



## MATEMATICA A - L

MAT/07 - 6 CFU - 1° Semester

### Teaching Staff

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### LEARNING OBJECTIVES

Give knowledge and basic logical-mathematical tools through which one can build "models" for the resolution of problems in biology and in chemical and pharmacological sciences.

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### DETAILED COURSE CONTENT

**Pre-knowledge:** Basic knowledge of set theory, algebra (factoring polynomials, equations and inequalities), analytic geometry (Cartesian representation of points and lines) of some elementary functions (parabolic, hyperbolic, exponential, logarithmic and trigonometric) and their graphs (construction for points); Scientific notation; Trigonometry.

**Logic, Set Theory and Set of Numbers.** Definition of sets; membership; cardinality. Logic: propositions, predicates and operators. Operations between sets (Identity Boolean; Read De Morgan); Definitions. Membership; Cardinality; Basic Sets Operations; Boolean identities; De Morgan laws. Natural numbers; Rational numbers. Real numbers, Intervals, upper and lower bounds; maximum and minimum; Cartesian products and their representation in  $\mathbb{R}^2$  and  $\mathbb{R}^3$ .

**Functions.** Definition; domain, codomain, image and graph; Injective, Surjective and bijective functions; Function composition; Inverse function; Monotonic functions; Absolute Maximum and minimum of a function; Numerical sequences; Functions for Life Sciences: trigonometric, exponential and logarithmic.

**Limits and Derivatives.** The concept of limit. Neighbourhoods and Limit point of a set. Limits of numerical sequences and related theorems. Limits of functions : definitions and related theorems.

**Continuous functions** and related theorems; Discontinuous functions; **Derivatives of a function** and related theorems (Lagrange, Rolle, Cauchy and De Hopital theorems); Graph of a function.

**Integrals and Differential Equations. Integrals.** Elements of measure theory; Definition of

definite integral; Theorems on definite integrals; Indefinite integrals; Integrals of elementary functions; Elements of integration methods. **Differential Equations.** First order differential equations. Examples in biology, chemistry and pharmaco-kinetics.

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## **TEXTBOOK INFORMATION**

### **Pre-knowledge**

- TeoriTest -Teoria ed esercizi per le prove di ammissione a Medicina, Odontoiatria, Veterinaria e per i corsi di laurea delle aree: Biotecnologie, Farmacia, CTF, Scienze biologiche.

AlphaTest Ed.

- EserciTest - AlphaTest Ed.

### **Calculus**

1. Calcolo Differenziale 1, Funzioni di una variabile reale, R.A.Adams-C.Essex, Casa Editrice Ambrosiana (2014)
  2. Metodi e Modelli Matematici, S.Motta e M.A.Ragusa, CULC (2011)
  3. Analisi Matematica, Vol 1, C.D.Pagani-S.Salsa, Zanichelli (Cap.1, Par.1,2)
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