

**FYAP2M**

2013 - 2014

Master [120] in Physical Engineering

**At Louvain-la-Neuve - 120 credits - 2 years - Day schedule - In french**Dissertation/Graduation Project : **YES** - Internship : **YES**Main study domain : **Sciences de l'ingénieur**Organized by: **Ecole Polytechnique de Louvain (EPL)**Programme code: **fyap2m** - European Qualifications Framework (EQF): 7**Table of contents**

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## FYAP2M - Introduction

## FYAP2M - Admission

***For the specific conditions of this program : refer to the French version***

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

## FYAP2M - Information

### Learning outcomes

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Thanks to an in-depth coverage of the various fields of physics (optics, electricity, mechanics, quantum physics, physics of materials,...), this open and comprehensive training will prepare the student towards a broad spectrum of professional and industrial specializations, as well as advanced technology activities featuring a strong "research" bias. It is based on a close dialogue between the formal representation of concepts within the field, the implementation of numerical simulation tools to grasp the consequences of these representations, and also experimentation via practical tutorials. Throughout the training, the student will have many opportunities to frequent experimental labs, to put formal learning into practice, and to implement cutting-edge research tools within these application fields. A traineeship in industry or in a research lab in Belgium or abroad can complement the training.

### Teaching method

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. Features favouring interdisciplinarity :

The Master's in applied physics is intrinsically interdisciplinary, since it is located at the interface between physics and materials science. It features a comprehensive base allowing the student to acquire the basics of the main application fields of applied physics, a training through practice and cutting edge research, and various options in each field of physics and materials science: nano-technology, materials science, numerical modelling, basic and applied physics and optics. Access to the field of management is included via options in management and the launching of small and medium-sized companies. The curriculum features a significant fraction of PHYS (or PHY) courses, as well as a few MATH, INMA, and MECA courses, bearing witness to the intent of being trans-disciplinary. What's more, the curriculum permits to choose up to 39 elective credits from amongst the UCL exact or medical sciences curricula, and up to 6 credits in the humanities, which allows a student to customize a curriculum depending on personal choices.

. Variety of teaching situations :

The pedagogy implemented in the engineering Master's curriculum is aligned with that of the engineering Bachelor's curriculum: active learning, a balanced mix of group and individual work, and substantial time devoted to the development of non-technical competencies. A salient feature of the curriculum is the immersion of students in the research laboratories of the various instructors (during teaching laboratory sessions, case studies, projects and final thesis), which allows them to become familiar with up-to-date methods in the related fields, and to learn through the questioning approach which is inherent to research. An optional 10-credit training period, to be performed for at least 2 months in a research centre or a company, will allow a motivated student to experience a professional environment.

. Variety of learning situations :

The student will encounter a variety of pedagogical tools tailored to the various disciplines : formal lectures, individual projects in small groups, tutorials, project-based learning, case studies, experimental laboratory work, computer simulations, teachware, industrial or research training, visits to industries, individual and group work, seminars given by outside scientists, etc.

This variety of situations will help students to build their knowledge in an iterative and progressive manner, while developing their autonomy, organizational skills, time management, and capacity to use various modes of communication, etc.

### Evaluation

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All learning activities are assessed as prescribed by the University internal regulations (see exam regulations), viz. written and oral exams, laboratory exams, individual or group work, public presentation of projects and final thesis.

Detailed assessment rules will be made clear by each individual instructor, at the first lecture.

### Mobility and/or Internationalisation outlook

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#### Global framework

The Faculty of Applied Sciences has taken part, since their inception, in all the various mobility programmes which have been set up at both the European and world levels.

The numerous contacts it has with professional circles, notably via its Advisory Board, have demonstrated to what extent employers are favourably impressed by a mobility experience in someone's CV. The ever-increasing internationalization of research via networks linking laboratories throughout the world, speaks in favour of encouraging this mobility.

Students' interest is aroused at the end of their Bachelor studies, notably via intensive courses such as those of the ATHENS ( ) or BEST ( ) networks.

In the course of the two-year Master's programme, students are encouraged to take part in a 1- or 2-semester exchange scheme

Within Belgium, the Faculty of Applied Sciences is involved in a privileged partnership with the Faculteit Ingenieurswetenschappen of the Katholieke Universiteit Leuven, with whom it has set up an exchange scheme relating to the first year of the Master's curriculum (<https://eng.kuleuven.be/>).

At the European level, the Faculty of Applied Sciences is strongly involved in the CLUSTER excellence network ( ). This network encourages internal mobility, since this is a guarantee of quality as concerns both the level of teaching and the hosting of exchange students. Moreover, Cluster partners have signed an agreement recognizing each other's Bachelor's curricula. This agreement stipulates that all Bachelors of network institutions will have access to the Master's studies in any institution on a par with local students.

Outside Europe, the Faculty of Applied Sciences is a partner in the Magalhaes network, which groups about fifteen European universities together with the best South American science and technology universities (<https://www.magalhaes-network.net/>).

Besides these network partnerships, the Faculty has also signed a number of individual agreements with various universities in Europe, North America or elsewhere in the world. A list of these agreements may be found on the website of UCL International Relations (<https://www.uclouvain.be/international.html>).

UCL is also a partner in the TIME programme ( ) which gives students the opportunity to obtain two engineering degrees, via a specifically tailored curriculum.

Specific features of the FYAP Master's:

Moreover, in order to further the insertion of the Master's into international programmes, all first semester MAPR courses are taught in English, unless all attendees decide otherwise at the outset, out of respect for non-French speaking participants. However, all second semester MAPR courses are taught in French, unless all attendees decide otherwise at the outset.

#### **International possibilities (for UCL students)**

Besides intensive courses which are one component of international relations, EPL students with outstanding results are encouraged to apply for 5- or 10-month exchange programmes.

When taking place during the first Master's year, exchanges are generally 10 months long. In the second year, they only last for a semester, either as courses or else research in a foreign laboratory as a complement to the final thesis.

Some other more specific exchange programmes have been set up with South America, where the academic year is naturally on an "austral" basis.

Students are informed about the various exchange programmes as from their second Bachelor's year. They are encouraged to prepare for their exchange in a timely manner, notably by taking language courses at the Modern Languages Institute of UCL.

#### **International appeal (for non-residents)**

As described below, the University of Louvain (UCL) has developed a long-standing experience of greeting foreign students within the framework of international or exchange programmes. The "Master in Chemical and Materials Engineering" fits within this general tradition, and offers the student a top-notch programme in Chemical Engineering and Materials Science, encompassing a wide field of scientific activities in Applied Physics and Chemistry. Admission requires approval by the Committee for Engineering Studies in Chemistry and Physics, on the basis of a comprehensive résumé submitted by the student pursuant to the general regulations of the University of Louvain published on [www.uclouvain.be](http://www.uclouvain.be).

To facilitate the integration of foreign students, courses are given in English during the first and third semesters of the Master's (this rule may be relaxed for some courses at the onset of the semester, if so decided by ALL participating students). This allows non-French-speaking students to begin their Master's studies under the best conditions, while upgrading their knowledge of French by following French-as-a-Foreign-Language classes (see below) or by immersion into the student life of Louvain-la-Neuve. However, the courses of the second and fourth semesters are given in French (unless decided otherwise by all participating students), which provides foreign students with a unique opportunity to master French, one of the important official languages of the European Union.

The curriculum consists of a large number of elective courses which allow students to set up a customized programme based on their previous learning experience, and comprises an optional traineeship in industry, 30 credits of work in research laboratories, and projects giving a more practical bent to the training. The instructors of the Master's in Chemical and Materials Science Engineering are recognized scientists, with track records of excellence in applied chemistry and physics, as testified by their integration into European networks of excellence (FAME, NANOBEAMS, NANOQUANTA), their participation in international research programmes, their numerous contracts with European industrial companies, and their large number of publications in high ranking scientific journals including Nature, Science, Nature Materials, Physical Review Letters, Journal of the American Chemical Society, Nano Letters, etc. This not only ensures that the most recent scientific advances in the fields of chemistry and physics are passed on to the students, but also that students are introduced to typical industrial concerns, issues and recent developments.

#### **Partner programmes**

- With European institutions

FYKI is currently concentrating on setting up partnership programmes with European institutions, in the fields of chemistry and materials science (refer to engineering Master's in chemistry and materials science for further details). Parts of these programmes will also be accessible to FYAP students, via Erasmus exchanges. The possibility of including the Master's engineering degree in applied physics within the framework of international Master's will be examined later.

- TIME programme with :

- Ecole Centrale Paris

- Supaero Toulouse

- Universidad Politecnica de Madrid

- Politecnico di Milano

- Politecnico di Torino

-The EPL has also signed a specific convention with the Institut Français du Pétrole (<https://www.ifp.fr/>) which allows the possibility of combining the second Master's year with the first year of the complementary programme at IFP.

## Possible trainings at the end of the programme

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Accessible complementary Master's degrees: Master's degrees in nanotechnology and nuclear engineering, biotechnology and applied biology, once they have been set up, will be natural extensions of the curriculum.

Accessible Ph. D. curricula : by virtue of its training towards and via research, the Master's in applied physics engineering gives its students an excellent preparation towards Ph. D. studies. Instructors involved in the Master's are members of the MAIN ("materials, interfaces and nanotechnology") doctoral school, which is there to welcome students who wish to further their studies via a Ph. D.

## FYAP2M - Contacts

### Curriculum Managment

Entite de la structure FYKI

Acronyme	<b>FYKI</b>
Dénomination	Commission de programme - Ingénieur civil en chimie et sciences des matériaux et ingénieur civil physicien
Adresse	Place Sainte Barbe, 2 bte L5.02.02 1348 Louvain-la-Neuve Tél 010 47 24 87 - Fax 010 47 40 28
Secteur	Secteur des sciences et technologies ( <a href="#">SST</a> )
Faculté	Ecole Polytechnique de Louvain ( <a href="#">EPL</a> )
Commission de programme	Commission de programme - Ingénieur civil en chimie et sciences des matériaux et ingénieur civil physicien ( <a href="#">FYKI</a> )

**Academic Supervisor :** [Christian BAILLY](#)

### Jury

Président du Jury : **Piotr SOBIESKI**

Secrétaire du Jury : **Sophie DEMOUSTIER**

### Usefull Contacts

Secrétariat : **Viviane ABEELS**

## FYAP2M - Detailed programme

### Programme structure

The student's curriculum will consist of at least 120 credits covering two years, with a minimum of 60 credits per year, and comprising :

- a core curriculum of at least 53 credits, including a final thesis, compulsory courses, and general interest electives;
- a 30-credit specialization;
- specialized elective courses, or one or more additional options (each totalling at least 20 credits, except for the management option) chosen from amongst the 8 options of the curriculum (nanotechnology, materials science, applied physics, basic physics, numerical modelling, optics, management or launching of small and medium-sized companies).

The final thesis is generally written during the last year. However, students may choose to take any given course in the first or second year, subject to possible prerequisites. This will be the case in particular for students pursuing part of their education abroad.

If, in the course of his (her) former curriculum, a student has already been credited with a subject included in the compulsory core curriculum, or any training deemed equivalent, this subject will be replaced by elective courses, while conforming to imposed constraints. The student is responsible for checking whether the minimum total number of credits has been reached, as well as those of the specialized field, which will appear on the final diploma.

The student's curriculum will be submitted for acceptance by the Applied physics and chemistry diploma committee, using an ad hoc form to be found on the website of the committee.

*Whatever the focus or the options chosen, the programme of this master shall totalize 120 credits, spread over two years of studies each of 60 credits.*

#### Core study

> [Core courses](#) [ en-prog-2013-fyap2m-lfyap220t.html ]

> [Professional focus](#) [ en-prog-2013-fyap2m-lfyap200s ]

#### Options courses

> [Materials sciences](#) [ en-prog-2013-fyap2m-lfyap220o.html ]

> [Applied Physics](#) [ en-prog-2013-fyap2m-lfyap221o.html ]

> [Fundamental Physics](#) [ en-prog-2013-fyap2m-lfyap222o.html ]

> [Optics](#) [ en-prog-2013-fyap2m-lfyap224o.html ]

> [Nanotechnology](#) [ en-prog-2013-fyap2m-lfyap225o.html ]

> [Option en technologies photovoltaïques](#) . [ en-prog-2013-fyap2m-lfyap229o.html ]

> [Setting up small and medium-sized businesses](#) [ en-prog-2013-fyap2m-lfyap226o.html ]

> [Business risks and opportunities](#) [ en-prog-2013-fyap2m-lfyap227o.html ]

> [Optional courses](#) [ en-prog-2013-fyap2m-lfyap228o.html ]

### Programme by subject

#### Core courses [53.0]

● Mandatory

△ Courses not taught during 2013-2014

⊕ Periodic courses taught during 2013-2014

⊗ Optional

⊖ Periodic courses not taught during 2013-2014

⊞ Two years course

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

		Year	
		1	2
● LFYAP2990	Travail de fin d'études	N.	28 Credits
			x



						Year	
						1	2
○ LELEC1330	Physics of electronics	Vincent Bayot (coord.), Denis Flandre, Laurent Francis, Jean-Pierre Raskin	30h+30h	5 Credits	1q	x	
○ LELEC1350	APPLIED ELECTROMAGNETISM	Christophe Craeye, Danielle Janvier	30h+30h	5 Credits	1q	x	
○ LPHY2141	Optique et lasers	Alain Cornet	30h+10h	5 Credits	1q	x	x
○ LPHY1223	Special Relativity	Jean-Marc Gérard, Jan Govaerts	22.5h +15h	4 Credits	1q	x	x

### ○ Religion courses for student in exact sciences

The student shall select 2 credits from amongst

The student shall select

⊗ LTECO2100	Questions of religious sciences: biblical readings	Hans Ausloos	15h	2 Credits	1q	x	x
⊗ LTECO2200	Questions of religious sciences: reflections about christian faith	Dominique Martens	15h	2 Credits	2q	x	x
⊗ LTECO2300	Questions of religious sciences: questions about ethics	Philippe Cochinaux	15h	2 Credits	1q	x	x

## Professional focus [30.0]

○ Mandatory

△ Courses not taught during 2013-2014

⊕ Periodic courses taught during 2013-2014

⊗ Optional

⊖ Periodic courses not taught during 2013-2014

‡ Two years course

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

						Year	
						1	2
○ LMAPR2014	Physics of Functional Materials	Xavier Gonze, Luc Piraux, Gian-Marco Rignanese (coord.)	37.5h +22.5h	5 Credits	1q	x	
○ LMAPR2451	Study of materials at the atomic scale	Jean- Christophe Charlier, Xavier Gonze, Gian-Marco Rignanese	30h+30h	5 Credits	2q	x	
○ LMAPR2471	Transport phenomena in solids and nanostructures	Jean- Christophe Charlier, Luc Piraux (coord.)	30h+30h	5 Credits	2q	x	
○ LMAPR2481	Deformation and fracture of materials	Francis Delannay, Thomas Pardoën	30h+30h	5 Credits	1q	x	
○ LMAPR2011	Methods of Physical and Chemical Analysis	Arnaud Delcorte, Jacques Devaux	30h+30h	5 Credits	1q	x	
○ LMAPR2019	Polymer Science and Engineering	Sophie Demoustier, Alain Jonas, Evelyne Van Ruymbeke	45h+15h	5 Credits	1q	x	

## Options

- > [Materials sciences](#) [ en-prog-2013-fyap2m-lfyap220o ]
- > [Applied Physics](#) [ en-prog-2013-fyap2m-lfyap221o ]
- > [Fundamental Physics](#) [ en-prog-2013-fyap2m-lfyap222o ]
- > [Optics](#) [ en-prog-2013-fyap2m-lfyap224o ]
- > [Nanotechnology](#) [ en-prog-2013-fyap2m-lfyap225o ]
- > [Option en technologies photovoltaïques](#) . [ en-prog-2013-fyap2m-lfyap229o ]
- > [Setting up small and medium-sized businesses](#) [ en-prog-2013-fyap2m-lfyap226o ]
- > [Business risks and opportunities](#) [ en-prog-2013-fyap2m-lfyap227o ]
- > [Optional courses](#) [ en-prog-2013-fyap2m-lfyap228o ]

## MATERIALS SCIENCES

L'objectif de cette option est de permettre à l'étudiant d'approfondir ses connaissances des métaux, céramiques, polymères, et matériaux pour l'électronique, sur base de la maîtrise des aspects physiques de leur comportement.

● Mandatory

△ Courses not taught during 2013-2014

⊕ Periodic courses taught during 2013-2014

⊗ Optional

⊖ Periodic courses not taught during 2013-2014

‡ Two years course

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

*The student registered in this option chooses*

*De 20 à 25 credits parmi*

						Year	
						1	2
⊗ LMAPR2010	<a href="#">Polymer Materials</a>	Christian Bailly, Bernard Nysten	45h+15h	5 Credits	1q	x	x
⊗ LMAPR2012	<a href="#">Macromolecular Nanotechnology</a>	Sophie Demoustier, Karine Glinel, Jean-François Gohy, Bernard Nysten	45h+15h	5 Credits	2q	x	x
⊗ LMAPR2013	<a href="#">Physical Chemistry for Metals and Ceramics</a>	Pascal Jacques	30h+30h	5 Credits	1q	x	x
⊗ LMAPR2631	<a href="#">Solid surface analysis and treatment</a>	Arnaud Delcorte, Bernard Nysten	37.5h +15h	5 Credits	2q	x	x
⊗ LMAPR2642	<a href="#">Characterisation of Inorganic Materials</a>	Pascal Jacques, Joris Proost	30h+30h	5 Credits	1q	x	x

**APPLIED PHYSICS [18.0]**

L'objectif de cette option est de doter l'étudiant de connaissances complémentaires concernant les techniques d'expérimentation et phénomènes physiques reliés aux basses températures, au domaine du nucléaire, et aux capteurs.

● Mandatory

△ Courses not taught during 2013-2014

⊕ Periodic courses taught during 2013-2014

⊗ Optional

⊖ Periodic courses not taught during 2013-2014

‡ Two years course

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

The student registered in this option chooses

						Year	
						1	2
⊗ LPHY2372	<a href="#">Experimental methods</a>	<a href="#">Krzysztof Piotrkowski, Xavier Urbain</a>	30h+15h	5 Credits	1q	x	x
⊗ LPHY2273	<a href="#">Cryophysique et questions spéciales de supraconductivité</a>	<a href="#">Vincent Bayot, Luc Piraux (coord.)</a>	45h+15h	5 Credits	1q	x	x
⊗ LELEC2811	<a href="#">Instrumentation and sensors</a>	<a href="#">Laurent Francis, Ernest Matagne</a>	30h+30h	5 Credits	1q	x	x
⊗ LMECA2600	<a href="#">Introduction to nuclear engineering and reactor technology.</a>	<a href="#">Hamid Aït Abderrahim</a>	30h+30h	5 Credits	1q	x	x
⊗ LMECA2771	<a href="#">Thermodynamics of irreversible phenomena.</a>	<a href="#">Miltiadis Papalexandris</a>	30h+30h	3 Credits	2q	x	x

## FONDAMENTAL PHYSICS

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Cette option permet à l'étudiant de compléter sa connaissance des théories de la physique concernant le monde des noyaux et atomes, ainsi que les phénomènes critiques (transitions de phase).

● Mandatory

△ Courses not taught during 2013-2014

⊕ Periodic courses taught during 2013-2014

⊗ Optional

⊖ Periodic courses not taught during 2013-2014

⊞ Two years course

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

The student registered in this option chooses

De 20 à 30 credits parmi

							Year	
							1	2
⊗ LPHY1221	Group theory	Philippe Ruelle	22.5h +15h	5 Credits	2q	x	x	
⊗ LPHY1323	General Relativity	Jean-Marc Gérard	30h+15h	5 Credits	2q	x	x	
⊗ LPHY1322	Quantum Physics 2	Christophe Ringeval	45h +22.5h	6 Credits	1q	x	x	
⊗ LPHY2110	Phénomènes critiques (théorie statistique des champs)	Philippe Ruelle	22.5h	4 Credits	1q	x	x	
⊗ LPHY2120	Théorie quantique des champs I (introduction)	Jean-Marc Gérard	22.5h	4 Credits	1q	x	x	
⊗ LPHY2122	Théorie quantique des champs II	Jan Govaerts	30h	5 Credits	2q	x	x	
⊗ LPHY2125	Mécanique quantique relativiste	Michel Herquet (compensates Fabio Maltoni), Fabio Maltoni	15h+15h	4 Credits	1q	x	x	
⊗ LPHY2171	Physique mathématique	Christophe Ringeval	30h+15h	5 Credits	1q	x	x	

**OPTICS**

L'objectif de cette option est d'introduire l'étudiant à la science des couleurs, aux matériaux utilisés en optique, aux lasers et à l'optronique. Cette formation fait appel à un ensemble de cours dispensés à Namur par les Facultés Universitaires Notre-Dame de la Paix.

● Mandatory

△ Courses not taught during 2013-2014

⊕ Periodic courses taught during 2013-2014

⊗ Optional

⊖ Periodic courses not taught during 2013-2014

‡ Two years course

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

*The student registered in this option chooses  
De 20 à 23 credits parmi*

						Year	
						1	2
⊗ LFUND2901	<a href="#">Introduction aux sciences des couleurs</a>	N.		3 Credits		x	x
⊗ LFUND2902	<a href="#">Optique des matériaux structurés</a>	N.		4 Credits		x	x
⊗ LFUND2903	<a href="#">Introduction à l'optronique</a>	N.		3 Credits		x	x
⊗ LFUND2904	<a href="#">Introduction à l'optique non linéaire</a>	N.		3 Credits		x	x
⊗ LFUND2905	<a href="#">Physique des lasers</a>	N.		4 Credits		x	x
⊗ LFUND2906	<a href="#">Bio-photonique</a>	N.		3 Credits		x	x
⊗ LFUND2907	<a href="#">Applications médicales et industrielles des lasers</a>	N.		3 Credits		x	x
⊗ LPHY2245	<a href="#">Lasers and applications</a>	<a href="#">Alain Cornet</a>	45h+15h	6 Credits	2q	x	x
⊗ LPHY2140	<a href="#">Photons, atoms and molecules</a>	<a href="#">André Nauts, Xavier Urbain</a>	30h	5 Credits	1q	x	x
⊗ LPHY2242	<a href="#">Méthodes d'analyse en physique atomique et moléculaire</a>	<a href="#">Xavier Urbain</a>	30h	5 Credits	1q	x	x
⊗ LPHY2243	<a href="#">Questions spéciales d'optique quantique</a>	<a href="#">Bernard Piraux</a>	37.5h	5 Credits	1q	x	x

**NANOTECHNOLOGY**

Commune aux masters ingénieur civil électricien, électromécanicien, physicien, en chimie et science des matériaux, cette option a pour objectif d'introduire l'étudiant à la physique et à la simulation des matériaux et des dispositifs utilisés dans le domaine de la micro- et de la nano-électronique, aux propriétés et aux méthodes de fabrication et de caractérisation des micro- et nano-structures, aux modes de fonctionnement des nano-dispositifs, ainsi qu'au développement et à l'intégration d'éléments (bio-) organiques dans les nano-systèmes.

● Mandatory

△ Courses not taught during 2013-2014

⊕ Periodic courses taught during 2013-2014

⊗ Optional

⊙ Periodic courses not taught during 2013-2014

‡ Two years course

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

The student registered in this option chooses

De 20 à 30 credits parmi

Year

1 2

**⊗ Physique des nano-structures et nano-matériaux**

Pour participer aux cours proposés dans cette rubrique, il est recommandé d'avoir déjà suivi au préalable un cours de Physique des Matériaux, comme par exemple le cours MAPR 1492. Les cours MAPR 2451 et 2471 ne sont pas accessibles aux étudiants du master ingénieur civil physicien.

⊗ LMAPR2015	Physics of Nanostructures	Jean-Christophe Charlier, Xavier Gonze, Luc Piraux	37.5h +22.5h	5 Credits	1q	X	X
⊗ LMAPR2451	Study of materials at the atomic scale	Jean-Christophe Charlier, Xavier Gonze, Gian-Marco Rignanese	30h+30h	5 Credits	2q	X	X
⊗ LMAPR2471	Transport phenomena in solids and nanostructures	Jean-Christophe Charlier, Luc Piraux (coord.)	30h+30h	5 Credits	2q	X	X
⊗ LPHY2273	Cryophysique et questions spéciales de supraconductivité	Vincent Bayot, Luc Piraux (coord.)	45h+15h	5 Credits	1q	X	X
⊗ LFUND2908	Théorie quantique de l'état solide organique	N.		3 Credits		X	X

**⊗ Nano- et micro-dispositifs semi-conducteurs**

Pour participer aux cours proposés dans cette rubrique, il est recommandé d'avoir déjà suivi au préalable un cours d'électronique physique ou de dispositifs semiconducteurs, comme par exemple un des cours ELEC 1330 ou ELEC 1755.

⊗ LELEC2541	Advanced electronic devices	Vincent Bayot (coord.), Denis Flandre, Jean-Pierre Raskin	30h+30h	5 Credits	2q	X	X
⊗ LELEC2550	Special electronic devices	Vincent Bayot (coord.), Denis Flandre, Laurent Francis, Jean-Pierre Raskin	30h+30h	5 Credits	1q	X	X
⊗ LELEC2710	NANOELECTRONICS	Vincent Bayot (coord.), Denis Flandre, Laurent Francis, Jean-Pierre Raskin	30h+30h	5 Credits	1q	X	X

**⊗ Micro- et nano-ingénierie**

⊗ LELEC2560	Micro and nanofabrication techniques	Vincent Bayot, Laurent Francis, Benoît Hackens, Jean-Pierre Raskin	30h+30h	5 Credits	2q	X	X
⊗ LELEC2895	Design of micro and nanosystems	Denis Flandre, Laurent Francis (coord.), Thomas Pardoën, Jean-Pierre Raskin	30h+30h	5 Credits	1q	X	X
⊗ LMAPR2012	Macromolecular Nanotechnology	Sophie Demoustier, Karine Glinel, Jean-François Gohy, Bernard Nysten	45h+15h	5 Credits	2q	X	X

						Year	
						1	2
⊗ LMAPR2631	Solid surface analysis and treatment	Arnaud Delcorte, Bernard Nysten	37.5h +15h	5 Credits	2q	x	x

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**OPTION EN TECHNOLOGIES PHOTOVOLTAÏQUES .**

Cette option couvre une thématique de grande importance sociétale et industrielle. Elle est commune aux étudiants des Masters ELEC, KIMA et FYAP. A partir de connaissances de base préalables en électronique physique, l'option vise d'abord la maîtrise du fonctionnement interne des cellules photovoltaïques, et est ensuite une extension par des cours au choix, vers des aspects applicatifs ou de R&D avancée, concernant leur fabrication, les propriétés quantiques ou optiques, les matériaux en couches minces, la connexion au réseau...

● Mandatory

△ Courses not taught during 2013-2014

⊕ Periodic courses taught during 2013-2014

⊗ Optional

⊖ Periodic courses not taught during 2013-2014

‡ Two years course

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

Year

1 2

**○ Cours obligatoire de l'option en technologies photovoltaïques (5 credits)**

● LELEC2550	<a href="#">Special electronic devices</a>	Vincent Bayot (coord.), Denis Flandre, Laurent Francis, Jean-Pierre Raskin	30h+30h	5 Credits	1q	x	x
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**○ Cours au choix de l'option en technologies photovoltaïques**

De 15 à 25 credits parmi

**⊗ Orientation cellules solaires**

Les étudiants ne peuvent choisir simultanément les cours LELEC 2710 et LMAPR 2015

⊗ LELEC2560	<a href="#">Micro and nanofabrication techniques</a>	Vincent Bayot, Laurent Francis, Benoît Hackens, Jean-Pierre Raskin	30h+30h	5 Credits	2q	x	x
⊗ LELEC2710	<a href="#">NANO ELECTRONICS</a>	Vincent Bayot (coord.), Denis Flandre, Laurent Francis, Jean-Pierre Raskin	30h+30h	5 Credits	1q	x	x
⊗ LMAPR2015	<a href="#">Physics of Nanostructures</a>	Jean- Christophe Charlier, Xavier Gonze, Luc Piraux	37.5h +22.5h	5 Credits	1q	x	x
⊗ LPHY2141	<a href="#">Optique et lasers</a>	Alain Cornet	30h+10h	5 Credits	1q	x	x

**⊗ Orientation couches minces**

⊗ LMAPR2020	<a href="#">Materials Selection</a>	Christian Bailly, Thomas Pardoën	30h +22.5h	5 Credits	2q	x	x
⊗ LMAPR2672	<a href="#">Processing of ceramics, powder metallurgy and surface treatments</a>	Francis Delannay, Jean-Pierre Erauw, Joris Proost	30h+30h	5 Credits	2q ⊖	x	x
⊗ LPHY2246	<a href="#">Basses pressions et physique du vide</a>	Laurent Francis, Benoît Hackens	30h	5 Credits	1q	x	x

**⊗ Orientation réseau électrique**

⊗ LELEC2595	<a href="#">Power quality</a>	Emmanuel De Jaeger	30h+15h	4 Credits	2q	x	x
⊗ LELEC2670	<a href="#">Renewable and non conventional sources of electrical energy</a>	Emmanuel De Jaeger, Pascal Jacques, Ernest Matagne	30h+15h	4 Credits	2q	x	x



## SETTING UP SMALL AND MEDIUM-SIZED BUSINESSES

Commune à la plupart des masters ingénieur civil, cette option a pour objectif de familiariser l'étudiant ingénieur civil avec les spécificités des P.M.E., de l'entrepreneuriat et de la création afin de développer chez lui les aptitudes, connaissances et outils nécessaires à la création d'entreprise. L'accès en est réservé uniquement à un nombre restreint d'étudiants sélectionnés sur base d'un dossier de motivation et d'interviews individuelles.

Les dossiers de motivation pour cette filière doivent être introduits avant la rentrée académique de Master1 auprès du :

Secrétariat CPME – Place des Doyens 1  
1348 Louvain-la-Neuve (tél 010/47 84 59).

Les étudiants sélectionnés remplaceront le mémoire prévu dans le tronc commun par un mémoire spécifique en création d'entreprise (nombre de crédits inchangé).

○ Mandatory

△ Courses not taught during 2013-2014

⊕ Periodic courses taught during 2013-2014

⊗ Optional

⊖ Periodic courses not taught during 2013-2014

⊞ Two years course

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

De 20 à 25 credits parmi

Year

1 2

### ○ Compulsory courses

○ LCPME2001	<a href="#">Entrepreneurship Theory (in French)</a>	Frank Janssen	30h+20h	5 Credits	1q	x	
○ LCPME2003	<a href="#">Business plan of the creation of a company (in French)</a>	Frank Janssen	30h+15h	5 Credits	2q		x
○ LCPME2002	<a href="#">Managerial, legal and economic aspects of the creation of a company (in French)</a>	Régis Coeurderoy, Yves De Cordt	30h+15h	5 Credits	1q	x	x
○ LCPME2004	<a href="#">Advanced seminar on Entrepreneurship (in French)</a>	Frank Janssen	30h+15h	5 Credits	2q	x	x

### ⊗ Prerequisite CPME course

Students who have not taken a management course within their former curriculum shall include LCPME2000 in their current curriculum.

○ LCPME2000	<a href="#">Venture creation financing and management I</a>	Régis Coeurderoy, Olivier Giacomini (compensates Régis Coeurderoy), Paul Vanzeveren	30h+15h	5 Credits	1+2q	x	
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**BUSINESS RISKS AND OPPORTUNITIES**

Commune à la plupart des masters ingénieur civil, cette option a pour objectif de familiariser l'étudiant avec les principes de base de la gestion des entreprises.

● Mandatory

△ Courses not taught during 2013-2014

⊕ Periodic courses taught during 2013-2014

⊗ Optional

⊖ Periodic courses not taught during 2013-2014

‡ Two years course

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

De 16 à 20 credits parmi

						Year	
						1	2
⊗ LFSA2140	Elements of law for industry and research	Fernand De Visscher, Werner Derijcke, Bénédicte Inghels	30h	3 Credits	1q	x	x
⊗ LFSA2230	Introduction to management and to business economics	Benoît Gailly	30h+15h	4 Credits	2q	x	x
⊗ LFSA1290	Introduction to financial and accounting management	Gerrit Sarens	30h+15h	4 Credits	2q	x	x
⊗ LFSA2202	Ethics and ICT	Axel Gosseries, Olivier Pereira	30h	3 Credits	2q	x	x
⊗ LFSA2245	Environment and Enterprise	Thierry Bréchet	30h	3 Credits	1q	x	x
⊗ LFSA2210	Organisation and human resources	John Cultiaux	30h	3 Credits	1+2q	x	x

⊗ **Alternative to the "Business risks and opportunities" for computer science students**

Computer science students who have already followed various courses of this discipline during their Bachelor's curriculum can select between 16 and 20 credits in the program "mineure en gestion pour les sciences informatiques" <http://www.uclouvain.be/xprog-2013-min-lgesc100i>

## OPTIONAL COURSES

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L'étudiant complète son programme par des cours au choix moyennant l'accord d'un conseiller, membre de la commission de programmes en chimie et physique appliquées (FYKI).

● Mandatory

△ Courses not taught during 2013-2014

⊕ Periodic courses taught during 2013-2014

⊗ Optional

⊖ Periodic courses not taught during 2013-2014

‡ Two years course

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

						Year	
						1	2
⊗ LFSA2351A	Group dynamics	Piotr Sobieski	15h+30h	3 Credits	1q	x	x
⊗ LFSA2351B	Group dynamics	Piotr Sobieski	15h+30h	3 Credits	2q	x	x

### ⊗ Company training periods

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Students may include in their curriculum a company training period worth 10 credits. However, if this activity is related to their final thesis, they shall choose the 5-credit LFSA 2996 course.

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⊗ LFSA2995	Stage en entreprise	Claude Oestges	30h	10 Credits		x	x
⊗ LFSA2996	Stage en entreprise	Claude Oestges		5 Credits		x	x

### ⊗ Sciences humaines

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L'étudiant peut choisir jusqu'à 6 crédits, à l'exception des étudiants ayant choisi une option en gestion ou en création des petites et moyennes entreprises.

### ⊗ Langues

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L'étudiant peut choisir jusqu'à 3 crédits, à l'exception des étudiants ayant choisi une option en gestion ou en création des petites et moyennes entreprises.

### ⊗ Autres cours

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L'étudiant sélectionne librement des cours parmi les programmes de sciences exactes ou médicales de l'UCL ou de la FTW/KULeuven. Les cours apparaissant dans les options de leur programme de master sont aussi accessibles à titre de cours au choix. L'attention des étudiants est également attirée sur les cours des masters ingénieur civil physicien, en chimie et science des matériaux, électricien, mécanicien ou en génie biomédical, et de la mineure en génie biomédical.

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