UCLouvain

lphys2303

2020

Cryophysics and vacuum physics

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 + 15.0 h	Q1

Teacher(s)	Bayot Vincent ;Hackens Benoît ;Melinte Sorin ;
Language :	English
Place of the course	Louvain-la-Neuve
Main themes	This teaching unit aims at giving students the tools to understand physical phenomena at play in high and ultra-high vacuum conditions, as well as at cryogenic temperature. It also allows them to directly experience technical aspects related to these disciplines. Applications of vacuum physics and cryophysics will be illustrated through different visits in research laboratories, and hands-on exercices, realized in the laboratory, will help them to visualize direct applications of the theory and to get used to the operation of low temperature and high vacuum production and control equipments.
Aims	**a. Contribution of the teaching unit to the learning outcomes of the programme (PHYS2M)** AA1: AA1.2, AA1.3, AA1.4 AA2: AA2.2, AA2.3 AA5: AA5.2, AA5.3 AA6: AA6.2, AA6.3 AA7: AA7.1, AA7.2 AA8 : AA8.1 **b. Specific learning outcomes of the teaching unit** 1 At the end of this teaching unit, the student will be able to: 1. properly choose high vacuum and/or cryogenic production and control system, adapted to a given set of requirements ; 2. describe the evolution of the properties of different classes of materials and of different cryogenic fluids as a function of temperature and pressure ; 3. describe the principles, and fully design an experimental setup operating at high and ultra-high vacuum and/or low temperature, fulfilling a set of constraints ; 4. describe and simulate the evolution of pressure inside a vacuum chamber as it is vacuum-pumped ; 5. manipulate the main elements of an experimental setup operating at low temperature and/or high vacuum. - - - - *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.** Written report on the project and its oral presentation during the exam. Lab reports. Knowledge of the theory is tested during the exam.
Teaching methods	**Due to the COVID-19 crisis, the information in this section is particularly likely to change.** Lectures, hands-on sessions in the laboratory, project
Content	• Cryogenic fluids • Low temperature materials properties • Cryogenic systems • Thermometry • Low temperature experiments • Kinetic theory of gases, Boltzmann distribution, perfect and real gas • Molecular flow, conductance, pumping speed • Phase changes, vapour pressure, phenomena on the surface • Instruments for the production and control of high/ultra-high vacuum
Bibliography	M. Guisset, Technique du vide, Louvain-la-Neuve, 1992. Transparents de l'unité d'enseignement, réalisés par les enseignant.e.s.

Faculty or entity in charge	PHYS

Force majeure

Evaluation methods	Due to the sanitary situation, the evaluation will be through an oral exam and a written report of the two projects

Programmes containing this learning unit (UE)				
Program title	Acronym	Credits	Prerequisite	Aims
Master [120] in Physical Engineering	FYAP2M	5		
Master [120] in Electrical Engineering	ELEC2M	5		
Master [120] in Physics	PHYS2M	5		