UCLouvain

lphys2242

2024

Fundamentals of quantum information

5.00 credits	30.0 h	Q2

This biannual learning is being organized in 2024-2025

Teacher(s)	Génévriez Matthieu (coordinator) ;Melinte Sorin ;Piraux Bernard ;
Language :	English > French-friendly
Place of the course	Louvain-la-Neuve
Prerequisites	Having followed LPHYS1241, LPHYS1342 and LPHYS1344is an asset
Main themes	Qubits, quantum weirdness, coherence and decoherence, quantum cryptography, teleportation, quantum computing.
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)** AA 1.1, AA 1.2, AA 1.5, AA1.6, AA 3.1, AA3.2, AA 3.3, AA 3.4, AA 4.2, AA 5.2, AA 5.4, AA 8.1 **b. Specific learning outcomes of the teaching unit** 1 At the end of this teaching unit, the student will be able to : 1. describe the essential concepts of quantum information ; 2. describe the tests of quantum entanglement and their experimental realization ; 3. explain the basic concepts of quantum cryptography and quantum computing.
Evaluation methods	Written examination, closed and open questions
Teaching methods	Lectures, exercises
Content	Basic concepts: superposition, Qubits Quantum weirdness (EPR paradox, Bell inequalities) Quantum cryptography Quantum teleportation Concepts of quantum computation Experiments leading to quantum computation Quantum network and multi-particle entanglement Decoherence and quantum error correction Entanglement purification
Bibliography	D. Heis, “Fundamentals of quantum information”, Springer, 2002. P. Lambropoulos and D. Petrosyan, « Fundamentals of Quantum Optics and Quantum Information », Springer, 2007.
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 Physical Engineering	FYAP2M	5		🔍
Master [120] in Physics	PHYS2M	5		🔍