



General information		Academic year 2022-2023
Academic subject	Algebra 2	
Degree programme	L-35 - Mathematics	
Programme year	Third	
Term	First	
European Credit Transfer and Accumulation System credits (ECTS)	7	
Language	Italian	
Attendance	Strongly encouraged	

Lecturers	
Name and surname	Roberto La Scala
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Department and office	Department of Mathematics, room 28 second floor
Virtual meeting room	Microsoft Teams: Algebra 2 (cod.fc3ithr)
Pagina web	https://www.dm.uniba.it/members/lascalea
Office hours	Mon. Wed. Fri. 12:00 – 13:00 in presence or online (by appointment)

Syllabus	
Learning objectives	Knowledge and application of the basic tools of modern algebra, such as groups, rings and fields theory.
Course prerequisites	The knowledge that is typically acquired in the first two years of a degree of L-35 class. In particular: arithmetic, basic algebraic structures and linear algebra.
Course contents	<p>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.</p> <p>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.</p> <p>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.</p>

Reference books	Herstein, Algebra, Editori Riuniti Jacobson, Basic Algebra I, Dover Books on Mathematics Piacentini-Cattaneo, Algebra, Zanichelli
Additional course	Lecture notes freely available on Internet J.S. Milne, Group Theory, www.jmilne.org/math J.S. Milne, Fields and Galois Theory, www.jmilne.org/math

Work schedule				
	Total	Lectures	Hands-on learning (recitations/laboratories /seminars/other)	Self-study
Hours	175	40	30	105
ECTS credits	7	5	2	

Teaching methods	
	Lectures and exercise sessions.

Expected learning outcomes	
Knowledge and understanding	Knowledge of fundamental concepts in modern algebra. Knowledge of basic mathematical proof techniques.
Applying knowledge and understanding	Ability to apply the acquired knowledge to different mathematical disciplines and their applications.
Making judgements	Evaluation of the correctness of the logical reasoning used in a proof. Ability to identify appropriate algebraic structures and tools to tackle complex problems.
Communication skills	Knowledge of the mathematical language and formalism, necessary for the consultation and understanding of the texts, the presentation of acquired theory, the description, analysis and solution of concrete problems.
Learning skills	Acquisition of an adequate study method, supported by the consultation of the texts and by the resolution of exercises and questions proposed periodically during the course.

Assessment and feedback	
Assessment methods	Oral final exam
Evaluation criteria	Correctness and completeness in the presentation of the concepts and general results studied during the course. Correctness and precision when applying solving techniques to specific problems inherent to the subject.
Grading policy	Final evaluation expressed in 30th and exam passed with at least 18 over 30.

Additional information	