

FACOLTÀ DI INGEGNERIA DELL'INFORMAZIONE,  
INFORMATICA E STATISTICA  
APPLIED COMPUTER SCIENCE AND ARTIFICIAL INTELLIGENCE  
**CALCULUS - Unit 1**  
COURSE SYLLABUS  
A.A.2020/2021

- 1) A REVIEW OF ELEMENTARY MATHEMATICS. Notations, terminology. Integer, rational and real numbers. Fractions, proportionality, percentages. Equations, inequalities, systems of equations. Powers and logarithms. Basic trigonometry. Cartesian coordinates and distance in the plane. Polar coordinates. Complex numbers.
- 2) FUNCTIONS OF A REAL VARIABLE. Sup and Inf, maximum and minimum of sets and of functions. Elementary functions. Limits and their properties. Special limits. Continuous functions and their properties. Fundamental theorems on continuous functions. Basic notions on sequences and series of real numbers.
- 3) THE DERIVATIVE. Definition and geometric meaning. Derivatives of elementary functions. Derivative of sums, products and ratio of two functions. Derivative of inverse functions and of the composition of two functions. Relative maxima and minima. Theorems of Weierstrass, Rolle, Cauchy, Lagrange. Functions with a vanishing derivative. The theorem of de l'Hopital. Application to the study of a graph. Higher order derivatives and functions with vanishing higher order derivatives. Taylor polynomial.
- 4) MULTIVARIABLE CALCULUS. Basic notions about functions of two variables. Limits and continuity. Partial derivatives.