UCLouvain

linma1315

2023

Mathematical analysis : complements

5.00 credits	30.0 h + 22.5 h	Q2

Teacher(s)	Absil Pierre-Antoine ;Van Schaftingen Jean ;Van Schaftingen Jean (compensates Absil Pierre-Antoine) ;
Language :	French
Place of the course	Louvain-la-Neuve
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.
Learning outcomes	**At the end of this learning unit, the student is able to :** 1 AA 1.1, 1.2, 1.3, 3.1. At the end of the course, the student will be able to: 1. by means of examples, statements and mathematical proofs, describe infinite-dimensional spaces, including their operators and convergence notions, and compare them to finite dimensional spaces, 2. apply definitions and results of measure theory to the study of function spaces and probability theory, 3. use advanced concepts of measure theory and functional analysis in applied mathematics.
Evaluation methods	• Work carried out during the term: homework assignments, exercises, or laboratory work. These activities are thus organized (and evaluated) only once per academic year. • Exam: written, or sometimes oral depending on the circumstances. The exam counts for 3/5 of the grade, the work during the term for 1/5 of the grade, and the evaluations during the term, each of them lower bounded by the exam grade, for 1/5 of the grade. The formula and further information are provided in the "Plan de cours" document available on Moodle (see "Online resources" below).
Teaching methods	The course includes interactive lectures and exercises. The emphasis is on critical understanding of the theory and active problem solving.
Content	Important concepts and results within the main themes of the course, such as: • Measure theory, Lebesgue integral, convergence theorems, • Complete metric spaces, Banach spaces and Hilbert spaces, spaces of continuous functions, spaces of integrable functions, • Continuous linear mappings, weak convergence, Riesz representation theorem, notions of spectral theory, • Distributions and Sobolev spaces.
Inline resources	https://moodle.uclouvain.be/course/view.php?id=2945
Bibliography	Livre de référence : Gerald Teschl, "Topics in Real and Functional Analysis" disponible gratuitement en ligne à l'adresse (https://www.mat.univie.ac.at/~gerald/ftp/book-fa/).
Other infos	
Faculty or entity in charge	MAP

Programmes containing this learning unit (UE)				
Program title	Acronym	Credits	Prerequisite	Learning outcomes
Minor in Applied Mathematics	LMINOMAP	5		
Specialization track in Applied Mathematics	FILMAP	5		
Mineure Polytechnique	MINPOLY	5		