is a prerequisite for studying more advanced topics of the field with a certain grade of autonomy, as well as consulting the specialized literature dedicated to the applications of the methods of Algebraic geometry in various scientific areas.
ASSESSMENT METHODS	The final exam is an oral examination. During the oral examination the student should answer to at least three questions based on the contents of the course and furthermore should expose one of the examples worked out during the problem sessions.The level of knowledge of the topics of the course, the ability to present them with rigorous proofs, the language skills specific for the field are evaluated in the oral examination. Description of evaluation methods - Excellent Rating: 30-30 cum laude vote. Outcome: excellent knowledge of the topics, excellent properties of language, good analytical ability, the student is able to apply knowledge to solve problems proposed. - Very good Rating: 26-29 vote. Outcome: Good mastery of the subjects, full language ability, the student is able to apply knowledge to solve problems proposed. - Good Rating: 24-25 vote. Outcome: Basic knowledge of the main topics, discrete properties of language, with limited ability to independently apply the knowledge to the solution of the proposed problems. - Satisfactory Rating: 21-23 vote. Outcome: the student does not have full command of the main teaching subjects but has the knowledge, satisfactory properties of language, lack of ability to independently apply the knowledge gained. - Sufficient Rating: 18-20 vote. Outcome: minimum basic knowledge of the main teaching and technical language issues, very little or no ability to independently apply the knowledge gained. - Insufficient rating. Outcome: the student does not have an acceptable knowledge of the contents of the topics covered in the course.
EDUCATIONAL OBJECTIVES	The goal of the course is to present the basics of the theory of solutions of systems of polynomial equations. Algebraic Geometry studies these solutions from a global point of view, by means of the theory of the algebraic varieties. These varieties will be defined and some of their basic and important properties will be studied.
TEACHING METHODS	40 hours of lectures 12 hours of problem sessions 98 hours of self-study
SUGGESTED BIBLIOGRAPHY	K. Hulek, Elementary Algebraic Geometry, Amer. Math. Soc., Student Mathematical Library Vol.20 (2003) I.R.Shafarevich, Basic Algebraic Geometry Vol. 1, Springer-Verlag, (1994) G. Kempf, Algebraic Varieties, Cambridge University Press. (1993)

SYLLABUS

Hrs	Frontal teaching
15	Affine algebraic sets. The Zariski topology. Decomposition in irreducible sets. The Hilbert Nullstellensatz. Polynomial functions and polynomial maps. Rational functions.
4	Projective algebraic sets and homogeneous ideals. Quasi-projective sets. The Hilbert Nullstellensatz in the projective setting. Projective hypersurfaces.

SYLLABUS

Hrs	Frontal teaching
11	Sheaves of functions. Algebraic varieties. Morphisms. Grassmann varieties.
10	Product of algebraic varieties. Segre varieties. Morphisms from projective varieties: closedness of the image. The Veronese map. Existence of non-trivial solutions of systems of homogeneous polynomial equations.

Hrs	Practice
4	Affine algebraic sets. Irreducible sets. Polynomial maps. Isomorphism. Rational functions.
1	Projective algebraic sets
4	Algebraic varieties
3	Quasi-projective varieties.