PHYS2 Licence en sciences physiques (Diploma of the Second Cycle (Licence) in Physical Sciences)

Programme management

PHYS Département de physique
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Admission procedure

The regular conditions and admission applications are detailed on the web page "Access to studies" :
http://www.ucl.ac.be/etudes/libres/acces.html

General structure of the programme

The second university study cycle ("licence") programme in Physical Sciences comprises three variants : the classical orientation, the applied orientation and the earth, space and climate physics orientation.

Programme content

"Options" and "free choice" programmes
The registration for the options and for the free choice programmes of the year must be approved by the Physics Department before the end of the third week of the 1st quadrimester. This registration will then be handed in to the secretary's office of the Faculty and to the jury secretary. The practical procedures relating to the options and to the "licence" thesis, not detailed on the study programme, are established by the Physics Department and made known to the students.

PHYS21 First year

Classical orientation
A. Compulsory courses
Complements in mathematics : according to choice, one of the mathematics courses included in the MATH 21 programme (among the compulsory and optional courses). This course will be followed in PHYS 21 or PHYS 22 , according to choice, for the classical orientation and only in PHYS21 for the Applied Physics orientation.

SC2140	Questions of religious sciences[15h] (1 credits) (in French)	José Reding

This course will be followed in the 1st or 2nd year, according to choice.

PHYS2111	Introduction to non-linear dynamics[30h+22.5h] (4.5 credits) (in French)	Jean Bricmont, Luc Haine
PHYS2121	Theoretical and mathematical physics1[22.5h+15h] (3.5 credits) (in French)	Jean-Pierre Antoine, Jean Bricmont, Philippe Ruelle
PHYS2290	Quantum mechanics[30h+22.5h] (6 credits) (in French)	Jacques Weyers
MAT1271	Calculation of probability and statistical analysis[30h+30h] (6 credits) (in French)	Rainer von Sachs

Students whose first study cycle ("candidature") programme included this subject, are dispensed from taking this course.

PHYS2263	General physics 1) Electromagnetism 2) Solid state physics 3) Atoms, molecules, ionised medium 4) Nucleus and elementary particles[120h+40h] (22.5 credits) (in French)	Pierre Defrance, Thierry Delbar, Vincent Lemaitre, André Nauts, Krzysztof Piotrzkowski, Luc Piraux
PHYS2143	General relativity and cosmology[22.5h+15h] (5 credits) (in French)	Jean-Marc Gérard
PHYS2460	Statistical mechanics[22.5h+15h] (4 credits) (in French)	Jean Bricmont

The students who do not take or do not pass the oral expression test in English will follow the course :

ANGL2462	English - Interactive Communication Skills[30h] (2 credits)	Françoise Stas

B. Integrated exercises

The students will follow three 20 hour modules chosen from the following integrated exercises :

PHYS2123	Seminar of theoretical and mathematical physics[60h] (6 credits) (in French)	Jean-Marc Gérard, Jean Pestieau, Philippe Ruelle
PHYS2264	Seminar of general physics[60h] (6 credits) (in French)	Krzysztof Piotrzkowski, Xavier Urbain

C. Options

The students will choose at least two options from the following list :

MECA2901	Continuum mechanics.[30h+30h] (5 credits) (in French)	François Dupret
PHYS2122	Theoretical and mathematical physics II[22.5h+15h] (3 credits) (in French)	Jean-Pierre Antoine, Jean Bricmont, Philippe Ruelle
PHYS2131	Sperical astronomy and mathematical astronomy[22.5h+15h] (3 credits) (in French)	Pascale Defraigne, Jean-Pascal van Ypersele de Strihou
PHYS2140	Internal geophysics[22.5h+15h] (3 credits) (in French)	Véronique Dehant
PHYS2270	Experimental methods[22.5h+7.5h] (3 credits) (in French)	Hugues Goosse, Pierre Leleux
PHYS2300	Advanced quantum mechanics (II)[22.5h+7.5h] (3.5 credits) (in French)	Jacques Weyers
PHYS2144	Universe models[15h] (1.5 credits) (in French)	Jean-Marc Gérard
PHYS2223	Physics of fluids II[22.5h+7.5h] (4.5 credits) (in French)	Eric Deleersnijder

The compulsory courses in Applied Physics may be chosen as options, except for :

PHYS2903	Red time Data acquisition and digital electronics[22.5h] (3 credits) (in French)	René Prieels

Applied Physics orientation

D. Compulsory courses

Complements in mathematics : one of the mathematics courses included on the MATH 21 programme (from among the compulsory and optional courses), according to choice.

SC2140	Questions of religious sciences[15h] (1 credits) (in French)	José Reding

This course will be followed in the 1st or 2nd year, according to choice.

PHYS2111	Introduction to non-linear dynamics[30h+22.5h] (4.5 credits) (in French)	Jean Bricmont, Luc Haine
PHYS2121	Theoretical and mathematical physics1[22.5h+15h] (3.5 credits) (in French)	Jean-Pierre Antoine, Jean Bricmont, Philippe Ruelle
PHYS2290	Quantum mechanics[30h+22.5h] (6 credits) (in French)	Jacques Weyers
MAT1271	Calculation of probability and statistical analysis[30h+30h] (6 credits) (in French)	Rainer von Sachs

The students whose "candidature" programme included this subject, are dispensed from taking this course.

PHYS2263	General physics 1) Electromagnetism 2) Solid state physics 3) Atoms, molecules, ionised medium 4) Nucleus and elementary particles[120h+40h] (22.5 credits) (in French)	Pierre Defrance, Thierry Delbar, Vincent Lemaitre, André Nauts, Krzysztof Piotrzkowski, Luc Piraux
PHYS2143	General relativity and cosmology[22.5h+15h] (5 credits) (in French)	Jean-Marc Gérard
PHYS2460	Statistical mechanics[22.5h+15h] (4 credits) (in French)	Jean Bricmont
PHYS2902	Optics[30h] (3 credits) (in French)	N.
PHYS2264	Seminar of general physics[60h] (6 credits) (in French)	Krzysztof Piotrzkowski, Xavier Urbain

[partim : 20 hours]

PHYS2181	Analogical electronics[22.5h+22.5h] (5 credits) (in French)	René Prieels

The students who do not take or do not pass the oral expression test in English will do the following course :

ANGL2462	English - Interactive Communication Skills[30h] (2 credits)	Françoise Stas

N.B. : The apprenticeship in industry (PHYS2998), which forms part of the second year of studies, may be completed during the summer holidays between the first two years of the programme, subject to the authorisation of the Physics Department.

Earth, Space and Climate Physics orientation

E. Compulsory courses

SC2140	Questions of religious sciences[15h] (1 credits) (in French)	José Reding

This course will be followed in the 1st or 2nd year, according to choice.

PHYS2140	Internal geophysics[22.5h+15h] (3 credits) (in French)	Véronique Dehant
PHYS2150	Numerical simulation methods in physics[15h+22.5h] (3 credits) (in French)	Eric Deleersnijder, Bernard Piraux
PHYS2223	Physics of fluids II[22.5h+7.5h] (4.5 credits) (in French)	Eric Deleersnijder
PHYS2263	General physics 1) Electromagnetism 2) Solid state physics 3) Atoms, molecules, ionised medium 4) Nucleus and elementary particles[120h+40h] (22.5 credits) (in French)	Pierre Defrance, Thierry Delbar, Vincent Lemaitre, André Nauts, Krzysztof Piotrzkowski, Luc Piraux

[partim : 30 hours-15 hours] (part 1)

MAT1261	Mathematical methods of classic mechanics 2[22.5h+30h] (5 credits) (in French)	Jean Bricmont, Luc Haine

The students whose "candidature" programme included this subject are dispensed from taking this course.

PHYS2121	Theoretical and mathematical physics1[22.5h+15h] (3.5 credits) (in French)	Jean-Pierre Antoine, Jean Bricmont, Philippe Ruelle

The students will choose two of the three following courses :

PHYS2460	Statistical mechanics[22.5h+15h] (4 credits) (in French)	Jean Bricmont
PHYS2290	Quantum mechanics[30h+22.5h] (6 credits) (in French)	Jacques Weyers
PHYS2111	Introduction to non-linear dynamics[30h+22.5h] (4.5 credits) (in French)	Jean Bricmont, Luc Haine

The students who do not take or pass the oral expression test in English will do the following course :

ANGL2462	English - Interactive Communication Skills[30h] (2 credits)	Françoise Stas

F. Integrated exercises

The students will follow three 20 hour modules selected from the two following types of integrated exercises :

PHYS2123	Seminar of theoretical and mathematical physics[60h] (6 credits) (in French)	Jean-Marc Gérard, Jean Pestieau, Philippe Ruelle
PHYS2264	Seminar of general physics[60h] (6 credits) (in French)	Krzysztof Piotrzkowski, Xavier Urbain

G. Options

The students will choose at least five options for a minimal volume of 130 hours (courses and exercises). Four courses will be chosen from the following list, the fifth will be chosen from the ensemble of the first year programme in physics.

Astronomy and Space Physics

PHYS2131	Sperical astronomy and mathematical astronomy[22.5h+15h] (3 credits) (in French)	Pascale Defraigne, Jean-Pascal van Ypersele de Strihou
PHYS2550	Astrophysics[30h] (4 credits) (in French)	Arlette Grotsch
PHYS2144	Universe models[15h] (1.5 credits) (in French)	Jean-Marc Gérard
PHYS2400	Space and high atmosphere physics[22.5h] (4 credits) (in French)	Viviane Pierrard, René Warnant
PHYS2143	General relativity and cosmology[22.5h+15h] (5 credits) (in French)	Jean-Marc Gérard

Meteorology and Climatology

PHYS2132	Introduction to climate modeling[22.5h+15h] (6 credits) (in French)	André Berger, Thierry Fichefet, Jean-Pascal van Ypersele de Strihou
PHYS2541	Meteorology and globe physics[37.5h+22.5h] (5 credits) (in French)	André Berger, Thierry Fichefet, Jean-Pascal van Ypersele de Strihou
PHYS2391	Elements of physical oceanography[15h] (2.5 credits) (in French)	Thierry Fichefet
PHYS2392	Atmospheric physics and dynamics[30h+9h] (6 credits) (in French)	André Berger, Thierry Fichefet

Observations and Data-processing

PHYS2904	Physics sensors[22.5h] (2 credits) (in French)	Hervé Buyse, Michel Van Ruymbeke
PHYS2181	Analogical electronics[22.5h+22.5h] (5 credits) (in French)	René Prieels
PHYS2905	Laboratory of applied physics[60h] (5 credits) (in French)	Alain Cornet, René Prieels, Michel Van Ruymbeke
[partim : 20 hours]		
GEOG2100	Remote sensing of the environment[30h+30h] (5 credits) (in French)	Eric Lambin
[partim : 30 hours]		
PHYS2907	Signal processing and information theory[22.5h+15h] (4 credits) (in French)	René Prieels

PHYS22 Second year

Classical orientation

A. Compulsory courses

Philosophical teachings :

SC2001	Introduction to contemporary philosophy[30h] (2 credits) (in French)	Laurent de Briey
or		
SC2220	Philosophy of science[30h] (2 credits) (in French)	Michel Ghins
or		
FILO2003	Ethics in the Natural Sciences[15h+15h] (2 credits) (in	Philippe Baret, Bernard Feltz, Thierry

	French)	Hance
SC2140	Questions of religious sciences[15h] (1 credits) (in French)	José Reding

This course will be followed in the 1st or 2nd year, according to choice.

PHYS2110	Molecular statitical physics[30h] (4 credits) (in French)	André Nauts
PHYS2997	Thesis tutorial[15h] (3 credits) (in English)	Jean-Pierre Antoine

Thesis follow-up seminar in Physics organised in English in the context of the "Language plan".
Complements of mathematics : according to choice, one of the mathematics courses from the MATH21 programme, if it wasn't followed in PHYS 21.

B. Thesis

The students will present a thesis (PHYS 2999). The choice of the thesis director must be approved by the Physics Department at the end of the third week of the first quadrimester, at the latest. The preparation of the thesis is equivalent to around 600 hours of course attendance. The readers of the thesis are appointed by the Physics Department at the beginning of the second quadrimester. The list of the thesis readers will be communicated to the jury secretary.

C. Options

In addition, the students will follow a minimum of 4 optional courses, totalling at least 90 hours (6h/quad.) to be chosen from the list below or from the "licence" programme in Physicl Sciences or, more generally, from any programme of the University. This choice must be approved by the lecturer who supervises the preparation of the thesis and by the President of the Physics Department.

PHYS2150	Numerical simulation methods in physics[15h+22.5h] (3 credits) (in French)	Eric Deleersnijder, Bernard Piraux
MECA2600	Introduction to nuclear engineering and reactor technology.[30h+30h] (5 credits) (in French)	Ernest Mund
MECA2853	Turbulence.[30h+15h] (4 credits) (in French)	Guy Schayes, Grégoire Winckelmans
PHYS2221	Special question about mathematical physics[22.5h] (4 credits) (in French)	N.
PHYS2310	Electroweak interactions[22.5h] (4 credits) (in French)	Jean Pestieau
PHYS2355	Nuclear physics[45h] (7 credits) (in French)	Thierry Delbar, Youssef El Masri, Youssef El Masri (supplée N.)
PHYS2391	Elements of physical oceanography[15h] (2.5 credits) (in French)	Thierry Fichefet
PHYS2392	Atmospheric physics and dynamics[30h+9h] (6 credits) (in French)	André Berger, Thierry Fichefet
PHYS2420	Special questions in solid state physics[22.5h] (3 credits) (in French)	Luc Piraux
PHYS2550	Astrophysics[30h] (4 credits) (in French)	Arlette Grotsch
PHYS2610	Quantum electrodynamics[30h] (5 credits) (in French)	Jean-Marc Gérard
PHYS2903	Red time Data acquisition and digital electronics[22.5h] (3 credits) (in French)	René Prieels
PHYS2908	Data processing in physics[15h] (3 credits) (in English)	Krzysztof Piotrzkowski
SC2002	Elements of mathematics and physics history[30h] (4.5 credits) (in French)	Patricia De Grave
PHYS2440	Electrostrong interactions and symmetries[45h] (5 credits) (in French)	Jean-Marc Gérard, Jacques Weyers
PHYS2700	Experimental methods of laser-matter interactions[45h] (6 credits) (in French)	Philippe Antoine, Pierre Defrance, Xavier Urbain

(A) Experimental methods on laser-matter interaction (22.5h) (3 ECTS)
(B) Corpuscular optics (22.5h) (3 ECTS)
(C) Experimental methods and atomic collisions (22.5h) (3 ECTS)
Two parts are given each year.

PHYS2750	Theoretical methods of laser-matter interactions[45h] (6 credits) (in French)	Philippe Antoine, Didier Fussen, Bernard Piraux

(A) Laser-matter interaction (22.5h) (3 ECTS)
(B) Atomic and molecular spectroscopy (22.5h) (3 ECTS)
(C) Theory of atomic collisions (22.5h) (3 ECTS)
Two parts are given each year.

PHYS2356	Recent developments in nuclear physics[45h] (7.5 credits) (in French)	Youssef El Masri, Jan Govaerts, Pierre Leleux, Krzysztof Piotrzkowski

C.f. avis ad valvas

PHYS2400	Space and high atmosphere physics[22.5h] (4 credits) (in French)	Viviane Pierrard, René Warnant

PHY1265	Globe physics[30h] (3 credits) (in French)	Bernard Ducarme, Jean-Pascal van Ypersele de Strihou
PHYS2132	Introduction to climate modeling[22.5h+15h] (6 credits) (in French)	André Berger, Thierry Fichefet, Jean-Pascal van Ypersele de Strihou
PHYS2906	Cryophysics[22.5h+15h] (3 credits) ∅ (in French)	Vincent Bayot
PHYS2907	Signal processing and information theory[22.5h+15h] (4 credits) (in French)	René Prieels

D. Seminars

PHYS2800	Séminaire des mémorants[15h] (in French)	N.

Applied Physics orientation

E. Compulsory courses

Philosophical teachings :

SC2001	Introduction to contemporary philosophy[30h] (2 credits) (in French)	Laurent de Briey
or		
SC2220	Philosophy of science[30h] (2 credits) (in French)	Michel Ghins
or		
FILO2003	Ethics in the Natural Sciences[15h+15h] (2 credits) (in French)	Philippe Baret, Bernard Feltz, Thierry Hance
SC2140	Questions of religious sciences[15h] (1 credits) (in French)	José Reding

This course will be followed in the 1st or 2nd year, according to choice.

PHYS2110	Molecular statitical physics[30h] (4 credits) (in French)	André Nauts
PHYS2903	Red time Data acquisition and digital electronics[22.5h] (3 credits) (in French)	René Prieels
PHYS2904	Physics sensors[22.5h] (2 credits) (in French)	Hervé Buyse, Michel Van Ruymbeke
PHYS2905	Laboratory of applied physics[60h] (5 credits) (in French)	Alain Cornet, René Prieels, Michel Van Ruymbeke
PHYS2997	Thesis tutorial[15h] (3 credits) (in English)	Jean-Pierre Antoine

Thesis follow-up seminar in physics organised in English in the context of the "Language plan".

F. Thesis

The students will do a thesis (PHYS2999). The choice of a thesis director must be approved by the Physics Department by the end of the third week of the 1st quadrimester. The preparation of the thesis is equivalent to about 600 hours of course attendance. The thesis readers are appointed by the Physics Department at the beginning of the second quadrimester. The list of the thesis readers will be communicated to the jury secretary.

G. Options in Applied Physics

In addition, the students will follow a minimum of 60 hours (4 h/quad.) of options, to be chosen from the following list :

PHYS2150	Numerical simulation methods in physics[15h+22.5h] (3 credits) (in French)	Eric Deleersnijder, Bernard Piraux
PHYS2901	Laser physics[22.5h+15h] (4 credits) (in French)	Alain Cornet, André Fayt
PHYS2906	Cryophysics[22.5h+15h] (3 credits) ∅ (in French)	Vincent Bayot
PHYS2907	Signal processing and information theory[22.5h+15h] (4 credits) (in French)	René Prieels
PHYS2910	Analysis methods[22.5h+15h] (3.5 credits) ∅ (in French)	Patrick Bertrand
PHYS2340	Use, management and control of radio elements[15h] (1.5 credits) (in French)	Thierry Ladrielle
PHYS2365	Nuclear detectors and electronics[15h] (2 credits) (in French)	Krzysztof Piotrzkowski
PHYS2997	Thesis tutorial[15h] (3 credits) (in English)	Jean-Pierre Antoine

Thesis follow-up seminar in Physics organised in English in the context of the "Language focus plan".

H. Apprenticeship in industry

The students will do a four-week period of work experience (PHYS2998) in a firm which is approved by the Physics Department. The period of apprenticeship cannot coincide with the the study timetable.

Earth, Space and Climate Physics orientation

I. Compulsory courses

Philosophical teachings :

SC2001	Introduction to contemporary philosophy[30h] (2 credits) (in French)	Laurent de Briey
or		
SC2220	Philosophy of science[30h] (2 credits) (in French)	Michel Ghins
or		
FILO2003	Ethics in the Natural Sciences[15h+15h] (2 credits) (in	Philippe Baret, Bernard Feltz, Thierry

	French)	Hance
SC2140	Questions of religious sciences[15h] (1 credits) (in French)	José Reding

This course will be followed in the 1st or 2nd year, according to choice.

MECA2853	Turbulence.[30h+15h] (4 credits) (in French)	Guy Schayes, Grégoire Winckelmans
MECA2771	Thermodynamics of irreversible phenomena.[30h+15h] (4 credits) (in French)	François Dupret, Miltiadis Papalexandris
PHYS2997	Thesis tutorial[15h] (3 credits) (in English)	Jean-Pierre Antoine

Thesis follow-up seminar in Physics organised in English in the context of the "Language plan".

J. Thesis

The students will do a thesis (PHYS2999). The choice of a thesis director must be approved by the Physics Department by the end of the third week of the 1st quadrimester at the latest. The preparation of the thesis is equivalent to about 600 hours of course attendance. The readers of the thesis are appointed by the Physics Department at the beginning of the second quadrimester. The list of thesis readers will be communicated to the jury secretary.

K. Options

Furthermore, the students will follow a minimum of three options, totalling at least 70 hours (courses and exercises) to be chosen from the "licence" programme in Physical Sciences or, more generally, from any of the University programmes. This choice must be approved by the lecturer supervising the preparation of the thesis and by the President of the Physics Department.

Positioning of the degree within the University cursus

The "licence" programme in Physics may be prolonged by third study cycle (master) studies, extended or specialised study diploma programmes or PhD programmes in the same or in a complementary speciality.
Specifically for Physics :
- the D.E.A. programme in Sciences, Physics orientation (SC3DA/P)
- the DES in x-ray protection and in ionizing ray applications (RPR3DS), organised by the Faculty of Medecine.