



Programme of Module "Matematica Discreta II"

- Code: F0126
- 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)

Teachers: Anna Guerrieri

1	Course objectives	<p>LOGIC: The goal of this Module is to provide the motivations, definitions and techniques in support of the usefulness of logic in the effective and efficient modeling of data and knowledge. This Module is an introduction to mathematical logic and covers elementary discrete mathematics for computer science. On successful completion of this module, the student should understand the fundamental concepts of mathematical logic and should be aware of potential applications in computing, including the limitations of algorithms. GEOMETRY: The goals of this Module are to introduce students to the terminology and theorems of plane and solid geometry, and to apply algebraic, spatial, and logical reasoning to solve geometry problems. This Module covers the fundamental concepts of Linear Algebra and its role in describing geometric settings. On successful completion of this module, the student will develop spatial sense, visualize and represent geometric figures, explore transformations of geometric figures, understand and apply geometric properties and relationships, synthesize geometric concepts into algebraic, functional, and problem-solving activities.</p>
2	Course content and learning outcomes (dublin descriptors)	<p>Topics of the module include:</p> <ul style="list-style-type: none"> • LOGIC Propositional Logic: Logical formulae, valuations, truth tables, logical equivalence of formulae, satisfaction and logical implication. Deductive Logic: Formal axiom schemes, the structure of formal proofs, Sequent Calculus, Natural Deduction, the Deduction Theorem, and connections between truth and proof (the Soundness and Completeness Theorems). • GEOMETRY Euclidean plane geometry, angles, radians, notion of geometric place, properties of triangles, parallelograms, circles, symmetry and similarity, transformations in the plane, Cartesian coordinates and equations of simple geometric places, elements of trigonometry, elements of spatial Euclidean geometry, volumes. <p>On successful completion of this module, the student should :</p> <ul style="list-style-type: none"> • On successful completion of this module, the student should • have profound knowledge of basic techniques in set theory; • have knowledge and understanding of logical and deductive arguments; • have profound knowledge of basic techniques in Linear Algebra; • have knowledge and understanding of logical and deductive arguments; • have knowledge and understanding of geometric relationships within the axiomatic structure of Euclidean geometry; • understand and apply geometric properties and relationships; • demonstrate capacity for finding rigorous proofs of small problems; • understand and explain the meaning of complex statements using mathematical notation and language;

		<ul style="list-style-type: none"> • understand the fundamental concepts of mathematical logic and should be aware of potential applications in computing. • demonstrate skill in mathematical reasoning, manipulation and calculation by synthesizing geometric concepts into algebraic, functional, and problem-solving activities; • understand and explain the meaning of complex statements using mathematical notation and language; • understand and explain the relation of geometry to algebra and trigonometry by using the Cartesian coordinate and recognize geometric relationships in the world; • ability to read and understand other books/papers using notions learnt by the course and understand their applications.
3	Course prerequisites	For LOGIC the student must have the basic mathematical notions and methods as acquired in the secondary Schools. For GEOMETRY the student must know: 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); Algebraic Structures (Groups, homeomorphisms, rings); Linear Algebra: Linear systems, matrices, matrix operations, vectors and vector spaces, elementary operations on vectors, linear independence, bases, rank of a matrix linear transformations, determinants, inner product spaces, eigenvalues, and eigenvectors.
4	Teaching methods and language	Lectures and Exercises Language: Italian Reference textbooks <ul style="list-style-type: none"> • B. Scimemi, <i>Algebretta</i>. Decibel . • Bottacin, <i>Appunti di logica matematica</i>. Appunti. • B. Scimemi, <i>Gruppi</i>. Decibel.
5	Assessment methods	Oral and written exam