


4 credits

22.5 h

Q1

Teacher(s)	Pierrard Viviane ;
Language :	English
Place of the course	Louvain-la-Neuve
Main themes	<p>The Sun: Stars (formation, diagram of Hertzsprung-Russell, fusion, abundance of elements) - Description of the inner Sun (radiative, convective zones) - The solar atmosphere (photosphere, chromosphere, corona) - Sunspots, solar activity cycle - Solar eruptions (CME, flares, prominences...) - Coronal holes</p> <p>Physics of gas and plasmas: Definitions and properties - Fundamental equations - kinetic and hydrodynamic approaches - Links and differences - Debye Length - Velocity distribution functions - Hydrostatic equilibrium - Hydrodynamic equilibrium</p> <p>The interplanetary space: Solar magnetic field - Solar wind - Comets - Application of the fundamental equations for plasmas</p> <p>The magnetosphere: Origin of the geomagnetic field - Description of the different regions of plasmas, currents - Magnetopause, polar cusps, plasmashet, Van Allen belts ...</p> <p>Movement of the particles in a magnetic field: Decomposition in 3 superposed movements - Drift forces - Application to the Van Allen belts</p> <p>Sun-magnetosphere interactions: Magnetic storms and substorms - Aurora - Space weather - Indexes of geomagnetic activity</p> <p>Ionosphere: Sources of ionization - Ionospheric layers - Propagation of radio waves - Refraction index - Perturbations due to the solar activity - Influence on satellites and GPS - Plasmopause formation</p> <p>Neutral atmosphere: Temperature profile - Troposphere, stratosphere, mesosphere, thermosphere, exosphere - Photodissociation, chemical reactions, ozone</p> <p>Planetary atmospheres: Mercury - Venus - Mars - Giant planets - Exoplanets</p>
Aims	<p>¹ 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</p> <p>-----</p> <p><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></p>
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.
Content	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 give also the physical approaches used to describe the gas and plasmas when the collisions decrease with altitude.
Bibliography	Support écrit : - 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 containing this learning unit (UE)				
Program title	Acronym	Credits	Prerequisite	Aims
Master [120] in Physics	PHYS2M	4		
Master [120] in Geography : Climatology	CLIM2M	4		