




5 credits

22.5 h + 15.0 h

Q2

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| Teacher(s)          | Dehant Véronique ;Lampens Patricia ;   |
| Language :          | French   |
| Place of the course | Louvain-la-Neuve   |
| Main themes         | <p>This teaching unit provides students with basic knowledge in relation to the Earth and the Universe in general; it presents an overview of the evolution up to the most recent developments related to the study of:</p> <ul style="list-style-type: none"> <li>- spherical astronomy,</li> <li>- geometrical and dynamical geodesy,</li> <li>- rotation of the Earth,</li> <li>- geophysics of the Earth and the planets,</li> <li>- astrophysics</li> </ul>   |
| Aims                | <p><b>a. Contribution of the teaching unit to the learning outcomes of the programme</b></p> <p>AA1 : 1.1, 1.3, 1.4, 1.5, 1.6, 1.7, 1.8<br/>                 AA2 : 2.1, 2.2, 2.4<br/>                 AA3 : 3.1, 3.2, 3.3, 3.4, 3.5, 3.6<br/>                 AA4 : 4.1, 4.2, 4.3<br/>                 AA6 : 6.5</p> <p><b>b. Specific learning outcomes of the teaching unit</b></p> <p>At the end of this teaching unit, the student will be able to:</p> <ol style="list-style-type: none"> <li>1. describe the Earth and the Universe in their generality;</li> <li>2. explain and apply the fundamentals of astronomy, planetology and Earth physics and dynamics;</li> <li>3. describe the major steps in these domains until recent developments;</li> <li>4. describe and explain the latest great discoveries made by astronomers, geophysicists or planetologists, and by the most challenging space missions;</li> <li>5. calculate sunrises and sunsets or the length of day and night for different locations on Earth;</li> <li>6. find a star in the sky from a star catalogue or, conversely, identify a star that one has observed using coordinate transformations and a catalogue of stellar positions;</li> <li>7. explain the different movements that animate the Earth in space (rotation around its axis, precession, nutations, polar motion and orbit around the Sun).</li> <li>8. describe and explain the main features of the planets and synthesize the results of the latest space missions on these planets or moons of the solar system;</li> <li>9. describe the general observed properties of stars, as well as their formation and evolution; explain the H-R diagram;</li> <li>10. report on the latest discoveries about stars, galaxies and the detection of exoplanets.</li> </ol> <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  | <p>Students have an exercise at the exam where the 3D mental vision and understanding are needed, which they may acquire by participating in the exercise sessions and the session organized at the Planetarium of Brussels. This practical exercise is linked to the current celestial events, such as the calculation of the length of day and night for different locations on Earth, for solar panels or for football matches. Students must apply the formulas developed during the course and the exercise sessions.</p> <p>Theoretical questions are also asked and students are expected to describe and characterize a planet or moon of the solar system with their own words based on what they have learned during the lectures, the exercise sessions, at the Planetarium of Brussels or on the web.</p>  |

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| <p>Teaching methods</p>            | <p>Lectures.<br/>                 Exercise sessions.</p> <p>The students are invited by the Royal Observatory of Belgium to the Planetarium of Brussels where they experience (1) a spatial simulation of (a) the theory seen within the framework of the lectures and (b) the exercises solved during the year (students can view in 3D the phenomena explained during the course and exercise sessions) and (2) an educative show chosen from the list of shows proposed by the Planetarium of Brussels.</p> <p>In the master class devoted to the planets, a presentation is given with 3D glasses, which allows to see splendid images of the planets and moons of the solar system. These 3D glasses are provided by the Royal Observatory of Belgium.</p> <p>Since they play a key role in several space missions and actively participate in ground or space observations, the lecturers have a prioritized access to unpublished images and important information and data, which they can communicate to the students. In addition, the instructors regularly apply the theory seen during the lectures to real cases.</p> |
| <p>Content</p>                     | <p>(1) Spherical astronomy, geographical location of a site on the Earth and astronomical location of a star on the celestial sphere.</p> <p>(2) Geometry and dynamics of the Earth and the contribution of artificial satellite observations.</p> <p>(3) Earth's rotation, precession, nutations, polar motion and the orbit of the Earth around the Sun. Definition of time and timescales.</p> <p>(4) Solar system and the main characteristics of the planets. Concept of habitability of planets and moons of solar and extrasolar planetary systems.</p> <p>(5) Fundamental characteristics of the stars, their distances, motions, colours and brightnesses.</p> <p>(6) Stellar formation and evolution.</p> <p>(7) Double and multiple star systems.</p> <p>(8) Structure of the Milky Way.</p> <p>(9) Overall large-scale structure of the Universe.</p> <p>(10) Exoplanets.</p>   |
| <p>Bibliography</p>                | <p>Un syllabus rédigé par les titulaires est disponible</p>   |
| <p>Faculty or entity in charge</p> | <p>PHYS</p>   |

| <b>Programmes containing this learning unit (UE)</b> |                           |         |              |   |
|--|---------------------------|---------|--------------|---|
| Program title  | Acronym                   | Credits | Prerequisite | Aims  |
| Minor in Physics                                     | <a href="#">LPHYS100I</a> | 5       |              |  |
| Minor in Scientific Culture                          | <a href="#">LCUSC100I</a> | 5       |              |  |
| Additional module in Physics                         | <a href="#">LPHYS100P</a> | 5       |              |  |