### LINMA2171

**Numerical Analysis : Approximation, Interpolation, Integration**

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<th>Credits</th>
<th>5.0</th>
<th>Hours</th>
<th>30.0 h + 22.5 h</th>
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</table>

**Teacher(s):** Absil Pierre-Antoine

**Language:** Anglais

**Place of the course:** Louvain-la-Neuve


**Prerequisites:**

- 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

**Aims:**

- AA1.1, AA1.2, AA1.3
  - At the end of the course, the student will be able to:
    - 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 iCampus & t; LINMA2171 & t; Documents et liens**

**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.
- Integration of differential equations: introduction to the finite element method.
- Other topics related to the course themes.

**Bibliography:**
- Reference book
- Complementary documents posted on iCampus
- Precisions are given in the course outline (plan de cours) available on iCampus.

**Faculty or entity in charge:** MAP
<table>
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<tr>
<th>Intitulé du programme</th>
<th>Sigle</th>
<th>Credits</th>
<th>Prerequis</th>
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