UCLouvain

lbir1340

2025

Basis of quantum mechanics and spectroscopy

3.00 credits	22.5 h + 22.5 h	Q2

Teacher(s)	Gaigneaux Eric (coordinator) ;Gonze Xavier ;
Language :	French > English-friendly
Place of the course	Louvain-la-Neuve
Prerequisites	*The prerequisite(s) for this Teaching Unit (Unité d'enseignement – UE) for the programmes/courses that offer this Teaching Unit are specified at the end of this sheet.*
Learning outcomes	
Evaluation methods	At the written examination, which is "with closed book", several questions of theory and problems are presented to the students. They demonstrate their knowledge by explaining the corresponding content of the course, and their ability to exploit this knowledge by solving the problems. For the spectroscopy, are more more specificially proposed exercices that require the exploitation of the features of a spectrum in order to infer the characteristics of the sample that has generated it (and vice versa : prediction of a spectrum from the sample characteristics). Recognition of a spectroscopic technique used to generate a given spectrum is also a pilar of the evaluation. Typically the global note is established on a basis of 30 points, coming for 20 of them from the evaluation of the knowledge of the student on the quantum mechanics part, and 10 of them on the spectrocopy part, and then reduced to 20 points.
Teaching methods	Magistral classes and exercices sessions.
Content	Introduction to quantum mechanics (14 h + 12 h): Experimental and theoretical bases. Resolution of Schrödinger equation for simple cases, with one particle (potential well, harmonic oscillator, rigid rotator, hydrogenoid atoms). Approximate treatment: polyelectronic atoms, H2+ molecular ion, diatomic molecules. Molecular dynamics and chemical bonding notions. Basis of spectroscopy (10 h + 8 h): Distinctions between spectrocopy and spectrometry, spectroscopies of absorption vs emission. Basis of spectroscopies : rotation, vibration, libration, rotational and vibrational Raman, UVVis, XPS, resonance techniques (mostly EPR).
Inline resources	The slides of the lecture are available on the moddle of the course.
Bibliography	• Notes de cours (syllabus) disponibles sur le moodle. Le cours ne fait appel à aucun support particulier qui serait payant et jugé obligatoire. Les ouvrages payants qui seraient éventuellement recommandés le sont à titre facultatif.
Other infos	
Faculty or entity in charge	AGRO

Programmes containing this learning unit (UE)

Program title	Acronym	Credits	Prerequisite	Learning outcomes
Bachelor in Bioengineering	BIR1BA	3	LBIR1211 AND LBIR1221	🔍