UCLouvain

linma2171

2021

Numerical Analysis : Approximation, Interpolation, Integration

5.00 credits	30.0 h + 22.5 h	Q1

Teacher(s)	Absil Pierre-Antoine ;
Language :	English
Place of the course	Louvain-la-Neuve
Prerequisites	Basic skills in numerical methods, as covered, for example, within LFSAB1104 (Numerical methods). Remark : LINMA2171 is the second part of a teaching programme in numerical analysis, of which LINMA1170 is the first part ; however, LINMA1170 is not a prerequisite for LINMA2171.
Main themes	• Interpolation • Function approximation • Numerical integration
Learning outcomes	**At the end of this learning unit, the student is able to :** • AA1.1, AA1.2, AA1.3 At the end of the course, the student will be able to: 1 • Implement, in concrete problems, the basic knowledge required from an advanced user and a developer of numerical computing software; • Analyze in depth various methods and algorithms for numerically solving scientific or technical problems, related in particular to interpolation, approximation, and integration of functions. Transversal learning outcomes : • Use a reference book in English; • Use programming languages for scientific computing.
Evaluation methods	• Homeworks, exercises, or laboratory work during the course semester • Exam Precisions are given in the course outline (plan de cours) available on Moodle.
Teaching methods	• Lectures • Homeworks, exercises, or laboratory work under the supervision of the teaching assistants
Content	• Polynomial interpolation: Lagrange's interpolation formula, Neville's algorithm, Newton's interpolation formula, divided differences, Hermite interpolation. • Interpolation by spline functions : cubic spline interpolation, B-splines. • Rational interpolation. • Trigonometric interpolation. • Orthogonal polynomials : Legendre polynomials, Chebyshev polynomials. • Polynomial minimax approximation : existence, de la Vallée-Poussin's theorem, equioscillation theorem, uniqueness, Chebyshev interpolation. • Polynomial approximation in the least-squares sense. • Numerical integration : Newton-Cotes formula, Gauss method. • Integration of differential equations : introduction to the finite element method. • Other topics related to the course themes.
Inline resources	https://moodle.uclouvain.be/course/view.php?id=747
Bibliography	• Ouvrage de référence • Documents complémentaires disponibles sur Moodle. Des précisions sont fournies dans le plan de cours disponible sur Moodle.
Faculty or entity in charge	MAP

Programmes containing this learning unit (UE)

Program title	Acronym	Credits	Prerequisite	Learning outcomes
Master [120] in Data Science Engineering	DATE2M	5		
Master [120] in Mathematics	MATH2M	5		
Master [120] in Data Science: Information Technology	DATI2M	5		
Master [120] in Mathematical Engineering	MAP2M	5		