UCLouvain

# lphys2223

*2020*

# utrino physics and dark matter

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 | Q2 |
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| Teacher(s) | Drewes Marco ; |
| Language : | English |
| Place of the course | Louvain-la-Neuve |
| Main themes | The teaching unit gives an overview of experimental and observational evidence for physics beyond the Standard Model of particle physics. The focus lies on two of the most studied problems, neutrino oscillations and the dark matter, and their theoretical interpretation. |
| Aims | **a. Contribution of the teaching unit to the learning outcomes of the programme (PHYS2M and PHYS2M1)**<br>1.1, 1.2, 1.6, 2.1, 3.1, 3.2, 3.3, 3.4, 4.1, 7.2, 8.1, 8.2.<br>**b. Specific learning outcomes of the teaching unit**<br>At the end of this teaching unit, the student will be able to :<br>1. describe neutrino oscillations in a simple quantum mechanical model ;<br>2. understand the role of neutrinos in particle physics and cosmology ;<br>3. be familiar with the most important neutrino experiments ;<br>4. understand the observational evidence for dark matter ;<br>5. follow the standard calculation for the density of cosmological thermal relics ;<br>6. put different explanations for the dark matter problem into context ;<br>7. have an overview of experimental search for dark matter.<br>- - - -<br>*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.**<br>Oral presentation and written report |
| Teaching methods | **Due to the COVID-19 crisis, the information in this section is particularly likely to change.**<br>Lectures and integrative project. |
| Content | Neutrinos and their role in the Standard Model of particle physics<br>Neutrino oscillations (experiment)<br>Neutrino masses (theory)<br>Neutrinos in cosmology (theory)<br>Evidence for the existence of dark matter (observational)<br>Dark matter theories<br>The search for dark matter |
| Bibliography | Giunti and Kim - Fundamentals of Neutrino Physics and Astrophysics.<br>Kolb and Turner - The Early Universe. |
| Faculty or entity in charge | PHYS |

| Programmes containing this learning unit (UE) | | | | |
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| Program title | Acronym | Credits | Prerequisite | Aims |
| Master [60] in Physics | PHYS2M1 | 5 | | 🔍 |
| Master [120] in Physics | PHYS2M | 5 | | 🔍 |