UCLouvain

lphys2112

2026

Mathematical physics

5.00 credits	30.0 h	Q1

Teacher(s)	Walmsley Hagendorf Christian ;
Language :	English > French-friendly
Place of the course	Louvain-la-Neuve
Prerequisites	Having followed LPHYS1202 is an asset.
Main themes	This teaching unit aims at presenting and deepening the mathematical structures supporting the construction of modern physics theories. These structures will be presented according to the logical flow in which they can be constructed. Various practical examples taken from actual physics will be used as an illustration of their importance.
Learning outcomes	**At the end of this learning unit, the student is able to :** **a. Contribution of the teaching unit to the learning outcomes of the programme (PHYS2M and PHYS2M1)** 1.2, 2.1, 2.5, 3.1, 3.2, 3.3, 3.4 **b. Specific learning outcomes of the teaching unit** 1 At the end of this teaching unit, the student will be able to : 1. express the axioms supporting the mathematical structures seen in the lectures ; 2. express and demonstrate the main theorems used in physics ; 3. generalize and apply the techniques seen in the lectures to new problem in physics.
Evaluation methods	Evaluation is based on a written examination covering the theoretical notions and their applications to problems in mathematical physics. It assesses students' understanding of the concepts studied in the course, their ability to employ mathematical tools to analyse problems arising from quantum mechanics and quantum field theory, as well as their proficiency in calculation techniques and the coherent presentation of solutions.
Teaching methods	The learning activity consists of lectures. They introduce the fundamental mathematical concepts and highlight their role in the formulation of quantum mechanics and quantum field theory. Exercises will be provided to foster a progressive deepening of the concepts introduced.
Content	This course offers an introduction to the mathematical structures underlying quantum theory. It covers selected chapters of functional analysis, such as Banach and Hilbert spaces, operators and spectral theory, elements of measure and integration theory, and distributions and Green's functions.
Inline resources	LPHYS2112 Moodle website
Bibliography	• G. Teschl, *Mathematical Methods in Quantum Mechanics*, AMS, 2014. • R.G. Bartle, *The Elements of Integration and Lebesgue Measure*, Wiley, 1995. • L. Schwartz, *Mathematics for the Physical Sciences*, Dover, 2008.
Faculty or entity in charge	PHYS

Programmes containing this learning unit (UE)

Program title	Acronym	Credits	Prerequisite	Learning outcomes
Master [60] in Physics	PHYS2M1	5		🔍
Master [120] in Physics	PHYS2M	5		🔍
Master [120] of Education, Section 4 : Physics	PHYS2M4	5		🔍