

### **Analysis 1**

# Introducing

#### Description

#### Series

- 1. Introduction, Finite and Infinite Series
- 2. Sums of non negative numbers
- 3. Rearrangement of series: absolute convergence, semi-convergence

Illustrations: decimal representation of natural numbers, of real numbers, notion of numerical errors

Topology of Normed Vector Spaces

- 1. Norms, Comparison of Norms
- 2. Sequences in Normed Spaces and Convergence
- 3. Topology: open and closed sets, closure, density
- 4. Limits, continuity of functions, compactness
- 5. Linear Applications between Normed Vector Spaces Illustrations: Iterative Methods to solve linear systems, matrix condition number

Several Variable Differential Calculus

- 1. Derivatives in several variable calculus
- 2. Partial and directional derivatives
- 3. Taylor expansion
- 4. The inverse function theorem, the implicit function theorem

Illustration: Newton method to solve a system of nonlinear equations.

#### **Objectives**

At the end of this module, the student will have understood and be able to explain (main concepts):

- The notion of numerical series and convergence of series
- The notion of differentiability of a function of multiple variables, partial derivatives
- The concept of norms, convergence of sequences in vectorial spaces, basic topological concepts: open and closed sets, compactness

The student will be able to:

Use the main mathematical results to

- Study the convergence of numerical series with majoration and comparison methods
- Study the differentiability of a function of multiple (real) variables, carry out an asymptotic expansion
- Manipulate norms of vectors and matrices, study the convergence of a sequence or function limits in vectors spaces.

#### Necessary prerequisites

Basic Calculus, Basic Linear algebra

#### Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

### Practical info





## Location(s)

Toulouse

