



### MATHEMATICAL ANALYSIS 2

<b>Enrollment year</b>	2014/2015
<b>Academic year</b>	2015/2016
<b>Regulations</b>	DM270
<b>Academic discipline</b>	MAT/05 (MATHEMATICAL ANALYSIS)
<b>Department</b>	DEPARTMENT OF CIVIL ENGINEERING AND ARCHITECTURE
<b>Course</b>	
<b>Curriculum</b>	PERCORSO COMUNE
<b>Year of study</b>	2°
<b>Period</b>	1st semester (28/09/2015 - 22/01/2016)
<b>ECTS</b>	6
<b>Lesson hours</b>	80 lesson hours
<b>Language</b>	ITALIAN
<b>Activity type</b>	WRITTEN AND ORAL TEST
<b>Teacher</b>	GIANAZZA UGO PIETRO - 2 ECTS VENERONI MARCO - 4 ECTS
<b>Prerequisites</b>	The student has to master the contents of the Calculus I, Geometry and Linear Algebra courses.
<b>Learning outcomes</b>	The course is the natural prosecution of the Calculus I course, and aims at giving the students, who will not have the possibility to take another Analysis course in the future, a comprehensive expertise of analytical tools, to be used in the more technical courses to come. It does not reduce to a simple recipe book: the focus is on teaching ideas and methods, along with the most significative theorems, all supplied by a large number of examples and exercises, both at introductory and advanced level.
<b>Course contents</b>	1. Power series Definition, radius of convergence, properties on the real line. Integration and derivation of a power series.

Taylor series.

2. Multivariate Calculus  
 Basic notion of topology and metrics in n-dimensional spaces.  
 Continuous functions: properties.  
 Partial and directional derivatives; gradient.  
 Higher order derivatives.  
 Local extrema and main results.  
 Vector-valued functions: main properties.

3. Curves  
 Definition of regular curve: main properties.  
 Rectifiable curves and how to compute their length.  
 Arc-length function.  
 Arc integrals for real valued functions.

4. Irrotational vector fields  
 Arc integral of a vector-valued function.  
 Irrotational vector fields: main properties.  
 Arc integral of an irrotational vector field: the fundamental theorem.  
 Conditions for a vector field to be irrotational.

5. Implicit functions  
 Implicit function theorem, and regularity of the implicitly defined function.  
 Constrained extrema and the Lagrange multiplier method.

6. Ordinary differential equations  
 Existence and uniqueness theorems.  
 Linear equations and systems, how to compute the general solution, and how to solve a Cauchy problem.  
 A first approach to boundary value problems for simple equations and systems.

7. Multiple integrals  
 Definition of a double integral in a rectangle, and how to compute it.  
 Extension to a Peano-Jordan measurable set.  
 Change of variables.  
 Geometric applications.  
 Green and divergence theorems for two-variable functions.  
 Triple integrals: extension of the methods considered for double integrals.

8. Surfaces  
 Regular surfaces: main properties.  
 Area of a regular surface.  
 Surface integrals and how to compute them.  
 Divergence and Stokes theorems for three-variable functions.

**Teaching methods**

Lectures (hours/year in lecture theatre): 53  
 Practical class (hours/year in lecture theatre): 32  
 Practicals / Workshops (hours/year in lecture theatre): 0

**Recommended or required readings**

N. Fusco, P. Marcellini, C. Sbordone. *Analisi Matematica due*. Liguori.  
 M. Bramanti, C.D. Pagani e S. Salsa. *Analisi matematica 2*. Zanichelli.

**Assessment methods**

The final test consists of a written and an oral exam, which have to be taken in the same session.

**Further information**

A more detailed description can be found on the web page at the URL

