# Mathematical Analysis II

## Prof. Marco Marzocchi

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

To teach students the rudiments of topology and finite-dimensional calculus.

At the end of the course, students will be able to face free and constrained optimisation problems in several variables, already possessing, in their cultural background, knowledge of important abstract structures that will prove fundamental in subsequent Analysis courses.

***COURSE CONTENT***

* Normed and inner-product spaces. Metric spaces, neighbourhoods, open and closed sets. Limit and continuity of a map. Sequences. Complete metric spaces. Statement of Banach's fixed point theorem. Some functional spaces. Series. Sequentially compact metric spaces. Compactness in Euclidean spaces. Weierstrass’ theorem. Uniform continuity. Connected metric spaces. Finite-dimensional normed and inner-product spaces.
* Directional derivative and differential. Finite-dimensional differential calculus. Higher-order directional derivatives and their symmetry. Taylor’s formula. Study of local maxima and minima. Submanifolds. Lagrange’s multiplier theorem.

***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 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.*