At Louvain-la-Neuve - 120 credits - 2 years - Day schedule - In English
Dissertation/Graduation Project: YES - Internship: optional
Activities in English: YES - Activities in other languages: YES
Activities on other sites: NO
Main study domain: Sciences de l'ingénieur et technologie
Organized by: Louvain School of Engineering (EPL)
Programme acronym: MAP2M - Francophone Certification Framework: 7

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Introduction

This Master’s degree programme develops the necessary knowledge and expertise for mathematical engineering:

• the design, analysis and implementation of mathematical models for the engineering of the complex systems of the industrial sector and the elaboration of effective strategies to optimise their performance;
• the implementation of theoretical and methodological tools in all areas of engineering sciences as well as in other fields such as economics, finance, environmental and life sciences.

Your profile

You

• have solid knowledge of mathematics
• are seeking an engineering programme with a focus on applied mathematics
• want access to engineering jobs (in manufacturing and services companies) or to the areas of life sciences, environment or finance;
• want to take advantage of the most recent research advances in your area of specialisation.

Your future job

Mathematical engineers are present in all industrial sectors: industrial chemistry, pharmaceutical and food industries, electronics and telecommunications, energy, metallurgy, aeronautics, civil engineering, mass distribution, banking or consulting services, nanotechnologies and medical technology.

They play a role in research and development, oversee production or management and work in marketing and sales (of high tech products).

We find them in departments of finance, computer science, training and quality control, in the public sector, higher education and in the Minister of equipment and transport (www.fabi.be)

Your programme

This Master’s degree programme offers you

• training in mathematical modelling in all areas of engineering sciences;
• flexibility when it comes to building your programme (major and elective courses compose more than half of the programme);
• the opportunity to complete part of the programme abroad or at KULeuven;
• via complementary modules, direct access to the second year Master’s degree programme in general statistics, biostatistics or actuarial sciences.
Learning outcomes

The Master in Mathematical Engineering is an interdisciplinary engineering master centred on the notion of mathematical model that has become instrumental in engineering sciences. Through a training in modelling, simulation and optimization (MSO), the students learn to design, analyse and implement mathematical models to be applied to complex systems of the industrial or corporate world, and to create efficient strategies to optimize their performance.

The mandatory courses provide the students with the necessary common skills in MSO. They span the domains of numerical analysis and scientific computing, dynamical systems, matrix computations, stochastic models, optimization models and methods.

Students are moreover offered several coherent lists of courses, called "options". Some of the options provide them with advanced skills in various branches of MSO: optimization and operations research, dynamical systems and control, and computational engineering. The other options pertain to data science, financial mathematics, cryptography & information security, biomedical engineering, business risks and opportunities, and launching of small and medium-sized companies.

Below is the competency framework common to all the engineering masters. The Master in Mathematical Engineering distinguishes itself by the interdisciplinary engineering scope of the competencies and by the fact that modelling-related competencies are strengthened by the strong MSO background acquired by the students.

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

1. demonstrating their mastery of a solid body of knowledge in basic engineering sciences allowing them to understand and solve problems related to their discipline
   1.1 Identify and use concepts, laws, and appropriate reasoning to solve a given problem
   1.2 Identify and use appropriate modelling and calculation tools to solve problems
   1.3 Verify the plausibility and confirm the validity of results
2. organise and carry out a procedure in applied engineering to develop a product (and/or service) that meets a need or solves a particular problem:
   2.1 Analyse the problem and formulate a corresponding specifications note
   2.2 Model the problem and design one or more original technical solutions that correspond to the specifications note
   2.3 Evaluate and classify the solutions in terms of all the criteria found in the specifications note: efficiency, feasibility, quality, ergonomics and environmental security
   2.4 Implement and test a solution through a mock up, a prototype or a numerical model
   2.5 Formulate recommendations to improve the operational character of the solution being studied
3. organise and carry out a research project in order to understand a physical phenomenon or a new problem relevant to the discipline
   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 or test hypotheses relating to the phenomenon being studied
   3.3 Write a cumulative 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
   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 team decisions and assume the consequences of these decisions (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.
   5.1 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 your arguments and adapt to the language of your interlocutors: technicians, colleagues, clients, superiors
   5.3 Communicate through graphs and diagrams: interpret a diagram, present project results, structure information
   5.4 Read and analyse different technical documents (rules, plans, specification notes)
   5.5 Draft documents that take into account contextual requirements and social conventions
   5.6 Make a convincing oral presentation using modern communication techniques.
6. Demonstrate that you are able to do your job with a professional conscience and in a socially responsible manner. Show that you can evaluate the socio-technical relevance of a solution before putting it into place.
   6.1 Rigorously apply the standards of your discipline (terminology, measurement units, quality standards and security)
   6.2 Find solutions that go beyond strictly technical issues by considering sustainable development and the socio-economic ethics of a project
   6.3 Demonstrate critical awareness of a technical solution in order to verify its robustness and minimize the risks that may occur during implementation.
   6.4 Evaluate oneself and independently develop necessary skills for “lifelong learning” in the field
Programme structure

The Master's degree programme consists of:

- A core curriculum (27 credits)
- The professional focus (30 credits).
- Elective courses (in the options, modules, courses of interest, or other courses if suitably motivated) to reach a total of at least 120 credits, including at least 20 credits among options 1 (optimization), 2 (systems) and 3 (computational engineering).

The graduation (or end of studies) project is normally carried out at the end of the programme (second year). Depending on the students' programme, he/she may take the courses in the first or second year if the course prerequisites allow it. This may be particularly useful for those students who pursue a portion of their studies outside of UCL as part of an exchange programme.

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 may count this activity toward their graduation requirements (but only if they respect programme rules). The student will also verify that he/she has obtained the minimum number of credits required for the approval of their diploma as well as for the approval of their major (in order to include their academic distinctions in the diploma supplement).

These types of programmes will be submitted for approval by the relevant Master's degree programme jury.

### MAP2M Programme

#### Detailed programme by subject

**CORE COURSES [27.0]**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
<th>Year</th>
<th>Activity with requisites</th>
<th>Teaching language</th>
</tr>
</thead>
<tbody>
<tr>
<td>LINMA2990</td>
<td>Graduation project/End of studies project</td>
<td>[30]</td>
<td>1</td>
<td>☑️</td>
<td>FR, EN, NL, DE</td>
</tr>
<tr>
<td>LEPL2020</td>
<td>Professional integration work</td>
<td>[2]</td>
<td>1</td>
<td>☑️</td>
<td>FR, EN, NL, DE</td>
</tr>
</tbody>
</table>

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

- Mandatory
- ☑️ Optional
- ☑️ Not offered in 2022-2023
- ☑️ Not offered in 2022-2023 but offered the following year
- ☑️ Offered in 2022-2023 but not the following year
- ☑️ Not offered in 2022-2023 or the following year
- ☑️ Open to incoming exchange students
- ☑️ Not open to incoming exchange students
- 🔒 Teaching language (FR, EN, ES, NL, DE, ...)

*LINMA2990:
The graduation project can be written and presented in French or English, in consultation with the supervisor. It may be accessible to exchange students by prior agreement between the supervisors and/or the two universities.*

*LEPL2020:
Les modules du cours LEPL2020 sont organisés sur les deux blocs annuels du master. Il est fortement recommandé à l'étudiant(e) de les suivre dès le bloc annuel 1, mais il elle ne pourra inscrire le cours que dans son programme de bloc annuel 2.*
PROFESSIONAL FOCUS [30.0]

- Mandatory
- Optional
- Not offered in 2022-2023
- Offered in 2022-2023 but not the following year
- Not offered in 2022-2023 or the following year
- Activity with requisites
- Open to incoming exchange students
- Not open to incoming exchange students
- Teaching language (FR, EN, ES, NL, DE, ...)

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

Year
1
2

Content:

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Instructor</th>
<th>Credits</th>
<th>Teaching Language</th>
</tr>
</thead>
<tbody>
<tr>
<td>LINMA2171</td>
<td>Numerical Analysis : Approximation, Interpolation, Integration</td>
<td>Pierre-Antoine Abis, Raphaël Jungers</td>
<td>[q1] [30h+22.5h] [5 Credits]</td>
<td>X</td>
</tr>
<tr>
<td>LINMA2370</td>
<td>Modelling and analysis of dynamical systems</td>
<td>Jean-Charles Delvenne</td>
<td>[q1] [30h+22.5h] [5 Credits]</td>
<td>X</td>
</tr>
<tr>
<td>LINMA2380</td>
<td>Matrix computations</td>
<td>Jean-Charles Delvenne, Raphaël Jungers</td>
<td>[q1] [30h+22.5h] [5 Credits]</td>
<td>X</td>
</tr>
<tr>
<td>LINMA2470</td>
<td>Stochastic modelling</td>
<td>Philippe Chevalier, Méhdi Madani, Raphaël Jungers</td>
<td>[q2] [30h+22.5h] [5 Credits]</td>
<td>X</td>
</tr>
<tr>
<td>LINMA2471</td>
<td>Optimization models and methods II</td>
<td>François Glineur, Geovani Nunes Grapiglia</td>
<td>[q1] [30h+22.5h] [5 Credits]</td>
<td>X</td>
</tr>
<tr>
<td>LINMA2710</td>
<td>Scientific computing</td>
<td>Pierre-Antoine Abis, Karl Mebergen, Anthony Papavasiliou</td>
<td>[q2] [30h+22.5h] [5 Credits]</td>
<td>X</td>
</tr>
</tbody>
</table>

OPTIONS

Dans la rubrique "Options du master ingénieur civil en mathématiques appliquées", l'étudiant·e sélectionne au moins 20 crédits parmi les trois premières options.

Dans la rubrique "Options et cours au choix en connaissances socio-économiques", l'étudiant·e valide une des deux options ou choisit obligatoirement au minimum 3 crédits parmi les cours au choix ou les cours de l’option en enjeux de l’entreprise.

Options et cours au choix en connaissances socio-économiques

- Business risks and opportunities [en-prog-2022-map2m-lmap233o]
- Major in small and medium sized business creation [en-prog-2022-map2m-lmap235o]
- Cours au choix en connaissances socio-économiques [en-prog-2022-map2m-lmap200o]

Others elective courses

- Others elective courses [en-prog-2022-map2m-lmap229o]
MAJORS FOR THE MASTER'S DEGREE IN MATHEMATICAL ENGINEERING

The student shall select at least 20 credits among the first three options

MAJOR IN OPTIMIZATION AND OPERATIONS RESEARCH ENGINEERING

This option provides the students with advanced skills in optimization models and methods (continuous or discrete, deterministic or stochastic) and introduces them to various domains of application, among which operations research (quantitative methods for decision making).

- Mandatory
- Optional
- Not offered in 2022-2023
- Not offered in 2022-2023 but offered the following year
- Offered in 2022-2023 but not the following year
- Not offered in 2022-2023 or the following year
- Open to incoming exchange students
- Not open to incoming exchange students
- Teaching language (FR, EN, ES, NL, DE, ...)

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

From 20 to 25 credits

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Instructor(s)</th>
<th>Credits</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>LINMA2415</td>
<td>Quantitative Energy Economics</td>
<td>Gauthier de Maere d'Aertrycke (compensates Anthony Papavasiliou)</td>
<td>5</td>
<td>French-friendly</td>
</tr>
<tr>
<td>LINMA2450</td>
<td>Combinatorial optimization</td>
<td>Julien Hendrickx Geovani Nunes Grapiglia</td>
<td>5</td>
<td>French-friendly</td>
</tr>
<tr>
<td>LINMA2460</td>
<td>Optimization : Nonlinear programming</td>
<td>Geovani Nunes Grapiglia</td>
<td>5</td>
<td>French-friendly</td>
</tr>
<tr>
<td>LINMA2491</td>
<td>Operational Research</td>
<td>Mehdi Madani (compensates Anthony Papavasiliou)</td>
<td>5</td>
<td>French-friendly</td>
</tr>
<tr>
<td>LINMA2345</td>
<td>Game theory</td>
<td>Matthew Philippe (compensates Raphaël Jungers)</td>
<td>5</td>
<td>French-friendly</td>
</tr>
</tbody>
</table>
MAJOR IN SYSTEMS AND CONTROL ENGINEERING

This option provides students with advanced skills in the modelling and analysis of dynamical systems and in the design of control laws, with applications in biological systems and ecological and epidemiological processes in particular.

- **Mandatory**
- **Optional**
- △ Not offered in 2022-2023
- ㅇ Not offered in 2022-2023 but offered the following year
- ㅇ Offered in 2022-2023 but not the following year
- △ ㅇ Not offered in 2022-2023 or the following year
- Activity with requisites
- ㅇ Open to incoming exchange students
- ㅇ Not open to incoming exchange students
- Teaching language (FR, EN, ES, NL, DE, ...)

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

From 20 to 30 credits

### Content:

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Instructor(s)</th>
<th>Credits</th>
<th>Language</th>
<th>Semester</th>
<th>Credits</th>
<th>Language</th>
</tr>
</thead>
<tbody>
<tr>
<td>LGBIO2060</td>
<td>Modelling of biological systems</td>
<td>Philippe Lefèvre</td>
<td>5</td>
<td>EN</td>
<td>q1</td>
<td>[30h+30h]</td>
<td>French-friendly</td>
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<tr>
<td>LINMA2300</td>
<td>Analysis and control of distributed parameter systems</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LINMA2361</td>
<td>Nonlinear dynamical systems</td>
<td>Pierre-Antoine Absil, Estelle Massart</td>
<td>5</td>
<td>EN</td>
<td>q1</td>
<td>[30h+22.5h]</td>
<td>French-friendly</td>
</tr>
<tr>
<td>LINMA2671</td>
<td>Advanced control and applications</td>
<td>Julien Hendrickx</td>
<td>5</td>
<td>EN</td>
<td>q2</td>
<td>[30h+30h]</td>
<td>French-friendly</td>
</tr>
<tr>
<td>LINMA2875</td>
<td>System identification</td>
<td>Gianluca Bianchin</td>
<td>5</td>
<td>EN</td>
<td>q2</td>
<td>[30h+22.5h]</td>
<td>French-friendly</td>
</tr>
<tr>
<td>LINMA2510</td>
<td>Mathematical ecology</td>
<td>Eric Deleersnijder, Emmanuel Hanert, Thierry Van Effelterre</td>
<td>5</td>
<td>EN</td>
<td>q2</td>
<td>[30h+22.5h]</td>
<td>French-friendly</td>
</tr>
</tbody>
</table>
MAJOR IN COMPUTATIONAL ENGINEERING

This option provides students with advanced skills in modelling techniques and numerical simulation methods to analyse and solve various engineering problems.

- ☑ Mandatory
- ☀ Optional
- △ Not offered in 2022-2023
- ☑ Not offered in 2022-2023 but offered the following year
- ☀ Offered in 2022-2023 but not the following year
- △ ☑ Not offered in 2022-2023 or the following year

Activity with requisites
- ☑ Open to incoming exchange students
- ☀ Not open to incoming exchange students
- ☑ Teaching language (FR, EN, ES, NL, DE, ...)

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

From 20 to 25 credits

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Instructor(s)</th>
<th>Credits</th>
<th>Hours</th>
<th>Teaching Language</th>
<th>Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>LGCIV2041</td>
<td>Numerical analysis of civil engineering structures</td>
<td>Hadrien Rattez, João Saraiva Esteves, Pacheco De Almeida</td>
<td>4</td>
<td>[20h+15h]</td>
<td>☑ French-friendly</td>
<td>1</td>
</tr>
<tr>
<td>LINMA2720</td>
<td>Mathematical modelling of physical systems</td>
<td>Vincent Legat</td>
<td>☑</td>
<td>[30h+22.5h]</td>
<td>△</td>
<td>1</td>
</tr>
<tr>
<td>LMECA2170</td>
<td>Numerical Geometry</td>
<td>Philippe Chatelain, Christophe Craeye (coord.) Jean-François Remacle</td>
<td>5</td>
<td>[30h+30h]</td>
<td>☑</td>
<td>1</td>
</tr>
<tr>
<td>LMECA2300</td>
<td>Advanced Numerical Methods</td>
<td>Philippe Chatelain, Christophe Craeye (coord.) Jean-François Remacle</td>
<td>5</td>
<td>[30h+30h]</td>
<td>☑</td>
<td>1</td>
</tr>
</tbody>
</table>
### MAJOR IN DATA SCIENCE

This option proposes a selection of courses of statistics, data mining, algorithmics and data architectures that introduce the students to several facets of Data Science.

- **Mandatory**
- **Optional**
- △ Not offered in 2022-2023 but offered the following year
- ◆ Offered in 2022-2023 but not the following year
- △ ◆ Not offered in 2022-2023 or the following year
- Activity with requisites
- ✗ Open to incoming exchange students
- ★ Not open to incoming exchange students
- ● Teaching language (FR, EN, ES, NL, DE, ...)

**From 20 to 30 credits**

#### Content:

**Compulsory courses in data science**

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Instructor</th>
<th>Credits</th>
<th>Language</th>
<th>Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>LINMA2472</td>
<td>Algorithms in data science</td>
<td>Jean-Charles Delvenne (coord.) Gautier Krings (compensates Vincent Blondel)</td>
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<td>EN</td>
<td>Q1</td>
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</table>

**Elective courses in data science**

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Instructor</th>
<th>Credits</th>
<th>Language</th>
<th>Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>LELEC2870</td>
<td>Machine learning : regression, deep networks and dimensionality reduction</td>
<td>John Lee Michel Verleysen</td>
<td>5</td>
<td>EN</td>
<td>Q1</td>
</tr>
<tr>
<td>LINFO2145</td>
<td>Cloud Computing</td>
<td>Etienne Riviere</td>
<td>5</td>
<td>EN</td>
<td>Q1</td>
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<tr>
<td>LINFO2172</td>
<td>Databases</td>
<td>Siegfried Nijssen</td>
<td>6</td>
<td>EN</td>
<td>Q2</td>
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<tr>
<td>LINFO2262</td>
<td>Machine Learning :classification and evaluation</td>
<td>Thibault Helleputte (compensates Pierre Dupont)</td>
<td>5</td>
<td>EN</td>
<td>Q2</td>
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<tr>
<td>LINFO2364</td>
<td>Mining Patterns in Data</td>
<td>Siegfried Nijssen</td>
<td>5</td>
<td>EN</td>
<td>Q2</td>
</tr>
<tr>
<td>LINFO2275</td>
<td>Data mining &amp; decision making</td>
<td>Marco Saerens</td>
<td>5</td>
<td>EN</td>
<td>Q2</td>
</tr>
<tr>
<td>LSTAT2020</td>
<td>Statistical softwares and basic statistical programming</td>
<td>Céline Bugli (compensates Bernadette Govaerts)</td>
<td>4</td>
<td>EN</td>
<td>Q1</td>
</tr>
<tr>
<td>LDATS2360</td>
<td>Seminar in data management: basic</td>
<td>Céline Bugli</td>
<td>5</td>
<td>EN</td>
<td>Q1</td>
</tr>
<tr>
<td>LDATA2010</td>
<td>Information visualisation</td>
<td>John Lee</td>
<td>5</td>
<td>EN</td>
<td>Q1</td>
</tr>
</tbody>
</table>
The objective of this major is to introduce students to quantitative financial techniques and actuarial sciences by presenting deterministic and stochastic mathematical methods used in financial markets. The main subjects covered deal with the evaluation of financial assets and insurance products in continuous-time. Special attention is paid to numerical simulation methods. In addition, for students who will to enroll in the Master's degree programme in actuarial sciences, all the compulsory courses of the programme ACTU2M validated in this major will be valorized.

| Mandatory |
| Optional |
| △ Not offered in 2022-2023 |
| ◊ Not offered in 2022-2023 but offered the following year |
| ◊ Offered in 2022-2023 but not the following year |
| △ ◊ Not offered in 2022-2023 or the following year |
| Activity with requisites |
| ◊ Open to incoming exchange students |
| ◊ Not open to incoming exchange students |
| ❖ Teaching language (FR, EN, ES, NL, DE, ...) |

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

### From 15 to 20 credits

#### Content:

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Instructor</th>
<th>Semester</th>
<th>Credits</th>
<th>Hours</th>
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<tr>
<td>LINMA2725</td>
<td>Financial mathematics</td>
<td>Pierre Devolder</td>
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<td>5</td>
<td>30+22.5</td>
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<tr>
<td>LACTU2020</td>
<td>Fixed income mathematics</td>
<td>Pierre Devolder</td>
<td>q1</td>
<td>7</td>
<td>45+15</td>
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<tr>
<td>LACTU2030</td>
<td>LIFE INSURANCE</td>
<td>Donatien Hainaut</td>
<td>q2</td>
<td>7</td>
<td>45</td>
</tr>
<tr>
<td>LACTU2170</td>
<td>STOCHASTIC FINANCE</td>
<td>Donatien Hainaut</td>
<td>q2</td>
<td>5</td>
<td>30</td>
</tr>
</tbody>
</table>
MAJOR IN CRYPTOGRAPHY AND INFORMATION SECURITY

As with the Master’s degree engineering programmes in electricity, computer sciences and applied mathematics, this major provides students with the knowledge of fundamental algorithms and mathematics in order to better understand information security as well as the design and implementation of solutions for problems related to electronic circuits and information systems.

- Mandatory
- Optional
- △ Not offered in 2022-2023
- ☑ Not offered in 2022-2023 but offered the following year
- ☑ Offered in 2022-2023 but not the following year
- △ ☑ Not offered in 2022-2023 or the following year
- □ Activity with requisites
- ☑ Open to incoming exchange students
- ☑ Not open to incoming exchange students
- ■ Teaching language (FR, EN, ES, NL, DE, ...)

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

Content:

Elective courses

In order to validate this option INFO and MAP students have to take at least 20 credits and the ELEC, DATE and DATI students have to take at least 15 credits among:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Teaching Language</th>
<th>Credits</th>
<th>Year</th>
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</thead>
<tbody>
<tr>
<td>LELEC2760</td>
<td>Secure electronic circuits and systems</td>
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<td>5</td>
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<tr>
<td>LINFO2144</td>
<td>Secured systems engineering</td>
<td></td>
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<tr>
<td>LINFO2347</td>
<td>Computer system security</td>
<td></td>
<td>5</td>
<td>△</td>
</tr>
<tr>
<td>LINGI2348</td>
<td>Information theory and coding</td>
<td></td>
<td>5</td>
<td>△</td>
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<tr>
<td>LMAT2440</td>
<td>Number theory</td>
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<tr>
<td>LMAT2450</td>
<td>Cryptography</td>
<td></td>
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<tr>
<td>LELEC2770</td>
<td>Privacy Enhancing technology</td>
<td></td>
<td>5</td>
<td>△</td>
</tr>
<tr>
<td>LINFO2347</td>
<td>Computer system security</td>
<td></td>
<td>5</td>
<td>△</td>
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<tr>
<td>LINGI2348</td>
<td>Information theory and coding</td>
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<tr>
<td>LMAT2450</td>
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<tr>
<td>LELEC2770</td>
<td>Privacy Enhancing technology</td>
<td></td>
<td>5</td>
<td>△</td>
</tr>
</tbody>
</table>
MAJOR IN BIOMEDICAL ENGINEERING

The goal of this major is to train engineers who are capable of meeting the future technological challenges in the scientific and technical areas of biomedical engineering. This major provides students with basic knowledge of several areas of biomedical engineering such as bioinstrumentation, biomaterials, medical imaging, mathematical modelling, artificial organs and rehabilitation, and biomechanics. Through the collaboration between the Louvain School of Engineering and the School of Medicine, students benefit from an interdisciplinary programme where the art of engineering is applied to the complex and varied biomedical field.

- Mandatory
- Optional
- △ Not offered in 2022-2023 but offered the following year
- ⊘ Offered in 2022-2023 but not the following year
- △ ⊘ Not offered in 2022-2023 or the following year
- Activity with requisites
- Open to incoming exchange students
- ⊘ Not open to incoming exchange students
- [FR] Teaching language (FR, EN, ES, NL, DE, ...)

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

From 15 to 30 credits

- Content:

Elective courses in biomedical engineering

Students enrolled in this major must select a minimum of 15 credits among the following elective courses except for those students enrolled in the Master's degree programme in computer science and engineering who are required to take 20 credits.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Instructor(s)</th>
<th>Credits</th>
<th>Year</th>
<th>Open to Exchange Students</th>
</tr>
</thead>
<tbody>
<tr>
<td>LGBIO2010</td>
<td>Bioinformatics</td>
<td>Vincent Branders (compensates Pierre Dupont)</td>
<td>5</td>
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<tr>
<td>LGBIO2020</td>
<td>Bioinstrumentation</td>
<td>André Mouraux Michiel Verleysen</td>
<td>5</td>
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<tr>
<td>LGBIO2030</td>
<td>Biomaterials</td>
<td>Sophie Demoustier Christine Dupont</td>
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<tr>
<td>LGBIO2040</td>
<td>Biomechanics</td>
<td>Greet Kerckhofs</td>
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<tr>
<td>LGBIO2050</td>
<td>Medical Imaging</td>
<td>Greet Kerckhofs John Lee Benoît Maçq Frank Peeters</td>
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<tr>
<td>LGBIO2060</td>
<td>Modelling of biological systems</td>
<td>Philippe LeFebvre</td>
<td>5</td>
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<tr>
<td>LGBIO2072</td>
<td>Mathematical models in neuroscience</td>
<td>Frédéric Crevecoeur</td>
<td>5</td>
<td>1</td>
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</tr>
</tbody>
</table>
Students taking 30 credits in this module will be able to complete the Master in Statistics, Biostatistics orientation [120 credits] in one year. More information via the Secretariat of the School of Statistics, Biostatistics and Actuarial Sciences (LSBA): info-stat-actu@uclouvain.be

Complement to the major in financial mathematics

In addition, students who would like to enrol subsequently in the Master in Actuarial Sciences will be able to add value to all the compulsory courses in the ACTU2M programme that they will have validated in the financial mathematics option.

Module in Biostatistics and Technometry

Students taking 30 credits in this module will be able to complete the Master in Statistics, Biostatistics orientation [120 credits] in one year. More information via the Secretariat of the School of Statistics, Biostatistics and Actuarial Sciences (LSBA): info-stat-actu@uclouvain.be

Module in General Statistics and Mathematics

Students taking 30 credits in this module will be able to complete the Master in Statistics [120 credits] in one year. More information via the Secretariat of the School of Statistics, Biostatistics and Actuarial Sciences (LSBA): info-stat-actu@uclouvain.be
### Courses of Interest

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Tutor/Instructor</th>
<th>Credits</th>
<th>Language</th>
<th>Year</th>
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</thead>
<tbody>
<tr>
<td>LSTAT2110</td>
<td>Data Analysis</td>
<td>Johan Segers</td>
<td>[q1] 30h+7.5h</td>
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<tr>
<td>LSTAT2120</td>
<td>Linear models</td>
<td>Christian Hafer</td>
<td>[q1] 30h+7.5h</td>
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<tr>
<td>LSTAT2130</td>
<td>Introduction to Bayesian statistics</td>
<td>Philippe Lambert</td>
<td>[q2] 22.5h+7.5h</td>
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<tr>
<td>LSTAT2150</td>
<td>Nonparametric statistics: smoothings methods</td>
<td>Rainer von Sachs</td>
<td>[q1] 15h+5h</td>
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<tr>
<td>LSTAT2170</td>
<td>Times series</td>
<td>Rainer von Sachs</td>
<td>[q2] 30h+7.5h</td>
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<tr>
<td>LDATS2360</td>
<td>Seminar in data management: basic</td>
<td>Céline Bugli</td>
<td>[q1] 15h+10h</td>
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<tr>
<td>LECON2021</td>
<td>Economic Fluctuations and Foundations of Macro Policy</td>
<td>Grégoire de Walque (compensates David De la Croix)</td>
<td>[q2] 30h</td>
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<td>LECON2031</td>
<td>Applied Econometrics : Time Series</td>
<td>Francesca Monti</td>
<td>[q1] 30h+12h</td>
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<tr>
<td>LECON2033</td>
<td>Applied econometrics: Microeconometrics</td>
<td>Muriel Dejemeppe Bertrand Verheyden (compensates Muriel Dejemeppe)</td>
<td>[q1] 30h+12h</td>
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<tr>
<td>LELEC1360</td>
<td>TELECOMMUNICATIONS</td>
<td>Charles Wlame (compensates Luc Vandendorpe)</td>
<td>[q2] 30h+30h</td>
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<tr>
<td>LELEC2880</td>
<td>Estimation and communication theory</td>
<td>Jérôme Louveaux (co-ord.)</td>
<td>[q2] 30h+30h</td>
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<tr>
<td>LELEC2885</td>
<td>Image processing and computer vision</td>
<td>Christophe De Vleeschouwer (co-ord.) Laurent Jacques</td>
<td>[q1] 30h+30h</td>
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<tr>
<td>LELEC2900</td>
<td>Signal processing</td>
<td>Laurent Jacques François Rottenberg (compensates Luc Vandendorpe)</td>
<td>[q2] 30h+30h</td>
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<tr>
<td>LINGI2348</td>
<td>Information theory and coding</td>
<td>Jérôme Louveaux Benoît Macq Olivier Pereira</td>
<td>[q2] 30h+15h</td>
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<tr>
<td>LMAT1371</td>
<td>Probability Theory</td>
<td>Johan Segers</td>
<td>[q2] 30h+22.5h</td>
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<tr>
<td>LMAT2130</td>
<td>Partial differential equations</td>
<td>Heiner Olbermann</td>
<td>[q1] 30h+15h</td>
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<td>Partial differential equation : heat equation, brownian moves and numerical aspects</td>
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<td>[q2] 30h+15h</td>
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<tr>
<td>LMAT2460</td>
<td>Finite mathematics and combinatorial structures</td>
<td>Thomas Peters</td>
<td>[q1] 30h</td>
<td>5</td>
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<tr>
<td>LMECA1100</td>
<td>Deformable solid mechanics.</td>
<td>Issam Doghri</td>
<td>[q1] 30h+30h</td>
<td>5</td>
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<tr>
<td>LMECA1321</td>
<td>Fluid mechanics and transfer phenomena.</td>
<td>Vincent Legal Grégoire Winckelmanns</td>
<td>[q1] 30h+30h</td>
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<tr>
<td>LMECA2660</td>
<td>Numerical methods in fluid mechanics</td>
<td>Grégoire Winckelmann</td>
<td>[q2] 30h+30h</td>
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<tr>
<td>LMECA2771</td>
<td>Thermodynamics of irreversible phenomena.</td>
<td>Mitridas Papalexandris</td>
<td>[q2] 30h+30h</td>
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<tr>
<td>LELME2732</td>
<td>Robot modelling and control</td>
<td>Renaud Ronsse</td>
<td>[q2] 30h+30h</td>
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<tr>
<td>LSTAT2100</td>
<td>Discrete data analysis.</td>
<td>Cécile Adam (compensates Anouar El Ghouch)</td>
<td>[q2] 30h+7.5h</td>
<td>5</td>
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<tr>
<td>LDATS2350</td>
<td>Data Mining</td>
<td>Robin Van Gribecck</td>
<td>[q1] 15h+15h</td>
<td>5</td>
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<tr>
<td>LGCIV2056</td>
<td>Marine Hydrodynamics</td>
<td>Eric Deleersnijder</td>
<td>[q1] 30h+15h</td>
<td>5</td>
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<tr>
<td>LLSMS2034</td>
<td>Supply Chain Planning</td>
<td>Marc Foret Mathieu Van Vyve</td>
<td>[q2] 30h</td>
<td>5</td>
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<tr>
<td>LMAPR2018</td>
<td>Rheology</td>
<td>Evelyne Van Ruymbeke</td>
<td>[q2] 30h+30h</td>
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<tr>
<td>LGBIO2072</td>
<td>Mathematical models in neuroscience</td>
<td>Frédéric Grevecoeur</td>
<td>[q1] 30h+30h</td>
<td>5</td>
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</tr>
</tbody>
</table>
## OPTIONS ET COURS AU CHOIX EN CONNAISSANCES SOCIO-ÉCONOMIQUES [3.0]

### BUSINESS RISKS AND OPPORTUNITIES

- **Mandatory**
- **Optional**
- △ Not offered in 2022-2023
- ☉ Not offered in 2022-2023 but offered the following year
- ★ Offered in 2022-2023 but not the following year
- △ ★ Not offered in 2022-2023 or the following year
- □ Activity with requisites
- ♢ Open to incoming exchange students
- ☹ Not open to incoming exchange students
- 🇫🇷 Teaching language (FR, EN, ES, NL, DE, ...)

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

<table>
<thead>
<tr>
<th>Year</th>
<th>Content:</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>LEPL2211 Business issues introduction Benoît Gailly [q2] [30h] [3 Credits]</td>
</tr>
<tr>
<td>1</td>
<td>LEPL2212 Financial performance indicators André Nsabimana [q2] [30h+5h] [4 Credits]</td>
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<tr>
<td>1</td>
<td>LEPL2214 Law, Regulation and Legal Context Vincent Cassiers Werner Derycke [q1] [30h+5h] [4 Credits]</td>
</tr>
<tr>
<td>2</td>
<td>LEPL2210 Ethics and ICT Axel Gossières Olivier Pereira [q2] [30h] [3 Credits]</td>
</tr>
<tr>
<td>2</td>
<td>LLSMS2280 Business Ethics and Compliance Management Carlos Desmet [q1] [30h] [5 Credits]</td>
</tr>
</tbody>
</table>

### One course between

**From 3 to 5 credits**

- LEPL2210 Ethics and ICT
- LLSMS2280 Business Ethics and Compliance Management

### Cours en marketing

- MGEST1108 Marketing Nadia Sinigaglia [q2] [45h+20h] [6 Credits] | X | X |
- MLSMM2136 Trends in Digital Marketing Ingrid Poncin [q2] [30h] [5 Credits] | X | |
- MLSMM2134 e-Consumer Behavior Karine Charry [q2] [30h] [5 Credits] | | X |

### Cours en Sourcing and Procurement

- LLSMS2036 Supply Chain Procurement Constantin Blome, Antony Pauira (compensates Per Joakim Agrell) [q1] [30h] [5 Credits] | X | |
- LLSMS2038 Procurement Organisation and Scope Constantin Blome [q1] [30h] [5 Credits] | X | |
- LLSMS2037 Sourcing Strategy Constantin Blome Michael Henke [q1] [30h] [5 Credits] | 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.*
MAJOR IN SMALL AND MEDIUM Sized BUSINESS CREATION

Commune à la plupart des masters de l'EPL, cette option a pour objectif de familiariser l'étudiant·e avec les spécificités de l'entrepreneuriat et de la création d'entreprise afin de développer chez lui les aptitudes, connaissances et outils nécessaires à la création d'entreprise.

Cette option rassemble des étudiants de différentes facultés en équipes interdisciplinaires afin de créer un projet entrepreneurial. La formation interdisciplinaire en création d'entreprise (CPME) est une option qui s'étend sur 2 ans et s'intègre dans plus de 30 Masters de 9 facultés/écoles de l'UCLouvain. Le choix de l’option CPME implique la réalisation d’un mémoire interfacultaire (en équipe) portant sur un projet de création d’entreprise. L’accès à cette option, ainsi qu’à chacun des cours, est limité aux étudiant·es sélectionnés sur dossier. Toutes les informations sur www.uclouvain.be/cpme.

L'étudiant·e qui choisit de valider cette option doit sélectionner au minimum 20 crédits et au maximum 25 crédits. Cette option n'est pas accessible en anglais et ne peut être prise simultanément avec l'option « Enjeux de l'entreprise ».

- **Mandatory**
- **Optional**
- Δ Not offered in 2022-2023
- © Not offered in 2022-2023 but offered the following year
- ★ Offered in 2022-2023 but not the following year
- Δ★ Not offered in 2022-2023 or the following year
- ● Activity with requisites
- ● Open to incoming exchange students
- ● Not open to incoming exchange students
- ● Teaching language (FR, EN, ES, NL, DE, ...)

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

### Content:

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

| LCPME2001 | Théorie de l'entrepreneuriat | Frank Janssen | [q1] [30h+20h] [5 Credits] |
| LCPME2002 | Aspects juridiques, économiques et managériaux de la création d'entreprise | Yves De Cordt, Marine Falize | [q1] [30h+15h] [5 Credits] |
| LCPME2003 | Plan d'affaires et étapes-clés de la création d'entreprise | Frank Janssen | [q2] [30h+15h] [5 Credits] |
| LCPME2004 | Séminaire d'approfondissement en entrepreneuriat | Frank Janssen | [q2] [30h+15h] [5 Credits] |

#### Prerequisite CPME courses

*Student who have not taken management courses during their previous studies must enroll in LCPME2021.*

| LCPME2021 | Financer son projet | Yves De Rongé | [q2] [30h+15h] [5 Credits] |

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## COURS AU CHOIX EN CONNAISSANCES SOCIO-ÉCONOMIQUES

### Mandatory
- LFSA2995  Company Internship  Dimitri Lederer, Jean-Pierre Raskin  q1+q2  30h  10 Credits  x  x
- LFSA2212  Innovation classes  Benoît Maço, Jean-Pierre Raskin, Benoît Raucenct  q1  30h+15h  5 Credits  > French-friendly  x  x
- LINMA2360  Project in mathematical engineering  Pierre-Antoine Absil, Laurent Jacques (compensates Anthony Papavassiliou)  q1+q2  30h+22.5h  5 Credits  > French-friendly  x  x
- LINMA2120  Applied mathematics seminar  Pierre-Antoine Absil, Gianluca Bianchini, Frédéric Crevecoeur (coord.), Jean-Charles Delverne, François Ginier, Julien Hendrickx, Laurent Jacques, Raphaël Jungers, Estelle Massart (compensates Anthony Papavassiliou), Geovani Nunes Grapiglia  q1+q2  30h  5 Credits  > French-friendly  x  x
- LINMA2415  Quantitative Energy Economics  Gauthier de Maere d'Aertrycke (compensates Anthony Papavassiliou)  q2  30h+22.5h  5 Credits  > French-friendly  x  x
- LMECA2645  Major technological hazards in industrial activity.  Denis Dochain, Aude Simar  q2  30h  3 Credits  x  x
- LACTU2170  STOCHASTIC FINANCE  Donatien Hainaut  q2  30h  5 Credits  x  x
- LACTU2030  LIFE INSURANCE  Donatien Hainaut  q1  45h  7 Credits  x  x
- LLSMS2034  Supply Chain Planning  Marc Foret, Mathieu Van Vyve  q2  30h  5 Credits  x  x
- LGBIO2220  Industrial project in biomedical engineering  Sophie Demoustier, Philippe Lefèvre, Renaud Ronsse  q1+q2  30h+30h  5 Credits  > French-friendly  x  x
- LINFO2399  Industrial seminar in computer science  Yves Deville, Bernard Geubelle  q2  30h  3 Credits  > French-friendly  x  x
- LINFO2402  Open Source Project  q1+q2  10h  5 Credits  > French-friendly  x  x

### Optional
- LINFO2399  Industrial seminar in computer science  Yves Deville, Bernard Geubelle  q2  30h  3 Credits  > French-friendly  x  x
- LINFO2402  Open Source Project  q1+q2  10h  5 Credits  > French-friendly  x  x

### Not offered in 2022-2023
- LELEC2590  Seminars in electronics and communications  Denis Flandre, Isabelle Huynen, Jérôme Louiseaux  q2  30h  3 Credits  x  x
- LMECA2711  Quality management and control.  Nicolas Bronchart  q2  30h+30h  5 Credits  x  x
- LSTAT2380  Statistical consulting  Christian Ritter  q1+q2  30h  5 Credits  > French-friendly  x  x
- LSTAT2390  Applied statistics workshops  Catherine Legrand, Christian Ritter  q1+q2  15h  3 Credits  > French-friendly  x  x

### Not offered in 2022-2023 but offered the following year
- LSTAT2390  Applied statistics workshops  Catherine Legrand, Christian Ritter  q1+q2  15h  3 Credits  > French-friendly  x  x

### Not offered in 2022-2023 or the following year
- LELEC2590  Seminars in electronics and communications  Denis Flandre, Isabelle Huynen, Jérôme Louiseaux  q2  30h  3 Credits  x  x
## OTHERS ELECTIVE COURSES

**Content:**

Les étudiant·e·s peuvent également inscrire à leur programme tout cours faisant partie des programmes d'autres masters de l'EPL moyennant l'approbation du jury restreint.

**Languages**

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

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Coordinator(s)</th>
<th>Credits</th>
<th>Offered in 2022-2023</th>
<th>Offered in 2023</th>
<th>Offered in 2023 but not the following year</th>
<th>Offered in 2022-2023 but not the following year</th>
<th>Offered in 2022-2023 or the following year</th>
<th>Activity with requisites</th>
<th>Open to incoming exchange students</th>
<th>Not open to incoming exchange students</th>
<th>Open to incoming exchange students</th>
<th>Teaching language (FR, EN, ES, NL, DE, ...)</th>
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<tr>
<td>LALLE2500</td>
<td>Professional development seminar German</td>
<td>Caroline Klein (coord.)</td>
<td>[30h]</td>
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<td>Caroline Klein (coord.)</td>
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<td>LESPA2600</td>
<td>Vocational Induction Seminar - Spanish (B2.2/C1)</td>
<td>Rocio Cuberos Vicente Paula Lorente Fernandez (coord.)</td>
<td>[30h]</td>
<td>[3 Credits]</td>
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<td>✗</td>
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<td>FR, EN, ES, NL, DE, ...</td>
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<tr>
<td>LESPA2601</td>
<td>Vocational Induction Seminar - Spanish (B2.2/C1)</td>
<td>Rocio Cuberos Vicente Paula Lorente Fernandez (coord.)</td>
<td>[30h]</td>
<td>[5 Credits]</td>
<td>✗</td>
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<td>FR, EN, ES, NL, DE, ...</td>
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<tr>
<td>LNEER2500</td>
<td>Seminar of Entry to professional life in Dutch - Intermediate level</td>
<td>Marie-Laurence Lambrecht (coord.)</td>
<td>[30h]</td>
<td>[3 Credits]</td>
<td>✗</td>
<td>✗</td>
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<td>FR, EN, ES, NL, DE, ...</td>
</tr>
<tr>
<td>LNEER2600</td>
<td>Seminar of entry to professional life in Dutch - Upper-Intermediate level</td>
<td>Marie-Laurence Lambrecht (coord.)</td>
<td>[30h]</td>
<td>[3 Credits]</td>
<td>✗</td>
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**Group dynamics**

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Coordinator(s)</th>
<th>Credits</th>
<th>Offered in 2022-2023</th>
<th>Offered in 2023</th>
<th>Offered in 2023 but not the following year</th>
<th>Offered in 2022-2023 but not the following year</th>
<th>Offered in 2022-2023 or the following year</th>
<th>Activity with requisites</th>
<th>Open to incoming exchange students</th>
<th>Not open to incoming exchange students</th>
<th>Open to incoming exchange students</th>
<th>Teaching language (FR, EN, ES, NL, DE, ...)</th>
</tr>
</thead>
<tbody>
<tr>
<td>LEPL2351</td>
<td>Group dynamics - Q1</td>
<td>Delphine Ducarme Claude Oestges (coord.) Thomas Pardoen Benoît Raucent</td>
<td>[30h]</td>
<td>[3 Credits]</td>
<td>✗</td>
<td>✗</td>
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</tr>
<tr>
<td>LEPL2352</td>
<td>Group dynamics - Q2</td>
<td>Delphine Ducarme Claude Oestges (coord.) Thomas Pardoen Benoît Raucent</td>
<td>[30h]</td>
<td>[3 Credits]</td>
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<td>✗</td>
<td>✗</td>
<td>FR, EN, ES, NL, DE, ...</td>
</tr>
</tbody>
</table>

**Autres UEs hors-EPL**

L'étudiant·e peut choisir maximum 8 ects de cours hors EPL considérés comme non-disciplinaires par la commission de diplôme
Course prerequisites

The table below lists the activities (course units, or CUs) for which there are one or more prerequisites within the programme, i.e. the programme CU for which the learning outcomes must be certified and the corresponding credits awarded by the jury before registering for that CU.

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

Prerequisites and student’s annual programme

As the prerequisite is for CU registration purposes only, there are no prerequisites within a programme year. Prerequisites are defined between CUs of different years and therefore influence the order in which the student will be able to register for the programme’s CUs.

In addition, when the jury validates a student’s individual programme at the beginning of the year, it ensures its coherence, meaning that it may:

• require the student to combine registration in two separate CUs which it considers necessary from a pedagogical point of view.
• transform a prerequisite into a corequisite if the student is in the final year of a degree course.

For more information, please consult the Academic Regulations and Procedures.

# Prerequisities list

<table>
<thead>
<tr>
<th>Code</th>
<th>Course Title</th>
<th>Prerequisite(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>MLSMM2134</td>
<td>&quot;E-comportement du consommateur&quot;</td>
<td>MGEST1108</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• MGEST1108 - Marketing</td>
</tr>
<tr>
<td>MLSMM2136</td>
<td>&quot;Tendances en Digital Marketing&quot;</td>
<td>MGEST1108</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• MGEST1108 - Marketing</td>
</tr>
</tbody>
</table>

The programme’s courses and learning outcomes

For each UCLouvain training programme, a reference framework of learning outcomes specifies the the skills expected of every graduate on completion of the programme. Course unit descriptions specify targeted learning outcomes, as well as the unit’s contribution to reference framework of learning outcomes.
Access Requirements

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

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

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

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

SUMMARY

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

Specific access requirements

This programme is taught in English with no prerequisite in French. A certificate is required for the holders of a non-Belgian degree, see selection criteria of the access on the file.

University Bachelors

<table>
<thead>
<tr>
<th>Diploma</th>
<th>Special Requirements</th>
<th>Access</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>UCLouvain Bachelors</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>
<tr>
<td>Bachelor in Engineering</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Others Bachelors of the French speaking Community of Belgium</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>
<tr>
<td>Bachelor in Engineering</td>
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</tr>
<tr>
<td>Bachelors of the Dutch speaking Community of Belgium</td>
<td></td>
<td>Access with additional training</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>
<tr>
<td>Bachelor in Engineering</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Foreign Bachelors</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.</td>
</tr>
<tr>
<td>Bachelor in engineering</td>
<td>Bachelors degree of Cluster Institution</td>
<td></td>
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</tbody>
</table>
Bachelor in Engineering  

For others institutions  

Access based on application  

Non university Bachelors

> Find out more about links to the university

**Holdings 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**

| Master in Engineering    | Direct access        |                                 |                          |

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

**Access based on validation of professional experience**

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

**Access based on application**

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

The first step 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 ([epl-admission@uclouvain.be](mailto:epl-admission@uclouvain.be)).

**Admission and Enrolment Procedures for general registration**

Unconditional admission to a Master’s degree in Applied mathematics engineering is afforded to bachelors in engineering, with a major or minor in applied mathematics.

Admission to this Master’s via a customized curriculum is also afforded to bachelors of science (in particular mathematics and physics), bachelors in bioengineering, as well as bachelors in engineering with no major nor minor in applied mathematics, under the following conditions.

A student with no major nor minor in applied mathematics, nor a curriculum deemed equivalent, shall submit a résumé to the Applied mathematics diploma committee, who will propose a customized Master’s curriculum (drawing on the volume of elective courses, without any additional credits). The procedure mentioned in note 1 of the conditions of admission applies.

A student who is not a bachelor in engineering, shall submit a résumé to the Faculty of Applied sciences. If this application is accepted, the Faculty will propose a customized Master’s curriculum (15 additional credits and possibility part of the volume of elective courses, or else an additional year of studies). The procedure mentioned in note 2 of the conditions of admission applies.

In some cases, a student might have to follow both above-mentioned procedures (when not a bachelor in engineering and with no minor in applied mathematics). The procedures mentioned in notes 1 and 2 of the conditions of admission then apply.
Teaching method

Interdisciplinary methods

The Master’s degree programme in engineering and Applied Mathematics is by its very nature interdisciplinary because it consists of a wide range of major courses some of which are research-based (Cryptography and information security, biomedical engineering) and offered by other academic departments (financial mathematics); this naturally reinforces the interdisciplinary nature of the programme.

The programme aims to give students knowledge and skills in mathematical modelling that is used in all engineering disciplines as well as in other areas such as economics, environmental sciences or life sciences.

A final interdisciplinary aspect to the programme is the graduation project, which is frequently completed outside the department of mathematical engineering. The graduation project makes up half of the workload for the second year of the programme. It offers students the opportunity to work in-depth on a given subject and due to its size and context, introduces students to the engineering or research professions. This project may focus on a topic relating to an applied mathematics research cluster (or possibly in collaboration with an external industrial partner); or it may focus on subjects related to applied mathematics in other research clusters at the Louvain School of Engineering as well as the faculties of science, economics, management or actuarial sciences.

Diverse learning situations

The pedagogy used in the Master’s degree programme in engineering is similar to that in the Bachelor’s degree programme in engineering. Students are exposed to a variety of pedagogies: lectures, individual projects and small group work, exercise and problem-solving sessions, case studies, experimental laboratories, computer simulations, educational software, internships in industry or research, individual or group work, seminars given by external scientists.

These various learning situations develop students’ knowledge of their discipline in a way that is interdisciplinary and non-technical. They permit 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. Students have access to the newest information technology (materials, software, networks) during their studies.

For example, the Business Creation major has an interactive approach and promotes “problem-based learning”. Throughout the programme, students must work as part of multidisciplinary teams. The project has an interdisciplinary focus and groups of three students, ideally from different faculties, may collaborate on a business creation project.

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”.

Evaluation methods conform to the rules used to evaluate coursework and exams. Further details about the methods specific to each academic department may be found in their respective evaluation descriptions (“Evaluating students’ knowledge”).

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.

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

To obtain a passing grade, the marks received for the teaching units are offset by their respective credits.

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

The Master’s degree programme in engineering and Applied Mathematics satisfies the prerequisites for other Master’s degree programmes that may be obtained upon completion of an additional year:

1. Master [120] en sciences actuarielles (UCLouvain)

Students who take LINMA2725, LACTU2020, LACTU2030, LACTU2070 and at least 15 credits in the Complement to the major in financial mathematics (see “Elective courses”) will get direct access to the second year of the Master [120] en sciences actuarielles.

2. Master’s degree [120] in general economics (UCLouvain)

Students who take 30 credits in the Module en biostatistique et technométrie will be able to complete in one year the Master [120] en statistique, orientation biostatistique.

3. Master’s degree [120] in general statistics (UCLouvain)
Students who take 30 credits in the Module en statistique générale et mathématique will be able to complete in one year the Master en statistique, orientation générale.

Furthermore, most of the UCLouvain Master’s degree programmes (generally 60) are open to UCLouvain Master’s degree diploma holders. For example:
- Different Master’s degree programmes (60) 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

Doctoral degree programmes
Enrolment in a doctoral degree programme in engineering sciences is open to students holding a Master’s degree in civil engineering. The Institute ICTEAM is associated with several specialised doctoral schools in particular the school “Systems, Optimization, Control and Networks” (for details see https://uclouvain.be/sites/socn/).

Contacts

Curriculum Management

Entity
Structure entity: SST/EPL/MAP
Denomination: MAP
Faculty: Louvain School of Engineering (EPL)
Sector: Sciences and Technology (SST)
Acronym: MAP

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Academic supervisor: Julien Hendrickx

Jury
- Président du Jury: Claude Oestges
- Secrétaire du Jury: Julien Hendrickx

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