Faculty of Applied Sciences

INMA1170   Numerical analysis

[22.5h+30h exercises] 5 credits

This course is taught in the 1st semester

Teacher(s):   Pierre-Antoine Absil, Paul Van Dooren, Paul Van Dooren
Language: French
Level: First cycle

Aims

To better understand numerical methods for solving equations and to analyze their numerical properties such as convergence and stability. Equations solvers include finding zeros, solving systems of equations and solving ordinary differential equations.

Main themes

Numerical solution on non-linear equations: location of real and complex zeros of a polynomial, iterative methods and convergence theorems.
Numerical solution of linear systems : iterative methods (conjugate gradients, Jacobi, Gauss-Seidel, Krylov methods), preconditioning.
Numerical solution of ordinary differential equations : multistep methods, stability analysis, stiff differential equations.

Content and teaching methods

1. Location of the roots of a polynomial
2. Approximation via fixed point iteration
3. Bernoulli method and the QD algorithm
4. Iterative methods for large scale systems
5. Ordinary differential equations

Other information (prerequisite, evaluation (assessment methods), course materials recommended readings, ...)

Prerequisites: First cycle level in numerical calculus and programming.
Support: many references are used and mentioned during the course.

Other credits in programs

FSA13BA	Troisième année de bachelier en sciences de l'ingénieur, orientation ingénieur civil	(5 credits)
MAP22	Deuxième année du programme conduisant au grade d'ingénieur civil en mathématiques appliquées	(5 credits)
STAT21MS/MM	Première année du master en statistique, orientation générale, à finalité spécialisée (méthodes mathématiques)	(5 credits)
STAT22MS/MM	Deuxième année du master en statistique, orientation générale, à finalité spécialisée (méthodes mathématiques)	(5 credits)