UNIVERSITÀ DEGLI STUDI DI PALERMO

DEPARTMENT	Ingegneria
ACADEMIC YEAR	2018/2019
BACHELOR'S DEGREE (BSC)	CHEMICAL AND BIOCHEMICAL ENGINEERING
SUBJECT	GEOMETRY
TYPE OF EDUCATIONAL ACTIVITY	A
AMBIT	50292-Matematica, informatica e statistica
CODE	03675
SCIENTIFIC SECTOR(S)	MAT/03
HEAD PROFESSOR(S)	RIZZO CARLA Assegnista di ricerca Univ. di PALERMO
OTHER PROFESSOR(S)	
CREDITS	6
INDIVIDUAL STUDY (Hrs)	96
COURSE ACTIVITY (Hrs)	54
PROPAEDEUTICAL SUBJECTS	
MUTUALIZATION	GEOMETRY - Corso: INGEGNERIA DELLA SICUREZZA GEOMETRY - Corso: SAFETY ENGINEERING
YEAR	1
TERM (SEMESTER)	1° semester
ATTENDANCE	Not mandatory
EVALUATION	Out of 30
TEACHER OFFICE HOURS	

DOCENTE: Prof.ssa CARLA RIZZO

PREREQUISITES	1. Classical knowledge of the concepts of mathematical logic. 2. Knowledge of numerical sets N, Z, Q, R and operations in them. 3. Main topics on equations. 4. Basic geometric entities (space, plane, straight line, angles). 5. Main topics on straight line.
LEARNING OUTCOMES	Knowledge and Understanding At the end of the course, the student will have acquired the knowledge of the terminology, and its use, the knowledge of the arguments and an appropriate computational techniques that allow him to effectively solve various problems in geometry. Implementation of the knowledge: The student will be able to use the methods and the conceptual tools of geometry to solve problems such as the study of a linear system, the determination of the rank of a matrix, the calculation of the determinant of a square matrix, the determination of the inverse matrix of an invertible matrix, the reduction to canonical form of the equation of a conic irreducible to real points, the determination of the minimum straight distance of two given skew straight lines. Moreover, he will be able to recognize whether and when a theorem can be used (or might be used) in specific cases. Making judgements The student will develop a critical ability in characterizing the suitable and relevant solution to the proposed problem, choosing the easiest strategy to deal with and solve the typical problems of linear algebra and analytical geometry, recognizing the usefulness algorithms learned during the course. The student will have acquired the ability to formalize and analyze new problems in full autonomy, both in qualitative and rigorous way. Communication skills The student will have acquired the ability to expose in clear and rigorous way, using adequately the disciplinary lexicon concerning the course contents. He will be also able to write the solution of a geometric problem in a rigorous and correct way. Learning skills The student will have learned the basic knowledge (linear algebra and analytic geometry). The student will have acquired the ability to contextualize own knowledges, eventually adapting it to a wide and multidisciplinary area of interests, in particular in engineering.
ASSESSMENT METHODS	The knowledge and the understanding about the contents of the course will be verified through a mid-term written test, a final written test and an oral discussion. In the written tests the exercises will be structured in several questions in order to determine whether the student has gained knowledge and understanding of the proposed arguments. The oral discussion consists in analyzing the written tests in order to assess the degree of acquired expertise and the possession of adequate capacity to explain and to deal with the content of the course. The final evaluation will be scaled according to the following conditions in thirtieths: 30 - 30 with honors Optimal knowledge of the contents of the course, optimal property of language, very good analytic abilities and competence in problem solving; 26-29 good mastery of the contents of the course, very good property of language, good competence in problem-solving ; 24-25 knowledge of base treated contents, discrete property of language, with limited ability to independently apply the competence to solve the proposed problems; 21-23 not have full mastery of the main contents of the course but possesses knowledge, satisfactory property of language, limited ability to apply the acquired knowledge; 18-20 minimal base knowledge of the contents of the course and of the technical language, minimal ability to apply the acquired knowledge; No sufficient the student does not possess an acceptable knowledge of the contents of the course (no sufficient).
EDUCATIONAL OBJECTIVES	The main objective of the course is to provide students with the main instruments for analyzing problems from mathematical point of view, in particular through the acquisition of mathematical concepts that support the engineering disciplines. Therefore, the educational objectives will be: 1. to promote the intuitive and logical abilities; 2. to acquire skills for abstracting and formalizing;

	3. to develop the abilities for critical examination and to outline logically the knowledge gained; 4. to be familiar with looking for alternative constructive solutions; 5. to be familiar with generalizing the solution to a specific problem in algorithms; 6. to improve the ability to use methods, instruments and mathematical models in different situations; 7. to promote the comprehension of the cross-cutting concepts in order to grasp analogies between different fields.
TEACHING METHODS	Traditional classes and exercises.
SUGGESTED BIBLIOGRAPHY	1. G.Vaccaro - A.Carfagna - L.Piccolella - "Lezioni di geometria e algebra lineare" - Zanichelli 2. A.Carfagna - L.Piccolella - "Complementi ed esercizi di geometria e algebra lineare" - Zanichelli 3. M. Abate - C. de Fabritiis - "Geometria analitica con elementi di algebra lineare" terza edizione (2015) - McGraw-Hill Milano

SYLLABUS

Hrs	Frontal teaching
5	Algebraic structures (groups and fields). Vector spaces, definitions and properties. Subspaces. Linear combinations, linear dependence and independence. Bases and coordinates. Dimension. Subspace intersection and sum.
5	Matrices, operations and their properties. Vector space of matrices. Reduction method of Gauss. Rank of a matrix. Determinant of a square matrix and properties. Submatrices and minors. Laplace Theorem. Matrix ad-joint and inverse matrix. Matrices of change of base.
5	Linear (algebraic) systems. Compatibility of a system. Solutions. Cramer's Theorem. Homogeneous systems. Gauss Method of elimination for linear systems.
6	Linear maps (or homomorphisms) of vector spaces. Image and core. Associated matrix. Rank and nullity of a linear map. Isomorphisms, endomorphisms. Eigenvalues and eigenvectors. Diagonalizable endomorphisms.
5	Affine geometry. Cartesian coordinates in the affine plan. Cartesian and vector equation of a straight line. Alignment condition for three points. Intersection and parallelism between straight lines. Straight lines for a point. Condition of belonging to a bundle.
6	Affine geometry. Cartesian coordinates in the 3D affine space. Cartesian and vector equation of a plane. Condition of parallelism between two planes. Planes bundle. Cartesian and vector equation of a straight line in space. Alignment condition for three points. Straight line through two points. Condition of parallelism between straight lines. Intersection and parallel between straight lines. Complanarity of two straight lines. Straight line for a point. Condition of belonging to a bundle.
4	Conics. Classification affine, improper points, conics degenerate. Canonical forms, equivalence between conics, reduction to canonical form. Bundle of conics. Polarity of a conic. Center, diameters, fires and directrixs of a conic.

Hrs	Practice
3	Vectorial spaces
3	Matrices.
3	Linear (algebraic) systems.
3	Linear maps.
3	Geometry in the affine plane.
6	Geometry in the affine space.
3	Conics