UCLouvain

lphy1251

2017

Statistical physics and Thermodynamics I

4 credits	30.0 h + 22.5 h	Q2

Teacher(s)	Goosse Hugues ;Hagendorf Christian ;
Language :	French
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.*
Main themes	- Thermodynamic state of a closed system, concepts of pressure and temperature. - Macroscopic properties of ideal gases. - Internal energy and first principle of thermodynamics, application to ideal gases. - Entropy and second principle of thermodynamics, applications (including heat engines). Microscopic formula for entropy (Boltzmann). - Thermodynamic functions and potentials. Corresponding microscopic formulae (partition function, free energy). Equilibrium conditions. - Real gases Phase changes in pure substances. - Equilibrium procedures: Microcanonical and canonical distribution
Aims	**a. Course contribution to the LO reference framework (programme LO)** **LO1:** 1.1, 1.3 **LO3:** 3.4, 3.5, 3.6 **b. Specific formulation of programme LOs for this course** At the end of this course, the student will be able: 1. to describe and interpret the fundamental concepts of thermodynamics, in particular the first and second principles of thermodynamics. 2. to apply the basic principles of thermodynamics to simple cases, standard heat engines and examples from everyday life. 1 3. to interpret transformations involving mass and energy transfers through the principles of thermodynamics. 4. to connect the concepts developed in the context of thermodynamics with those tackled in other courses, in particular mechanics and chemistry. 5. to discuss the main processes associated with phase changes in pure substances. 6. to describe and apply the kinetic theory of gases, including an introduction to real gases. 7. to describe and interpret the fundamental concepts of statistical physics, in particular in the context of microcanonical and canonical distributions. 8. to find the fundamental connections in macroscopic thermodynamics by explaining the transition from the microscopic to the macroscopic level. 9. to describe the principle of maximum entropy of data - - - - *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	Closed question, short or long development,written exams.
Teaching methods	Lectures Individual, supervised exercise sessions
Content	1. Introduction to basic concepts 2. Entropy, temperature, pressure 3. Energy conservation 4. Microscopic study of liquids, ideal gases and real gases 5. Transformations 6. Phase transitions in a pure substance 7. Statistical physics
Bibliography	Georges Gonczi (2005). Comprendre la thermodynamique. Ellipses, 260pp, ISBN 2-7298-2363-8

Faculty or entity in charge	PHYS

Programmes containing this learning unit (UE)				
Program title	Acronym	Credits	Prerequisite	Aims
Bachelor in Physics	PHYS1BA	4	LPHYS1111	🔍
Minor in Physics	LPHYS100I	4		🔍