

5 credits

30.0 h + 22.5 h

Q2

Teacher(s)	Absil Pierre-Antoine (compensates Van Schaftingen Jean) ;Absil Pierre-Antoine ;Van Schaftingen Jean ;
Language :	French
Place of the course	Louvain-la-Neuve
Prerequisites	Basic calculus and linear algebra, such as taught, for example, in LFSAB1101 (Mathématiques I) et LFSAB1102 (Mathématiques II) <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>
Main themes	This course covers themes in mathematical analysis (measure theory, functional analysis and function spaces) that play a role in the foundations of various areas of applied mathematics such as dynamical systems, partial differential equations, optimal control, scientific computing, stochastic processes and financial mathematics.
Aims	<p>AA 1.1, 1.2, 1.3, 3.1.</p> <p>At the end of the course, the student will be able to:</p> <ol style="list-style-type: none"> <li>1. by means of examples, statements and mathematical proofs, describe infinite-dimensional spaces, including their operators and convergence notions, and compare them to finitedimensional spaces,</li> <li>2. apply definitions and results of measure theory to the study of function spaces and probability theory,</li> <li>3. use advanced concepts of measure theory and functional analysis in applied mathematics.</li> </ol> <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, tests or practical work carried out during the semester</li> <li>• Exam</li> </ul> <p>More elaborate information on the evaluation procedure is given in the course outline, made available on Moodle at the beginning of the academic year.</p>
Teaching methods	The course includes interactive lectures and exercises. The emphasis is on critical understanding of the theory and active problem solving.
Content	<p>Important concepts and results within the main themes of the course, such as:</p> <ul style="list-style-type: none"> <li>• Measure theory, Lebesgue integral, convergence theorems,</li> <li>• Complete metric spaces, Banach spaces and Hilbert spaces, spaces of continuous functions, spaces of integrable functions,</li> <li>• Continuous linear mappings, weak convergence, Riesz representation theorem, notions of spectral theory,</li> <li>• Distributions and Sobolev spaces.</li> </ul>
Bibliography	<p>Livre de référence :Gerald Teschl, "Topics in Real and Functional Analysis" (disponible gratuitement en ligne à l'adresse <a href="https://www.mat.univie.ac.at/~gerald/ftp/book-fa/">https://www.mat.univie.ac.at/~gerald/ftp/book-fa/</a>).</p>
Other infos	
Faculty or entity in charge	MAP

<b>Programmes containing this learning unit (UE)</b>				
Program title	Acronym	Credits	Prerequisite	Aims
Bachelor in Engineering	FSA1BA	5	LEPL1101 AND LEPL1102 AND LEPL1105	