Faculty of Applied Sciences

INMA2710   Numerical algorithms

[30h+15h exercises] 4 credits

This course is taught in the 1st semester

Teacher(s):   Paul Van Dooren
Language: French
Level: Second cycle

Aims

To strengthen the know-how in "scientific computing" via a critical analysis of algorithms and via the development of state-of-the-art algorithms in numerical analysis, that have a good performance on modern computing platforms.

Main themes

- Quantitative study of floating point rounding errors
- Specification of the notions of "numerical stability" and "conditioning"
- Development of iterative methods and convergence criteria that are computer-independent
- Examples of complexity analysis of algorithms
- Development of high performance parallel algorithms

Content and teaching methods

- Qualitative analysis of rounding errors
- Definition of numerical stability and conditioning
- Convergence of iterative algorithms
- Critical analysis of classical algorithms illustrating basic concepts
- LU factorization of matrices
- Iterative refinement
- Bloc methods and parallel algorithms
- Algorithms for polynomials
- Fast matrix multiplication
- Fast Fourier Transform

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

Prerequisites:
Basic knowledge (1st cycle) in numerical analysis and programming (MATLAB)
Evaluation:
Theoretical exercises and MATLAB exercises count together for 15% of the final score. The written exam amounts for 85% of the final score.
Supporting material:
Typeset course notes complemented by the book: Nick Higham, "Accuracy and Stability of Numerical Algorithms", SIAM Publications, Philadelphia, 1995

Other credits in programs

INFO23	Troisième année du programme conduisant au grade d'ingénieur civil informaticien	(4 credits)
MAP22	Deuxième année du programme conduisant au grade d'ingénieur civil en mathématiques appliquées	(4 credits)
MATH22/G	Deuxième licence en sciences mathématiques	(4 credits)