UCLouvain

lphys1347

2024

Physique atomique et moléculaire

5.00 credits	22.5 h + 22.5 h	Q2

Teacher(s)	Génévriez Matthieu ;Lauzin Clément ;
Language :	French
Place of the course	Louvain-la-Neuve
Learning outcomes	
Evaluation methods	The assessment of learning will be done by written exam. The learning outcomes of more advanced topics may possibly be subjected to an oral evaluation. The written exam will include: • open and closed questions with short or long developments • problem-solving with quantified result.
Teaching methods	The learning activities consist of lectures, exercises, practical work, software manipulations and database consultations. The pedagogical material of the lectures are the blackboard and the slide show. The lectures are intended to introduce the fundamental concepts, to motivate them by showing examples and establishing results, to show their reciprocal links and their relations with the different parts associated with this teaching unit, and to establish links with the rest of the teaching units of the Bachelor in Physical Sciences. The tutorials aim at learning how to use the ideas and formalism developed in the lectures, for example to explain the results of experiments carried out in specific laboratory session or described in the framework of the lectures. The tutorials will also allow students to learn how to choose and use calculation methods for their analysis, and to interpret the results obtained. Dedicated laboratory sessions aim at giving an introduction to experimental methods in atomic and molecular physics, and to validate the theoretical concepts discussed during the course through the direct observation of our physical world.
Content	**I. Atomic physics**. (hourly volume of 11.25 h). Method: Explanation of the structure of atoms and ions based on a brief review of the results of quantum physics. Their interaction with light is described within the framework of spectroscopy. 1. Hydrogen-like systems, quantum defect, Rydberg states. 2. Multi-electron systems. 3. Central field and corrections, coupling schemes, fine and hyperfine structure, isoelectronic series. 4. Radiative transitions, dipole approximation, multipolar transitions, selection rules, radiative cascades. **II. Molecular physics** (hourly volume of 11.25 h). 1. The Born-Oppenheimer approximation. 2. Separation of coordinates. 3. Electronic states: molecular orbitals and atomic orbitals. 4. Vibrational states and rotational states. 5. Symmetries of diatomic molecules. 6. Correlation diagrams. 7. Radiative transitions, selection rules.
Inline resources	Various resources (slides and additional relevant documents) are put online via the MoodleUCL platform.
Bibliography	B. H. Bransden, C. J. Joachain (1990), "Physics of atoms and molecules", John Wiley and sons, ISBN-13: 978-0582356924. C. Foot (2005), 'Atomic Physics', Oxford University Press, ISBN: 9780198506966
Faculty or entity in charge	PHYS

Programmes containing this learning unit (UE)				
Program title	Acronym	Credits	Prerequisite	Learning outcomes
Minor in Physics	MINPHYS	5		🔍
Master [120] in Physical Engineering	FYAP2M	5		🔍
Bachelor in Physics	PHYS1BA	5		🔍