Università degli Studi di L'Aquila - Dipartimento di Ingegneria e Scienze dell'Informazione e Matematica

Course catalogue

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Programme of Module "Matematica Discreta I"

- Code: F0124
- Type of course unit: Compulsory (Bachelor Degree in Computer Science curriculum General)
- Level of course unit: Undergraduate Degrees
- Semester: 2

Number of ects credits: (Bachelor Degree in Computer Science) 6 (workload 150 hours)

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1	**Course objectives**	The goal of this course is to expose the main concrete techniques in linear algebra (matrices, systems, determinants, vector spaces and linear maps) and to show the first strategies in abstract algebra.
2	**Course content and learning outcomes (dublin descriptors)**	Topics of the module include: • Sets: functions, equivalence relations, products, elementary combinatorics. • Permutations. • Groups: subgroups, quotients, isomporphism theorems, factor groups, permutation groups, cyclic groups. • Arithmetic: divisibility theory in the ring of integers and of polinomials over a field. • Congruences. Chinese remainder theorem. • Rings: subrings, ideals, quotients, isomorphism theorem, ring of polynomials, domains, euclidean rings, PID, UFD. • Fields: simple field extensions, finite fields. • Matrices and systems of linear equations: Gauss reduction, determinants. • Vectors, vector spaces, independence, bases. • inner product, cross product. • Eigenvalues, eigenvectors. Diagonalization and canonical forms of matrices. • Application: systems of differential equations. On successful completion of this module, the student should : • being aware of the main structures in Linear Algebra and Abstract Algebra. • demonstrate skill in mathematical reasoning, manipulation and calculation, demonstrate capacity for finding rigorous proofs of small problems; demonstrate skill in mathematical reasoning, manipulation and calculation by synthesizing geometric concepts into algebraic, functional, and problem-solving activities; demonstrate capacity to deduce properties of, and relationships between, figures from given assumptions and from using transformations.
3	**Course prerequisites**	Set Theory (language of set theory, the notion of function, graphs of fundamental functions, concept of sufficient and necessary condition), Numerical Structures (natural numbers, prime numbers, numerical fractions, rational numbers, basics of real numbers, inequalities, absolute value, powers and roots); Elementary algebra (polynomials and operations on polynomials, identity, first- and second-degree equations).
4	**Teaching methodsand language**	Lectures and exercises **Language**: Italian **Reference textbooks** • A. Bernardi A Gimigliano, ***Algebra lineare e geometria analitica***. Cittàstudi.
5	**Assessment methods**	Written exam and oral discussion of the written exam.