





5 credits

30.0 h + 22.5 h

Q1

Teacher(s)	Absil Pierre-Antoine ;
Language :	English
Place of the course	Louvain-la-Neuve
Prerequisites	<p>Basic skills in numerical methods, as covered, for example, within LFSAB1104 (Numerical methods).</p> <p>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.</p> <p><i>The prerequisite(s) for this Teaching Unit (Unité d'enseignement – UE) for the programmes/courses that offer this Teaching Unit are specified at the end of this sheet.</i></p>
Main themes	<ul style="list-style-type: none"> <li>• Interpolation</li> <li>• Function approximation</li> <li>• Numerical integration</li> </ul>
Aims	<ul style="list-style-type: none"> <li>• AA1.1, AA1.2, AA1.3</li> </ul> <p>At the end of the course, the student will be able to:</p> <ul style="list-style-type: none"> <li>• Implement, in concrete problems, the basic knowledge required from an advanced user and a developer of numerical computing software;</li> <li>1 • Analyze in depth various methods and algorithms for numerically solving scientific or technical problems, related in particular to interpolation, approximation, and integration of functions.</li> </ul> <p>Transversal learning outcomes :</p> <ul style="list-style-type: none"> <li>• Use a reference book in English;</li> <li>• Use programming languages for scientific computing.</li> </ul> <p>-----</p> <p><i>The contribution of this Teaching Unit to the development and command of the skills and learning outcomes of the programme(s) can be accessed at the end of this sheet, in the section entitled "Programmes/courses offering this Teaching Unit".</i></p>
Evaluation methods	<ul style="list-style-type: none"> <li>• Homeworks, exercises, or laboratory work during the course semester</li> <li>• Exam</li> </ul> <p>Precisions are given in the course outline (plan de cours) available on Moodle.</p>
Teaching methods	<ul style="list-style-type: none"> <li>• Lectures</li> <li>• Homeworks, exercises, or laboratory work under the supervision of the teaching assistants</li> </ul>
Content	<ul style="list-style-type: none"> <li>• Polynomial interpolation: Lagrange's interpolation formula, Neville's algorithm, Newton's interpolation formula, divided differences, Hermite interpolation.</li> <li>• Interpolation by spline functions : cubic spline interpolation, B-splines.</li> <li>• Rational interpolation.</li> <li>• Trigonometric interpolation.</li> <li>• Orthogonal polynomials : Legendre polynomials, Chebyshev polynomials.</li> <li>• Polynomial minimax approximation : existence, de la Vallée-Poussin's theorem, equioscillation theorem, uniqueness, Chebyshev interpolation.</li> <li>• Polynomial approximation in the least-squares sense.</li> <li>• Numerical integration : Newton-Cotes formula, Gauss method.</li> <li>• Integration of differential equations : introduction to the finite element method.</li> <li>• Other topics related to the course themes.</li> </ul>
Inline resources	<a href="https://moodleucl.uclouvain.be/course/view.php?id=5443">https://moodleucl.uclouvain.be/course/view.php?id=5443</a>
Bibliography	<ul style="list-style-type: none"> <li>• Ouvrage de référence</li> <li>• Documents complémentaires disponibles sur Moodle.</li> </ul> <p>Des précisions sont fournies dans le plan de cours disponible sur Moodle.</p>

Faculty or entity in charge	MAP
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Programmes containing this learning unit (UE)				
Program title	Acronym	Credits	Prerequisite	Aims
Master [120] in Data Science Engineering	<a href="#">DATE2M</a>	5		
Master [120] in Statistics: General	<a href="#">STAT2M</a>	5		
Master [120] in Mathematical Engineering	<a href="#">MAP2M</a>	5		
Bachelor in Mathematics	<a href="#">MATH1BA</a>	5	<a href="#">LMAT1121</a>	
Master [120] in data Science: Information technology	<a href="#">DATI2M</a>	5		