# Complements of Mathematical Analysis

## Prof. Marco Marzocchi

***COURSE AIMS AND INTENDED LEARNING OUTCOMES***

To teach students the main elements of systems of ordinary differential equations and measure theory.

At the end of the course, students will be able to solve problems of integral calculus in several variables and canonical types of ordinary differential equations. Students will also possess the advanced tools of Measurement Theory as preparation for Advanced Analysis courses.

***COURSE CONTENT***

* Systems of first-order ordinary linear differential equations. Local existence and uniqueness of the Cauchy problem. Maximal solutions. Wronskian and the variation of constants method. Linear differential equations with constant coefficients.
* Hausdorff’s measure in a Euclidean space. Outer measures in a Euclidean space. Measurable functions, integrable functions and summable functions. Passage to the limit under an integral sign. Statement of Fubini’s theorem. Statements of the area formula and change of variable theorem. Integrals depending on a parameter. Gauss-Green formula and divergence theorem. Stokes' theorem.
* Linear differential forms. Integral along a curve. Exact differential forms. Closed differential forms. Solenoidal vector fields. Vector potential on star-shaped open sets.

***READING LIST***

MARCO DEGIOVANNI, *Analisi Matematica – II Parte,* lecture notes.

***TEACHING METHOD***

Lectures and class exercises.

***ASSESSMENT METHOD AND CRITERIA***

A compulsory written exam and an optional oral exam. The written exam consists of two or three questions. To be allowed to take the oral exam, students must have passed the written exam. The oral exam involves an interview, with questions relating to the topics covered.

***NOTES AND PREREQUISITES***

Students must possess a good command of the concepts introduced in the first and second year Analysis courses.

*Further information can be found on the lecturer's webpage at http://docenti.unicatt.it/web/searchByName.do?language=ENG or on the Faculty notice board.*