# . – Advanced Mathematical Analysis

## Prof. Marco Marzocchi

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

To teach students the most complex results of finite-dimensional infinitesimal calculus.

At the end of the course, students will have a more in-depth view of the numerous notions learned in previous Analysis courses, in particular Functional Analysis, which will help them solve the more complex problems of advanced topics.

***COURSE CONTENT***

– Advanced theory of limits. Upper and lower limits.

Sequences and subsequences. Bolzano-Weierstrass theorem. Cauchy convergence criterion for sequences and series. Cauchy condensation and Cauchy product of two series. Zero point existence theorem, inverse function theorem and Weierstrass's theorem. Uniform continuity.

– Taylor's formula with integral remainder. Integration of rational functions. First-order and second-order linear differential equations with constant coefficients on the complex plane.

- Banach fixed-point theorem. Compact metric spaces.

Notions of equivalence between metrics.

Local inversion and implicit function theorems.

Quadratic forms and eigenvalues. Systems of first-order ordinary linear differential equations. Linear differential equations with constant coefficients. Fubini’s theorem. Area formula and the change of variable theorem. Simply connected open sets.

***READING LIST***

MARCO DEGIOVANNI, *Approfondimenti di Analisi Matematica,* lecture notes.

***TEACHING METHOD***

Lectures and class exercises.

***ASSESSMENT METHOD AND CRITERIA***

An oral exam involving an interview with questions on the topics covered.

***NOTES AND PREREQUISITES***

Students must have 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.*