

M1 – Course description **MU4PYA10**

Course:	Code Apogée UE : MU4PYA10	
	Nombre d'ECTS : 6	
Course coordinators:	Sorbonne Université Name : FILLION Jean-Hugues Adress : Campus Pierre et Marie, 4 place Jussieu Paris 5ème. T32-33- 319 Phone : 01 44 27 96 05 Email : jean-hugues.fillion@sorbonne-universite.fr	Université de Paris Name : COUDREAU Thomas Adress : MPQ, 10 rue Alice Domon et Léonie Duquet, Bureau 697A Phone : +33 6 11 19 25 70 Email : thomas.coudreau@u-paris.fr
Number of hours:	60	
Semester :	2	
Lecture localization:	Campus Jussieu (Sorbonne Université) – Université de Paris	
Laboratories:	no	
Objectives:	Bring the basic knowledge for understanding the structure and properties of isolated atoms and molecules and their interaction with electromagnetic radiation treated classically.	
Prerequisites:	Quantum Mechanics : Hamiltonien, Eigenvalues and Eigenstates, Angular Momentum Coupling, Particle in a central Field, Time-Independent Perturbation Theory, Identical Particles	
Topics/program:	Atomic Physics Hydrogen atom Alkali atom Fine and hyperfine structure Light – matter interaction Quantum information Diatomics Molecules The Electronic Structure of Diatomic Molecules The Born Oppenheimer approximation Electronic energy levels and symetry properties of the electronic wavefunctions The Simple Molecular-Orbital Theory Rotation and Vibration of Diatomic Molecules Radiative Transitions, Molecular Spectra. The Franck-Condon Principle	
Competences expected after the course:	The student will be able to: - apply physics and mathematics to solve the Schrödinger equation and the Dirac equation for hydrogen-like atoms. - explain the buildup of multi-electron atoms and simple molecules and their characteristics. - analyse emission and absorption spectra of simple atoms and molecules	
Bibliography:	Physics of atoms and molecules" de B.H. Brandsen et C.J. Joachain, Ed. Longman. Molecules and Radiation : an introduction to Modern Molecular Spectroscopy, Jeffrey I. Steinfeld, Dover « Quantum Physics », C. Cohen-Tannoudji et al, Wiley « Introduction to quantum optics », G. Grynberg et al., Cambridge University Press	
Evaluation :	Written Examination	
Barèmes (Apogée) :	Ecrit : 100 /100	