

Academic subject: GEOMETRY 2			
Degree Class: L-35-Scienze Matematiche		Degree Course: Mathematics	
		Academic Year: 2017/2018	
		Kind of class: Mandatory	Year: 1
			Period: 2
			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
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Prerequisites: The notions given in the course of Geometry 1			
Educational objectives: Acquisition of abstract concepts relating to Linear Algebra and Affine Geometry			
Expected learning outcomes (according to Dublin Descriptors)	Knowledge and understanding: Acquiring fundamental concepts of Affine Geometry and acquisition of calculus techniques		
	Applying knowledge and understanding: The student should be able to do simple proofs similar to the ones seen in the course		
	Making judgements: The student should be able to apply the notions and the techniques learnt in the course		
	Communication: The student should be able to state, prove theorems and discuss the problems about the statement of a theorem		
	Lifelong learning skills: Acquiring the ability to read books concerning the program		
Course program			
<u>Euclidean vector spaces</u> Euclidean vector spaces. The norm of a vector. Orthogonal and orthonormal vectors. Orthogonal complement of a vector subspace. Angle between two non zero vectors. Spectral Theorem. Unitary operators. Rotations and reflections.			
<u>Affine spaces</u> Affine spaces associated to a vector space, fundamental examples. Affine subspaces and their direction: properties, 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 of weighted points. Affine frames and affine coordinates. Change of affine frames. Parametric and cartesian 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 and intersection of lines, coordinates axes, parametric equations and cartesian equation of a line. Affine space $A_3(V, K; f)$: parallel lines, parallel planes, parallelism between a line and a plane, coplanar lines, sheaves of planes, coordinate axes and planes, parametric and cartesian equations of a plane, parametric and cartesian equations of a line.			
<u>Euclidean spaces</u> Euclidean space associated to a Euclidean vector space. Cartesian frames and cartesian coordinates. Distance between			

two points. Euclidean line E_1 . Euclidean plane E_2 : orthogonal lines, angle between two lines, distances in E_2 . Euclidean space plane E_3 : orthogonal lines, orthogonal planes, orthogonality between a line and a plane, distances in plane E_3 , minimum distance between lines.

Affine maps and Affine transformations.

Affine maps and characterization of affine maps. Affine transformations. Affine group $\text{Aff}(A_n)$ and its subgroups. Equations of affine transformations. Translations. Fixed points of an affine transformation. Decomposition of an affine transformation. Homotheties and equation of homotheties.

Isometries of Euclidean space.

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 sections

Auxiliary teaching:

tutorial activity

Assessment methods:

Written and oral exam, joint 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.