

Analysis 2

Introducing

Description

Program (detailed contents):

Sequence of functions

1. Pointwise convergence, uniform convergence
 2. Properties of the limit function
 3. Approximation: interpolation, density
- Applications: interpolation, numerical integration

Series of functions

1. Pointwise, uniform, normal convergence
2. Properties of series of functions
3. Power series

Banach Spaces

1. Cauchy sequences, properties
2. Contraction Mapping theorem
3. Series in Banach spaces

Ordinary Differential Equations: Linear case

1. Examples, affine ODEs
2. Linear ODEs with constant coefficients. Phase portraits. Stability
3. Gronwall Lemma

Introduction to Optimization

1. Convexity: definition, examples
2. Symmetric, positive definite matrices
3. Minimization (compactness arguments). Optimality conditions of order 1 and 2.

Integration

1. Integrals of functions on infinite interval or unbounded functions
2. Integrals with parameters: convergence, continuity, differentiability
3. Integrals of several variables: Fubini theorem, Change of variable.

Objectives

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

- Notion of pointwise and uniform convergence
- Notion of completeness and applications
- Integrals of functions unbounded or on unbounded domains, with parameters, with several variables

The student will be able to:

- Study pointwise or uniform convergence of a sequence of functions
- Study functions defined as integrals or series of functions with parameters
- Solve linear ordinary differential equations
- Carry out computations of integrals on bounded intervals, of unbounded functions.
- Find extrema of C^1 or C^2 functions.

Necessary prerequisites

Linear Algebra, Analysis 1

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