KIMA2M
2017 - 2018

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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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 I, 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.
> Major in Polymers and macro-molecules  [ en-prog-2017-kima2m-ikima223o.html ]
> Major in Mechanics of materials  [ en-prog-2017-kima2m-ikima224o.html ]
> Major in Biomaterials  [ en-prog-2017-kima2m-ikima225o.html ]
> Major in Nanotechnology  [ en-prog-2017-kima2m-ikima233o.html ]
> Major in small and medium sized business creation  [ en-prog-2017-kima2m-ikima230o.html ]
> Major in business risks and opportunities  [ en-prog-2017-kima2m-ikima231o.html ]
> Elective courses  [ en-prog-2017-kima2m-ikima937o.html ]

KIMA2M Detailed programme

Programme by subject

CORE COURSES [35.0]

- ○ Mandatory
- △ Courses not taught during 2017-2018
- ○ Optional
- ◊ Periodic courses taught during 2017-2018
- □ Activity with requisites

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)

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
<th>Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>LKIMA2990</td>
<td>Graduation project/End of studies project</td>
<td>26</td>
<td></td>
</tr>
<tr>
<td>LMAPR2011</td>
<td>Molecules and materials analysis</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>LTECO2100</td>
<td>Questions of religious sciences: Biblical readings</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td>LTECO2200</td>
<td>Questions of religious sciences: reflections about Christian faith</td>
<td>15</td>
<td></td>
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<tr>
<td>LTECO2300</td>
<td>Questions of religious sciences: questions about ethics</td>
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For students who did their bachelor at UCL
The student shall select

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<td>Questions of religious sciences: Biblical readings</td>
<td>15</td>
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<tr>
<td>LTECO2200</td>
<td>Questions of religious sciences: reflections about Christian faith</td>
<td>15</td>
<td></td>
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<tr>
<td>LTECO2300</td>
<td>Questions of religious sciences: questions about ethics</td>
<td>15</td>
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</table>

Transversal skills and professional contacts

If the student takes the internship LFSA2995 the maximum authorized credits are 26
De 3 à 21 credits parmi
### PROFESSIONAL FOCUS [30.0]

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.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Instructor(s)</th>
<th>Credits</th>
<th>Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>LMAPR2013</td>
<td>Physical Chemistry for Metals and Ceramics</td>
<td>Pascal Jacques</td>
<td>5</td>
<td>1 q</td>
</tr>
<tr>
<td>LMAPR2014</td>
<td>Physics of Functional Materials</td>
<td>Xavier Gonze, Luc Piraux, Gian-Marco Rignanese</td>
<td>5</td>
<td>1 q</td>
</tr>
<tr>
<td>LMAPR2019</td>
<td>Polymer Science and Engineering</td>
<td>Sophie Demoustier, Alain Jonas, Evelyne Van Ruymbeke</td>
<td>5</td>
<td>1 q</td>
</tr>
<tr>
<td>LMAPR2430</td>
<td>Industrial processes for the production of base chemicals</td>
<td>Juray De Wilde</td>
<td>5</td>
<td>1 q</td>
</tr>
<tr>
<td>LMAPR2481</td>
<td>Deformation and fracture of materials</td>
<td>Thomas Pardoen</td>
<td>5</td>
<td>1 q</td>
</tr>
<tr>
<td>LMAPR2647</td>
<td>Sustainable treatment of industrial and domestic waste: Fundamentals</td>
<td>Olivier Françoisse, Patricia Luis Alconero (coord.), Olivier Noiset, Benoit Stenuit</td>
<td>5</td>
<td>1 q</td>
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</tbody>
</table>
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.

Major in chemical and materials

- Major in chemical and environmental engineering
- Major in inorganic materials and processes
- Major in Polymers and macro-molecules
- Major in Mechanics of materials
- Major in Biomaterials
- Major in nanotechnology

Major in small and medium sized business creation

- Major in small and medium sized business creation
- Major in business risks and opportunities
- Elective courses

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.

Required courses (15 credits)

- LMAPR2118 Fluid-fluid separations
- LMAPR2330 Reactor Design
- LMAPR2648 Sustainable treatment of industrial and domestic waste: Case studies

Recommended courses

- LINMA1510 Linear Control
- LINMA2300 Analysis and control of distributed parameter systems
- LMAPR2320 Advanced Reactor and Separation Technologies for the Production of Base Chemicals and Polymers

De 20 à 30 credits parmi

Year

1

2

Students have to take in priority LINMA1510 if they didn’t follow it during Bachelor. If they have already taken it they can follow LINMA2300. min=5 credits parmi
### Elective courses

**max=10 credits parmi**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
<th>Year</th>
<th>Period</th>
</tr>
</thead>
<tbody>
<tr>
<td>LBIRC2102A</td>
<td>Organic Analysis II - partim A</td>
<td>5</td>
<td>30h</td>
<td>2q</td>
</tr>
<tr>
<td>LENV2007</td>
<td>Renewable energies</td>
<td>4</td>
<td>30h</td>
<td>1q</td>
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<tr>
<td>LENV2101</td>
<td>Sociétés, populations, environnement, développement: problématiques et approches interdisciplinaires</td>
<td>6</td>
<td>45h</td>
<td>1q</td>
</tr>
<tr>
<td>LFSA2245</td>
<td>Environment and business</td>
<td>3</td>
<td>30h</td>
<td>1q</td>
</tr>
<tr>
<td>LINMA1702</td>
<td>Applied mathematics : Optimization I</td>
<td>5</td>
<td>30h</td>
<td>2q</td>
</tr>
<tr>
<td>LMAPR2020</td>
<td>Materials Selection</td>
<td>5</td>
<td>30h</td>
<td>2q</td>
</tr>
<tr>
<td>LMAPR2141</td>
<td>Metals Processing and Recycling</td>
<td>5</td>
<td>30h+30h</td>
<td>2q</td>
</tr>
<tr>
<td>LMECA2645</td>
<td>Major technological hazards in industrial activity.</td>
<td>3</td>
<td>30h</td>
<td>2q</td>
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</tbody>
</table>
### 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.

<table>
<thead>
<tr>
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<th>Instructor(s)</th>
<th>Credits</th>
<th>Period</th>
</tr>
</thead>
<tbody>
<tr>
<td>LMAPR2141</td>
<td>Metals Processing and Recycling</td>
<td>Philippe Henry, Joris Proost</td>
<td>5</td>
<td>2q</td>
</tr>
<tr>
<td>LMAPR2642</td>
<td>Crystallographic and microstructural characterisation of materials</td>
<td>Hosni Idrissi, Pascal Jacques</td>
<td>5</td>
<td>1q</td>
</tr>
<tr>
<td>LMAPR2672</td>
<td>Sintered materials and surface treatments</td>
<td>Jean-Pierre Erauw, Pascal Jacques (coord.) Joris Proost</td>
<td>5</td>
<td>2q</td>
</tr>
<tr>
<td>LKULH2013</td>
<td>Phase equilibria in inorganic materials and processes</td>
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<tr>
<td>LMAPR2420</td>
<td>High performance metallic materials</td>
<td>Pascal Jacques, Aude Simar</td>
<td>5</td>
<td>2q</td>
</tr>
<tr>
<td>LMAPR2482</td>
<td>Plasticity and metal forming</td>
<td>Laurent Delannay, Thomas Pardoen</td>
<td>5</td>
<td>2q</td>
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</tbody>
</table>

**Required courses**

**Optional courses**

**Mandatory**

△ Courses not taught during 2017-2018

★ Periodic courses taught during 2017-2018

Activity with requisites

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De 20 à 30 credits parmi
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.

Mandatory

Optional

Courses not taught during 2017-2018

Periodic courses taught during 2017-2018

Activity with requisites

De 20 à 30 credits parmi

Required courses

- LMAPR2016  Project in Polymer Science  Charles-André Fustin  Alain Jonas  0h+45h  5 Credits  2q  

Polymer science complements

- LCHM2261  Polymer Chemistry and Physico-Chemistry  Jean-François Gohy  Alain Jonas  45h+15h  5 Credits  1q  

Macromolecular bio and nanotechnology

- LCHM2170  Introduction to protein biotechnology  Pierre Morsonne  Patrice Soumillion  22.5h +7.5h  3 Credits  1q  

- LMAPR2012  Macromolecular Nanotechnology  Sophie Demoisier  Karine Glinel  (compensates Bernard Nysten)  Karine Glinel  Jean-François Gohy  Bernard Nysten (coord.)  45h+15h  5 Credits  2q  

Polymer materials engineering

- LMAPR2010  Polymer Materials  Christian Bailly  Bernard Nysten  Evelyne Van Ruymbeke (compensates Bernard Nysten)  45h+15h  5 Credits  1q  

- LMAPR2018  Rheometry and Polymer Processing  Christian Bailly  Evelyne Van Ruymbeke  30h +22.5h  5 Credits  2q  

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

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Faculty</th>
<th>Credits</th>
<th>Period</th>
<th>Prerequisites</th>
</tr>
</thead>
<tbody>
<tr>
<td>LMAPR2018</td>
<td>Rheometry and Polymer Processing</td>
<td>Christian Bailly, Evelyne Van Ruymbeke</td>
<td>5</td>
<td>2q</td>
<td></td>
</tr>
<tr>
<td>LMAPR2020</td>
<td>Materials Selection</td>
<td>Christian Bailly, Thomas Pardoen</td>
<td>5</td>
<td>2q</td>
<td></td>
</tr>
<tr>
<td>LMAPR2482</td>
<td>Plasticity and metal forming</td>
<td>Laurent Delannay, Thomas Pardoen</td>
<td>5</td>
<td>2q</td>
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<tbody>
<tr>
<td>LMECA2141</td>
<td>Rheology</td>
<td>Vincent Legat, Evelyne Van Ruymbeke</td>
<td>5</td>
<td>1q</td>
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<tr>
<td>LMECA2640</td>
<td>Mechanics of composite materials</td>
<td>Issam Doghri</td>
<td>5</td>
<td>2q</td>
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<tbody>
<tr>
<td>LMECA1120</td>
<td>Introduction to finite element methods.</td>
<td>Vincent Legat</td>
<td>5</td>
<td>2q</td>
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<tr>
<td>LGCV1022</td>
<td>Mechanics of structures</td>
<td>Pierre Latteur</td>
<td>5</td>
<td>1q ou 2q</td>
<td></td>
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<tr>
<td>LMECA2520</td>
<td>Calculation of planar structures</td>
<td>Issam Doghri</td>
<td>5</td>
<td>2q</td>
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<td>High performance metallic materials</td>
<td>Pascal Jacques, Aude Simar</td>
<td>5</td>
<td>2q</td>
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<tr>
<td>LMECA2860</td>
<td>Welding</td>
<td>Pascal Jacques, Aude Simar</td>
<td>5</td>
<td>1q</td>
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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.

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<thead>
<tr>
<th>Course</th>
<th>Credits</th>
<th>Year</th>
<th>Activities</th>
</tr>
</thead>
<tbody>
<tr>
<td>LGBIO2030</td>
<td>5</td>
<td>1q</td>
<td>Mandatory</td>
</tr>
<tr>
<td>LGBIO2020</td>
<td>5</td>
<td>2q</td>
<td>Mandatory</td>
</tr>
<tr>
<td>LBIR1321</td>
<td>3</td>
<td>1q</td>
<td>Optional</td>
</tr>
<tr>
<td>LBIO1335</td>
<td>3</td>
<td>1q</td>
<td>Optional</td>
</tr>
<tr>
<td>LEOLEC2560</td>
<td>5</td>
<td>2q</td>
<td>Periodic</td>
</tr>
<tr>
<td>LMAPR2012</td>
<td>5</td>
<td>2q</td>
<td>Periodic</td>
</tr>
<tr>
<td>LIRC2101A</td>
<td>4</td>
<td>1q</td>
<td>Activity</td>
</tr>
<tr>
<td>LIRC2108</td>
<td>5</td>
<td>2q</td>
<td>Activity</td>
</tr>
<tr>
<td>LGBIO2020</td>
<td>5</td>
<td>1q</td>
<td>Activity</td>
</tr>
<tr>
<td>LGBIO1114</td>
<td>5</td>
<td>2q</td>
<td>Activity</td>
</tr>
<tr>
<td>LMAPR2010</td>
<td>5</td>
<td>1q</td>
<td>Activity</td>
</tr>
<tr>
<td>LMAPR2018</td>
<td>5</td>
<td>2q</td>
<td>Activity</td>
</tr>
<tr>
<td>LMAPR2631</td>
<td>5</td>
<td>2q</td>
<td>Activity</td>
</tr>
</tbody>
</table>

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
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.

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

Mandatory
Courses not taught during 2017-2018
Periodic courses taught during 2017-2018
Activity with requisites

Optional
Periodic courses not taught during 2017-2018

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

| Course Code | Course Title | Instructor(s) | Credits | Hours | Times
|-------------|--------------|---------------|---------|-------|-------|
| LMAPR2015  | Physics of Nanostructures | Jean-Christophe Charlier, Xavier Gonze, Aurélien Lherbier (compensates Xavier Gonze), Aurélien Lherbier (compensates Jean-Christophe Charlier), Luc Piraux | 5 Credits | 37.5h + 22.5h | 1q
| LMAPR2451  | Atomistic and nanoscopic simulations | Jean-Christophe Charlier, Xavier Gonze, Aurélien Lherbier (compensates Jean-Christophe Charlier), Gian-Marco Rignanese | 5 Credits | 30h + 30h | 2q
| LMAPR2471  | Transport phenomena in solids and nanostructures | Jean-Christophe Charlier, Aurélien Lherbier (compensates Jean-Christophe Charlier), Luc Piraux | 5 Credits | 30h + 30h | 2q
| LPHY2273  | Cryophysique et questions spéciales de supraconductivité | Vincent Bayot, Luc Piraux | 5 Credits | 45h + 15h | 1q

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.

| Course Code | Course Title | Instructor(s) | Credits | Hours | Times
|-------------|--------------|---------------|---------|-------|-------|
| LELEC2541  | Advanced Transistors | Vincent Bayot (coord.), Denis Flandre, Jean-Pierre Raskin | 5 Credits | 30h + 30h | 2q
| LELEC2550  | Special electronic devices | Vincent Bayot (coord.), Denis Flandre, Laurent Francis, Jean-Pierre Raskin | 5 Credits | 30h + 30h | 1q
| LELEC2710  | Nanoelectronics | Vincent Bayot (coord.), Denis Flandre, Laurent Francis, Jean-Pierre Raskin | 5 Credits | 30h + 30h | 1q

Micro and nano-engineering

| Course Code | Course Title | Instructor(s) | Credits | Hours | Times
|-------------|--------------|---------------|---------|-------|-------|
| LELEC2560  | Micro and Nanofabrication Techniques | Laurent Francis, Benoit Hackens, Jean-Pierre Raskin | 5 Credits | 30h + 30h | 2q
| LELEC2895  | Design of micro and nanosystems | Denis Flandre, Laurent Francis (coord.), Thomas Pardoen, Jean-Pierre Raskin | 5 Credits | 30h + 30h | 1q
<table>
<thead>
<tr>
<th>Code</th>
<th>Course Title</th>
<th>Lecturers</th>
<th>Credits</th>
<th>2q</th>
<th>3q</th>
</tr>
</thead>
<tbody>
<tr>
<td>LMAPR2012</td>
<td>Macromolecular Nanotechnology</td>
<td>Sophie Demoustier, Karine Glinel (Bernard Nysten), Jean-François Gohy</td>
<td>5</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>LMAPR2631</td>
<td>Surface Analysis</td>
<td>Arnaud Delcorte, Bernard Nysten</td>
<td>5</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
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).

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

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

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Instructor(s)</th>
<th>Credits</th>
<th>Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>LCPME2001</td>
<td>Entrepreneurship Theory (in French)</td>
<td>Frank Janssen</td>
<td>5</td>
<td>1q x</td>
</tr>
<tr>
<td>LCPME2002</td>
<td>Managerial, legal and economic aspects of the creation of a company (in French)</td>
<td>Yves De Cordt, Marine Falize</td>
<td>5</td>
<td>1q x</td>
</tr>
<tr>
<td>LCPME2003</td>
<td>Business plan of the creation of a company (in French)</td>
<td>Frank Janssen</td>
<td>5</td>
<td>2q x</td>
</tr>
<tr>
<td>LCPME2004</td>
<td>Advanced seminar on Enterpreneurship (in French)</td>
<td>Roxane De Hoe (compensates Frank Janssen)</td>
<td>5</td>
<td>2q x</td>
</tr>
</tbody>
</table>

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**Prerequisite CPME courses**

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

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Instructor(s)</th>
<th>Credits</th>
<th>Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>LCPME2000</td>
<td>Venture creation financement and management I</td>
<td>Yves De Rongé, Olivier Giacomin</td>
<td>5</td>
<td>1q x</td>
</tr>
</tbody>
</table>
### 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.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Lecturer(s)</th>
<th>Credits</th>
<th>Periods</th>
</tr>
</thead>
<tbody>
<tr>
<td>LFSA1290</td>
<td>Introduction to financial and accounting management</td>
<td>André Nsabimana (compensates Gerrit Sarens) Gerrit Sarens</td>
<td>4</td>
<td>2q</td>
</tr>
<tr>
<td>LFSA2140</td>
<td>Elements of law for industry and research</td>
<td>Werner Derijcke Bénédicte Inghels Christophe Lazaro</td>
<td>3</td>
<td>1q</td>
</tr>
<tr>
<td>LFSA2210</td>
<td>Organisation and human resources</td>
<td>John Cultiaux</td>
<td>3</td>
<td>2q</td>
</tr>
<tr>
<td>LFSA2230</td>
<td>Introduction to management and to business economics</td>
<td>Benoit Gailly</td>
<td>4</td>
<td>2q</td>
</tr>
<tr>
<td>LFSA2245</td>
<td>Environment and business</td>
<td></td>
<td>3</td>
<td>1q</td>
</tr>
</tbody>
</table>

**One course between**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Lecturer(s)</th>
<th>Credits</th>
<th>Periods</th>
</tr>
</thead>
<tbody>
<tr>
<td>LFSA2202</td>
<td>Ethics and ICT</td>
<td>Axel Gossieres Olivier Pereira</td>
<td>3</td>
<td>2q</td>
</tr>
<tr>
<td>LLMS2280</td>
<td>Business Ethics and Compliance Management</td>
<td>Carlos Desmet</td>
<td>5</td>
<td>1q</td>
</tr>
</tbody>
</table>

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**

- LFSA1290 Introduction to financial and accounting management  
  - André Nsabimana (compensates Gerrit Sarens) Gerrit Sarens  
  - 30h+15h  
  - 4 Credits  
  - 2q

- LFSA2140 Elements of law for industry and research  
  - Werner Derijcke Bénédicte Inghels Christophe Lazaro  
  - 30h  
  - 3 Credits  
  - 1q

- LFSA2210 Organisation and human resources  
  - John Cultiaux  
  - 30h  
  - 3 Credits  
  - 2q

- LFSA2230 Introduction to management and to business economics  
  - Benoit Gailly  
  - 30h+15h  
  - 4 Credits  
  - 2q

- LFSA2245 Environment and business  
  - 30h  
  - 3 Credits  
  - 1q

**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

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Responsible</th>
<th>Credits</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>LFSA2995</td>
<td>Company Internship</td>
<td>Jean-Pierre Raskin</td>
<td>10</td>
<td>1 + 2q</td>
</tr>
<tr>
<td>LFSA2996</td>
<td>Company Internship</td>
<td></td>
<td>5</td>
<td>1 + 2q</td>
</tr>
<tr>
<td>LMECA2711</td>
<td>Quality management and control</td>
<td>Nicolas Bronchart</td>
<td>5</td>
<td>2q</td>
</tr>
</tbody>
</table>

### Compétences transversales et contact avec l'entreprise

L'étudiant choisit minimum 3 crédits parmi un stage, un ou plusieurs cours de l'option "Enjeux de l'entreprise", l'option "CPME", une UE d'activité professionnelle liée à la discipline min=3 credits parmi

### Internship

- **Internship**
  - LFSA2995: Company Internship
    - Jean-Pierre Raskin
    - 30h
    - 10 Credits
  - LFSA2996: Company Internship
    - 5 Credits
    - 1 + 2q

### Professional integration activity specific to the program

- **Professional integration activity specific to the program**
  - LMECA2711: Quality management and control
    - Nicolas Bronchart
    - 30h+30h
    - 5 Credits
    - 2q

### Communication

L'étudiant choisit maximum 8 crédits visant le développement de ses compétences de communication max=8 credits parmi

### Languages

Students may select from any language course offered at the ILV. Special attention is placed on the following seminars in professional development:

- **Languages**
  - LALLE2500: Professional development seminar German
    - Caroline Klein
    - Ann Rinder (coord.)
    - 30h
    - 3 Credits
    - 1 + 2q
  - LALLE2501: Professional development seminar-German
    - Caroline Klein
    - Ann Rinder (coord.)
    - 5 Credits
    - 1 + 2q
  - LIESPA2600: Vocational Induction Seminar - Spanish (B2.2/C1)
    - Paula Lorente Fernandez (coord.)
    - 30h
    - 3 Credits
    - 1q
  - LIESPA2601: Vocational Induction Seminar - Spanish (B2.2/C1)
    - Paula Lorente Fernandez (coord.)
    - 5 Credits
    - 1q
  - LNEER2500: Seminar of Entry to professional life in Dutch - Intermediate level
    - Isabelle Demeulenaere (coor.)
    - Mariken Smit
    - 30h
    - 3 Credits
    - 1 ou 2q
  - LNEER2600: Seminar of entry to professional life in Dutch - Upper-Intermediate level
    - Isabelle Demeulenaere (coor.)
    - 30h
    - 3 Credits
    - 1 ou 2q

### Group dynamics

- **Group dynamics**
  - LFSA2351A: Group dynamics
    - Piotr Sobieski (coord.)
    - Vincent Wertz (coord.)
    - 15h+30h
    - 3 Credits
    - 1q
  - LFSA2351B: Group dynamics
    - Piotr Sobieski (coord.)
    - Vincent Wertz (coord.)
    - 15h+30h
    - 3 Credits
    - 2q

### Autre UE non disciplinaires

L'étudiant peut proposer maximum 8 crédits d'ouverture vers d'autres disciplines (maximum un cours BEST ou des UE hors EPL).
max=8 credits parmi
Course prerequisites

A document entitled en-prerequis-2017-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.
### Admission

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

This programme is taught in English with no prerequisite in French. The student is supposed to have at least a B2 level in the European Framework of Reference.

- University Bachelors
- Non university Bachelors
- Holders of a 2nd cycle University degree
- Holders of a non-University 2nd cycle degree
- Adults taking up their university training
- Personalized access

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### University Bachelors

<table>
<thead>
<tr>
<th>Diploma</th>
<th>Special Requirements</th>
<th>Access</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>UCL Bachelors</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bachelor in Engineering</td>
<td></td>
<td>Direct access</td>
<td>Students who have neither major nor minor in the field of their civil engineering Master's degree may have an adapted master programme.</td>
</tr>
</tbody>
</table>

### Others Bachelors of the French speaking Community of Belgium

<table>
<thead>
<tr>
<th>Diploma</th>
<th>Special Requirements</th>
<th>Access</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bachelor in engineering</td>
<td></td>
<td>Direct access</td>
<td>Students with a Bachelor's degree in engineering sciences who have not taken the equivalent of a minor in the field of their civil engineering master degree may have an adapted master programme.</td>
</tr>
</tbody>
</table>

### Bachelors of the Dutch speaking Community of Belgium

<table>
<thead>
<tr>
<th>Diploma</th>
<th>Special Requirements</th>
<th>Access</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bachelor in engineering</td>
<td></td>
<td>Direct access</td>
<td>Students who have no specialisation in the field of their civil engineering master degree may have an adapted master programme with up to 60 additional credits.</td>
</tr>
</tbody>
</table>

### Foreign Bachelors

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### Non university Bachelors

<table>
<thead>
<tr>
<th>Diploma</th>
<th>Access</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>UCL</td>
<td></td>
<td>&gt; Find out more about links to the university</td>
</tr>
</tbody>
</table>

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### Holders of a 2nd cycle University degree

<table>
<thead>
<tr>
<th>Diploma</th>
<th>Special Requirements</th>
<th>Access</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>&quot;Licenciés&quot;</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Masters

<table>
<thead>
<tr>
<th>Master in engineering</th>
<th>Direct access</th>
</tr>
</thead>
</table>

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**Holders of a non-University 2nd cycle degree**

<table>
<thead>
<tr>
<th>Diploma</th>
<th>Access</th>
<th>Remarks</th>
</tr>
</thead>
</table>

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**Adults taking up their university training**

> See the website [Valorisation des acquis de l'expérience](https://uclouvain.be/en/study/inscriptions/futurs-etudiants.html)

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

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**Personalized access**

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

The first step of the admission procedure requires to submit an application online : [https://uclouvain.be/en/study/inscriptions/futurs-etudiants.html](https://uclouvain.be/en/study/inscriptions/futurs-etudiants.html)

Selection criteria are summarized here.

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**Admission and Enrolment Procedures for general registration**
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 Management

Entity
Structure entity: SST/EPL/FYKI
Denomination (FYKI)
Faculty: Louvain School of Engineering (EPL)
Sector: Sciences and Technology (SST)
Acronym: FYKI
Postal address: Place Sainte Barbe 2 - bte L5.02.02 1348 Louvain-la-Neuve
Tel: +32 (0)10 47 24 - Fax: +32 (0)10 47 40

Academic Supervisor
- Christian BAILLY

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

Usefull Contacts
- Mme: vinciane.gandibleux@uclouvain.be (Tel: 010 47 96 23)