KIMA2M

2016 - 2017

Master [120] in Chemical and Materials Engineering

At Louvain-la-Neuve - 120 credits - 2 years - Day schedule - In english
Dissertation/Graduation Project : **YES** - Internship : **optional**
Activities in other languages : **YES**
Activities on other sites : **optional**
Main study domain : **Sciences de l'ingénieur et technologie**
Organized by: **Ecole Polytechnique de Louvain (EPL)**
Programme code: **kima2m** - Francophone Certification Framework: 7

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KIMA2M - Introduction

Introduction

Introduction

In order to meet essential challenges such as energy management, communication and information, sustainable development and climate change, it is essential to foster scientific and technological creativity in the field of industrial materials and processes.

You

• have acquired solid knowledge of chemical or physical engineering and mathematics;

• are interested in research and development as well as production and management in cutting edge industries: chemistry, metals and materials, metallic products, plastics, electronics or the process industry;

• would like to take advantage of the most recent research advances in your area of specialisation.

Your future job

Jobs in chemical and materials engineering range from research and development to production and marketing.

You can become :

• A « systems » engineer :

Who designs new products or devices with specific properties or functions, e.g. a mitral valve, an electroluminescent polymer for a flexible display, a metallic alloy or a light composite for aerospace applications, a nanomaterial usable for memory storage.

• A « process » engineer :

Who develops new production processes or manages the operation of production units, e.g. a plastics extrusion line, a factory for the extraction of a pharmaceutical compounds from a given plant l, a water or waste treatment plant, a production line for electronic components, a production unit for a high purity chemical compound, etc.

• A combination of both :

For instance, you develop a polymer material for the automotive industry and the synthesis/compounding process required for its industrial scale up.

Your programme

The master offers:

• a specialised training in an international environment; from 2015-2016, all courses organized by the programme commission (i.e. courses with LMAPR2xxx designation) are taught in English ; assistance provided as needed to French-speaking students (“French-friendly” approach).

• an interdisciplinary approach to problem solving, rooted in physics and chemistry;

• research-based training : integration of students in experimental laboratories, research projects ;

• exposure to industry : factory visits, industry internships, graduation project in a company ;

• the possibility to obtain a dual degree if you are accepted in the Master’s degree programme “Functionalised Advanced Materials & Engineering” (FAME), part of the Erasmus Mundus programme. It is entirely in English and starts with a year of general training either at the National Polytechnic Institute of Grenoble (France) or at the University of Augsburg (Germany); in the second year, students specialise in a field of materials sciences at one of 7 partner universities. UCL offers a specialisation in materials and nano-structures engineering. Upon completing the programme, students are granted a dual Master’s degree. More information available on the web page https://www.uclouvain.be/master-fame.html

KIMA2M - Teaching profile

Learning outcomes

Building on fundamental scientific and technical knowledge (physics, chemistry, mechanics, mathematics) acquired during the Bachelor's program, the master's program in chemistry and materials science enables the student to develop polytechnic as well as specialized competences relating to materials, nanotechnology, as well as chemical and environmental engineering, which will allow him/her to fill leadership positions in the design and production of advanced materials and systems as well as the development and management of advanced technological processes.

The program takes up the broad challenges confronting today's engineers, thanks to a curriculum taught entirely in English (courses with MAPR2xxx designation) with assistance provided to French-speaking students.

The program combines coherence and flexibility thanks to a modular structure : a specialized focus and a common core taken by all students, complemented by major and elective courses, which provides students with a specific focus to their training. Depending on the majors chosen, the student may become :

• A systems engineer who designs new products or devices with targeted properties and functions;

• A process or chemical engineer who develops new production processes and optimizes or manages production facilities;

• A combination of both.

Through these activities, the chemical and materials engineer systematically takes into account constraints, values and rules (legal, ethical or economic).

He/she is autonomous, capable of managing industrial projects and comfortable working as part of a team. He/she is able to communicate in a foreign language, English in particular.

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

1.demonstrate mastery of a solid body of knowledge and skills in engineering sciences allowing one to solve problems related to materials and procedures (axis 1).

1.1 Identify and use concepts, laws and reasoning to solve a realistic problem.
1.2 Identify, develop and use adequate modelling and calculation tools to solve realistic and complex problems.
1.3 Verify the likelihood and confirm the validity of the results relating to a given problem.

2. organise and carry out an engineering procedure for the development of a specific material, a complex material system, a high purity product and/or complex compound or a process meeting a need or solving a particular problem (axis 2).

2.1 Analyse a problem or functional requirement of realistic complexity and formulate a corresponding specifications note. An industrial specification for a material or a process contains many elements ranging from technical demands, to economic and logistic constraints as well as legal and safety aspects.

2.2 Model a problem and design one or more original technical solutions corresponding to the specifications note.

2.3 Evaluate and classify solutions with regard to all the criteria in the specifications note: efficiency, feasibility, quality, security and interaction/integration with other processes/components.

2.4 Implement and test a solution in the form of a mock-up, a prototype, a lab or pilot module and/or a numerical model.

2.5 Come up with recommendations to improve the operationalisation of a solution under study.

3. organise and carry out a research project to understand a physical or chemical phenomenon or a new problem in materials engineering and science or chemical engineering (axis 3).

3.1 Document and summarize the existing body of knowledge in the area under consideration.

3.2 Propose a model and/or an experimental device in order to simulate and test hypotheses relating to the phenomenon under study.

3.3 Write a summary report that explains the potential of the theoretical or technical innovations resulting from the research project

4. contribute as part of a team to the planning and completion of a project while taking into account its objectives, allocated resources, and constraints (axis 4).

4.1 Frame and explain the project's objectives (in terms of performance indicators) while taking into account its issues and constraints (resources, budget, deadlines).
4.2 Collaborate on a work schedule, deadlines and roles.
4.3 Work in a multidisciplinary environment with peers holding different points of view; manage any resulting disagreement or conflicts.
4.4 Make individual as well as team decisions when choices have to be made, whether they are about technical solutions or the division of labour to complete a project.

5. communicate effectively (orally or in writing) with the goal of carrying out assigned projects in the workplace. Ideally, the student should be able to communicate in one or more foreign languages in addition to his/her mother tongue (axis 5).

5.1 Clearly identify the needs of the client or the user: question, listen and understand all aspects of their request and not just the technical aspects.

5.2 Present arguments and adapt to the language of the interlocutors: technicians, colleagues, clients, superiors.

5.3 Communicate through graphs and diagrams: interpret a diagram, present project results, structure information.

5.4 Read and use different technical documents (rules, plans, specification notes).

5.5 Draft documents that take into account demands and conventions of the field.

5.6 Make a convincing oral presentation possibly using modern communication techniques.

6. demonstrate rigor, openness, critical thinking and a sense of ethics in your work. Using the technological and scientific innovations at your disposal, validate the socio-technical relevance of a hypothesis or a solution and act responsibly (axis 6).

6.1 Apply the standards of your discipline (terminology, measurement units, quality, security and environmental standards).

6.2 Find solutions that go beyond strictly technical issues by considering sustainable development and the ethical aspects of a project (for example, “life cycle analysis” among others).

6.3 Demonstrate critical awareness of a technical solution in order to verify its robustness and minimize the risks that may occur during implementation. (This skill is mainly developed during the graduation project which requires the critical analysis of implemented techniques as well as research for the Master’s thesis.)

6.4 Evaluate oneself and independently develop necessary skills for “lifelong learning” in the field (this skill is most notably developed through projects requiring bibliographic research).

Programme structure

The Master’s degree programme consists of:

-a core curriculum (35 credits) including the graduation project (28 credits), the course « molecules and materials analysis » LMAPR2011 (5 credits) and a religion course (2 credits);

-a professional focus (30 credits);

-one or more majors;

-elective courses to round out the programme.

The overwhelming majority of courses is given in English (all courses with LMAPR2xxx designation and a large proportion of the courses organized by EPL), with assistance provided to French-speaking students (« French-friendly » approach).

The student MUST choose at least one major among the six proposed in chemistry and materials.

He/she is further ALLOWED to choose a major among the two proposed in Business management and creation.

Normally, professional focus courses are taken during the first annual unit and the graduation project during the last one. However, students may (depending on their project) take these courses in the 1st or 2nd annual unit as long as they have completed the course prerequisites. This is particularly the case for students who complete part of their education abroad (ERASMUS or MERCATOR exchange, FAME dual degree).

If during the student’s previous studies, he or she has already taken a course that is part of the programme (either required or elective) or they have participated in an academic activity that is approved by the programme commission, the student will replace them with other elective courses or activities that are in keeping with programme regulations.

Regardless of the focus, major /or elective courses selected, the Master’s degree programme will consist of minimum of 120 credits divided over two annual units. The first annual unit has to consist of a minimum of 60 credits, the second the number of credits needed to complete the Master’s degree.

The student will verify that he/she has obtained the minimum number of credits required for the approval of the diploma as well as for the approval of the major, in order to include them in the diploma supplement.

Programmes that respect the above rules will be submitted for approval to the relevant Master’s degree programme commission.

For a programme-type, and regardless of the focus, options/or elective courses selected, this master will carry a minimum of 120 credits divided over two annual units, corresponding to 60 credits each.

> Core courses for the Master's degree in chemical and materials engineering *[en-prog-2016-kima2m-lkima220t.html]*

> Professional focus *[en-prog-2016-kima2m-lkima200s]*

Options courses

> Major in chemical and materials *[en-prog-2016-kima2m-lkima936r.html]*
> Major in chemical and environmental engineering *[en-prog-2016-kima2m-lkima221o.html]*
> Major in inorganic materials and processes *[en-prog-2016-kima2m-lkima222o.html]*

KIMA2M Detailled programme

Programme by subject

CORE COURSES [35.0]

O Mandatory	⊠ Optional
△ Courses not taught during 2016-2017	⊘ Periodic courses not taught during 2016-2017
⊕ Periodic courses taught during 2016-2017	Activity with requisites

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

Students particularly interested in materials and molecules characterization can complete their training by taking additional major or elective courses. Specifically, these include: LMAPR2631 « surface analysis », LMAPR2642 « crystallographic and microstructural characterization of materials » and LBIRC2102A «organic analysis II, partim" (taught in French)

						Year 1	2
O LKIMA2990	Graduation project/End of studies project	Vinciane.Gandibleux (coord.)		28 Credits			x
O LMAPR2011	Molecules and materials analysis	Arnaud.Delcorte Sophie.Hermans	30h+30h	5 Credits	1q	x	x

O *Religion courses for students in natural sciences (2 credits)*

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	Marcela.Lobo	15h	2 Credits	1q	x	x

PROFESSIONAL FOCUS [30.0]

O Mandatory	⊠ Optional
△ Courses not taught during 2016-2017	⊘ Periodic courses not taught during 2016-2017
⊕ Periodic courses taught during 2016-2017	Activity with requisites

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

The goal of the professional focus is to provide students with fundamental knowledge about materials as well as chemical and environmental processes. These courses are normally taken in the first semester of the first annual unit; furthermore they are intended to help students select their subsequent coursework, namely their major courses

						Year 1	Year 2
O LMAPR2013	Physical Chemistry for Metals and Ceramics	Pascal.Jacques	30h+30h	5 Credits	1q	x	
O LMAPR2014	Physics of Functional Materials	Xavier.Gonze Luc.Piraux Gian-Marco.Rignanese	37.5h +22.5h	5 Credits	1q	x	
O LMAPR2019	Polymer Science and Engineering	Sophie.Demoustier Alain.Jonas Evelyne.Vanruymbeke	45h+15h	5 Credits	1q △	x	
O LMAPR2430	Industrial processes for the production of base chemicals	Juray.Dewilde	30h +22.5h	5 Credits	1q	x	
O LMAPR2481	Deformation and fracture of materials	Thomas.Pardoen	30h+30h	5 Credits	1q	x	
O LMAPR2647	Sustainable treatment of industrial and domestic waste: Fundamentals	Olivier.Francoisse Patricia.Luis Olivier.Noiset	30h+15h	5 Credits	1q	x	

OPTIONS

Students must select at least one major among the following: Chemical and environmental engineering, Inorganic materials and processes, Biomaterials, Polymers and macro-molecules, Mechanics of materials, and Nano-technology.They are also allowed to take an additionnal major in management or CPME.

Major in chemical and materials

> Major in chemical and environmental engineering *[en-prog-2016-kima2m-lkima221o]*
> Major in inorganic materials and processes *[en-prog-2016-kima2m-lkima222o]*
> Major in Polymers and macro-molecules *[en-prog-2016-kima2m-lkima223o]*
> Major in Mechanics of materials *[en-prog-2016-kima2m-lkima224o]*
> Major in Biomaterials *[en-prog-2016-kima2m-lkima225o]*
> Major in nanotechnology *[en-prog-2016-kima2m-lkima233o]*

Major in small and medium sized business creation

> Major in small and medium sized business creation *[en-prog-2016-kima2m-lkima230o]*
> Major in business risks and opportunities *[en-prog-2016-kima2m-lkima231o]*

Elective courses

> Elective courses *[en-prog-2016-kima2m-lkima234o]*

MAJOR IN CHEMICAL AND MATERIALS

MAJOR IN CHEMICAL AND ENVIRONMENTAL ENGINEERING

The objective of this major is to enable the student to master the concepts and technologies used in chemical and environmental engineering with an emphasis on the dimensioning and optimisation of processes. Particular attention is given to energy control, safety and environmental aspects. The student progressively develops a global understanding of a chemical process and an in-depth knowledge of its parts and mutual interactions.

O Mandatory	⊠ Optional
△ Courses not taught during 2016-2017	⊘ Periodic courses not taught during 2016-2017
⊕ Periodic courses taught during 2016-2017	Activity with requisites

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

De 20 à 30 credits parmi

O Required courses (15 credits)

						Year 1	Year 2
O LMAPR2118	Fluid-fluid separations	Patricia.Luis Denis.Mignon Bart.Vanderbruggen (compensates Patricia Luis Alconero)	30h +22.5h	5 Credits	2q	x	x
O LMAPR2330	Reactor Design	Juray.Dewilde	30h+30h	5 Credits	2q	x	x
O LMAPR2648	Sustainable treatment of industrial and domestic waste: Case studies	Damien.Debecker Olivier.Francoisse Patricia.Luis Olivier.Noiset Benoit.Stenuit	30h+15h	5 Credits	2q	x	x

⊠ Recommended courses

min=5 credits parmi

⊠ LINMA2300	Process Control	Denis.Dochain	30h+30h	5 Credits	1q	x	x

						Year 1	2
⊠ LMAPR2320	Process development in industrial organic chemistry	Juray.Dewilde Patricia.Luis Denis.Mignon	30h+15h	5 Credits	1q	x	x
⊠ LMAPR2380	Solid-fluid separation	Pierre.Adam Tom.Leyssens	30h +22.5h	5 Credits	1q	x	x
⊠ LMAPR2691	Technology of chemical and environmental engineering	P.Descamps Patricia.Luis Gregoire.Winckelmans	30h+15h	5 Credits	2q ⊕	x	x

⊠ *Elective courses*

max=10 credits parmi

⊠ LBIRC2102A	Organic Analysis II - partim A	Sonia.Collin (coord.) Marie-France.Herent Raphael.Robiette	30h+30h	5 Credits	2q	x	x
⊠ LENVI2007	Renewable energies	Xavier.Draye Patrick.Gerin (coord.) Herve.Jeanmart Geoffrey.Vanmoeseke	30h	4 Credits	1q	x	x
⊠ LENVI2101	Sociétés, populations, environnement, développement: problématiques et approches interdisciplinaires	Denis.Dochain Bernard.Feltz Pierre-Joseph.Laurent Jean-Pascal.Vanypersele	45h	6 Credits	1q	x	x
⊠ LFSA2245	Environment and business	Thierry.Brechet	30h	3 Credits	1q	x	x
⊠ LINMA1702	Applied mathematics : Optimization I	Francois.Glineur	30h +22.5h	5 Credits	2q	x	x
⊠ LMAPR2020	Materials Selection	Christian.Bailly Thomas.Pardoen	30h +22.5h	5 Credits	2q	x	x
⊠ LMAPR2141	Metals Processing and Recycling	Philippe.Henry (compensates Joris Proost) Joris.Proost	30h+30h	5 Credits	2q	x	x
⊠ LMECA2645	Major technological hazards in industrial activity.	Denis.Dochain Alexis.Dutrieux	30h	3 Credits	2q	x	x

MAJOR IN INORGANIC MATERIALS AND PROCESSES

This major enables the student to develop in-depth knowledge about the synthesis, processing and recycling of inorganic materials (metals, ceramics, sintered materials, inorganic glasses), their structural and functional properties, their microstructural details at different scales, and the relationship between their properties and their production methods

O Mandatory	⊠ Optional
△ Courses not taught during 2016-2017	⊘ Periodic courses not taught during 2016-2017
⊕ Periodic courses taught during 2016-2017	Activity with requisites

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

De 20 à 30 credits parmi

O Required courses

						Year 1	Year 2
O LMAPR2141	Metals Processing and Recycling	Philippe.Henry (compensates Joris Proost) Joris.Proost	30h+30h	5 Credits	2q	x	x
O LMAPR2642	Crystallographic and microstructural characterisation of materials	Pascal.Jacques	30h+30h	5 Credits	1q	x	x

⊠ Thermodynamics and processes of elaboration

⊠ LMAPR2672	Sintered materials and surface treatments	Jean-Pierre.Erauw Pascal.Jacques Joris.Proost	30h+30h	5 Credits	2q ⊕	x	x
⊠ LKULH2013	Phase equilibria in inorganic materials and processes			5 Credits		x	x

⊠ Implementation and durability

⊠ LMAPR2420	High performance metallic materials	Pascal.Jacques Aude.Simar	30h+30h	5 Credits	2q ⊘	x	x
⊠ LMAPR2482	Plasticity and metal forming	Laurent.Delannay Thomas.Pardoen	30h +22.5h	5 Credits	2q	x	x

MAJOR IN POLYMERS AND MACRO-MOLECULES

The objective of this major is to help students master the relationships between the chemical structure of organic macro-molecules (polymers, bio-macromolecules, etc.), the microstructure of their derivative materials, the main synthesis methods and their implementation, and structural and functional properties occurring at a macroscopic and industrial level as well as at the level of nanotechnology and its applications.

O Mandatory	⊠ Optional
△ Courses not taught during 2016-2017	⊘ Periodic courses not taught during 2016-2017
⊕ Periodic courses taught during 2016-2017	Activity with requisites

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

De 20 à 30 credits parmi

O Required courses

						Year 1	Year 2
O LMAPR2016	Project in Polymer Science	Charles-Andre.Fustin Alain.Jonas	0h+45h	5 Credits	2q	x	x

⊠ Polymer science complements

⊠ LCHM2261	Polymer Chemistry and Physico-Chemistry	Jean-Francois.Gohy Alain.Jonas	45h+15h	5 Credits	1q	x	x

⊠ Macromolecular bio and nanotechnology

⊠ LCHM2170	Introduction to protein biotechnology	Pierre.Morsomme Patrice.Soumillion	22.5h +7.5h	3 Credits	1q	x	x
⊠ LFUND2908	Théorie quantique de l'état solide organique			3 Credits		x	x
⊠ LMAPR2012	Macromolecular Nanotechnology	Sophie.Demoustier (compensates Bernard Nysten) Sophie.Demoustier Sophie.Demoustier (compensates Karine Glinel) Karine.Glinel Jean-Francois.Gohy (compensates Bernard Nysten) Jean-Francois.Gohy Jean-Francois.Gohy (compensates Karine Glinel) Bernard.Nysten	45h+15h	5 Credits	2q	x	x

⊠ Polymer materials engineering

⊠ LMAPR2010	Polymer Materials	Christian.Bailly Bernard.Nysten Evelyne.Vanruymbeke	45h+15h	5 Credits	1q △	x	x
⊠ LMAPR2018	Rheometry and Polymer Processing	Christian.Bailly Evelyne.Vanruymbeke	30h +22.5h	5 Credits	2q	x	x

MAJOR IN MECHANICS OF MATERIALS

The objective of this major is to introduce students to the principal mechanical characteristics of various categories of materials, to the consequences of these properties on their processing and use, to the methods used to simulate these properties, and to the criteria used to select materials for a given application.

O Mandatory	⊠ Optional
△ Courses not taught during 2016-2017	⊘ Periodic courses not taught during 2016-2017
⊕ Periodic courses taught during 2016-2017	Activity with requisites

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

De 20 à 30 credits parmi

O Required courses

						Year 1	Year 2
O LMAPR2018	Rheometry and Polymer Processing	Christian.Bailly Evelyne.Vanruymbeke	30h +22.5h	5 Credits	2q	x	x
O LMAPR2020	Materials Selection	Christian.Bailly Thomas.Pardoen	30h +22.5h	5 Credits	2q	x	x
O LMAPR2482	Plasticity and metal forming	Laurent.Delannay Thomas.Pardoen	30h +22.5h	5 Credits	2q	x	x

⊠ Composite materials

⊠ LMECA2141	Rheology	Vincent.Legat Evelyne.Vanruymbeke	30h+30h	5 Credits	1q	x	x
⊠ LMECA2640	Mechanics of composite materials	Issam.Doghri	30h+30h	5 Credits	2q	x	x

⊠ Solid mechanics and numerical methods

⊠ LMECA1120	Introduction to finite element methods.	Vincent.Legat	30h+30h	5 Credits	2q	x	x
⊠ LGCIV1022	Mechanics of structures	Pierre.Latteur	30h+30h	5 Credits	1q	x	x
⊠ LMECA2520	Calculation of planar structures	Issam.Doghri	30h+30h	5 Credits	2q	x	x

⊠ Mechanical metallurgy

⊠ LMAPR2420	High performance metallic materials	Pascal.Jacques Aude.Simar	30h+30h	5 Credits	2q ⊘	x	x
⊠ LMECA2860	Welding.	Pascal.Jacques Aude.Simar	30h+30h	5 Credits	1q	x	x

MAJOR IN BIOMATERIALS

The objective of this major is to introduce students to the principal biochemical and biological concepts that are useful for developing applications in the field of biomaterials.

O Mandatory	⊠ Optional
△ Courses not taught during 2016-2017	⊘ Periodic courses not taught during 2016-2017
⊕ Periodic courses taught during 2016-2017	Activity with requisites

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

KIMA students are required to enrol in LGBIO2030 and LBIR1220A except if these 1st cycle course requirements were fulfilled previously. GBIO students are required to enrol in LMAPR2481 and LMAPR1805 except if these 1st cycle course requirements were fulfilled previously.
De 20 à 30 credits parmi

O Required courses (10 credits)

						Year 1	Year 2
O LBIR1220A	Biochimie I (partim EPL)	Michel.Ghislain Yvan.Larondelle (coord.)	30h+15h	5 Credits	2q	x	
O LGBIO2030	Biomaterials	Sophie.Demoustier Christine.Dupont Gaetane.Leloup	30h+30h	5 Credits	1q	x	

⊠ Recommended courses

⊠ LBIR1321	Biochemistry II : metabolic pathways and their regulation	Michel.Ghislain (coord.) Yvan.Larondelle	30h+15h	3 Credits	1q	x	x
⊠ LBIO1335	Immunology	Jean-Paul.Dehoux	25h+15h	3 Credits	1q	x	x
⊠ LELEC2560	Micro and Nanofabrication Techniques	Laurent.Francis Benoit.Hackens Jean-Pierre.Raskin	30h+30h	5 Credits	2q	x	x
⊠ LMAPR2012	Macromolecular Nanotechnology	Sophie.Demoustier (compensates Bernard Nysten) Sophie.Demoustier Sophie.Demoustier (compensates Karine Glinel) Karine.Glinel Jean-Francois.Gohy (compensates Bernard Nysten) Jean-Francois.Gohy Jean-Francois.Gohy (compensates Karine Glinel) Bernard.Nysten	45h+15h	5 Credits	2q	x	x

⊠ Elective courses

⊠ LBIRC2101A	Analyse biochimique et notions de génie génétique: analyse biochimique	Francois.Chaumont Charles.Hachez Pierre.Morsomme	18.5h +22.5h	4 Credits	1q	x	x
⊠ LBIRC2108	Biochemical and Microbial Engineering	Iwona.Cybulska	30h +22.5h	5 Credits	2q	x	x
⊠ LGBIO2020	Bioinstrumentation	Andre.Mouraux Michel.Verleysen	30h+30h	5 Credits	1q	x	x
⊠ LGBIO1114	Artificial organs and rehabilitation	Luc-Marie.Jacquet Philippe.Lefevre Renaud.Ronsse	30h+30h	5 Credits	2q	x	x
⊠ LMAPR2010	Polymer Materials	Christian.Bailly Bernard.Nysten Evelyne.Vanruymbeke	45h+15h	5 Credits	1q △	x	x
⊠ LMAPR2018	Rheometry and Polymer Processing	Christian.Bailly Evelyne.Vanruymbeke	30h +22.5h	5 Credits	2q	x	x

						Year 1	2
⊠ LMAPR2631	Surface Analysis	Arnaud.Delcorte Bernard.Nysten Bernard.Nysten (compensates Arnaud Delcorte)	30h+15h	5 Credits	2q	x	x

MAJOR IN NANOTECHNOLOGY

As with the Master's degree programmes in electrical, electromechanic, physical, chemical, and materials science engineering, the objective of this major is to introduce students to the physics and simulation of materials and devices used in the field of micro- and nanotechnologies, to the properties and methods used to manufacture and characterise micro and nanostructures, to the ways in which nano-devices function as well as to the development and integration of (bio) organic elements in nano-systems.

O Mandatory	⊠ Optional
△ Courses not taught during 2016-2017	⊘ Periodic courses not taught during 2016-2017
⊕ Periodic courses taught during 2016-2017	Activity with requisites

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

The student choosing this major selects
De 20 à 30 credits parmi

⊠ Nano-structures and the physics of nano-materials

To enrol in this major, students should have already taken a physical materials class such as MAPR1492. The classes MAPR2451 and 2471 are not open to students in the Master's degree programme in physical engineering

					Year 1	Year 2
⊠ LMAPR2015	Physics of Nanostructures	Jean-Christophe.Charlier Xavier.Gonze Aurelien.Lherbier (compensates Jean-Christophe Charlier) Luc.Piraux	37.5h +22.5h	5 Credits	1q	x	x
⊠ LMAPR2451	Atomistic and nanoscopic simulations	Jean-Christophe.Charlier Xavier.Gonze Aurelien.Lherbier (compensates Jean-Christophe Charlier) Aurelien.Lherbier (compensates Xavier Gonze) Gian-Marco.Rignanese	30h+30h	5 Credits	2q	x	x
⊠ LMAPR2471	Transport phenomena in solids and nanostructures	Jean-Christophe.Charlier Aurelien.Lherbier (compensates Jean-Christophe Charlier) Luc.Piraux	30h+30h	5 Credits	2q	x	x
⊠ LPHY2273	Cryophysique et questions spéciales de supraconductivité	Vincent.Bayot Luc.Piraux	45h+15h	5 Credits	1q	x	x
⊠ LFUND2908	Théorie quantique de l'état solide organique			3 Credits		x	x

⊠ Nano and micro semi-conductor devices

To enrol in these courses it is recommended that students have already taken a course in physical electronics or in semiconductor devices such as ELEC 1330 or ELEC 1755 or similar.

					Year 1	Year 2
⊠ LELEC2541	Advanced Transistors	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 and nano-engineering

					Year 1	Year 2
⊠ LELEC2560	Micro and Nanofabrication Techniques	Laurent.Francis Benoit.Hackens Jean-Pierre.Raskin	30h+30h	5 Credits	2q	x	x
⊠ LELEC2895	Design of micro and nanosystems	Denis.Flandre Laurent.Francis (coord.) Thomas.Pardoen Jean-Pierre.Raskin	30h+30h	5 Credits	1q	x	x

						Year 1	2
⊠ LMAPR2012	Macromolecular Nanotechnology	Sophie.Demoustier (compensates Bernard Nysten) Sophie.Demoustier Sophie.Demoustier (compensates Karine Glinel) Karine.Glinel Jean-Francois.Gohy (compensates Bernard Nysten) Jean-Francois.Gohy Jean-Francois.Gohy (compensates Karine Glinel) Bernard.Nysten	45h+15h	5 Credits	2q	x	x
⊠ LMAPR2631	Surface Analysis	Arnaud.Delcorte Bernard.Nysten Bernard.Nysten (compensates Arnaud Delcorte)	30h+15h	5 Credits	2q	x	x

MAJOR IN SMALL AND MEDIUM SIZED BUSINESS CREATION

MAJOR IN SMALL AND MEDIUM SIZED BUSINESS CREATION

The goal of this major is to familiarise engineering students with the specifics of small and medium sized businesses, entrepreneurship, and business creation so they may develop the necessary skills, knowledge and tools to create a business. This major is reserved for a small number of students and selection is based on a written application and individual interview.

The written application must be submitted before the start of the academic year for Master's 1.

Applications may be sent to:

Secrétariat CPME-Place des Doyens, 1

1348 Louvain-la-Neuve (tel. 010/47 84 59)

Selected students will replace their Master's thesis in the common core curriculum with a thesis related to business creation (the number of credits remaining the same).

O Mandatory	⊠ Optional
△ Courses not taught during 2016-2017	⊘ Periodic courses not taught during 2016-2017
⊕ Periodic courses taught during 2016-2017	Activity with requisites

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

Further information about this major may be found at http//www.uclouvain.be/cpme. This major may not be taken at the same time as a major in management. Students in this major may choose 20-25 credits from the following courses:
De 20 à 25 credits parmi

O *Required courses for the major in small and medium sized businesses*

						Year 1	Year 2
O LCPME2001	Entrepreneurship Theory (in French)	Frank.Janssen	30h+20h	5 Credits	1q	x	
O LCPME2002	Managerial, legal and economic aspects of the creation of a company (in French)	Regis.Coeurderoy Yves.Decordt Marine.Falize (compensates Régis Coeurderoy)	30h+15h	5 Credits	1q	x	x
O LCPME2003	Business plan of the creation of a company (in French)	Frank.Janssen	30h+15h	5 Credits	2q		x
O LCPME2004	Advanced seminar on Enterpreneurship (in French)	Roxane.DeHoe (compensates Frank Janssen) Frank.Janssen	30h+15h	5 Credits	2q	x	x

⊠ *Prerequisite CPME courses*

Students who have not taken management courses during their previous studies must enroll in LCPME2000.

O LCPME2000	Venture creation financement and management I	Olivier.Giacomin Paul.Vanzeveren	30h+15h	5 Credits	1q	x	

MAJOR IN BUSINESS RISKS AND OPPORTUNITIES

As with most of the Master's degree programmes in civil engineering, the objective of this major is to introduce students to the basic principles of business management.

O Mandatory	⊠ Optional
△ Courses not taught during 2016-2017	⊘ Periodic courses not taught during 2016-2017
⊕ Periodic courses taught during 2016-2017	Activity with requisites

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

This major may not be taken at the same time as the major in small and medium sized business creation. The class FSA2240 is not included in this major for GCE students. Students selecting this major may take 16-20 credits among the following courses:

De 16 à 20 credits parmi

						Year 1	Year 2
⊠ LFSA2140	Elements of law for industry and research	Fernand.Devisscher Werner.Derijcke Benedicte.Inghels	30h	3 Credits	1q	x	x
⊠ LFSA2230	Introduction to management and to business economics	Benoit.Gailly Vincent.Reuter (compensates Benoît Gailly)	30h+15h	4 Credits	2q	x	x
⊠ LFSA1290	Introduction to financial and accounting management	Andre.Nsabimana (compensates Gerrit Sarens) Gerrit.Sarens	30h+15h	4 Credits	2q	x	x
⊠ LFSA2202	Ethics and ICT	Axel.Gosseries Maxime.Lambrecht (compensates Olivier Pereira) Olivier.Pereira	30h	3 Credits	2q	x	x
⊠ LFSA2245	Environment and business	Thierry.Brechet	30h	3 Credits	1q	x	x
⊠ LFSA2210	Organisation and human resources	John.Cultiaux	30h	3 Credits	2q	x	x

⊠ *Alternative to the major in business risks and opportunities for computer science students*

Computer science students who have already taken courses in this field while pursuing their Bachelor's degree may choose between 16-20 credits from the courses offered in the management minor for computer sciences.

ELECTIVE COURSES

ELECTIVE COURSES

Students round out their programme with elective courses. Students may select these courses from the courses offered in science programmes or the medical programme at UCL or FTW/KULeuven provided they been approved by an advisor-member of the programme commission for chemistry and applied physics (FYKI). Specifically, courses offered as majors in the Master's degree programme in chemical and materials engineering may also be taken as elective courses. Students should especially consider courses offered as part of the Master's degree programmes in physical, electrical, mechanical and biomedical engineering

O Mandatory	⊠ Optional
△ Courses not taught during 2016-2017	⊘ Periodic courses not taught during 2016-2017
⊕ Periodic courses taught during 2016-2017	Activity with requisites

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

⊠ *Company internships (10 credits)*

Students enrolling in a 5 credit internship coupled with the graduation project (LFSA 2996) must round out their programme with a 5 credit course approved by the programme commission.
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 FSA 2996 course.

					Year 1	Year 2
⊠ LFSA2995	Company Internship	Jean-Pierre.Raskin	30h	10 Credits	1 + 2q	x	x
⊠ LFSA2996	Company Internship			5 Credits	1 + 2q	x	x
⊠ LFSA2351A	Group dynamics	Piotr.Sobieski (coord.) Vincent.Wertz (coord.)	15h+30h	3 Credits	1q	x	x
⊠ LFSA2351B	Group dynamics	Piotr.Sobieski (coord.) Vincent.Wertz (coord.)	15h+30h	3 Credits	2q	x	x

⊠ *Language courses*

Students may take a maximum of 3 credits except for students who have chosen the management or CPME majors.
max=3 credits parmi

⊠ LALLE2500	Professional development seminar German	Caroline.Klein Ann.Rinder (coord.)	30h	3 Credits	1 + 2q	x	x
⊠ LALLE2501	Professional development seminar-German	Caroline.Klein Ann.Rinder (coord.)	30h	5 Credits	1 + 2q	x	x
⊠ LESPA2600	Vocational Induction Seminar - Spanish (B2.2/C1)	Paula.Lorente (coord.)	30h	3 Credits	1q	x	x
⊠ LESPA2601	Vocational Induction Seminar - Spanish (B2.2/C1)	Paula.Lorente (coord.)	30h	5 Credits	1q	x	x
⊠ LNEER2500	Professional development seminar: Dutch - intermediate level	Isabelle.Demeulenaere (coord.) Mariken.Smit	30h	3 Credits	1 ou 2q	x	x
⊠ LNEER2600	Professional development seminar: Dutch - upper-intermediate level	Isabelle.Demeulenaere (coord.)	30h	3 Credits	1 ou 2q	x	x

⊠ *Human sciences*

Students may take a maximum of 6 credits except for students who have chosen the management or CPME majors.
max=6 credits parmi

⊠ *Other courses*

⊠ LFSA2212	Innovation classes	Pierre.Latteur Benoit.Macq Benoit.Raucent	30h+15h	5 Credits	1q	x	x

Course prerequisites

A document entitled en-prerequis-2016-kima2m.pdf specifies the activities (course units - CU) with one or more pre-requisite(s) within the study programme, that is the CU whose learning outcomes must have been certified and for which the credits must have been granted by the jury before the student is authorised to sign up for that activity.

These activities are identified in the study programme: their title is followed by a yellow square.

As the prerequisites are a requirement of enrolment, there are none within a year of a course.

The prerequisites are defined for the CUs for different years and therefore influence the order in which the student can enrol in the programme's CUs.

In addition, when the panel validates a student's individual programme at the beginning of the year, it ensures the consistency of the individual programme:

- It can change a prerequisite into a corequisite within a single year (to allow studies to be continued with an adequate annual load);
- It can require the student to combine enrolment in two separate CUs it considers necessary for educational purposes.

For more information, please consult regulation of studies and exams.

The programme's courses and learning outcomes

For each UCL training programme, a reference framework of learning outcomes specifies the competences expected of every graduate on completion of the programme. You can see the contribution of each teaching unit to the programme's reference framework of learning outcomes in the document "In which teaching units are the competences and learning outcomes in the programme's reference framework developed and mastered by the student?"

The document is available by clicking this link after being authenticated with UCL account.

KIMA2M - Information

Admission

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

A student with no major in applied chemistry and physics from UCL, nor any option deemed equivalent, shall submit an application to the Faculty of applied sciences, including a detailed past curriculum (courses and grades by year). Engineering Bachelors are exempted from this procedure, if they have a minor in applied chemistry and physics from UCL, or an option deemed equivalent. The Faculty, after consulting the Applied chemistry and physics diploma committee, will decide as to the applicant's admissibility, pursuant to rules relative to links between degrees. Moreover, the Faculty can propose a customized curriculum, by drawing on the volume of elective courses of the KIMA curriculum and, if necessary, up to 15 additional credits. For some students (e.g. bachelors in industrial engineering), the Faculty might require an additional year of studies prior to the Master's, corresponding to 60 credits of the major in applied chemistry and physics.

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University Bachelors

Diploma	Special Requirements	Access	Remarks
UCL Bachelors			
Bachelor in engineering	Major or minor in applied chemistry and physics	Direct access	
Bachelor in engineering		Access with additional training	Students who have neither majored nor minored in the field of their civil engineering Master's degree, must submit a written application in which they list their detailed course curriculum (list of course work and marks year by year) to the programme commission. The jury will then suggest a programme in keeping with the student's previous course of study with the possible addition of a maximum of 15 supplemental credits.
Bachelor in chemical sciences Bachelier en sciences physiques Bachelier en sciences mathématiques Bachelier en sciences biologiques Bachelier en sciences géographiques, orientation générale Bachelier en sciences de l'ingénieur, orientation bioingénieur	Minor in applied chemical and physical engineering	Access with additional training	The jury may admit candidates with excellent academic records and training on the basis of their written application provided that they integrate a maximum of 60 additional credits into their Master's degree programme. A minor in engineering sciences (Applied chemistry and physics) is considered an advantage for candidates seeking this type of admission
Others Bachelors of the French speaking Community of Belgium			
Bachelor in engineering	With specific options in former institution related to applied chemistry and physics	Direct access	
Bachelor in engineering		Access with additional training	Students with a Bachelor's degree in engineering sciences (with a focus on chemical

			and materials engineering) who have not taken the equivalent of a minor in applied chemistry and physics must submit a written application to the chemical and materials engineering programme commission in which they list their detailed course curriculum (list of course work and marks year by year). The jury will suggest a programme in keeping with the student's previous course of study with the possible addition of a maximum of 15 supplemental credits.
Bachelor in chemistry, physics, mathematics, biology or geography Bachelor in bio-engineering	With specific options in former institution related to applied chemistry and physics	Access with additional training	The jury may admit candidates with excellent academic records and training on the basis of their written application provided that they integrate a maximum of 60 additional credits into their Master's degree programme. A minor in engineering sciences (applied chemistry and physics) is considered an advantage for candidates seeking this type of admission.
Bachelors of the Dutch speaking Community of Belgium			
Bachelor in bio-engineering	With specific options in former institution related to applied chemistry and physics	Direct access	
Bachelor in bio-engineering		Access with additional training	Students who have no specialisation in chemical and materials engineering must submit a written application to the programme commission in chemical and materials engineering in which they list their detailed course curriculum (list of course work and marks year by year). The jury will suggest a programme in keeping with the student's previous course of study with the possible addition of a maximum of 15 supplemental credits.
Bachelor's degree equivalent to one of those required from graduates of the French-speaking community	With specific options in former institution related to applied chemistry and physics	Access with additional training	Students without a Bachelor's degree in engineering sciences (with a focus on chemical and materials engineering) must submit a written application to EPL in which they list their detailed course curriculum (list of course work and marks year by year). The jury will determine whether the student may be admitted (based solely on the common Bachelor's degree training for engineering sciences with a focus on chemical and materials engineering) and their decision will be in keeping with the rules pertaining to bridge years. When necessary, the jury may suggest a programme in keeping with the student's previous course of study with the possible addition of a

			maximum of 15 supplemental credits.
Foreign Bachelors			
Bachelor in bio-engineering	Bachelors from the Cluster network	Direct access	Conditions imposed on UCL engineering Bachelor.
Bachelor in bio-engineering	Other institutions	Access with additional training	Students will submit a written application for admission to EPL in which they list their detailed course curriculum (list of course work and marks year by year). The jury will determine whether the candidate may be admitted according to the regulations. Where necessary the jury may suggest a programme in keeping with the student's previous course of study with the possible addition of a maximum of 15 supplemental credits.

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Non university Bachelors

Diploma	Access	Remarks
> Find out more about links to the university		
> BA en sciences industrielles - type long	Accès au master moyennant ajout de maximum 60 crédits d'enseignements supplémentaires obligatoires au programme. Voir 'Module complémentaire'	Type long

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Holders of a 2nd cycle University degree

Diploma	Special Requirements	Access	Remarks
"Licenciés"			
Engineers, bioengineers, graduates in chemistry, physics, mathematics, biology or geography, all of these being considered equivalent to the corresponding Bachelor's degree		Direct access	
Masters			
Master in engineering		Direct access	

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Holders of a non-University 2nd cycle degree

Diploma	Access	Remarks
> Find out more about links to the university		

> MA en sciences de l'ingénieur industriel (toutes finalités) > MA en sciences industrielles (toutes finalités)	Accès direct au master moyennant ajout éventuel de 15 crédits max	Type long

Adults taking up their university training

> See the website Valorisation des acquis de l'expérience

It is possible to gain admission to all masters courses via the validation of professional experience procedure.

Personalized access

Reminder : all Masters (apart from Advanced Masters) are also accessible on file.

Students may submit an application for admission to the Louvain School of Engineering in which they list their detailed course curriculum (list of course work and marks year by year). The School in collaboration with the relevant programme commission will determine whether the student may be admitted and their decision will respect the programme rules. When necessary, they may suggest an individualised programme consisting of a part of the elective courses in the relevant Master's degree programme in civil engineering with the possible addition of a maximum of 15 supplemental credits.

The School in collaboration with the relevant programme commission will determine whether the student may be admitted and their decision will respect the programme rules. When necessary, the jury may suggest a programme in keeping with the student's previous course of study with the possible addition of a maximum of 15 supplemental credits.

Admission and Enrolment Procedures for general registration

Specific procedures :

A student with no major in applied chemistry and physics from UCL, nor any option deemed equivalent, shall submit an application to the Faculty of applied sciences, including a detailed past curriculum (courses and grades by year). Engineering Bachelors are exempted from this procedure, if they have a minor in applied chemistry and physics from UCL, or an option deemed equivalent. The Faculty, after consulting the Applied chemistry and physics diploma committee, will decide as to the applicant's admissibility, pursuant to rules relative to links between degrees. Moreover, the Faculty can propose a customized curriculum, by drawing on the volume of elective courses of the KIMA curriculum and, if necessary, up to 15 additional credits. For some students (e.g. bachelors in industrial engineering), the Faculty might require an additional year of studies prior to the Master's, corresponding to 60 credits of the major in applied chemistry and physics.

Teaching method

A variety of teaching methods

The teaching methods used in the Master's degree programme in chemical and materials engineering are in keeping with those used in the Bachelor's degree programme in engineering sciences: active learning, an equal mix of group work and individual work, and emphasis on the development of non-technical skills. An important characteristic of the programme is the immersion of students in the research laboratories of the professors who teach in the programme (lab work, case studies, projects and theses), which allows students to learn cutting edge methods used in their field and to learn from the questioning process inherent in research. In addition, there is an optional 10 credit internship carried out over at least 9 months in a research centre or company that allows motivated students to get experience in the professional world.

Diverse learning situations

Students are exposed to a variety of pedagogies: lectures, projects, exercise and problem-solving sessions, case studies, experimental laboratories, computer simulations, educational software, internships in industry or research, factory visits, graduation trips, individual or group work, seminars given by visiting scientists. This variety of pedagogies helps students to build their knowledge in an iterative and progressive manner all the while developing their independence, organisational and time management skills as well as their ability to communicate.

Interdisciplinary Methods

The Master's degree in chemical and materials engineering is by its very nature interdisciplinary because it serves as an interface between chemistry and physics. It has an interdisciplinary foundation, which provides students with an introduction the large array of applications used in applied physics and chemistry and training through practical work and cutting edge research as well as major courses in chemistry and material technologies: polymers and macromolecules, inorganic materials and processes, materials mechanics, chemical engineering, nanotechnologies and environmentalism and sustainable development. The programme is open to biotechnology with majors in biomaterials and bioprocesses as well as to business management with majors in management and small and medium sized business creation. The programme is composed of a significant number of classes such as PHYS (or PHY), CHIM (or CHM), BIOL, INMA, MECA, ELEC, BRNA and BIR, which shows that the programme is open and interdisciplinary. Finally, the programme allows students to select up to 40 credits of elective courses from the medical and science programmes and up to 6 credits of classes in the humanities and social sciences, which allow students to create a personalised programme of study.

Evaluation

The evaluation methods comply with the regulations concerning studies and exams. More detailed explanation of the modalities specific to each learning unit are available on their description sheets under the heading "Learning outcomes evaluation method".

Student work is evaluated according to University rules (see the rules for evaluating coursework and exams) namely written and oral exams, laboratory exams, individual or group work, public presentations of projects and theses defences. Details about evaluation methods for each teaching unit are explained by the professors at the beginning of the semester.

For more information on evaluation methods, students may consult the relevant evaluation descriptions.

Mobility and/or Internationalisation outlook

Since its creation, the Louvain School of Engineering (EPL) has participated in diverse exchange programs that were put into place at the European level and beyond.

Possible trainings at the end of the programme

Accessible specialised Master's degrees

The Master's degree in nanotechnology and the Master's degree in nuclear engineering are natural extensions of the programme.

Accessible doctoral degrees

The Master's degree programme in chemistry and materials engineering also prepares students for doctoral programmes. Programme professors are members of doctoral programmes such as CHIM (molecular, supramolecular and functional chemistry), MAIN (materials, interfaces and nanotechnologies) and GEPROC (process engineering). These programmes are suitable for students who would like to continue their studies at the doctoral level.

UCL Master's degrees (about 60) are accessible to UCL Master's degree holders

For example:

- The Master's degree (120) in sciences and environmental management and the Master's degree (60) in sciences and environmental management (automatic admission with possible complementary coursework)
- Different Master's degree programmes in management (automatic admission based on written application): see this list
- The Master's degree (60) in information and communication at Louvain-la-Neuve or the Master's degree (60) in information and communication at Mons

Contacts

Curriculum Managment

Entite de la structure FYKI

Acronyme	**FYKI**
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 (SST)
Faculté	Ecole Polytechnique de Louvain (EPL)
Commission de programme	Commission de programme - Ingénieur civil en chimie et sciences des matériaux et ingénieur civil physicien (FYKI)

Academic Supervisor : Christian BAILLY

Jury

Président du Jury : Jean-Didier LEGAT
Secrétaire du Jury : Luc PIRAUX

Usefull Contacts

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