Content

Course Code	Course Name	Semester	Theory	Practice	Lab	Credit	ECTS
MATH 513	Algebraic Geometry	2	3	0	0	3	7

Prerequisites	
Admission Requirements	

Language of Instruction	English
Course Type	Elective
Course Level	Masters Degree
Objective	The aim of this course is to understand affine and porjective geometry and to learn the relation between algebraic notions and geometric structures
Content	Ring theory and fields (summary), Polynomials and afine space, Affine algebraic sets, İdeals of algebraic sets, Hilbert's Nullstellensatz theorem, Radical ideals and Nullstellensatz theorem; Zariski topology and irreducible algebraic sets, Decomposition of an algebraic set, Polynomial mappings and polynomial functions, Coordinate ring of an algebraic set, Affine change of coordinates, Rational functions and local rings; Projective space, Projective algebra-geometry dictionary, Homogeneous coordinate ring and function field, Projective change of coordinates, Dehomogenization and homogenization of polynomials, Affine-projective transfer of algebraic sets, Multiprojective space and Segre product; Algebraic set of a monomial ideal, Hilbert function and dimension, Dimension of a projective algebraic set, Elementary properties of dimension; Tangent spaces and singularities, blow-up, Smooth algebraic sets, Blow-up of curves and surfaces, Examples.
References	A Primer of Algebraic Geometry, Huishi Li Ideals, Varieties and Algorithms, D. Cox, J. Little, D. O'Shea

Theory Topics

Week	Weekly Contents
1	Ring theory and fields (summary), Polynomials and afine space
2	Affine algebraic sets, Ideals of algebraic sets
3	Hilbert's Nullstellensatz theorem, Radical ideals and Nullstellensatz theorem
4	Zariski topology and irreducible algebraic sets, Decomposition of an algebraic set
5	Polynomial mappings and polynomial functions, Coordinate ring of an algebraic set
6	Affine change of coordinates, Rational functions and local rings
7	Projective space, Projective algebra-geometry dictionary
8	Homogeneous coordinate ring and function field, Projective change of coordinates
9	Dehomogenization and homogenization of polynomials, Affine-projective transfer of algebraic sets
10	Multiprojective space and Segre product
11	Algebraic set of a monomial ideal, Hilbert function and dimension
12	Dimension of a projective algebraic set, Elementary properties of dimension
13	Tangent spaces and singularities, Blow-up, Smooth algebraic sets
14	Blow-up of curves and surfaces, Examples