UCLouvain

lepl1201

2020

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 + 30.0 h	Q1

Teacher(s)	Keunings Roland ;Legat Jean-Didier ;SOMEBODY ;
Language :	French
Place of the course	Louvain-la-Neuve
Main themes	The course is structured in two parts. The first addresses point mass mechanics, and the second electrostatics. The second part concludes with some elements introductory to the theory of electrical circuits. Both components of the course share a common conceptual framework, in which basic physics concepts are introduced in a unified approach (forces, potential and mechanical energies, conservation equations). The first part introduces the concepts of geometry and vector spaces necessary to express the notions of forces and torques, and in particular the conditions of static equilibrium. Next, the concepts and tools of kinematics are developed, leading to Newton's principles, their physical meaning and consequences. Finally, based on these principles, the conservation laws of linear momentum and energy are established, by also discussing their physical significance. The second part introduces the main quantities and laws relevant to electrostatics in vacuum, exploiting the physics concepts of the first part of the course. The generalisation of these laws to dielectric media is developed. Conducting materials are considered, leading to the concept of electrical resistance. Then follows an introduction to the basics of the theory of electrical circuits (Ohm's and Kirchhoff's laws, electrical capacitance and inductance).
Aims	**Contribution of the course to the program objectives**: Regarding the learning outcomes of the program of Bachelor in Engineering, this course contributes to the development and the acquisition of the following learning outcomes: • LO 1.1 • LO 2.3, 2.4, 2.6, 2.7 • LO 3.1, 3.2, 3.3 • LO 4.2, 4.3, 4.4 **Specific learning outcomes of the course**: 1 More precisely, at the end of the course the students will be able to • Apply Newton's principles in order to either express the differential equations of a system dynamics, or determine unknown forces acting on it ; implement the time evolution equations of global quantities relevant to a system of point masses subjected to an ensemble of external and internal forces (kinetic, potential and mechanical energy, momentum) ; - Evaluate the electric field associated to an electric charge distribution, and use Gauss' law to determine electric field distributions within simple devices in vacuum and materials ; - By relying on Ohm's and Kirchhoff's laws, compute and measure the continuous electrical characteristics of simple passive and dynamical circuits. *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'.* - - - - *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 individual exam covering both parts of the course. Details are defined on the course website.
Teaching methods	**Due to the COVID-19 crisis, the information in this section is particularly likely to change.** The two parts (mechanics and electricity) share a common formalism and the concepts introduced in each part are treated in a unified manner (forces, potential functions, energy, conservation laws,'). In addition to formal lectures, tutored sessions are organized on a weekly basis (APE and APP), during which the students work in groups of 6 with a problem-based learning approach. Every week, each student must complete a series of exercices within the MasteringPhysics learning environment.
Content	Part 1 : Point mass mechanics - geometry and vector spaces - forces - torques - static equilibrium - kinematics - Newton's principles - conservation laws ' collisions ' periodic motion

	Part 2 : Electrostatics, basics of circuit theory - Electrostatics in vacuum - Electrostatics in matter - Ohm's and Kirchhoff's laws - Basics of electrical circuits
Faculty or entity in charge	BTCI

Programmes containing this learning unit (UE)				
Program title	Acronym	Credits	Prerequisite	Aims
Bachelor in Engineering : Architecture	ARCH1BA	5		
Bachelor in Engineering	FSA1BA	5		