Academic subject: GEOMETRY 2			
Degree Class: L-35-Scienze Matematiche		**Degree Course:** Mathematics	**Academic Year:** 2018/2019
		Kind of class: Mandatory	**Year:** 1 / **Period:** II
			ECTS: 8 divided into **ECTS lessons:** 5 **ECTS exe/lab/tutor:** 3
Time management, hours, in–class study hours, out–of–class study hours lesson: 40 exe/lab/tutor: 30 in–class study: 70 out–of–class study: 130			
Language: Italian	**Compulsory Attendance:** no		
Subject Teacher: Amici Oriella Maria	**Tel:** 085442691 **e-mail:** oriellamaria.amici@uniba.it	**Office:** Department of Mathematics Room 14 , Floor III	**Office days and hours:** Wednesday 11-13, other days by appointment.
Prerequisites: Basic knowledge of Linear Algebra: vector spaces, linear maps and bilinear forms.			
Educational objectives: Acquiring language and techniques of affine geometry.			
Expected learning outcomes (according to Dublin Descriptors)	**Knowledge and understanding:** Acquiring fundamental concepts in Affine Geometry . Acquiring basic mathematical proof techniques. **Applying knowledge and understanding:** Students should become able to prove properties dealing with the program topics. **Making judgements:** Ability to analyze the consistency of the logical arguments used in a proof. **Communication:** Students should acquire the mathematical language and formalism necessary to explain the assimilated knowledge and solve problems . **Lifelong learning skills:** Acquiring suitable learning methods necessary to read and understand texbooks dealing with the program topics.		

Course program

Euclidean vector spaces.

Scalar products on real vector spaces. The norm of a vector. Orthogonal and orthonormal vectors. Orthogonal complement of a vector subspace. Orthonormal bases. Gram-Schmidt process. Angle between two vectors. Spectral Theorem. Unitary operators. Orthogonal matrices. Rotations and reflections.

Affine spaces.

Affine spaces associated to a vector space over the field K , K=C oppure K=R: elementary properties and examples. Affine subspaces: properties and examples. Affine subspace spanned by k points. Intersection of affine subspaces. Affinely independent points. Parallel subspaces and properties. Affine Grassmann identity and particular cases. Barycenter . Equations of an affine subspace. Orientation of real affine space. Affine line A_1(V, K; f). Affine plane A_2(V, K; f): parallel lines , equations of a line. Affine space A_3 (V, K; f): parallel lines, parallel planes, equations of a plane and equations of a line.

Euclidean spaces.

Euclidean space associated to a euclidean vector space. Euclidean line E_1. Euclidean plane E_2 : perpendicular lines,

angle between two lines, distances in E_2. Euclidean space plane E_3: perpendicular lines, perpendicular planes, distances in E_3 .

Affine maps and Affine transformations.
Affine maps and characterization of affine maps. Affine transformations: definition, main properties and equation. The affine group Aff(An) and its subgroups. Translations. Fixed points of an affine transformation. Decomposition of an affine transformation. Homotheties and equation of homotheties.

Isometries of Euclidean space.
Isometries and characterization of isometries. Examples: translations and rotations.

Complex Extension of real Affine space.
Real Affine transformations.
Complex Extension of Euclidean space.

Teaching methods:
Lectures and exercise sessions.

Auxiliary teaching:

Tutorial activity

Assessment methods:
Written and oral exam. Joint exam with Geometry 1

Bibliography:
E. Semesi, Geometria I, Ed. Boringhieri.
M.I. Stoka, Corso di Geometria, Ed. Cedam Padova.
S. Abeasis, Algebra lineare e Geometria, Ed. Zanichelli.
G. Anichini, G. Conti, Algebra lineare e geometria analitica- Eserciziario, Ed. Pearson.
G. Campanella, Affinità, isometrie, proiettività, Ed, Pearson.