

At Louvain-la-Neuve - 120 credits - 2 years - Day schedule - In EnglishDissertation/Graduation Project : **YES** - Internship : **NO**Activities in English: **YES** - Activities in other languages : **NO**Activities on other sites : **optional**Main study domain : **Sciences**Organized by: **Faculty of Science (SC)**Programme acronym: **PHYS2M** - Francophone Certification Framework: 7**Table of contents**

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PHYS2M - Introduction

Introduction

Introduction

The physicist possesses great capacities of reasoning and abstraction. He/she continually asks questions about the physical world around him/her in order to understand how it works. He/she observes, makes assumptions, formalizes concepts, and writes and solves the equations governing them in order to confront them with observations and experience. Thanks to his/her advanced and versatile scientific training, he/she contributes to the great challenges of the Society of today and tomorrow. He/she is involved in cutting-edge research and the resolution of important questions related to the genesis and evolution of the Universe, fundamental interactions between elementary particles, quantum optics, statistical physics, origins of the Earth, global climate change, sustainable development, energy choices, etc.

The skills developed by the physicist as part of his/her training, including his/her ability to model and characterize large data sets, can be valued in many professions specific to the realms of today's physics, such as superconductivity, instrumentation and metrology, laser physics, nuclear physics, nonlinear physics, cosmology, astrophysics, astronomy, planetology, geophysics, meteorology, climatology, oceanography and glaciology, or fields as diverse as medical sciences, space sciences and signal processing, but also actuarial sciences, finance, consultancy, banking and all areas where statistical methods, IT and tools related to artificial intelligence are important. Through his/her teamwork skills, the physicist also develops skills in communication, scientific popularization and management. His/her various skills enables him/her to contribute to the creation of tomorrow's jobs.

The Master [120] in Physics constitutes the logical continuation of the Bachelor in Physics. Its purpose is to enable you (1) to completely master the fundamental laws and essential tools of today's physics, (2) to specialize in a field of physics, (3) to acquire disciplinary skills and cross-cutting essential to exercise a professional activity related to physics, and (4) to train you, depending on the chosen focus, for a specific job. Three focuses are proposed: the research focus, the specialized focus on medical physics, which trains you for the profession of hospital physicist, and the teaching focus.

Your profile

You hold a Bachelor's degree in physics or in a discipline related to physics. You want to develop advanced knowledge and skills in physics. You want to deepen the fundamental theories of physics and gain a solid background in experimental and modeling techniques as well as in data analysis. You want to conduct research in universities, public research institutes or industrial laboratories, or to teach physics in high schools, or to practice physics in hospitals. You plan to perform a PhD in science. You then have the profile to begin a Master [120] in Physics. You will have the chance to receive a personalized training with internationally recognized teachers.

Your future job

The training in physics aims at mastering advanced physical and mathematical tools. It develops skills such as curiosity and scientific rigor, the capacity for abstraction, the modeling of complex physical problems, the sense of precision and experimental measurement as well as the ability to work in a team and to communicate.

Thanks to this versatile training, there are many career opportunities.

One main track is to start a career in research (university laboratories, private laboratories, European Organization for Nuclear Research - CERN, Atomic Energy Commission, Institute for Space Aeronomy of Belgium, Royal Meteorological Institute of Belgium, Royal Observatory of Belgium, etc.) or in secondary or higher education (high schools).

Physicists also find jobs in the private or financial sector. Some of them work in the medical area as a hospital physicist, in the high technology industry (telecommunications, optics, aeronautics, space industry, medical equipment, etc.), in the field of energy, in the area of information technology (big data processing, design of calculation programmes, etc.), for banks and insurance companies, in the field of environmental consultancy and in the sector of scientific communication and popularization.

Your programme

The programme of the Master [120] in Physics, which can be completed in two years, offers :

- an advanced and specialized training in physics that prepares you for the job of researcher, teacher or hospital physicist, depending on the focus chosen.
- a deepening of the fundamental theories of physics,
- a learning of the most advanced experimental and modeling techniques of today's physics,
- teaching units taught, for most of them, in English,
- a lot of practical works (exercises, laboratories, and personal or group projects),
- the possibility to conduct research within the Master's thesis in one of the research institutes of UCLouvain, one of the federal scientific institutes in which academic members of the School of Physics work, a private company or a hospital,
- the possibility to follow part your studies in a foreign university.

PHYS2M - Teaching profile

Learning outcomes

Observe and understand the physical reality of the world around him/her, understand it, explain it and model it, these are the challenges that the student enrolled in the Master [120] in Physics is preparing to meet. This programme aims to develop mastery of the fundamental laws and essential tools of today's physics, with a focus that allows entering the world of research or industry (research focus), the world of education (training focus) or the hospital environment (specialized focus on medical physics). It leads to the acquisition of skills such as the ability to analyze a physical problem, the ability of abstraction and modeling, the rigor in reasoning and expression, the autonomy and the ability to communicate, including in English.

At the end of his/her training at the Faculty of Sciences, the student will have acquired the disciplinary and cross-disciplinary knowledge, and skills needed to perform numerous professional activities. His/her modeling and in-depth understanding of phenomena, his/her liking for research and his/her scientific rigor will be sought not only in scientific professions (research, development, teaching, etc.), but also more generally in the current and future Society.

On successful completion of this programme, each student is able to :

1. Master and use in depth the specialized knowledges of physics.
 - 1.1 Formulate the fundamental concepts of current physical theories, highlighting their main ideas, and link these theories together.
 - 1.2 Identify and apply physical theories to solve a problem.
 - 1.3 Know and use adequately the principles of experimental physics : measurements, their uncertainties, measuring instruments and their calibration, the processing of data by computer tools.
 - 1.4 Explain and design a measurement method and implement it.
 - 1.5 Model complex systems and predict their evolution using numerical methods, including computer simulations.
 - 1.6 Retrace the historical evolution of physical concepts and recognize the role of physics in various parts of the body of knowledge and culture.
2. Demonstrate methodological, technical and practical skills useful for solving problems in physics.
 - 2.1 Choose, knowing their limitations, a method and tools to solve a novel problem in physics.
 - 2.2 Design and use instruments to measure or study a physical system.
 - 2.3 Properly handle computer tools to help solve problems in physics, while knowing the limitations of these tools.
 - 2.4 Design algorithms adapted to the problems addressed and translate them into computer programmes.
 - 2.5 Apply adequate tools, both basic and more advanced, to model complex physical systems and solve specific problems in physics application fields.
3. Apply a scientific approach and reasoning, and identify, using an inductive or deductive approach, the unifying aspects of different situations and experiences.
 - 3.1 Evaluate the simplicity, clarity, rigor, originality of a scientific reasoning, and identify any flaws.
 - 3.2 Develop or adapt a physical reasoning and formalize it.
 - 3.3 Argue the validity of a scientific result and adapt its argumentation to various audiences.
 - 3.4 Show the analogies between different problems in physics, in order to apply known solutions to new problems.
4. Build new knowledge and research related to issues in one or more areas of current physics.
 - 4.1 Develop an autonomous physical intuition by anticipating expected results and verifying consistency with existing results.
 - 4.2 Analyze a research problem and select the appropriate tools to study it in a thorough and original way.
5. Learn and act autonomously to continue training in an independent way.
 - 5.1 Search in the physical literature for sources and assess their relevance.
 - 5.2 Read and interpret an advanced physics text and relate it to acquired knowledge.
 - 5.3 Acquire new scientific and technical skills.
 - 5.4 Judge autonomously the relevance of a scientific approach and the interest of a physical theory
6. Work in a team and collaborate with students and professionals in other disciplinary fields to achieve common goals and produce results.
 - 6.1 Share knowledge and methods.
 - 6.2 Identify individual and collective goals and responsibilities, and work in accordance with these roles.
 - 6.3 Manage, individually and as a team, a major project in all its aspects.
 - 6.4 Evaluate your performance as an individual and team member, and evaluate the performance of others.
 - 6.5 Recognize and respect the views and opinions of team members.

- 7.4 Adapt the presentation to the level of expertise of the interlocutors.
- 7.5 Use a variety of media and computer tools to communicate (explain, write, publish) concepts and physical results.
- 7.6 Discuss with colleagues from other disciplines.
8. If he/she chooses the research training, actively address a research theme.
- 8.1 Achieve a level of expertise in a chosen field of contemporary physics.
- 8.2 Deepen a subject beyond current knowledge.
9. If he/she chooses the specialized focus on medical physics, practice the profession of physicist in the hospital environment.
- 9.1 Identify and apply the imaging and treatment techniques specific to physicists in the hospital environment.
- 9.2 Intervene in a clinical setting.
- 9.3 Undertake basic and clinical research.
10. If he/she chooses the teaching focus, mobilize the necessary skills to effectively start the profession of teacher in physics in high schools, and be able to evolve positively there.
- 10.1. Intervene in school context, in partnership with different actors.
- 10.2. Teach in authentic and varied situations.
- 10.3. Exercise a reflexive glance and to project him/her/self in a logic of continuous development.

For more details, consult the Aggregation of Upper Secondary Education (Physical Sciences).

The contribution of each teaching unit to the programme's reference for learning outcomes can be found in the document "Through which teaching units the skills of the programme's reference system are developed and mastered by the student?".

The document is accessible by means of identification with the global UCLouvain identifier by clicking [PHYS2A](#).

Programme structure

The programme leading to the Master's [120] degree in physics includes a core curriculum, which consists of :

- 30 credits of specialized training in physics, to be chosen from a list of teaching units organized into subject blocks and to be followed during the first semester of the first annual unit,
- 5 credits of physics seminar, to be followed during the second annual unit,
- 2 credits of training in human sciences, to be chosen from a list of teaching units and to be followed during the first or second annual unit,
- 28 credits of activities related to the Master's thesis, which include the Master's thesis itself (26 credits) and the thesis tutorial (2 credits), to be carried out during the second annual unit.

The programme also includes 30 credits of teaching units specific to the chosen focus, to be followed during the first or second annual unit, as well as 25 credits of elective teaching units, to be selected from a list of teaching units organized into subject blocks and to be followed mainly during the second annual unit.

PHYS2M Programme

Detailed programme by subject

CORE COURSES [65.0]




- Mandatory
- ✂ Optional
- △ Not offered in 2023-2024
- ⊖ Not offered in 2023-2024 but offered the following year
- ⊕ Offered in 2023-2024 but not the following year
- △ ⊕ Not offered in 2023-2024 or the following year
- Activity with requisites
- ⊗ Open to incoming exchange students
- ⊗ Not open to incoming exchange students
- [FR] Teaching language (FR, EN, ES, NL, DE, ...)

Click on the course title to see detailed informations (objectives, methods, evaluation...)

o Formation spécialisée en physique (30 crédits)

NB : Des programmes types en fonction des orientations de la recherche en sciences physiques à l'UCLouvain sont proposés sur le site Web de l'école de physique. L'étudiant-e choisit 30 crédits parmi les UE ci-dessous (les UE LPHYS2143 et LPHYS2102 sont vivement conseillées pour les étudiant-e-s inscrit-e-s à la finalité spécialisée) :

⊗ Physique statistique et mathématique

| | | | | | |
|-------------|----------------------|---------------------|--------------------------------------------------------------------------------------------------------------------------------------------|---|--|
| ⊗ LPHYS2112 | Mathematical physics | Christophe Ringeval | EN [q1] [30h] [5 Credits]  > French-friendly | X | |
| ⊗ LPHYS2113 | Critical phenomena | Philippe Ruelle | EN [q1] [22.5h+7.5h] [5 Credits]  > French-friendly | X | |
| ⊗ LPHYS2114 | Nonlinear dynamics | Michel Crucifix | EN [q1] [22.5h+22.5h] [5 Credits]  > French-friendly | X | |



⊗ Gravitation, cosmologie et astroparticules

| | | | | | |
|-------------|-----------|---------------------|------------------------------------------------------------------------------------------------------------------------------------|---|--|
| ⊗ LPHYS2122 | Cosmology | Christophe Ringeval | EN [q1] [30h] [5 Credits]  > French-friendly | X | |
|-------------|-----------|---------------------|------------------------------------------------------------------------------------------------------------------------------------|---|--|

⊗ Physique des particules

| | | | | | |
|-------------|---------------------------------------------------|---------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------|---|--|
| ⊗ LPHYS2131 | Fundamental interactions and elementary particles | Agni Bethani (compensates) Christophe Delaere Céline Degrande Christophe Delaere Vincent Lemaître | EN [q1] [52.5h+7.5h] [10 Credits]  > French-friendly | X | |
| ⊗ LPHYS2132 | Quantum field theory 1 | Céline Degrande Marco Drewes | EN [q1] [52.5h+7.5h] [10 Credits]  > French-friendly | X | |

⊗ Physique atomique, moléculaire et optique

| | | | | | |
|-------------|--------------------------------|-------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------|---|--|
| ⊗ LPHYS2141 | Introduction to quantum optics | Matthieu Génévriez Xavier Urbain | EN [q1] [22.5h+7.5h] [5 Credits]  > French-friendly | X | |
| ⊗ LPHYS2143 | Optics and lasers | Clément Lauzin | EN [q1] [22.5h+22.5h] [5 Credits]  > French-friendly | X | |

⊗ Physique de la Terre, des planètes et du climat

| | | | | | |
|-------------|---------------------------------------------------------------------|---------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------|---|--|
| ⊗ LPHYS2161 | Internal geophysics of the Earth and planets | Véronique Dehant (coord.) Jérémy Requier | EN [q1] [22.5h+7.5h] [5 Credits]  > French-friendly | X | |
| ⊗ LPHYS2162 | Introduction to the physics of the climate system and its modelling | Hugues Gousse Francesco Ragone | EN [q1] [22.5h+22.5h] [5 Credits]  > French-friendly | X | |
| ⊗ LPHYS2163 | Atmosphere and ocean : physics and dynamics | Thierry Fichetef François Massonnet | EN [q1] [52.5h+7.5h] [10 Credits]  > French-friendly | X | |



⊗ Instrumentation et méthodes numériques

| | | | | | |
|-------------|----------------------------------------------------------|---------------------|---------------------------------------------------------------------------------------------------------------------------------------------|---|--|
| ⊗ LPHYS2101 | Analog and digital electronics | Eduardo Cortina Gil | EN [q1] [45h+45h] [10 Credits]  > French-friendly | X | |
| ⊗ LPHYS2102 | Ionizing Radiation Detection and Nuclear Instrumentation | Eduardo Cortina Gil | EN [q1+q2] [26h+26h] [5 Credits]  > French-friendly | X | |

o Séminaire de physique (5 crédits)

| | | | | | |
|-------------|-----------------|-----------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------|--|---|
| o LPHYS2191 | Physics seminar | Michel Crucifix Gwenhaël de Wasseige | EN [q1+q2] [0h+30h] [5 Credits]  > French-friendly | | X |
|-------------|-----------------|-----------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------|--|---|

o Activités liées au mémoire (28 crédits)

| | | | | | |
|-------------|-----------------|------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------|--|---|
| o LPHYS2197 | Thesis tutorial | Ahmed Adriouèche Gwenhaël de Wasseige | EN [q1] [15h] [2 Credits]  > French-friendly | | X |
| o LPHYS2199 | Master's thesis | Eduardo Cortina Gil (coord.) | EN [q1+q2] [] [26 Credits]  > French-friendly | | X |

o Formation en sciences humaines (2 crédits)

L'étudiant-e choisit une UE parmi :

| | | | | Year | |
|--------------|-------------------------------------------|--------------------------------------------------------------------------------------|-------------------------------|------|---|
| | | | | 1 | 2 |
| ⊗ LSC2001 | Introduction to contemporary philosophy | Peter Verdée Peter Verdée (compensates Charles Pence) | EN [q2] [30h] [2 Credits] | x | x |
| ⊗ LSC2220 | Philosophy of science | Alexandre Guay | EN [q2] [30h] [2 Credits] | x | x |
| ⊗ LFILO2003E | Ethics in the Sciences and technics (sem) | Alexandre Guay (compensates Charles Pence) Hervé Jeanmart René Rezsóhazy | EN [q2] [15h+15h] [2 Credits] | x | x |
| ⊗ LTHEO2840 | Science and Christian faith | Benoît Bourguine Paulo Jorge Dos Santos Rodrigues | EN [q1] [15h] [2 Credits] | x | x |

⊗ Formation facultative

These credits are not counted within the 120 required credits.

| | | | | | |
|-------------|------------------------------------------|---------------------------------------------------|----------------------------------|---|---|
| ⊗ LSST1001 | IngénieursSud | Stéphanie Merle Jean-Pierre Raskin (coord.) | EN [q1+q2] [15h+45h] [5 Credits] | x | x |
| ⊗ LSST1002M | Information and critical thinking - MOOC | Myriam De Kesel Jean-François Rees | EN [q2] [30h+15h] [3 Credits] | x | x |

LIST OF FOCUSES

- > **Research Focus** [en-prog-2023-phys2m-lphys200a]
- > **Teaching Focus** [en-prog-2023-phys2m-lphys200d]
- > **Professional Focus : Medical Physics** [en-prog-2023-phys2m-lphys200s]

RESEARCH FOCUS [30.0]

- Mandatory
- ⊗ Optional
- △ Not offered in 2023-2024
- ⊖ Not offered in 2023-2024 but offered the following year
- ⊕ Offered in 2023-2024 but not the following year
- △ ⊕ Not offered in 2023-2024 or the following year
- Activity with requisites
- 🌐 Open to incoming exchange students
- 🚫 Not open to incoming exchange students
- [FR] Teaching language (FR, EN, ES, NL, DE, ...)

Click on the course title to see detailed informations (objectives, methods, evaluation...)

Year

1 2

o Content:

⊗ Physique statistique et mathématique

| | | | | | |
|-------------|--------------------------|-----------------|----------------------------------------------------------|---|---|
| ⊗ LPHYS2211 | Group theory | Philippe Ruelle | EN [q2] [22.5h+22.5h] [5 Credits] 🌐 > French-friendly | X | |
| ⊗ LPHYS2215 | Statistical field theory | | EN [q2] [30h] [5 Credits] ⊖ 🌐 > French-friendly | X | X |

⊗ Gravitation, cosmologie et astroparticules

| | | | | | |
|-------------|-------------------------------------------|----------------------|--------------------------------------------------|---|--|
| ⊗ LPHYS2221 | Astrophysics and astroparticles | Gwenhaël de Wasseige | EN [q2] [30h] [5 Credits] 🌐 > French-friendly | X | |
| ⊗ LPHYS2223 | utrino physics and dark matter | Marco Drewes | EN [q2] [30h] [5 Credits] 🌐 > French-friendly | X | |
| ⊗ LPHYS2224 | Advanced cosmology and general relativity | Christophe Ringeval | EN [q2] [30h] [5 Credits] 🌐 > French-friendly | X | |




⊗ Physique des particules

LPHYS2233A, LPHYS2233B and LPHYS2233C cannot be taken if the full course LPHYS2233 is selected.

| | | | | | |
|--------------|-----------------------------------------------------------------------------|---------------------------------------------------------------------------------------|----------------------------------------------------------|---|---|
| ⊗ LPHYS2233 | Experimental methods in fundamental physics | Agni Bethani (compensates Giacomo Bruno Giacomo Bruno Eduardo Cortina Gil | EN [q2] [52.5h+7.5h] [10 Credits] 🌐 > French-friendly | X | |
| ⊗ LPHYS2233A | Experimental methods in fundamental physics - Introduction and use of GEANT | Giacomo Bruno Eduardo Cortina Gil | EN [q2] [22.5h+7.5h] [4 Credits] 🌐 > French-friendly | X | |
| ⊗ LPHYS2233B | Experimental methods in fundamental physics - Advanced detection methods | Giacomo Bruno Eduardo Cortina Gil | EN [q2] [25h+5h] [5 Credits] 🌐 | X | |
| ⊗ LPHYS2233C | Experimental methods in fundamental physics - Data analysis methods | Giacomo Bruno Eduardo Cortina Gil | EN [q2] [27.5h+2.5h] [5 Credits] 🌐 | X | |
| ⊗ LPHYS2234 | Quantum field theory 2 | Marco Drewes | EN [q2] [30h] [5 Credits] ⊕ 🌐 > French-friendly | X | X |

⊗ Physique atomique, moléculaire et optique








| | | | | | |
|-------------|-------------------------------------|----------------|---------------------------------------------------------|---|---|
| ⊗ LPHYS2242 | Fundamentals of quantum information | | EN [q2] [30h] [5 Credits] ⊖ 🌐 > French-friendly | X | X |
| ⊗ LPHYS2244 | Molecular physics | Clément Lauzin | EN [q2] [22.5h+7.5h] [5 Credits] 🌐 > French-friendly | X | |
| ⊗ LPHYS2245 | Lasers physics | Clément Lauzin | EN [q2] [22.5h+7.5h] [5 Credits] 🌐 > French-friendly | X | |

| | | | | Year | |
|-------------|------------------------------------------------------|---------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------|------|---|
| | | | | 1 | 2 |
| ⊗ LPHYS2246 | Experimental methods in atomic and molecular physics | Clément Lauzin Xavier Urbain | EN [q2] [30h] [5 Credits]  > French-friendly | X | |
| ⊗ LPHYS2247 | Special topics in quantum optics | Matthieu Génévriez | EN [q2] [30h] [5 Credits]  > French-friendly | X | |
| ⊗ LPHYS2248 | Ultra-fast laser physics | Clément Lauzin | EN [q2] [22.5h+7.5h] [5 Credits]  > French-friendly | X | X |






⊗ Physique de la matière condensée et des milieux continus

| | | | | | |
|-------------|--------------------------------------|------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------|---|--|
| ⊗ LMAPR2451 | Atomistic and nanoscopic simulations | Jean-Christophe Charlier Xavier Gonze Gian-Marco Rignanese | EN [q2] [30h+30h] [5 Credits]  > French-friendly | X | |
|-------------|--------------------------------------|------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------|---|--|

⊗ Physique de la Terre, des planètes et du climat

| | | | | | |
|-------------|--------------------------------------------------------|---------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------|---|---|
| ⊗ LPHYS2260 | Geodesy and GNSS (Global Navigation Satellite System) | Véronique Dehant (coord.) Sébastien Le Maistre Jérémy Requier | EN [q2] [30h] [5 Credits]  > French-friendly | X | X |
| ⊗ LPHYS2264 | Oscillations and instabilities in the climate system | Michel Crucifix | EN [q2] [30h] [5 Credits]  > French-friendly | X | X |
| ⊗ LPHYS2265 | Sea ice-ocean-atmosphere interactions in polar regions | | EN [q2] [30h] [5 Credits]  > French-friendly | X | X |
| ⊗ LPHYS2266 | Physics of the upper atmosphere and space | Viviane Pierrard | EN [q2] [22.5h+7.5h] [5 Credits]  > French-friendly | X | |
| ⊗ LPHYS2267 | Paleoclimate dynamics and modelling | Qiuzhen Yin | EN [q2] [22.5h+7.5h] [5 Credits]  > French-friendly | X | |
| ⊗ LPHYS2268 | Forecast, prediction and projection in climate science | François Massonnet | EN [q2] [22.5h+7.5h] [5 Credits]  > French-friendly | X | |
| ⊗ LPHYS2269 | Remote sensing of climate change | Emmanuel Dekemper | EN [q2] [30h] [5 Credits]  > French-friendly | X | X |

⊗ Compléments de mathématique

| | | | | | |
|------------|-----------------------------------------------|-------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------|---|---|
| ⊗ LMAT2130 | Partial differential equations | Heiner Obermann | EN [q1] [30h+15h] [5 Credits]  | X | X |
| ⊗ LMAT2160 | Training seminar for mathematical researchers | Pierre-Emmanuel Caprace Jean Van Schaftingen | FR [q1] [15h] [5 Credits]  > English-friendly | X | X |
| ⊗ LMAT2250 | Calculus of variations | | FR [q2] [30h+15h] [5 Credits]  > English-friendly | X | X |
| ⊗ LMAT2420 | Complex analysis | Tom Claeys | EN [q2] [30h+15h] [5 Credits]  > French-friendly | X | X |
| ⊗ LMAT2470 | Processus stochastiques (statistique) | Donatien Hainaut | FR [q2] [30h] [5 Credits]  > English-friendly | X | |

TEACHING FOCUS [30.0]

IMPORTANT NOTE: In accordance with article 138 para. 4 of the decree of 7 November 2013 concerning higher education and the academic organisation of studies, teaching practice placements will not be assessed in the September session. Students are required to make every effort to successfully complete the teaching practice in the June session, subject to having to retake the year.

- Mandatory
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Click on the course title to see detailed informations (objectives, methods, evaluation...)

Year

1 2

o Content:**o Module concevoir, planifier et évaluer des pratiques d'enseignement et d'apprentissage**

| | | | | | |
|-------------|------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------|---|---|
| ○ LPHYS2492 | Stages d'enseignements en physique (en ce compris le séminaire d'intégration des stages) | Gabriel Dias de Carvalho Junior | (FR) [q1+q2] [15h+40h] [7 Credits] 🌐 | X | X |
| ○ LSCI2320 | Didactics and epistemology of science | Myriam De Kesel (coord.) Gabriel Dias de Carvalho Junior Stéphanie Wilmet | (FR) [q1] [22.5h] [2 Credits] 🌐 | X | X |
| ○ LPHYS2471 | Didactics and Epistemology of Physics | Gabriel Dias de Carvalho Junior | (FR) [q1+q2] [37.5h] [4 Credits] 🌐 | X | X |
| ○ LAGRE2220 | General didactics and education to interdisciplinarity | Stéphane Colognesi Severine De Croix Myriam De Kesel Jean-Louis Dufays Anne Ghysselinckx Véronique Lemaire Benoît Vercruysse | (FR) [q1+q2] [37.5h] [3 Credits] 🌐 | X | X |

o Didactique et épistémologie d'une autre discipline (en ce compris le stage d'écoute) (4 credits)

un cours au choix parmi les cours suivants

| | | | | | |
|-------------|----------------------------------------------------------------------------------|---------------------------------------------------------------------|----------------------------------------|---|---|
| ⊗ LCHM2340 | Didactics and epistemology of chemistry | Marc de Wergifosse (coord.) Nathalie Matthys Stéphanie Wilmet | (FR) [q1+q2] [37.5h] [4 Credits] 🌐 | X | X |
| ⊗ LBIO2340 | Didactics and Epistemology of Biology | Myriam De Kesel | (FR) [q1+q2] [37.5h+0h] [4 Credits] 🌐 | X | X |
| ⊗ LMAT2320A | Didactique et épistémologie de la mathématique (en ce compris le stage d'écoute) | Cécile Coyette Sonia Ghorbal Laure Ninove | (FR) [q1+q2] [37.5h+10h] [4 Credits] 🌐 | X | X |
| ⊗ LGEO2320A | Didactique et épistémologie de la géographie (en ce compris le stage d'écoute) | Marie-Laurence De Keersmaecker | (FR) [q1] [37.5h+10h] [4 Credits] 🌐 | X | X |

o Module comprendre et analyser l'institution scolaire et son contexte**o Séminaire d'observation et d'analyse de l'institution scolaire et de son contexte (en ce compris le stage d'observation) (4 credits)**

Choisir 1 des activités suivantes. Le cours et le séminaire doivent être suivis au même quadrimestre.

| | | | | | |
|--------------|------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------|-------------------------------------|--|---|
| ⊗ LAGRE2120P | Observation et analyse de l'institution scolaire et de son contexte (en ce compris le stage d'observation) | Vincent Dupriez Antoine Lecat (compensates) Branka Cattonar | (FR) [q1] [22.5h+25h] [4 Credits] 🌐 | | X |
| ⊗ LAGRE2120Q | Observation et analyse de l'institution scolaire et de son contexte (en ce compris le stage d'observation) | Vincent Dupriez Antoine Lecat (compensates) Branka Cattonar | (FR) [q2] [22.5h+25h] [4 Credits] 🌐 | | X |

| | | | | Year | |
|-------------|------------------------------|-------------------------------------------------------------------------------------------------------------|---------------------------|------|---|
| | | | | 1 | 2 |
| ○ LAGRE2400 | See specifications in french | Mathias El Berhouni (compensates) Xavier Delgrange Hervé Pourtois (coord.) Pierre-Etienne Vandamme | PR [q2] [20h] [2 Credits] | x | x |

o Module animer un groupe et travailler en équipe

○ Comprendre l'adolescent en situation scolaire, gérer la relation interpersonnelle et animer le groupe classe (4 credits)

Choisir 1 des activités suivantes.

| | | | | | |
|--------------|---------------------------------------------------------------------------------------------------------------|-------------------------------------------------------|-----------------------------------|--|---|
| ⊗ LAGRE2020P | Comprendre l'adolescent en situation scolaire, Gérer la relation interpersonnelle et animer le groupe classe. | Baptiste Barbot Véronique Leroy Nathalie Roland | PR [q2] [22.5h+22.5h] [4 Credits] | | x |
| ⊗ LAGRE2020Q | Comprendre l'adolescent en situation scolaire, Gérer la relation interpersonnelle et animer le groupe classe. | Baptiste Barbot Véronique Leroy Nathalie Roland | PR [q2] [22.5h+22.5h] [4 Credits] | | x |

PROFESSIONAL FOCUS : MEDICAL PHYSICS [30.0]

Les étudiants ayant choisi cette finalité doivent obligatoirement avoir choisi les cours PHY 2130, PHY 2236 et PHY 2340 parmi les cours de base et les cours au choix. Ils suivront aussi tous les cours repris ci-dessous.

- Mandatory
- ⊗ Optional
- △ Not offered in 2023-2024
- ⊖ Not offered in 2023-2024 but offered the following year
- ⊕ Offered in 2023-2024 but not the following year
- △ ⊕ Not offered in 2023-2024 or the following year
- Activity with requisites
- 🌐 Open to incoming exchange students
- 🚫 Not open to incoming exchange students
- [FR] Teaching language (FR, EN, ES, NL, DE, ...)

[Click on the course title to see detailed informations \(objectives, methods, evaluation...\)](#)

Year

1 2

○ Alternatives (below)

○ This goal is only available through the special program in medical physics organized in co-graduation with the KU Leuven

UE au choix [25.0]

UE AU CHOIX [25.0]

- Mandatory
- ⊗ Optional
- △ Not offered in 2023-2024
- ⊙ Not offered in 2023-2024 but offered the following year
- ⊕ Offered in 2023-2024 but not the following year
- △ ⊕ Not offered in 2023-2024 or the following year
- Activity with requisites
- 🌐 Open to incoming exchange students
- 🚫 Not open to incoming exchange students
- [FR] Teaching language (FR, EN, ES, NL, DE, ...)

Click on the course title to see detailed informations (objectives, methods, evaluation...)

Year

1 2

o Content:

⊗ UE recommandées pour la finalité approfondie

⊗ Physique statistique et mathématique

| | | | | |
|-------------|-----------------------------------------------|----------------------------------------------------|--------------------------------------------------|---|
| ⊗ LPHYS2316 | Advanced mathematical physics | Philippe Ruelle Christian Walmsley Hagendorf | EN [q1] [30h] [5 Credits] 🌐 > French-friendly | X |
|-------------|-----------------------------------------------|----------------------------------------------------|--------------------------------------------------|---|

⊗ Physique des particules

LPHYS2336A and LPHYS2336B cannot be taken if the full course LPHYS2336 is selected .

| | | | | |
|--------------|---------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------|----------------------------------------------------------|---|
| ⊗ LPHYS2335 | Standard model and beyond | Fabio Maltoni | EN [q1] [52.5h+7.5h] [10 Credits] 🌐 > French-friendly | X |
| ⊗ LPHYS2336 | Accelerator, astroparticle, and gravitational wave physics | Giacomo Bruno Eduardo Cortina Gil Gwenhaël de Wasseige Vincent Lemaître | EN [q1] [52.5h+7.5h] [10 Credits] 🌐 > French-friendly | X |
| ⊗ LPHYS2336A | Accelerator, astroparticle, and gravitational wave physics - Accelerator physics | Giacomo Bruno Eduardo Cortina Gil Gwenhaël de Wasseige Vincent Lemaître | EN [q1] [25h+5h] [5 Credits] 🌐 | X |
| ⊗ LPHYS2336B | Accelerator, astroparticle, and gravitational wave physics - Astroparticle and gravitational wave physics | Giacomo Bruno Eduardo Cortina Gil Gwenhaël de Wasseige Vincent Lemaître | EN [q1] [27.5h+2.5h] [5 Credits] 🌐 | X |

⊗ Physique de la matière condensée et des milieux continus

| | | | | |
|-------------|-----------------------------------------------------------|--------------------------------------------------------|----------------------------------------------------------|---|
| ⊗ LMAPR2014 | Physics of Functional Materials | Xavier Gonze Luc Piraux Gian-Marco Rignanese | EN [q1] [37.5h+22.5h] [5 Credits] 🌐 > French-friendly | X |
| ⊗ LMAPR2015 | Physics of Nanostructures | Jean-Christophe Charlier Xavier Gonze Luc Piraux | EN [q1] [37.5h+22.5h] [5 Credits] 🌐 > French-friendly | X |
| ⊗ LMAPR2018 | Rheology | Evelyne Van Ruymbeke | EN [q2] [30h+30h] [5 Credits] 🌐 > French-friendly | X |
| ⊗ LMECA2854 | Heat and mass transfer II | Yann Bartosiewicz Matthieu Duponcheel | EN [q2] [30h+30h] [5 Credits] 🌐 > French-friendly | X |
| ⊗ LMECA2771 | Thermodynamics of irreversible phenomena. | Miltiadis Papalexandris | EN [q2] [30h+30h] [5 Credits] 🌐 > French-friendly | X |
| ⊗ LPHYS2351 | Superconductivity | Luc Piraux | EN [q1] [22.5h+7.5h] [5 Credits] 🌐 > French-friendly | X |

⊗ Physique de la Terre, des planètes et du climat

| | | | | |
|-------------|-------------------------------------------------------|-----------------------------------------------------------------|------------------------------------------------------|---|
| ⊗ LENVI2005 | Climate change: impacts and solutions | Michel Crucifix Pierre Delmelle (coord.) Kristof Van Oost | FR [q2] [30h] [3 Credits] 🌐 | X |
| ⊗ LGCIV2056 | Marine Hydrodynamics | Eric Deleersnijder | EN [q1] [30h+15h] [5 Credits] 🌐 > French-friendly | X |

| | | | | Year | |
|-------------|--------------------------------|-----------------------------------------------------------------|--------------------------------------------------------|------|---|
| | | | | 1 | 2 |
| ✘ LGEO1343 | Earth observation by satellite | Eric Lambin | EN [q1] [30h+30h] [5 Credits] 🌐 | | x |
| ✘ LINMA2510 | Mathematical ecology | Eric Deleersnijder Emmanuel Hanert Thierry Van Effelterre | EN [q2] [30h+22.5h] [5 Credits] 🌐 > French-friendly | x | x |

✘ Instrumentation et méthodes numériques

| | | | | | |
|-------------|--------------------------------|--------------------------------------------------|------------------------------------------------------|---|---|
| ✘ LEPL1106 | Signals and systems | Julien Hendrickx Luc Vandendorpe | EN [q2] [30h+30h] [5 Credits] 🌐 | x | |
| ✘ LEPL1110 | Finished elements | Vincent Legat Jean-François Remacle | EN [q2] [30h+30h] [5 Credits] 🌐 | x | x |
| ✘ LPHYS2303 | Cryophysics and vacuum physics | Vincent Bayot Benoît Hackens Sorin Melinte | EN [q1] [30h+15h] [5 Credits] 🌐 > French-friendly | | x |

✘ Compléments de mathématique

NB : l'UE LMAT1271 est vivement conseillée.

| | | | | | |
|-------------|-----------------------------------------------------|-----------------------------------------------------------------------------|--------------------------------------------------------|---|---|
| ✘ LINMA2361 | Nonlinear dynamical systems | Estelle Massart Estelle Massart (compensates Pierre-Antoine Absil) | EN [q1] [30h+22.5h] [5 Credits] 🌐 > French-friendly | | x |
| ✘ LMAT1271 | Calculation of probability and statistical analysis | Rainer von Sachs | EN [q2] [30h+30h] [6 Credits] 🌐 > English-friendly | x | |
| ✘ LMAT2240 | Low-dimensional topology | Pedro Dos Santos Santana Forte Vaz Pascal Lambrechts | EN [q2] [30h+15h] [5 Credits] 🌐 | x | x |
| ✘ LMAT2430 | Lie's theory elements and differential geometry | Pierre Bieliavsky | EN [q2] [30h+15h] [5 Credits] 🌐 | x | x |

✘ UE au choix recommandées pour la finalité didactique

| | | | | | |
|-------------|---------------------------------------------------|-------------------------------------------|------------------------------------|---|---|
| ✘ LSCI2330 | Séminaire de recherche en didactique des sciences | Myriam De Kesel (coord.) Jim Plumet | EN [q2] [15h+30h] [5 Credits] 🌐 | x | x |
| ✘ LMAT2330 | Seminar on the teaching of mathematics | Enrico Vitale | EN [q1+q2] [15h+30h] [4 Credits] 🌐 | x | x |
| ✘ LGEO2330 | Séminaire de didactique de la géographie | | EN [q2] [0h+30h] [5 Credits] 🌐 | x | x |
| ✘ LAGRE2310 | Micro-teaching exercises | Marc Blondeau Pascalia Papadimitriou | EN [q1 or q2] [15h] [2 Credits] 🌐 | x | x |
| ✘ LAGRE2221 | Learning and teaching with new technologies | Sandrine Decamps | EN [q1] [15h+15h] [2 Credits] 🌐 | x | x |

✘ UE au choix recommandées pour la finalité spécialisée

| | | | | | |
|-------------|-------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------|---|---|
| ✘ WRPR2002 | Compléments de radioprotection | Dana Ioana Dumitriu Michaël Dupont Olivier Gheysens François Jamar (coord.) | EN [q2] [20h+10h] [3 Credits] 🌐 | x | x |
| ✘ WRDGN3120 | Methods, techniques and quality controle in medical imaging | François Jamar Renaud Lhommel Nicolas Michoux (coord.) Vassiliki Pasoglou | EN [q2] [25h+5h] [3 Credits] 🌐 | | x |
| ✘ LMECA2600 | Introduction to nuclear engineering and reactor technology | Hamid Ait Abderrahim | EN [q1] [30h+30h] [5 Credits] 🌐 > French-friendly | x | x |
| ✘ WRPR3010 | Questions spéciales de radioprotection | Nathalie De Patoul Dana Ioana Dumitriu Damien Dumont Michaël Dupont Olivier Gheysens François Jamar (coord.) Renaud Lhommel Sébastien Lichtherte Edmond Sterpin Aude Vaandering | EN [q2] [40h] [4 Credits] 🌐 | x | x |
| ✘ WMNUC2100 | Master and complementary master | Véronique Roelants Thierry Vander Borghet (coord.) | EN [q1] [15h] [2 Credits] 🌐 | x | x |
| ✘ LGBIO1111 | Cell biology and physiology | Charles De Smet Christophe De Vleeschouwer Pascal Kienlen-Campard | EN [q2] [30h+15h] [5 Credits] 🌐 | x | x |

| | | | | Year | |
|-------------|----------------------------------------|------------------|---------------------------|------|---|
| | | | | 1 | 2 |
| ⊗ LGBIO1112 | Introduction to biomedical engineering | Philippe Lefèvre | FR [q2] [45h] [5 Credits] | x | x |

⊗ **Optional courses :**

These credits are not counted within the 120 required credits.

| | | | | | |
|-------------|------------------------------------------|------------------------------------------------|----------------------------------|---|---|
| ⊗ LSST1001 | IngénieursSud | Stéphanie Merle Jean-Pierre Raskin (coord.) | FR [q1+q2] [15h+45h] [5 Credits] | x | x |
| ⊗ LSST1002M | Information and critical thinking - MOOC | Myriam De Kesel Jean-François Rees | FR [q2] [30h+15h] [3 Credits] | x | x |

Alternatives

> [Master \[120\] in Physics \[professional focus of Medical Physics : UCLouvain-KULeuven\]](https://uclouvain.be/en-prog-2023-phys2m-programme) [<https://uclouvain.be/en-prog-2023-phys2m-programme>]

MASTER [120] IN PHYSICS [PROFESSIONAL FOCUS OF MEDICAL PHYSICS : UCLOUVAIN-KULEUVEN]

- Mandatory
- ✘ Optional
- △ Not offered in 2023-2024
- ⊙ Not offered in 2023-2024 but offered the following year
- ⊕ Offered in 2023-2024 but not the following year
- △ ⊕ Not offered in 2023-2024 or the following year
- Activity with requisites
- 🌐 Open to incoming exchange students
- 🌐 Not open to incoming exchange students
- [FR] Teaching language (FR, EN, ES, NL, DE, ...)

Click on the course title to see detailed informations (objectives, methods, evaluation...)

Year

1 2

o Tronc commun

o Physics, Mathematics and Chemistry (16 credits)

| | | | | | |
|-------------|--------------------------------------------------------------------------|----------------------------|------------------------------------|---|--|
| ● EPHMD2398 | Introductory Nuclear Physics | | EN [q1] [18h] [3 Credits] 🌐 | X | |
| ● LPHYS2102 | Ionizing Radiation Detection and Nuclear Instrumentation | Eduardo Cortina Gil | EN [q1+q2] [26h+26h] [6 Credits] 🌐 | X | |
| ● LPHMD2357 | Computational and Numerical Methods for Medical Physics | John Lee Edmond Sterpin | EN [q1] [24h+10h] [4 Credits] 🌐 | X | |

o Nuclear and Radiochemistry (3 credits)

Choose a course from

| | | | | | |
|-------------|--------------------------------------------------------------|----------------|-------------------------------|--|---|
| ✘ LPHYS2504 | Use, management and control of radioelements | Pascal Froment | EN [q2] [22.5h] [3 Credits] 🌐 | | X |
| ✘ EPHMD2393 | Nuclear and Radiochemistry | | EN [q2] [18h] [3 Credits] 🌐 | | X |

o Medical oriented courses

From 20 to 23credit(s)

| | | | | | |
|--------------|-----------------------------------------------------------|-----------------------|--------------------------------|--|---|
| ● WRDTH2331B | Radiobiology - (partim radiobiology) | Xavier Geets (coord.) | EN [q1] [16h] [3 Credits] 🌐 | | X |
| ● EPHMD2377 | Radiation Epidemiology and Radiopathology | | EN [q1+q2] [13h] [4 Credits] 🌐 | | X |

o Cell Biology, Anatomy and Physiology

Choose between the UCLouvain module and the KU Leuven module

✘ Cell Biology, Anatomy and Physiology (KU Leuven) (13 credits)

| | | | | | |
|-------------|-------------------------------------------------|--|--------------------------------|---|--|
| ● EPHMD2334 | Basics concepts of Cell Biology | | EN [q1] [39h] [5 Credits] 🌐 | X | |
| ● EPHMD2314 | Human System Physiology | | EN [q2] [28h+2h] [5 Credits] 🌐 | X | |
| ● EPHMD2370 | Human Anatomy and Histology | | EN [q2] [18h] [3 Credits] 🌐 | X | |

✘ Cell Biology, Anatomy and Physiology (UCLouvain) (10 credits)

| | | | | | |
|-------------|------------------------------------------------|----------------------------------------------------------------------------|---------------------------------|---|--|
| ● LGBIO1113 | Systems Anatomy and Physiology | Catherine Behets Wydemans Olivier Cornu Greet Kerckhofs | EN [q2] [30h+15h] [5 Credits] 🌐 | X | |
| ● LGBIO1111 | Cell biology and physiology | Charles De Smet Christophe De Vleeschouwer Pascal Kienlen-Campard | EN [q2] [30h+15h] [5 Credits] 🌐 | X | |

Year

1 2

o Medical Information Systems (3 credits)

Choose a course from

| | | | | |
|-----------|------------------------------|------------------------------------------|---------------------------|---|
| EPHMD2376 | Medical Information Systems | | EN [q1] [23h] [3 Credits] | X |
| WFSP2253 | Hospital information systems | Benoît Debande (coord.) Claude Michel | EN [q1] [20h] [3 Credits] | X |

o Medical physics and technology

From 23 to 24credit(s)

| | | | | |
|------------|-----------------------------------------------------------------|--------------------------------------------------|----------------------------------------------------|---|
| EPHMD2362 | Technology and Techniques in Radiology | | EN [q1] [16h+4h] [3 Credits] | X |
| WRDTH3160T | Technology, Dosimetry and Treatment Planning in Radiotherapy | Edmond Sterpin (coord.) | EN [q1] [20h] [3 Credits] | X |
| WMNUC3120T | Technology and techniques in nuclear medicine - (partim theory) | | EN [q1] [20h] [3 Credits] | X |
| LGBIO2070 | Engineering challenges in protontherapy | Guillaume Janssens John Lee Edmond Sterpin | EN [q2] [30h+30h] [5 Credits] > French-friendly | X |
| WRFAR2100 | Radiochemistry, radiotoxicology & radiopharmacy | Bernard Gallez | EN [q1] [22.5h+60h] [4 Credits] | X |

o Medical Imaging

Choose a course from

| | | | | |
|-----------|------------------------------|-------------------------------------------------------------|----------------------------------------------------|---|
| EPHMD2335 | Medical Imaging and Analysis | | EN [q2] [36h+20h] [6 Credits] | X |
| LGBIO2050 | Medical Imaging | Greet Kerckhofs John Lee Benoît Macq Frank Peeters | EN [q1] [30h+30h] [5 Credits] > French-friendly | X |

o Medical Physics : Specialisation (3 credits)

Choose a course from

| | | | | |
|-----------|--------------------------------------------------------------|----------------|---------------------------|---|
| EPHMD2372 | Quality Assurance and Special Techniques in Radiology | | EN [q1] [14h] [3 Credits] | X |
| LPHMD2373 | Quality Assurance and Special Techniques in Nuclear Medicine | | EN [q2] [22h] [3 Credits] | X |
| WRDTH3161 | Quality assurance and special techniques in radiotherapy | Edmond Sterpin | EN [q2] [20h] [3 Credits] | X |

o Safety and Ethics

From 13 to 17credit(s)

| | | | | |
|-----------|--------------------------|----------------|---------------------------|---|
| WRDTH3120 | Fundamental of dosimetry | Edmond Sterpin | EN [q1] [20h] [3 Credits] | X |
|-----------|--------------------------|----------------|---------------------------|---|

o Radiation protection

Choose between the UCLouvain module and the KU Leuven module

EPHMD2397 Radiation protection (KU Leuven) (4 credits)

| | | | | |
|-----------|----------------------|--|------------------------------|---|
| EPHMD2397 | Radiation Protection | | EN [q1+q2] [18h] [4 Credits] | X |
|-----------|----------------------|--|------------------------------|---|

WRPR2001-2002-3010 Radiation protection (UCLouvain) (8 credits)

| | | | | |
|----------|----------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|---|
| WRPR2001 | Notions de base de radioprotection | Pascal Carlier Michaël Dupont François Jamar (coord.) Renaud Lhomme | EN [q1] [10h+5h] [2 Credits] | X |
| WRPR2002 | Compléments de radioprotection | Dana Ioana Dumitriu Michaël Dupont Olivier Gheysens François Jamar (coord.) | EN [q2] [20h+10h] [3 Credits] | X |
| WRPR3010 | Questions spéciales de radioprotection | Nathalie De Patoul Dana Ioana Dumitriu Damien Dumont Michaël Dupont Olivier Gheysens François Jamar (coord.) Renaud Lhomme Sébastien Lichtherte Edmond Sterpin Aude Vaandering | EN [q2] [40h] [3 Credits] | X |

o Philosophy, Sustainability and Ethics (6 credits)

Choose between the UCLouvain module and the KU Leuven module

⌘ Philosophy, Sustainability and Ethics (KU Leuven) (6 credits)

| | | | | | |
|-------------|---------------------------------------------------------|--|---------------------------|--|---|
| o EPHMD2354 | Science and Sustainability: a socio-ecological approach | | EN [q1] [24h] [3 Credits] | | x |
| o EPHMD2379 | Ethics and Law in Biomedical Research | | EN [q2] [20h] [3 Credits] | | x |

⌘ Philosophy, Sustainability and Ethics (UCLouvain) (6 credits)

| | | | | | |
|------------|------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------|---------------------------|--|---|
| o WMDS2135 | Enjeux sociaux et éthique de la santé et de la médecine 1 | | FR [q2] [24h] [2 Credits] | | x |
| o WMDS2235 | Enjeux sociaux et éthiques de la santé et de la médecine 2 | Isabelle Aujoulat Anne Berquin Jean-Philippe Cobbaut Dominique Lamy Alain Loute (coord.) Isabelle Scheers | FR [q2] [18h] [2 Credits] | | x |

o Select (2 credits)

| | | | | | |
|--------------|-------------------------------------------|--------------------------------------------------------------------------------------|-------------------------------|--|---|
| ⌘ LSC2001 | Introduction to contemporary philosophy | Peter Verdée Peter Verdée (compensates Charles Pence) | FR [q2] [30h] [2 Credits] | | x |
| ⌘ LSC2220 | Philosophy of science | Alexandre Guay | EN [q2] [30h] [2 Credits] | | x |
| ⌘ LFILO2003E | Ethics in the Sciences and technics (sem) | Alexandre Guay (compensates Charles Pence) Hervé Jeanmart René Rezsöhazi | FR [q2] [15h+15h] [2 Credits] | | x |

o Internships and Master's thesis support (11 credits)

This internship will be completed by a second one which is part of the professional focus.

The Thesis Tutorial supports the thesis which is part of the professional focus.

| | | | | | |
|-------------|-----------------|------------------------------------------|------------------------------------------------|--|---|
| o LPHMD2366 | Internship 1 | | EN [q2] [] [9 Credits] | | x |
| o LPHYS2197 | Thesis tutorial | Ahmed Adriouèche Gwenhaël de Wasseige | EN [q1] [15h] [2 Credits] > French-friendly | | x |

o Une finalité à choisir parmi**o Professional Focus : Medical Physics (30 credits)****o Content:**

| | | | | | |
|-------------|---------------|---------------------------------|----------------------------|--|---|
| o LPHMD2371 | Internship 2 | | EN [q2] [] [6 Credits] | | x |
| o LPHMD2199 | Master Thesis | Eduardo Cortina Gil (coord.) | FR [q1+q2] [] [24 Credits] | | x |

Supplementary classes

To access this Master, students must have a good command of certain subjects. If this is not the case, students must take supplementary classes chosen by the faculty to satisfy course prerequisites.

These additional teaching units (maximum 60 credits) will be selected in the programme of the second and third annual units of the Bachelor's degree in physics, in consultation with the Study advisor, depending on the previous teaching units followed by the student and his/her training project, and will be submitted to the approval of the School of Physics.

- Mandatory
- ✘ Optional
- △ Not offered in 2023-2024
- ⊙ Not offered in 2023-2024 but offered the following year
- ⊕ Offered in 2023-2024 but not the following year
- △ ⊕ Not offered in 2023-2024 or the following year
- Activity with requisites
- 🌐 Open to incoming exchange students
- 🌐 Not open to incoming exchange students
- (FR) Teaching language (FR, EN, ES, NL, DE, ...)

Click on the course title to see detailed informations (objectives, methods, evaluation...)

o Enseignements supplémentaires

Course prerequisites

There are no prerequisites between course units (CUs) for this programme, i.e. the programme activity (course unit, CU) whose learning outcomes are to be certified and the corresponding credits awarded by the jury before registration in another CU.

The programme's courses and learning outcomes

For each UCLouvain training programme, a [reference framework of learning outcomes](#) specifies the the skills expected of every graduate on completion of the programme. Course unit descriptions specify targeted learning outcomes, as well as the unit's contribution to reference framework of learning outcomes.

PHYS2M - Information

Access Requirements

Master course admission requirements are defined by the French Community of Belgium Decree of 7 November 2013 defining the higher education landscape and the academic organisation of courses.

General and specific admission requirements for this programme must be satisfied at the time of enrolling at the university.

Unless explicitly mentioned, the bachelor's, master's and licentiate degrees listed in this table or on this page are to be understood as those issued by an institution of the French, Flemish or German-speaking Community, or by the Royal Military Academy.

In the event of the divergence between the different linguistic versions of the present conditions, the French version shall prevail.

SUMMARY

- > [General access requirements](#)
- > [Specific access requirements](#)
- > [University Bachelors](#)
- > [Non university Bachelors](#)
- > [Holders of a 2nd cycle University degree](#)
- > [Holders of a non-University 2nd cycle degree](#)
- > [Access based on validation of professional experience](#)
- > [Access based on application](#)
- > [Admission and Enrolment Procedures for general registration](#)

Specific access requirements

Since this program is taught in English, no prior proof of French language proficiency is required, except for students wishing to access the didactic program who must provide proof of a CEFR level C1 proficiency.

Students who wish to be admitted on the basis of a dossier (see tables below) are invited to consult the [criteria for the evaluation of application](#).

Concerning the specific program in medical physics in co-graduation UCLouvain - KU Leuven, [specific information](#) is applicable. Apply at <https://www.kuleuven.be/english/application/instructions>

University Bachelors

| Diploma | Special Requirements | Access | Remarks |
|-------------------------------------------------|-------------------------------------------------------|---------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| UCLouvain Bachelors | | | |
| Bachelor in Physics | | Direct access | |
| Bachelor in Mathematics | Si l'étudiant a suivi la Titre inconnu:Iminphys | Access based on application | In some cases, the UCLouvain Enrolment Office, after reviewing their online enrolment or re-enrolment application, will ask the students concerned to provide an enrolment authorisation from the faculty/ school. |
| Bachelor in Engineering | Si l'étudiant a suivi la Titre inconnu:Iminphys | Access based on application | In some cases, the UCLouvain Enrolment Office, after reviewing their online enrolment or re-enrolment application, will ask the students concerned to provide an enrolment authorisation from the faculty/ school. |
| Bachelor in Geography : General | Crédits de la Minor in Physics acquis | Access based on application | In some cases, the UCLouvain Enrolment Office, after reviewing their online enrolment or re-enrolment application, will ask the students concerned to provide an enrolment |

authorisation from the faculty/
school.

Others Bachelors of the French speaking Community of Belgium

| | |
|-------------------------------------------------------------------|---------------------------------------------|
| | Direct access |
| Bachelier en sciences de l'ingénieur, orientation ingénieur civil | Access based on application |

Bachelors of the Dutch speaking Community of Belgium

Direct access

Foreign Bachelors

[Access based on application](#)

Non university Bachelors

> Find out more about [links](#) to the university

Holders of a 2nd cycle University degree

| Diploma | Special Requirements | Access | Remarks |
|-------------|----------------------|---------------|---------|
| "Licenciés" | | Direct access | |
| Masters | | Direct access | |

Holders of a non-University 2nd cycle degree

Access based on validation of professional experience

> It is possible, under certain conditions, to use one's personal and professional experience to enter a university course without having the required qualifications. However, validation of prior experience does not automatically apply to all courses. Find out more about [Validation of priori experience](#).

Access based on application

Access based on application : access may be granted either directly or on the condition of completing additional courses of a maximum of 60 ECTS credits, or refused.

The first step in the procedure is to submit a file online (see <https://uclouvain.be/en/study/inscriptions/futurs-etudiants.html>).

Students who wish to be admitted on the basis of a dossier are invited to consult the [criteria for the evaluation of application](#).

Admission and Enrolment Procedures for general registration

Specific professional rules

Successful completion of the master's course with **teaching focus** leads to the award of the master's degree with teaching focus and the title of secondary school education specialist.

The [Réforme des Titres et Fonctions](#) ("Titles and Functions Reform"), in force since 1 September 2016, is intended to harmonise the titles, functions and pay scales of basic and secondary education professionals in French Community of Belgium networks.

It also aims to guarantee the priority of preferred titles over minimum titles and to establish a regime for titles in short supply.

AESS holders can learn which functions they can carry out and the pay scales from which they can benefit by [clicking here](#).

The university cannot be held responsible for any problems that students may encounter at a later date with a view to a teaching appointment in the French Community of Belgium.

Teaching method

Most teaching units are given by default in English.

Various teaching methods are used : lectures, flipped classroom, project-based learning, etc. Exercise and practical lab sessions are organized for certain teaching units. Individual or group projects are planned for most of the teaching units. These projects play a significant role (around 20%) in the final grade.

Almost all teaching units have a website on the MoodleUCL platform. Useful information is provided, as well as syllabi and other documents essential to student's work.

The Master's thesis is a formative activity that must lead students to demonstrate their ability to (1) deal in depth with a physical problem in all its real complexity, by conducting a personal research, under the direction of a promoter, and (2) write a summary of his/her work and defend it in public in a rigorous and educational way, while being able to answer relatively specific questions. The various stages are : constitution of a relevant bibliography on the subject, reading and understanding of the selected articles, implementation and execution of the project, analysis and interpretation of the results obtained, writing of a synthesis manuscript and oral presentation of the latter. To carry out this project, the student is embedded in a research group with which he/she can interact.

A "thesis tutorial" introduces the student to scientific communication and, in particular, to the oral presentation of a scientific subject in English.

The physics seminar is composed of three series of presentations to which students must attend : lectures of general interest, more specific seminars dealing with physics research carried out in UCLouvain research institutes and testimonials from former students on their professional background.

Evaluation

The evaluation methods comply with the regulations concerning studies and exams (<https://uclouvain.be/fr/decouvrir/rgee.html>). More detailed explanation of the modalities specific to each learning unit are available on their description sheets under the heading "Learning outcomes evaluation method".

The evaluation methods are in accordance with the regulations for studies and examinations. More details on the terms and conditions specific to each teaching unit are available in their fact sheet under the heading "Assessment of student achievement".

The student is evaluated on the basis of the personal work that he/she will have accomplished (readings, consultation of databases and bibliographical references, writing of monographs and reports, presentation of seminars, dissertation, etc.). When the training requires it, the student is also evaluated regarding his/her ability to assimilate the masterly taught subject. The evaluation of the Master's thesis is based on the work performed during the year and its written and oral presentation.

To obtain the average, the marks obtained for the different teaching units are weighted by their respective credits.

If a student enrolled in an exam at the January session has not been able to present the examination for reasons of force majeure which are duly justified, he/she may ask the President of the Jury for permission to present the examination at the June session. The President of the Jury judges the relevance of the application and, if the course owner agrees, may authorize the student to present the examination at the June session.

Mobility and/or Internationalisation outlook

Most teaching units are given by default in English.

Students who have chosen the research focus are encouraged to study abroad outside the Wallonia-Brussels Federation within the framework of a Socrates/Erasmus agreement or equivalent (Mercator, Erasmus Belgica), preferably during the second semester of the first annual unit or the first semester of the second annual unit. This study stay will consist of following several teaching units proposed by the host university, for a maximum of 30 credits, and/or preparing the Master's thesis. For a list of Belgian and foreign universities

Possible trainings at the end of the programme

Whatever the focus chosen, the Master's [120] degree gives direct access to the PhD in Science.

In addition, there are two particularly adapted programmes that allow for further study and obtaining specific diplomas :

1) An additional year of study at Mol, after the Master's [120] degree, allows to follow the English-speaking interuniversity programme giving the title of "Master in Nuclear Engineering" managed by BNEN (Belgian Nuclear Higher Education Network) (intensive courses are given in English by professors from different Belgian universities at the Mol Nuclear Research Center).

2) For students who have completed and passed a Master's [120] degree with specialized focus on medical physics, an expert's license in radiotherapy, medical radiophysics or radiology may be obtained by carrying out a 1-yr internship after the Master [120]. This internship also includes some additional teaching units required by the Federal Agency for Nuclear Control. These teaching units provide additional training in the following areas :

- principles, techniques and quality control in medical imaging ;
- special radiological protection issues and supplements ;
- radiochemistry, radiotoxicology and radiopharmacy ;
- assessment of the risks of radioactive releases into the environment in normal and accidental situations, and emergency plan for nuclear risks.

In addition, UCLouvain Masters (usually 60) are widely available to UCLouvain Masters' graduates. For example :

- the Master [120] in Science and Environmental Management and the Master [60] in Science and Environmental Management (direct access with possible supplements) ;
- the different Masters [60] in management science (direct access through examination of the file) : see the list ;
- Master [60] in Information and Communication in Louvain-la-Neuve or Master [60] in Information and Communication in Mons.

Certificates

The teaching units listed in the specialized focus on medical physics may be followed for obtaining certificates of complementary studies in radiation protection and application of ionizing radiation for persons wishing to obtain accreditation for the surveillance and protection of workers and population against the danger of ionizing radiation.

Accessibility : doctors, pharmacists, veterinarians, science graduates, civil engineers, agronomists, industrial engineers.

These students will, among other things, have to follow advanced teaching units in nuclear physics and nuclear techniques :

LPHYS2102 Detectors and sensors

LPHY2360 Atomic, nuclear and radiation Physics

LPHYS2504 Production, use, management and control of radioelements.

Contacts

Curriculum Management

Entity

Structure entity

Denomination

Faculty

Sector

Acronym

Postal address

SST/SC/PHYS

(PHYS)

Faculty of Science (SC)

Sciences and Technology (SST)

PHYS

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<https://uclouvain.be/fr/facultes/sc/phys>

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