

# Mathematical Analysis 2

**Teacher:** Avallone Anna

**Curriculum:** <http://oldwww.unibas.it/matematica/curricula.html>

**Language:** Italian

**Content:** Differential calculus and Riemann integral for functions of several variables. Implicit functions and applications to the theory of constrained maxima and minima. Integrals on curves. Numeric series. Sequences and series of functions. Differential equations.

**Book text:** Fusco-Marcellini-Sbordone. Analisi Matematica 2. Liguori editore.

**Aim:** The aim of the course is to give to students skills to understand and use techniques for the study of basic notions of mathematical analysis of II year.

**Prerequisites:** Differential and integral calculus in 1 variable and basic notions of geometry.

**Teaching methods:** The learning objectives will be achieved both through lectures and through exercises.

**Assessment:** There will be a written test and an oral test.

**Extended program:**

## DIFFERENTIAL CALCULUS

Norm and scalar product in  $\mathbb{R}^n$ . Topology in  $\mathbb{R}^n$  Functions of several variables: limit, continuity, partial derivatives, directional derivatives, differentiable functions. Differential theorem. Derivatives of superior order. Schwartz theorem. Taylor formula. Lagrange theorem. Relative maximum and minimum. Vector functions.

## IMPLICIT FUNCTIONS AND ESTREMI VINCOLATI

Implicit functions. Dini theorem. Constrained maxima and minima. Lagrange theorem for constrained maxima and minima.

## **INTEGRATION THEORY**

Peano-Jordan measure. Characterization of measurable sets. Property of measure. Integrals in  $\mathbb{R}^n$ . Characterization of integrable functions. Integrability of continuous functions. Reduction formulas. Formula of change of variables.

### **Curves and integrals on curves**

Curves in  $\mathbb{R}^n$ . Length of curves. Integrals on curves.

## **DIFFERENTIAL FORMS**

Dual of  $\mathbb{R}^n$ . Integrals of differential forms on curves. Characterization of exact differential forms. Closed differential forms.

## **NUMERIC SERIES**

Convergent and divergent series. Geometric, harmonic, exponential series. Property of series. Convergence criterion. Absolutely convergent series. Leibniz theorem.

## **SEQUENCES OF FUNCTIONS**

Pointwise convergence. Uniform convergence. Cauchy criterion. Weierstrass theorem on sequences of functions, Continuity, derivatives and integrals of limit of sequences of functions.

## **SERIES OF FUNCTIONS**

Pointwise, uniform, total and absolute convergence of series of functions. Continuity, derivability and integrability of sum of series of functions. Power series. Property of sum of power series. Taylor series.

## **DIFFERENTIAL EQUATIONS**

Existence and unicity of Cauchy problem for differential equations. Linear differential equations.