UCLouvain

lphys2247

2020

Special topics in quantum optics

Due to the COVID-19 crisis, the information below is subject to change, in particular that concerning the teaching mode (presential, distance or in a comodal or hybrid format).

5 credits	30.0 h	Q2

Teacher(s)	Piraux Bernard ;
Language :	English
Place of the course	Louvain-la-Neuve
Main themes	Classical and quantum description of light-matter interaction, Floquet theory, dressed state model, coherent and squeezed states, statistical properties of light.
Aims	1 **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** At the end of this teaching unit, the student will be able to : 1. handle the description of laser-matter interaction using perturbative and non perturbative approaches ; 2. apply the dressed state model to various laser-atom interaction processes ; 3. use the quantification of light to describe coherent and squeezed states. - - - - *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".*
Evaluation methods	**Due to the COVID-19 crisis, the information in this section is particularly likely to change.** Oral exam during which the student presents a work, the subject of which has been specified during the last lecture.
Teaching methods	**Due to the COVID-19 crisis, the information in this section is particularly likely to change.** Lectures and exercises to be prepared at home before they are solved during the lectures.
Content	Light-atom interaction. Classical model. Semi-classical model 1. 1. Time-dependent and time-independent perturbation theory 2. Level-shift operator 3. Floquet theory Quantum model 1. 1. Field quantization 2. Dressed state model 3. Coherent states 4. Squeezed states Statistical properties of light
Inline resources	The lecture notes
Bibliography	M. Fox, **Quantum Optics, an introduction**, Oxford Master Series in Atomic, Optical, and Laser Physics, 2006. M. Fox , **Optique quantique. Une introduction** , trad. B. Piraux, De Boeck Université, 2011. M.O. Scully & M.S. Zubairy « Quantum Optics », Cambridge University Press, 1997. C. Cohen-Tannoudji, Bernard Diu, Franck Laloë, **Mécanique quantique** – Tome III, CNRS Editions, EDP Sciences - Collection : Savoirs actuels, 2017. C. Cohen-Tannoudji, J. Dupont-Roc & G. Grynberg, **Processus d'interaction entre photons et atomes** , CNRS Édition, EDP Sciences, collection : Savoirs actuels, 2001. G. Grynberg, A. Aspect, C . Fabre, Introduction to Quantum Optics, Cambridge University Press, 2010.
Faculty or entity in charge	PHYS

Programmes containing this learning unit (UE)				
Program title	Acronym	Credits	Prerequisite	Aims
Master [60] in Physics	PHYS2M1	5		🔍
Master [120] in Physics	PHYS2M	5		🔍