Academic subject: Algebra 2			
Degree Class: L-35 - Scienze Matematiche		**Degree Course:** Mathematics	**Academic Year:** 2020/2021
		Kind of class: mandatory	**Year:** 3 / **Period:** 1
			ECTS: 7 divided into **ECTS lessons:** 5 **ECTS exe/lab/tutor:** 2
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: 100			
Language: Italian	**Compulsory Attendance:** no		
Subject Teacher: Roberto La Scala	**Tel:** +39 080 5442674 **e–mail:** roberto.lascala@uniba.it	**Office:** Department of Mathematics Room 28, Floor 2	**Office days and hours:** Monday 11-13. Other days and times by appointment.
Prerequisites: Mathematical knowledge which usually is acquired during the first two years of a degree of L-35 class. Especially: arithmetics, basic algebraic structures and linear algebra.			
Educational objectives: Acquiring language and techniques of modern algebra, especially the theory of groups, rings and fields.			
Expected learning outcomes (according to Dublin Descriptors)	**Knowledge and understanding:** Acquiring fundamental concepts in modern algebra. Acquiring basic mathematical proof techniques. **Applying knowledge and understanding:** The acquired theoretical knowledge is useful in great part of mathematics and its applications. **Making judgements:** Ability to analyze the consistency of the logical arguments used in a proof. Problem solving skills should be supported by the capacity in evaluating the consistency of the found solution with the theoretical knowledge. **Communication:** Students should acquire the mathematical language and formalism necessary to read and comprehend textbooks, to explain the acquired knowledge, and to describe, analyze and solve problems. **Lifelong learning skills:** Acquiring suitable learning methods, supported by textbooks consultation and by solving the exercises and questions periodically suggested during the course.		
Programma del corso Examples of groups. Definitions and first results in the theory of groups. Product and intersection of groups. Direct and semidirect product. Group isomorphism theorems. Examples of group actions. Conjugation classes of the symmetric group. Fundamental theorems for group actions. Homomorphisms and presentations. Sylow theorems. Structure of a finite abelian group. Classification of groups of low order. Examples of commutative and non-commutative rings. Units and zero-divisors. Ring isomorphisms theorems. Finite rings. Chinese remainder theorem. Integral domains, division rings and fields. Fraction field. Prime and maximal ideals. Prime and irreducible elements. Euclidean domains. Gauss integers. Principal ideal domains. Unique factorization domains.			

The characteristic of a field. Frobenius endomorphism. Field extensions. Degree multiplication rule. Algebraic and transcendent extensions. Transitivity of algebraic extensions. Algebraic closure. Splitting fields. Cyclotomic polynomials. The splitting field is unique. Algebraic closed fields. Primitive element theorem. Finite fields. The multiplicative group of a finite field.

Teaching methods:
Lectures and exercise sessions.

Auxiliary teaching:
Lecture notes freely available on the Internet
J.S. Milne, Group Theory, www.jmilne.org/math
J.S. Milne, Fields and Galois Theory, www.jmilne.org/math

Assessment methods:
Oral exam.

Bibliography:
Herstein, Algebra, Editori Riuniti
Jacobson, Basic Algebra I, Dover Books on Mathematics
Piacentini-Cattaneo, Algebra, Zanichelli