Content

Course Code	Course Name	Semester	Theory	Practice	Lab	Credit	ECTS
MAT116	Analytic Geometry	1	3	2	0	5	8

Prerequisites	
Admission Requirements	

Language of Instruction	French
Course Type	Compulsory
Course Level	Bachelor Degree
Objective	Develop analytical tools to draw a connection between high school geometry, linear algebra and multivariable analysis
Content	Plane Geometry -Coordinates in the plane (Cartesian and polar), -Vectors (arithmetic operations, dot product, determinant, orthogonality, linear dependence), -Complex numbers (arithmetic and geometry, polar representation), -Representations of lines in the plane (two points, one point and a direction vector, one point and a normal vector, Cartesian equation, parametric equation), -Analysis of the intersection of lines using systems of equations (Gaussian elimination, matrices, Cramer's rule) Spatial Geometry (3D Geometry) -Coordinates in space (Cartesian, cylindrical, spherical), -Vectors (arithmetic operations, dot product, determinant, cross product, orthogonality, linear dependence), -Representations of lines and planes in space, -Methods for computing intersections, distances, and angles between lines and planes in space Conic Sections -Types of conics and their various representations (geometric, single-focus definition, double-focus definition, second-degree equations), -Classification of second-degree equations in two variables
References	Shared lecture notes Géométrie, Cours et Exercices, A. Warusfel et al., Vuibert 2002 Géométrie élémentaire, André Gramain, Hermann, 1997. Précis de géométrie analytique, G.Papelier, Vuibert 1950. Exercises de géométrie analytique, P.Aubert, G.Papelier,Vuibert 1953. Cours de géométrie analytique, B. Niewenglowski, Gauthier-Villars, 1894.

Theory Topics

Week	Weekly Contents
1	Real line, Concept of a reference frame on a line and on a plane, Coordinate systems (Cartesian, polar)
2	Vectors (Concept of a vector in the plane, its formal definition, vector arithmetic, vector coordinates, linear (in)dependence)
3	The norm of a vector, dot product and determinant of two vectors, their geometric interpretations, Complex numbers
4	Arithmetic of complex numbers, Representation of lines in the plane
5	Intersection of lines, solving systems of linear equations, Introduction to matrices
6	Arithmetic of 2×2 matrices
7	Geometry of three-dimensional space (reference frames, coordinate systems, vectors, cross product, determinant)
8	Midtem
9	Representation of lines and planes, and their intersections
10	Intersections of lines and planes
11	Introduction to conic sections, study of types of conics
12	Study of conic sections

Week	Weekly Contents
13	Classification of quadratic forms in two variables
14	Classification of quadratic forms in two variables