UCL Université catholique de Louvain

LPHY2162

2015-2016

Physics of the upper atmophere and space

4.0 credits	22.5 h	1q

Teacher(s) :	Pierrard Viviane ;
Language :	Anglais
Place of the course	Louvain-la-Neuve
Prerequisites :	There are no specific preliminary needs.
Main themes :	The goal of this formation is to give to the students an overview of the physical properties of the planetary and stellar atmospheres. The influence of the Sun on the terrestrial atmosphere and the space environment of the Earth are described in detail. The lecture gives also the physical approaches used to describe the gas and plasmas when the collisions decrease with the altitude. Description: The Sun: Stars (formation, destruction, groups) - Description of the inner Sun (fusion, abundance of the elements, radiative, convective zones) ' The solar atmosphere solaire (photosphere, chromosphere, corona) - Sunspots, solar activity cycle ' Solar eruptions (CME, flares, proeminences')- Coronal holes Physics of gas and plasmas: Definitions and properties ' Fundamental equations: kinetic and hydrodynamic approaches- Links and differences- Application: hydrostatic equilibrium The solar wind: Discovery ' Solar magnetic field - Observations: slow-speed and high-speed solar wind - Application of the fundamental equations for plasmas The magnetosphere: Origin of the geomagnetic field - Description of the different regions of plasmas, currents - Magnetopause, polar cusps, plasmasheet, Van Allen belts ' Movement of the particles in a magnetic field: Decomposition in 3 superposed movements ' Drift forces - Application to the Van Allen belts Sun-magnetosphere interactions: Magnetic storms and substorms - Aurora ' Space weather - Indexes of geomagnetic activity Ionosphere: Sources of ionization - Ionospheric layers - Propagation of radio waves- Refraction index - Perturbations due to the solar activity - Influence on satellites and GPS ' Plasmapause formation Neutral atmosphere: Temperature profile - Troposphere, stratosphere, mesosphere, thermosphere, exosphere - Photodissociation, chemical reactions, ozone Planetary atmospheres: Mercury ' Venus ' Mars ' Giant planets- Exoplanets
Aims :	This formation is addressed to physicists, engineers, geologists and all scientists interested by this topic. It is particularly useful for the students in the option Physics of the Earth *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 :	Evaluation: The evaluation is obtained by a written exam. In addition, volunteer students can make an oral personal presentation on a topic concerning the physics of high atmosphere and space that will be counted as ¼ for the global evaluation.
Bibliography :	Course materials: - Pierrard V., L'environnement spatial de la Terre, Presses Universitaires de Louvain, 214 p., 2010.
Other infos :	This formation is addressed to all physicists, engineers and geologists and is particularly useful for the students in physics of the Earth section. There are no specific preliminary needs. Support: notes are distributed at each lecture. Evaluation: the examination is prepared by written and is followed by an oral presentation.
Faculty or entity in charge:	PHYS

Programmes / formations proposant cette unité d'enseignement (UE)				
Intitulé du programme	Sigle	Credits	Prerequis	Acquis d'apprentissage
Master [120] in Physics	PHYS2M	4	-	
Master [120] in Geography : Climatology	CLIM2M	4	-	