<table>
<tr><td colspan="5">Academic subject: ALGEBRAIC GEOMETRY</td></tr>
<tr><td colspan="2">Degree Class:
L-35-Scienze Matematiche</td><td colspan="2">Degree Course:
Mathematics</td><td>Academic Year:
2018/2019</td></tr>
<tr><td colspan="2"></td><td colspan="2">Kind of class:
Optional</td><td>Year: 3 | Period: II</td></tr>
<tr><td></td><td></td><td colspan="2"></td><td>ECTS: 7
divided into
ECTS lessons: 6,5
ECTS exe/lab/tutor: 0,5</td></tr>
<tr><td colspan="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</td></tr>
<tr><td>Language:
Italian</td><td>Compulsory Attendance:
no</td><td colspan="3"></td></tr>
<tr><td>Subject Teacher:
Amici Oriella Maria</td><td>Tel: 085442691
e-mail:
oriellamaria.amici@uniba.it</td><td>Office:
Department of Mathematics
Room 14 , Floor III</td><td colspan="2">Office days and hours:
Wednesday 11-13, other days by appointment.</td></tr>
<tr><td colspan="5">Prerequisites: Mathematical knowledge which usually is acquired during the first two years of a degree of L-35. Especially: linear algebra, affine geometry, projective geometry, topology.</td></tr>
<tr><td colspan="5">Educational objectives: Acquiring knowledge of basic notions in Algebraic Geometry, especially in the theory of curves and algebraic varieties.</td></tr>
<tr><td>Expected learning outcomes (according to Dublin Descriptors)</td><td colspan="4">Knowledge and understanding: Acquiring fundamental concepts in affine and projective Algebraic Geometry. Acquiring main tools basic 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.</td></tr>
<tr><td colspan="5">Course program
<u>Projective spaces</u>

<u>Algebraic curves</u>
Plane curves. Rational curves .Rational maps. Weierstrass normal form of a cubic. Singular and non singular points. Local parameter on the curve at point. Tangent line. Flex point. Projective curves. Birational curves. Hessian curve . Pascal’s line. Linear system of plane curves.

<u>Algebraic preliminaries</u>
Polynomials. Sums, products and intersections of ideals. Notherian rings. Homogeneous forms. Homogeneous ideals.

<u>Algebraic varieties</u></td></tr>
</table>

Affine algebraic varieties. Hypersurfaces. The ideal-variety correspondence. Zariski topology. Ideal of variety. Homogeneization and dehomogeneization of a polynomial. Projective algebraic varieties. The radical of an ideal. Radical ideals.

Groebner bases and Nullstellensatz.
Monomial ordering. Monomial ideal. The Hilbert basis Theorem. Groebner bases and properties. Nullstellensatz and Projective Nullstellensatz. The ideal-variety correspondence. Irreducible varieties and ideal primes. Minimal decomposition of a variety.

The Elimination and Extension Theorems.
Elimination ideal. Elimination Theorem. Resultants. The Extension Theorems.

Rational functions on a variety
Regular mappings. Coordinate ring. Rational functions on a variety. Field of rational functions on a variety. Rational mappings. Birationally equivalent varieties. Rational variety.

Dimension of a variety.

Teaching methods:
Lectures and exercise sessions

Auxiliary teaching:

Assessment methods:
Oral exam

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.
O. ZARISKI-P. SAMUEL, Commutative Algebra I e II, Springer Verlag, Berlin, 1958.