FSAB1201 Physics 1

[30h+30h exercises] 6 credits

This course is taught in the 1st semester

Teacher(s):	Guy Campion (coord.), Jan Govaerts, Jean-Didier Legat, Charles Trullemans
Language:	French
Level:	First cycle

Aims

Introductory course to point mass mechanics, and to electro- and magneto-statics.
This activity must bring students to a level where they are 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, angular momentum) ;
Evaluate the electric field associated to an electric charge distribution, and use Gauss' law to determine electric field distributions within simple devices with dielectric materials ;
By relying on Ohm's and Kirchhoff's laws, compute and measure the continuous electrical characteristics of simple passive and dynamical circuits.

Main themes

The course is structured in two parts. The first (3.5 ECTS) addresses point mass mechanics, and the second (2.5 ECTS) electro- and magneto-statics. 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 three conservation laws of momentum, angular 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). A first approach towards measurement in the physical sciences is developed, through a characterisation of the dominant effects as observed in electrical circuits.

Content and teaching methods

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Part 1 : Point mass mechanics
- Geometry and vector spaces - forces - torques - static equilibrium
- Kinematics
- Newton's principles
- Conservation laws
Part 2 : Electro- and magneto-statics, basics of circuit theory
- Electrostatics in vacuum
- Electrostatics in matter
- Ohm's and Kirchhoff's laws
- Basics of electrical circuits

Other information (prerequisite, evaluation (assessment methods), course materials recommended readings, ...)

-No prerequisite
-The evaluation has 2 components: an intermediary evaluation during the quadrimester and a final exam at the end of the quadrimester (written exam). The final mark is a combination of the scores in these two evaluations
- Workfiles for each of the parts (available on the website and in
printed version); Reference book: University Physics (Freedman and Young)

Other credits in programs

ARCH11BA	Première année de bachelier en sciences de l'ingénieur, orientation ingénieur civil architecte	(6 credits)	Mandatory
ARCH12BA	Deuxième année de bachelier en sciences de l'ingénieur, orientation ingénieur civil architecte	(6 credits)	
FSA11BA	Première année de bachelier en sciences de l'ingénieur, orientation ingénieur civil	(6 credits)	Mandatory
FSA12BA	Deuxième année de bachelier en sciences de l'ingénieur, orientation ingénieur civil	(6 credits)	