


5 credits

30.0 h + 22.5 h

Q2

Teacher(s)	Fichet Thierry ; Lemaitre Vincent ;
Language :	French
Place of the course	Louvain-la-Neuve
Main themes	<p>In continuation of the topics addressed in the LPHYS1111 Mechanics 1 teaching unit, wave phenomena such as mechanical waves (coupled springs and pendulums, vibrating string), sound waves and waves on water are studied. The concepts of normal modes of vibration, dispersion, reflection and transmission relationships, wave packets, phase velocity and group velocity, and two- and three-dimensional waves are discussed. Then we talk about the statics and the dynamics of the fluids by insisting on the concepts of pressure and waves on the water. The concept of viscosity and some simple flow examples are presented for incompressible viscous fluids.</p> <p>The basic notions of thermodynamics are then introduced. The concepts of thermodynamic state, pressure and temperature are defined. Internal energy and the first principle of thermodynamics as well as entropy and the second principle of thermodynamics are then presented. Equilibrium conditions and applications (including cycles and thermal machines) are studied. Finally, we describe the kinetic theory of gases, the macroscopic properties of perfect gases and the phase changes of pure bodies.</p> <p>In addition, during the semester and opening up to modern physics, two conferences</p>
Aims	<i>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".</i>
Evaluation methods	<ul style="list-style-type: none"> <li>' These methods are to be specified by the teachers who will be in charge of this teaching (with the exception of the mention of the two compulsory conferences).</li> <li>' Written exam: resolution of exercises, demonstrations of theoretical reasoning.</li> <li>' Correction of laboratory reports.</li> <li>' Participation in the two compulsory conferences organized as part of this teaching unit.</li> </ul>
Teaching methods	<p><b>The teaching of both parts of this teaching unit is at the appreciation and availability of the course holder e(s). If necessary, sections 9 to 15 may be given before sections 1 to 8.</b></p> <p>Demonstration on the blackboard, slide showings, projection of animations, realization of experiments during the lectures, realization of laboratories, exercises sessions.</p> <p>Laboratory work is done in teams of two or three students. They must perform a delicate measure involving concepts that have been (or will be) introduced as part of the teaching units LPHYS1111 and LPHYS1112.</p> <p>In particular, a great autonomy is required for the realization of these laboratories. The results are then presented in the form of a written report.</p> <p>The waves are present everywhere, whether in mechanical systems, sound, or in fluids (or of course in electromagnetism, as seen in the teaching unit LPHYS1221). The focus is therefore on the common mathematical description of all these wave phenomena. In the same way, thermodynamics makes it possible to make links between different disciplines, in particular mechanics, chemistry and electromagnetism.</p>
Content	<p>The table of contents includes the following points:</p> <p>Part 1</p> <ol style="list-style-type: none"> <li>1) Free oscillations of simple systems.</li> <li>2) Free oscillations of systems with a large number of degrees of freedom.</li> <li>3) Forced oscillation.</li> <li>4) Progressive waves.</li> <li>5) Reflection, transmission and interference.</li> <li>6) Modulation, pulse and wave packets.</li> <li>7) Two- and three-dimensional waves, polarization.</li> <li>8) Introduction to statics and dynamics of fluids.</li> </ol> <p>Part 2</p> <ol style="list-style-type: none"> <li>9) Thermodynamic system, transformations and state variables.</li> <li>10) Internal energy and first principle of thermodynamics.</li> <li>11) Entropy and second principle of thermodynamics.</li> <li>12) Kinetic theory of gas - perfect gas.</li> <li>13) Transformations and thermal machines.</li> <li>14) Phase transitions of pure bodies.</li> </ol>

Bibliography	Cours de physique de Berkeley. Volume 3 : ondes. Ansermet J.P. et S. Bréchet, 2016. Thermodynamique. Presses polytechniques et universitaires romandes. Goncz G., 2005. Comprendre la thermodynamique. Ellipses, 260 pp., ISBN 2-7298-2363-8. Bocquet L., J.-P. Faroux, J. Renault, 2002. Toute la thermodynamique, la mécanique des fluides et les ondes mécaniques. Dunod, 519 pp., ISBN 2-10-005568-2.
Faculty or entity in charge	PHYS

<b>Programmes containing this learning unit (UE)</b>				
Program title	Acronym	Credits	Prerequisite	Aims
Bachelor in Mathematics	<a href="#">MATH1BA</a>	5		
Minor in Physics	<a href="#">LPHYS100I</a>	5		