

**MAP2M**

2015 - 2016

## Master [120] in Mathematical 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 : **NO**Main study domain : **Sciences de l'ingénieur et technologie**Organized by: **Ecole Polytechnique de Louvain (EPL)**Programme code: **map2m** - Francophone Certification Framework: 7**Table of contents**

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## MAP2M - Introduction

### Introduction

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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 engineering complex systems for 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 sciences or daily life.

#### 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 advancement in the life sciences, environment, finance or economics;
- want to take advantage of the most recent research advances in your area of specialisation.

#### Your future job

Civil engineers are present in all industrial sectors: industrial chemistry, pharmaceutical and food industries, electronics and telecommunications, energy, metallurgy, aeronautics, design and 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](http://www.fabi.be))

#### Your programme

This Master's degree programme offers you

- training in mathematical modelling in all engineering sciences fields;
- flexibility when it comes to building your programme (major and elective courses compose more than half of the programme);
- the chance to complete part of the programme abroad or at KULeuven;
- automatic access to the second year Master's degree programme in economics, statistics or actuarial sciences.

## MAP2M - Teaching profile

### Learning outcomes

By enrolling in the Master's degree programme in Engineering and Applied Mathematics, students will acquire the necessary knowledge and expertise for mathematical engineering. Students will learn to design, analyse, and implement mathematical models for engineering complex systems in the industrial sector and to elaborate on effective strategies for optimising their performance.

During their training, students will acquire theoretical and methodological tools that are used in all the fields of engineering sciences as well as in other fields such as economics, finance, environmental sciences or daily life.

The Master's degree in Engineering and Applied Mathematics is characterised by the flexibility it offers students when it comes to their programme, half of which is composed of elective courses. In particular, a wide range courses, composed of twelve course modules (known as major course modules) are available, some of which focus on the fundamental disciplines of applied mathematics (optimisation and operational research, automatic and dynamic systems, discrete mathematics and computer science). Other modules focus on mathematical applications (such as financial mathematics, information and signal processing, biomedical engineering, cryptography and computer security, modelling and simulating physical phenomena, statistics). Finally, there are modules that deal with the economic sphere (management, economics, econometrics, small and medium sized business creation).

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

1. demonstrate mastery of a solid body of knowledge of the fundamentals of science in general and engineering sciences in particular, which will allow you to understand and solve problems relating to engineering:

- 1.1 Identify and implement concepts, laws, reasoning applicable to a given problem
- 1.2 Identify and use modelling and calculation tools to solve problems
- 1.3 Check the credibility of solutions to problems

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 a 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. Ideally you are able to communicate in one or more foreign language in addition to French

- 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 graphics 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 students' programme will consist of:

- a core curriculum (30 credits)
- professional specialisation (30 credits)
- one or more major courses or elective courses (see below)

The graduation project is normally conducted in the last year. However, students may, depending on their training, conduct this project in either the first or second year so long as they have completed the prerequisite courses. This is especially the case for students who have completed a portion of their studies abroad.

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 requested 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 commission.

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

### > Core curriculum for the Master's degree in Engineering and Applied Mathematics

[\[ en-prog-2015-map2m-lmap220t.html \]](#)

### > Professional focus [\[ en-prog-2015-map2m-lmap220s \]](#)

### Options courses

- > Major courses for the Master's degree in engineering and applied mathematics [\[ en-prog-2015-map2m-lmap902r.html \]](#)
  - > Major in optimisation and operational research [\[ en-prog-2015-map2m-lmap221o.html \]](#)
  - > Major in automatics and dynamical systems [\[ en-prog-2015-map2m-lmap222o.html \]](#)
  - > Major in discrete mathematics and computer science [\[ en-prog-2015-map2m-lmap223o.html \]](#)
  - > Major in financial mathematics [\[ en-prog-2015-map2m-lmap226o.html \]](#)
  - > Major in information and signal processing [\[ en-prog-2015-map2m-lmap233o.html \]](#)
  - > Major in biomedical engineering [\[ en-prog-2015-map2m-lmap230o.html \]](#)
  - > Major in cryptography and information security [\[ en-prog-2015-map2m-lmap234o.html \]](#)
  - > Major in modelling and simulation of physical phenomena [\[ en-prog-2015-map2m-lmap224o.html \]](#)
  - > Major in statistics [\[ en-prog-2015-map2m-lmap227o.html \]](#)
  - > Major in business risks and opportunities [\[ en-prog-2015-map2m-lmap231o.html \]](#)
  - > Major in economics and econometrics [\[ en-prog-2015-map2m-lmap225o.html \]](#)
  - > Major in small and medium sized business creation [\[ en-prog-2015-map2m-lmap232o.html \]](#)
- > Elective courses available to students enrolled in the Master's degree for engineering and applied mathematics [\[ en-prog-2015-map2m-lmap229o.html \]](#)

## MAP2M Detailed programme

### Programme by subject

#### CORE COURSES [30.0]

- Mandatory  
 Courses not taught during 2015-2016  
 Periodic courses taught during 2015-2016
- Optional  
 Periodic courses not taught during 2015-2016  
 Activity with requisites

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

Students may choose

|                                 |   |    |  |            |  | Year |   |
|---------------------------------|---|----|--|------------|--|------|---|
|                                 |   |    |  |            |  | 1    | 2 |
| <input type="radio"/> LINMA2990 | Graduation project/End of studies project | N. |  | 28 Credits |  |      | x |

#### Religion courses for students in natural sciences

Select 2 credits from among  
The student shall select

|                                    |  |                         |     |           |    |   |   |
|------------------------------------|--|-------------------------|-----|-----------|----|---|---|
| <input type="checkbox"/> LTECO2100 | Questions of religious sciences: Biblical readings                 | Hans Ausloos            | 15h | 2 Credits | 1q | x | x |
| <input type="checkbox"/> LTECO2200 | Questions of religious sciences: reflections about Christian faith | Dominique Martens       | 15h | 2 Credits | 2q | x | x |
| <input type="checkbox"/> LTECO2300 | Questions of religious sciences: questions about ethics            | Marcela Lobo Bustamante | 15h | 2 Credits | 1q | x | x |

#### PROFESSIONAL FOCUS [30.0]

- Mandatory  
 Courses not taught during 2015-2016  
 Periodic courses taught during 2015-2016
- Optional  
 Periodic courses not taught during 2015-2016  
 Activity with requisites

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

|                                 |  |  |               |           |    | Year |   |
|---------------------------------|--|--|---------------|-----------|----|------|---|
|                                 |  |  |               |           |    | 1    | 2 |
| <input type="radio"/> LINMA2171 | Numerical Analysis : Approximation, Interpolation, Integration | Pierre-Antoine Absil                             | 30h<br>+22.5h | 5 Credits | 1q | x    |   |
| <input type="radio"/> LINMA2370 | Modelling and analysis of dynamical systems                    | Jean-Charles Delvenne,<br>Denis Dochain (coord.) | 30h<br>+22.5h | 5 Credits | 1q | x    |   |
| <input type="radio"/> LINMA2380 | Matrix theory  | Paul Van Dooren                                  | 30h<br>+22.5h | 5 Credits | 1q | x    |   |
| <input type="radio"/> LINMA2470 | Stochastic modelling   | Philippe Chevalier                               | 30h<br>+22.5h | 5 Credits | 2q | x    |   |
| <input type="radio"/> LINMA2471 | Optimization models and methods                                | François Glineur                                 | 30h<br>+22.5h | 5 Credits | 1q | x    |   |

#### Elective course for the Applied Mathematics professional focus (5 credits)

Students may round out their programme by selecting one of the two courses below. If they have already taken these courses, they may choose another 5 credit course in the Master's degree programme in engineering and applied mathematics

|                                    |  |  |         |           |    |   |   |
|------------------------------------|--|--|---------|-----------|----|---|---|
| <input type="checkbox"/> LINMA1510 | Linear Control                                   | Denis Dochain  | 30h+30h | 5 Credits | 2q | x | x |
| <input type="checkbox"/> LINMA1731 | Stochastic processes : Estimation and prediction | Pierre-Antoine Absil,<br>Luc Vandendorpe<br>(coord.) | 30h+30h | 5 Credits | 2q | x | x |



## OPTIONS

Students may complete their programme with major and/or elective courses. They may select 60 credits from among the following courses:

### Major courses for the Master's degree in engineering and applied mathematics

- > Major in optimisation and operational research [ en-prog-2015-map2m-lmap221o ]
- > Major in automatics and dynamical systems [ en-prog-2015-map2m-lmap222o ]
- > Major in discrete mathematics and computer science [ en-prog-2015-map2m-lmap223o ]
- > Major in financial mathematics [ en-prog-2015-map2m-lmap226o ]
- > Major in information and signal processing [ en-prog-2015-map2m-lmap233o ]
- > Major in biomedical engineering [ en-prog-2015-map2m-lmap230o ]
- > Major in cryptography and information security [ en-prog-2015-map2m-lmap234o ]
- > Major in modelling and simulation of physical phenomena [ en-prog-2015-map2m-lmap224o ]
- > Major in statistics [ en-prog-2015-map2m-lmap227o ]
- > Major in business risks and opportunities [ en-prog-2015-map2m-lmap231o ]
- > Major in economics and econometrics [ en-prog-2015-map2m-lmap225o ]
- > Major in small and medium sized business creation [ en-prog-2015-map2m-lmap232o ]
- > Elective courses available to students enrolled in the Master's degree for engineering and applied mathematics [ en-prog-2015-map2m-lmap229o ]

## MAJOR COURSES FOR THE MASTER'S DEGREE IN ENGINEERING AND APPLIED MATHEMATICS

Students may select one or more of the major courses listed below.

### MAJOR IN OPTIMISATION AND OPERATIONAL RESEARCH

The objective of this major is to introduce students to certain advanced methods and concepts in optimisation (using whole variables or non-linear functions, stochastic processes) and familiarise them with applications including operational research (quantitative methodology in decision-making processes).

● Mandatory

△ Courses not taught during 2015-2016

⊕ Periodic courses taught during 2015-2016

⊗ Optional

⊖ Periodic courses not taught during 2015-2016

■ Activity with requisites

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

The student shall select

De 15 à 30 credits parmi

|             |  |  |               |           |    | Year |   |
|-------------|--|--|---------------|-----------|----|------|---|
|             |  |  |               |           |    | 1    | 2 |
| ⊗ LINMA2360 | <a href="#">Project in mathematical engineering</a>  | Pierre-Antoine Absil,<br>François Glineur<br>(coord.),<br>Yurii Nesterov,<br>Paul Van Dooren | 30h<br>+22.5h | 5 Credits | 2q | x    | x |
| ⊗ LINMA2415 | <a href="#">Quantitative Energy Economics</a>        | Anthony Papavasiliou   | 30h<br>+22.5h | 5 Credits | 2q | x    | x |
| ⊗ LINMA2450 | <a href="#">Combinatorial optimization</a>           | Jean-Charles Delvenne,<br>Julien Hendrickx   | 30h<br>+22.5h | 5 Credits | 1q | x    | x |
| ⊗ LINMA2460 | <a href="#">Optimization : Nonlinear programming</a> | Yurii Nesterov   | 30h<br>+22.5h | 5 Credits | 2q | x    | x |
| ⊗ LINMA2491 | <a href="#">Operational Research</a>                 | Anthony Papavasiliou   | 30h<br>+22.5h | 5 Credits | 2q | x    | x |
| ⊗ LINMA2345 | <a href="#">Game theory</a>                          | Raphaël Jungers  | 30h<br>+22.5h | 5 Credits | 2q | x    | x |





**MAJOR IN AUTOMATICS AND DYNAMICAL SYSTEMS**

The objective of this major is to familiarise students with certain advanced concepts in automatics and dynamic systems theory, which includes the identification of dynamic systems, the synthesis of automatic control systems and the implementation of numerical regulation as well as the modelling and analysis of dynamic non-linear phenomena.

● Mandatory

△ Courses not taught during 2015-2016

⊕ Periodic courses taught during 2015-2016

⊗ Optional

⊖ Periodic courses not taught during 2015-2016

■ Activity with requisites

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

The student shall select  
De 15 à 30 credits parmi

Year

1 2

**⊗ Recommended courses in automatics and dynamic systems**

Students may select a minimum of 10 credits from among the following:

|             |                                       |  |               |           |    |   |   |
|-------------|---------------------------------------|--|---------------|-----------|----|---|---|
| ⊗ LINMA2120 | Applied mathematics research seminar  | Pierre-Antoine Absil,<br>Vincent Blondel,<br>Philippe Chevalier,<br>Jean-Charles Delvenne<br>(coord.),<br>François Glineur,<br>Julien Hendrickx,<br>Raphaël Jungers,<br>Philippe Lefèvre,<br>Yurii Nesterov,<br>Paul Van Dooren,<br>Mathieu Van Vyve | 30h           | 3 Credits | 2q | X | X |
| ⊗ LINMA2360 | Project in mathematical engineering   | Pierre-Antoine Absil,<br>François Glineur<br>(coord.),<br>Yurii Nesterov,<br>Paul Van Dooren   | 30h<br>+22.5h | 5 Credits | 2q | X | X |
| ⊗ LINMA2361 | Nonlinear dynamical systems           | Pierre-Antoine Absil   | 30h<br>+22.5h | 5 Credits | 1q | X | X |
| ⊗ LINMA2671 | Automatic : Theory and implementation | Julien Hendrickx   | 30h+30h       | 5 Credits | 1q | X | X |
| ⊗ LINMA2875 | System Identification                 | Julien Hendrickx   | 30h+30h       | 5 Credits | 2q | X | X |

**⊗ Courses of interest in automatics and dynamic systems**

|             |  |   |               |           |    |   |   |
|-------------|--|---|---------------|-----------|----|---|---|
| ⊗ LELEC2870 | Machine Learning : regression, dimensionality reduction and data visualization | John Lee (compensates<br>Michel Verleysen),<br>Michel Verleysen   | 30h+30h       | 5 Credits | 1q | X | X |
| ⊗ LGBIO2060 | Modelling of biological systems  | Philippe Lefèvre  | 30h+30h       | 5 Credits | 1q | X | X |
| ⊗ LINGI2262 | Machine Learning :classification and evaluation                                | Pierre Dupont   | 30h+30h       | 5 Credits | 2q | X | X |
| ⊗ LMAPR2510 | Mathematical ecology   | Eric Deleersnijder,<br>Emmanuel Hanert,<br>Thierry Van Effelterre | 30h<br>+22.5h | 5 Credits | 2q | X | X |
| ⊗ LMECA2732 | Introduction to robotics   | Renaud Ronsse   | 30h+30h       | 5 Credits | 2q | X | X |

**MAJOR IN DISCRETE MATHEMATICS AND COMPUTER SCIENCE**

The goal of this major is to familiarise the student with certain advanced concepts in discrete mathematics such as the analysis of complex algorithms, numerical calculation, combinatorial problems, as well as computer science tools pertaining to applied mathematics.

● Mandatory

△ Courses not taught during 2015-2016

⊕ Periodic courses taught during 2015-2016

⊗ Optional

⊖ Periodic courses not taught during 2015-2016

■ Activity with requisites

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

*The student shall select  
De 15 à 30 credits parmi*

|             |   |  |               |           |    | Year |   |
|-------------|---|--|---------------|-----------|----|------|---|
|             |   |  |               |           |    | 1    | 2 |
| ⊗ LINGI1123 | <a href="#">Computability and complexity</a>                        | Yves Deville   | 30h+30h       | 5 Credits | 2q | x    | x |
| ⊗ LINMA2111 | <a href="#">Discrete mathematics II : Algorithms and complexity</a> | Vincent Blondel,<br>Jean-Charles Delvenne<br>(coord.)  | 30h<br>+22.5h | 5 Credits | 2q | x    | x |
| ⊗ LINMA2450 | <a href="#">Combinatorial optimization</a>                          | Jean-Charles Delvenne,<br>Julien Hendrickx   | 30h<br>+22.5h | 5 Credits | 1q | x    | x |
| ⊗ LINMA2472 | <a href="#">Advanced topics in discrete mathematics</a>             | Vincent Blondel<br>(coord.),<br>Jean-Charles Delvenne,<br>Gautier Krings<br>(compensates Vincent<br>Blondel) | 30h<br>+22.5h | 5 Credits | 1q | x    | x |
| ⊗ LINMA2710 | <a href="#">Numerical algorithms</a>                                | Paul Van Dooren  | 30h<br>+22.5h | 5 Credits | 2q | x    | x |
| ⊗ LMAT2450  | <a href="#">Cryptography</a>  | Olivier Pereira  | 30h+15h       | 5 Credits | 1q | x    | x |
| ⊗ LMAT2460  | <a href="#">Finite mathematics and combinatorial structures</a>     | Jean-Charles Delvenne,<br>Jean-Pierre Tignol   | 30h           | 5 Credits | 1q | x    | x |
| ⊗ LSINF1121 | <a href="#">Algorithmics and data structures</a>                    | Pierre Schaus  | 30h+30h       | 5 Credits | 1q | x    | x |

**MAJOR IN FINANCIAL MATHEMATICS**

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, students taking INMA2725, ACTU2020, ACTU2070 and at least 15 credits from the complementary module in financial mathematics (see the section on "elective courses") as part of their elective courses are automatically admitted to the second year of the Master's degree programme (120) in actuarial sciences.

● Mandatory

△ Courses not taught during 2015-2016

⊕ Periodic courses taught during 2015-2016

⊗ Optional

⊖ Periodic courses not taught during 2015-2016

■ Activity with requisites

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

*The student shall select*

*De 15 à 20 credits parmi*

|             |  |  |               |           |    | Year |   |
|-------------|--|--|---------------|-----------|----|------|---|
|             |  |  |               |           |    | 1    | 2 |
| ⊗ LINMA2725 | <a href="#">Financial mathematics</a>    | <a href="#">Pierre Devolder</a>  | 30h<br>+22.5h | 5 Credits | 1q | x    | x |
| ⊗ LACTU2020 | <a href="#">Fixed income mathematics</a> | <a href="#">Pierre Devolder</a>  | 30h+15h       | 5 Credits | 1q | x    | x |
| ⊗ LACTU2030 | <a href="#">LIFE INSURANCE 1</a>         | <a href="#">Michel Denuit,</a><br><a href="#">Françoise Gilles,</a><br><a href="#">Françoise Gilles</a><br>(compensates Michel Denuit) | 30h+15h       | 5 Credits | 1q | x    | x |
| ⊗ LACTU2070 | <a href="#">STOCHASTIC FINANCE 1</a>     | <a href="#">Pierre Devolder</a>  | 30h           | 5 Credits | 2q | x    | x |

**MAJOR IN INFORMATION AND SIGNAL PROCESSING**

As with the Master's degree engineering programmes in electricity, electromechanics and applied mathematics, the objective of this major is to provide students with the new tools pertaining to graphs, discrete mathematics, matrices and optimisation. Students may use these tools, for example, in communication problems, the analysis and recognition of data and signals, and in cryptography and system identification.

○ Mandatory

△ Courses not taught during 2015-2016

⊕ Periodic courses taught during 2015-2016

⊗ Optional

⊖ Periodic courses not taught during 2015-2016

■ Activity with requisites

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

The student shall select  
De 15 à 30 credits parmi

Year

1 2

**○ Prerequisite courses in information and signal processing**

Students who have not previously taken LINMA1510 or its equivalent, must take it as part of their major coursework. In this case, the minimum number of required credits for this major increases to 20.

|             |                |               |         |           |    |   |   |
|-------------|----------------|---------------|---------|-----------|----|---|---|
| ○ LINMA1510 | Linear Control | Denis Dochain | 30h+30h | 5 Credits | 2q | X | X |
|-------------|----------------|---------------|---------|-----------|----|---|---|

**○ Required courses (ELEC/ELEM)/recommended courses (MAP) in signal processing**

|             |  |   |         |           |    |   |   |
|-------------|--|---|---------|-----------|----|---|---|
| ○ LINGI2348 | Information theory and coding  | Jérôme Louveaux,<br>Benoît Macq (coord.),<br>Olivier Pereira    | 30h+15h | 5 Credits | 2q | X | X |
| ○ LELEC2870 | Machine Learning : regression, dimensionality reduction and data visualization | John Lee (compensates<br>Michel Verleysen),<br>Michel Verleysen | 30h+30h | 5 Credits | 1q | X | X |
| ○ LELEC2885 | Image processing and computer vision   | Christophe De<br>Vleeschouwer,<br>Laurent Jacques               | 30h+30h | 5 Credits | 1q | X | X |

**⊗ Elective courses for signal processing**

|             |   |   |               |           |    |   |   |
|-------------|---|---|---------------|-----------|----|---|---|
| ⊗ LELEC2880 | Modem design  | Jérôme Louveaux,<br>Luc Vandendorpe                   | 30h+30h       | 5 Credits | 2q | X | X |
| ⊗ LINGI2262 | Machine Learning :classification and evaluation     | Pierre Dupont   | 30h+30h       | 5 Credits | 2q | X | X |
| ⊗ LINMA2111 | Discrete mathematics II : Algorithms and complexity | Vincent Blondel,<br>Jean-Charles Delvenne<br>(coord.) | 30h<br>+22.5h | 5 Credits | 2q | X | X |
| ⊗ LMAT2450  | Cryptography  | Olivier Pereira                                       | 30h+15h       | 5 Credits | 1q | X | X |
| ⊗ LINMA2875 | System Identification                               | Julien Hendrickx                                      | 30h+30h       | 5 Credits | 2q | X | X |

**⊗ Elective courses exclusively for students enrolled in the ELEC/ELME Master's degree programme**

|             |  |   |               |           |    |   |   |
|-------------|--|---|---------------|-----------|----|---|---|
| ⊗ LINMA1691 | Discrete mathematics - Graph theory and algorithms | Vincent Blondel,<br>Jean-Charles Delvenne<br>(compensates Vincent<br>Blondel) | 30h<br>+22.5h | 5 Credits | 1q | X | X |
| ⊗ LINMA1702 | Applied mathematics : Optimization I               | François Glineur  | 30h<br>+22.5h | 5 Credits | 2q | X | X |
| ⊗ LINMA2380 | Matrix theory                                      | Paul Van Dooren   | 30h<br>+22.5h | 5 Credits | 1q | X | X |

**⊗ Elective courses exclusively for students enrolled in the MAP Master's degree programme**

|             |                    |                                 |         |           |    |   |   |
|-------------|--------------------|---------------------------------|---------|-----------|----|---|---|
| ⊗ LELEC1360 | TELECOMMUNICATIONS | Luc Vandendorpe                 | 30h+30h | 5 Credits | 2q | X | X |
| ⊗ LELEC2900 | Signal processing  | Benoît Macq,<br>Luc Vandendorpe | 30h+30h | 5 Credits | 2q | X | X |



**MAJOR IN BIOMEDICAL ENGINEERING**

As with most of the civil engineering programmes, 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
- △ Courses not taught during 2015-2016
- ⊕ Periodic courses taught during 2015-2016
- ⊗ Optional
- ⊖ Periodic courses not taught during 2015-2016
- Activity with requisites

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

The student may choose  
De 15 à 30 credits parmi

Year

1 2

**Required courses in biomedical engineering**

Students enrolled in this major must select a minimum of 10 credits among the following required courses except for those students enrolled in the Master's degree programme in engineering and computer science who are required to take 20 credits.

|             |   |   |         |           |    |   |   |
|-------------|---|---|---------|-----------|----|---|---|
| ⊗ LGBIO2010 | <a href="#">Bioinformatics</a>                  | <a href="#">Pierre Dupont,</a><br><a href="#">Michel Ghislain</a>   | 30h+30h | 5 Credits | 2q | x | x |
| ⊗ LGBIO2020 | <a href="#">Bioinstrumentation</a>              | <a href="#">André Mouraux,</a><br><a href="#">Michel Verleysen</a>  | 30h+30h | 5 Credits | 1q | x | x |
| ⊗ LGBIO2030 | <a href="#">Biomaterials</a>                    | <a href="#">Sophie Demoustier,</a><br><a href="#">Christine Dupont,</a><br><a href="#">Gaëtane Leloup</a>               | 30h+30h | 5 Credits | 1q | x | x |
| ⊗ LGBIO2040 | <a href="#">Biomechanics</a>                    | <a href="#">François Henrotte</a><br>(compensates Emilie Marchandise),<br><a href="#">Emilie Marchandise</a>            | 30h+30h | 5 Credits | 2q | x | x |
| ⊗ LGBIO2050 | <a href="#">Medical Imaging</a>                 | <a href="#">Anne Bol,</a><br><a href="#">John Lee,</a><br><a href="#">Benoît Macq,</a><br><a href="#">Frank Peeters</a> | 30h+30h | 5 Credits | 1q | x | x |
| ⊗ LGBIO2060 | <a href="#">Modelling of biological systems</a> | <a href="#">Philippe Lefèvre</a>  | 30h+30h | 5 Credits | 1q | x | x |

**Elective courses in biomedical engineering for students enrolled in the ELEC Master's degree programme**

|             |  |   |         |           |    |   |   |
|-------------|--|---|---------|-----------|----|---|---|
| ⊗ LELEC2870 | <a href="#">Machine Learning : regression, dimensionality reduction and data visualization</a> | <a href="#">John Lee</a> (compensates <a href="#">Michel Verleysen</a> ),<br><a href="#">Michel Verleysen</a> | 30h+30h | 5 Credits | 1q | x | x |
| ⊗ LELEC2885 | <a href="#">Image processing and computer vision</a>   | <a href="#">Christophe De Vleeschouwer,</a><br><a href="#">Laurent Jacques</a>                                | 30h+30h | 5 Credits | 1q | x | x |

**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

△ Courses not taught during 2015-2016

⊕ Periodic courses taught during 2015-2016

⊗ Optional

⊖ Periodic courses not taught during 2015-2016

■ Activity with requisites

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

The student shall select  
De 15 à 30 credits parmi

Year

1 2

**○ Required courses for ELEC, INFO and MAP**

|             |  |   |         |           |    |   |   |
|-------------|--|---|---------|-----------|----|---|---|
| ● LMAT2450  | <a href="#">Cryptography</a>                           | <a href="#">Olivier Pereira</a>           | 30h+15h | 5 Credits | 1q | x | x |
| ● LINGI2347 | <a href="#">Computer system security</a>               | <a href="#">Marco Canini</a>              | 30h+15h | 5 Credits | 2q | x | x |
| ● LELEC2760 | <a href="#">Secure electronic circuits and systems</a> | <a href="#">François-Xavier Standaert</a> | 30h+30h | 5 Credits | 2q | x | x |

**⊗ Elective courses ELEC, INFO and MAP**

In order for the following courses to count toward this major, students must have completed the prerequisite courses LELEC 2760, LINGI 2347 and LMAT 2450

|             |   |   |               |           |    |   |   |
|-------------|---|---|---------------|-----------|----|---|---|
| ⊗ LINGI2144 | <a href="#">Secured systems engineering</a>   | <a href="#">Gildas Avoine</a>   | 30h+15h       | 5 Credits | 1q | x | x |
| ⊗ LINGI2348 | <a href="#">Information theory and coding</a>   | <a href="#">Jérôme Louveaux,</a><br><a href="#">Benoît Macq (coord.),</a><br><a href="#">Olivier Pereira</a>    | 30h+15h       | 5 Credits | 2q | x | x |
| ⊗ LINMA2111 | <a href="#">Discrete mathematics II : Algorithms and complexity</a>   | <a href="#">Vincent Blondel,</a><br><a href="#">Jean-Charles Delvenne</a><br>(coord.)                           | 30h<br>+22.5h | 5 Credits | 2q | x | x |
| ⊗ LELEC2620 | <a href="#">Modeling and implementation of analog and mixed analog/digital circuits and systems on chip</a> | <a href="#">David Bol</a>   | 30h+30h       | 5 Credits | 2q | x | x |
| ⊗ LELEC2870 | <a href="#">Machine Learning : regression, dimensionality reduction and data visualization</a>              | <a href="#">John Lee (compensates</a><br><a href="#">Michel Verleysen),</a><br><a href="#">Michel Verleysen</a> | 30h+30h       | 5 Credits | 1q | x | x |
| ⊗ LMAT2440  | <a href="#">Number theory</a>   | <a href="#">Olivier Pereira,</a><br><a href="#">Jean-Pierre Tignol</a>  | 30h+15h       | 5 Credits | 1q | x | x |

**⊗ Elective courses ELEC and MAP**

In order for the following courses to count toward this major, students must have completed the prerequisite courses LELEC 2760, LINGI 2347 and LMAT 2450

|             |                                   |                                     |         |           |    |   |   |
|-------------|-----------------------------------|-------------------------------------|---------|-----------|----|---|---|
| ⊗ LINGI1341 | <a href="#">Computer networks</a> | <a href="#">Olivier Bonaventure</a> | 30h+30h | 6 Credits | 1q | x | x |
|-------------|-----------------------------------|-------------------------------------|---------|-----------|----|---|---|

**MAJOR IN MODELLING AND SIMULATION OF PHYSICAL PHENOMENA**

The goal of this major is to expose students to the modelling of physical phenomena, most notably in the field of continuum mechanics (fluids, flows, transfers, deformable solids) and electromagnetics as well as to computer methods and tools used in numerical simulations.

● Mandatory

△ Courses not taught during 2015-2016

⊕ Periodic courses taught during 2015-2016

⊗ Optional

⊖ Periodic courses not taught during 2015-2016

■ Activity with requisites

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

*The student may choose*

*De 15 à 30 credits parmi*

Year

1 2

|             |   |   |                |           |    | 1 | 2 |
|-------------|---|---|----------------|-----------|----|---|---|
| ⊗ LELEC1350 | <a href="#">APPLIED ELECTROMAGNETISM</a>  | <a href="#">Christophe Craeye, Danièle Janvier</a>                          | 30h+30h        | 5 Credits | 1q | x | x |
| ⊗ LMAPR2510 | <a href="#">Mathematical ecology</a>  | <a href="#">Eric Deleersnijder, Emmanuel Hanert, Thierry Van Effelterre</a> | 30h<br>+22.5h  | 5 Credits | 2q | x | x |
| ⊗ LMAT2130  | <a href="#">Partial differential equations : Poisson and Laplace equations</a>                      | <a href="#">Augusto Ponce, Jean Van Schaftingen</a>                         | 30h+30h        | 5 Credits | 1q | x | x |
| ⊗ LMAT2410  | <a href="#">Partial differential equation : heat equation, brownian moves and numerical aspects</a> | <a href="#">Augusto Ponce, Jean Van Schaftingen</a>                         | 30h+15h        | 5 Credits | 2q | x | x |
| ⊗ LMECA1100 | <a href="#">Deformable solid mechanics.</a>   | <a href="#">Issam Doghri</a>  | 30h+30h        | 5 Credits | 2q | x | x |
| ⊗ LMECA1321 | <a href="#">Fluid mechanics and transfer phenomena.</a>   | <a href="#">Vincent Legat, Grégoire Winckelmans</a>                         | 30h+30h        | 5 Credits | 2q | x | x |
| ⊗ LMECA1120 | <a href="#">Introduction to finite element methods.</a>   | <a href="#">Vincent Legat</a>   | 30h+30h        | 5 Credits | 2q | x | x |
| ⊗ LMECA2131 | <a href="#">Introduction to nonlinear solid mechanics.</a>  | <a href="#">Issam Doghri</a>  | 30h+30h        | 5 Credits | 2q | x | x |
| ⊗ LMECA2141 | <a href="#">Rheology</a>  | <a href="#">Vincent Legat, Evelyne Van Ruymbeke</a>                         | 30h+30h        | 5 Credits | 1q | x | x |
| ⊗ LMECA2660 | <a href="#">Numerical methods in fluid mechanics</a>  | <a href="#">Grégoire Winckelmans</a>  | 30h+30h        | 5 Credits | 2q | x | x |
| ⊗ LPHY1352A | <a href="#">Physique des fluides</a>  | N.  | 22.5h<br>+7.5h | 4 Credits |    | x | x |
| ⊗ LINMA2720 | <a href="#">Mathematical modelling of physical systems</a>  | <a href="#">Roland Keunings</a>   | 30h<br>+22.5h  | 5 Credits | 2q | x | x |



**MAJOR IN STATISTICS**

This major allows students to learn the fundamental concepts pertaining to probabilities and mathematical statistics and teaches them about the principal tools used in most of the areas where statistics are used.

In addition, students taking 25 credits in this major, are automatically admitted to the second year Master's degree programme (120) in statistics (specialisation possible).

● Mandatory

△ Courses not taught during 2015-2016

⊕ Periodic courses taught during 2015-2016

⊗ Optional

⊖ Periodic courses not taught during 2015-2016

■ Activity with requisites

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

*The student may choose*

*De 15 à 30 credits parmi*

|             |  |  |                |           |    | Year |   |
|-------------|--|--|----------------|-----------|----|------|---|
|             |  |  |                |           |    | 1    | 2 |
| ⊗ LMAT1371  | <a href="#">Probability</a>                          | Johan Segers                             | 30h<br>+22.5h  | 5 Credits | 2q | x    | x |
| ⊗ LSTAT2020 | <a href="#">Statistical computing</a>                | Céline Bugli                             | 20h+20h        | 5 Credits | 1q | x    | x |
| ⊗ LSTAT2040 | <a href="#">Statistical analysis</a>                 | Anouar El Ghouch,<br>Ingrid Van Keilegom | 30h+15h        | 4 Credits | 2q | x    | x |
| ⊗ LSTAT2100 | <a href="#">Discrete data analysis.</a>              | Patrick Bogaert,<br>Anouar El Ghouch     | 22.5h<br>+7.5h | 4 Credits | 2q | x    | x |
| ⊗ LSTAT2110 | <a href="#">Data Analysis</a>                        | Christian Hafner,<br>Johan Segers        | 22.5h<br>+7.5h | 4 Credits | 1q | x    | x |
| ⊗ LSTAT2120 | <a href="#">Linear models</a>                        | Christian Hafner                         | 22.5h<br>+7.5h | 4 Credits | 1q | x    | x |
| ⊗ LSTAT2130 | <a href="#">Introduction to Bayesian statistics.</a> | Philippe Lambert                         | 15h+5h         | 3 Credits | 2q | x    | x |
| ⊗ LSTAT2170 | <a href="#">Times series</a>                         | Rainer von Sachs                         | 22.5h<br>+7.5h | 4 Credits | 2q | x    | x |
| ⊗ LSTAT2320 | <a href="#">Design of experiment.</a>                | Patrick Bogaert,<br>Bernadette Govaerts  | 22.5h<br>+7.5h | 4 Credits | 2q | x    | x |
| ⊗ LSTAT2350 | <a href="#">Data Mining</a>                          | Libei Chen                               | 15h+15h        | 4 Credits | 2q | x    | x |

## MAJOR IN BUSINESS RISKS AND OPPORTUNITIES

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

Students may be exempted from certain of these classes provided they have completed similar courses or activities as part of their previous coursework or training. The exempted courses are replaced by in-depth courses from the core curriculum for the Master's degree in business management and/or a technological project completed in collaboration with students from LSM.

- Mandatory
- △ Courses not taught during 2015-2016
- ⊕ Periodic courses taught during 2015-2016
- ⊗ Optional
- ⊖ Periodic courses not taught during 2015-2016
- Activity with requisites

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

*This major may not be taken at the same time as the major in small and medium business creation. Students selecting this major may choose*

*De 16 à 20 credits parmi*

|            |  |  |         |           |    | Year |   |
|------------|--|--|---------|-----------|----|------|---|
|            |  |  |         |           |    | 1    | 2 |
| ⊗ LFSA2140 | <a href="#">Elements of law for industry and research</a>            | <a href="#">Fernand De Visscher, Werner Derijcke, Bénédicte Inghels</a>    | 30h     | 3 Credits | 1q | x    | x |
| ⊗ LFSA2230 | <a href="#">Introduction to management and to business economics</a> | <a href="#">Benoît Gailly</a>  | 30h+15h | 4 Credits | 2q | x    | x |
| ⊗ LFSA1290 | <a href="#">Introduction to financial and accounting management</a>  | <a href="#">André Nsabimana (compensates Gerrit Sarens), Gerrit Sarens</a> | 30h+15h | 4 Credits | 2q | x    | x |
| ⊗ LFSA2202 | <a href="#">Ethics and ICT</a>                                       | <a href="#">Axel Gosseries, Olivier Pereira</a>                            | 30h     | 3 Credits | 2q | x    | x |
| ⊗ LFSA2245 | <a href="#">Environment and business</a>                             | <a href="#">Thierry Bréchet</a>  | 30h     | 3 Credits | 1q | x    | x |
| ⊗ LFSA2210 | <a href="#">Organisation and human resources</a>                     | <a href="#">John Cultiaux</a>  | 30h     | 3 Credits | 2q | x    | x |

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

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

**MAJOR IN ECONOMICS AND ECONOMETRICS**

The goal of this major is to allow university students to understand and analyse contemporary economic and social questions whether they be "microeconomic" in nature (business strategies, competition problems, etc.) or "macroeconomic" (growth, inequalities, exchange rates, monetary politics). The courses in this major allow students to understand and use the fundamental tools and concepts for economic analysis as well as the relevant quantitative methods, in particular econometrics. This give students the necessary foundation to pursue studies in economics.

In addition, students taking INMA2415, ECON2011, ECON2021, at least one of the pair of courses ECON2031/ECON2033 and at least 15 credits in the complementary module in economics and econometrics (see the section on elective courses) as part of their elective courses are automatically accepted into the second year of the Master's degree programme (120) in general economics (specialisation possible).

● Mandatory

△ Courses not taught during 2015-2016

⊕ Periodic courses taught during 2015-2016

⊗ Optional

⊖ Periodic courses not taught during 2015-2016

■ Activity with requisites

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

*The student may choose*

*De 15 à 25 credits parmi*

|             |   |  |               |           |      | Year |   |
|-------------|---|--|---------------|-----------|------|------|---|
|             |   |  |               |           |      | 1    | 2 |
| ⊗ LECON2011 | <a href="#">Interdependencies and Strategic Behavior</a>              | N.   | 30h+12h       | 5 Credits | 2q △ | x    | x |
| ⊗ LECON2021 | <a href="#">Economic Fluctuations and Foundations of Macro Polici</a> | <a href="#">David De la Croix,</a><br><a href="#">Jean-François Fagnart</a><br>(compensates David De la Croix) | 30h           | 5 Credits | 2q   | x    | x |
| ⊗ LECON2031 | <a href="#">Applied Econometrics : Time Series</a>                    | <a href="#">Zhengyuan Gao</a>  | 30h+12h       | 5 Credits | 1q   | x    | x |
| ⊗ LECON2033 | <a href="#">Applied econometrics: Microeconometrics</a>               | <a href="#">Muriel Dejemeppe</a>   | 30h+12h       | 5 Credits | 1q   | x    | x |
| ⊗ LINMA2415 | <a href="#">Quantitative Energy Economics</a>                         | <a href="#">Anthony Papavasiliou</a>   | 30h<br>+22.5h | 5 Credits | 2q   | x    | x |

## 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).

○ Mandatory

△ Courses not taught during 2015-2016

⊕ Periodic courses taught during 2015-2016

⊗ Optional

⊖ Periodic courses not taught during 2015-2016

■ Activity with requisites

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

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

Year

1 2

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

| Course ID   | Course Title  | Instructor  | Hours   | Credits   | 1  | 2 | X | X |
|-------------|---|---|---------|-----------|----|---|---|---|
| ○ LCPME2001 | <a href="#">Entrepreneurship Theory (in French)</a>   | Frank Janssen   | 30h+20h | 5 Credits | 1q |   | x |   |
| ○ LCPME2003 | <a href="#">Business plan of the creation of a company (in French)</a>                          | Frank Janssen   | 30h+15h | 5 Credits | 2q |   |   | x |
| ○ LCPME2002 | <a href="#">Managerial, legal and economic aspects of the creation of a company (in French)</a> | Régis Coeurderoy,<br>Yves De Cordt,<br>Marine Falize<br>(compensates<br>Régis Coeurderoy) | 30h+15h | 5 Credits | 1q |   | x | x |
| ○ LCPME2004 | <a href="#">Advanced seminar on Entrepreneurship (in French)</a>                                | Roxane De Hoe<br>(compensates Frank<br>Janssen),<br>Frank Janssen                         | 30h+15h | 5 Credits | 2q |   | x | x |

### ⊗ Prerequisite CPME courses

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

|             |   |                                       |         |           |           |  |   |  |
|-------------|---|---------------------------------------|---------|-----------|-----------|--|---|--|
| ○ LCPME2000 | <a href="#">Venture creation financement and management I</a> | Olivier Giacomini,<br>Paul Vanzeveren | 30h+15h | 5 Credits | 1 +<br>2q |  | x |  |
|-------------|---|---------------------------------------|---------|-----------|-----------|--|---|--|

## ELECTIVE COURSES AVAILABLE TO STUDENTS ENROLLED IN THE MASTER'S DEGREE FOR ENGINEERING AND APPLIED MATHEMATICS

● Mandatory

△ Courses not taught during 2015-2016

⊕ Periodic courses taught during 2015-2016

⊗ Optional

⊖ Periodic courses not taught during 2015-2016

■ Activity with requisites

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

Depending on their major, students round out their programme with elective courses (if necessary) to reach a total of 60 credits of major and elective courses.

|             |                |                         |         |           |    | Year |   |
|-------------|----------------|-------------------------|---------|-----------|----|------|---|
|             |                |                         |         |           |    | 1    | 2 |
| ⊗ LFSA2351A | Group dynamics | Piotr Sobieski (coord.) | 15h+30h | 3 Credits | 1q | x    | x |
| ⊗ LFSA2351B | Group dynamics | Piotr Sobieski (coord.) | 15h+30h | 3 Credits | 2q | x    | x |

### ⊗ Core courses

It is recommended that students who have not previously taken these three classes (or their equivalents) integrate them into their programme.

|             |                                     |   |               |           |    |   |  |
|-------------|-------------------------------------|---|---------------|-----------|----|---|--|
| ⊗ LINMA1315 | Mathematical analysis : complements | Michel Willem   | 30h<br>+22.5h | 5 Credits | 2q | x |  |
| ⊗ LMECA1901 | Continuum mechanics.                | Philippe Chatelain,<br>Philippe Chatelain<br>(compensates Emilie<br>Marchandise),<br>Emilie Marchandise | 30h+30h       | 5 Credits | 1q | x |  |
| ⊗ LMAT1222  | Complex analysis                    | Luc Haine   | 30h+15h       | 5 Credits | 2q | x |  |

### ⊗ Recommended courses

Among the 60 credits from major and elective courses, students must select a minimum of 30 credits among the list below and from the core courses

|             |   |  |               |           |    |   |   |
|-------------|---|--|---------------|-----------|----|---|---|
| ⊗ LELEC2900 | Signal processing                                   | Benoît Macq,<br>Luc Vandendorpe  | 30h+30h       | 5 Credits | 2q | x | x |
| ⊗ LGBIO2060 | Modelling of biological systems                     | Philippe Lefèvre   | 30h+30h       | 5 Credits | 1q | x | x |
| ⊗ LINGI2348 | Information theory and coding                       | Jérôme Louveaux,<br>Benoît Macq (coord.),<br>Olivier Pereira   | 30h+15h       | 5 Credits | 2q | x | x |
| ⊗ LINMA2111 | Discrete mathematics II : Algorithms and complexity | Vincent Blondel,<br>Jean-Charles Delvenne<br>(coord.)  | 30h<br>+22.5h | 5 Credits | 2q | x | x |
| ⊗ LINMA2120 | Applied mathematics research seminar                | Pierre-Antoine Absil,<br>Vincent Blondel,<br>Philippe Chevalier,<br>Jean-Charles Delvenne<br>(coord.),<br>François Glineur,<br>Julien Hendrickx,<br>Raphaël Jungers,<br>Philippe Lefèvre,<br>Yurii Nesterov,<br>Paul Van Dooren,<br>Mathieu Van Vyve | 30h           | 3 Credits | 2q | x | x |
| ⊗ LINMA2345 | Game theory   | Raphaël Jungers  | 30h<br>+22.5h | 5 Credits | 2q | x | x |
| ⊗ LINMA2360 | Project in mathematical engineering                 | Pierre-Antoine Absil,<br>François Glineur<br>(coord.),<br>Yurii Nesterov,<br>Paul Van Dooren   | 30h<br>+22.5h | 5 Credits | 2q | x | x |
| ⊗ LINMA2361 | Nonlinear dynamical systems                         | Pierre-Antoine Absil   | 30h<br>+22.5h | 5 Credits | 1q | x | x |
| ⊗ LINMA2415 | Quantitative Energy Economics                       | Anthony Papavasiliou   | 30h<br>+22.5h | 5 Credits | 2q | x | x |
| ⊗ LINMA2450 | Combinatorial optimization                          | Jean-Charles Delvenne,<br>Julien Hendrickx   | 30h<br>+22.5h | 5 Credits | 1q | x | x |
| ⊗ LINMA2460 | Optimization : Nonlinear programming                | Yurii Nesterov   | 30h<br>+22.5h | 5 Credits | 2q | x | x |

|             |  |  |               |            |           | Year |   |
|-------------|--|--|---------------|------------|-----------|------|---|
|             |  |  |               |            |           | 1    | 2 |
| ⊗ LINMA2472 | Advanced topics in discrete mathematics                        | Vincent Blondel (coord.),<br>Jean-Charles Delvenne,<br>Gautier Krings<br>(compensates Vincent Blondel) | 30h<br>+22.5h | 5 Credits  | 1q        | x    | x |
| ⊗ LINMA2491 | Operational Research   | Anthony Papavasiliou   | 30h<br>+22.5h | 5 Credits  | 2q        | x    | x |
| ⊗ LINMA2671 | Automatic : Theory and implementation                          | Julien Hendrickx   | 30h+30h       | 5 Credits  | 1q        | x    | x |
| ⊗ LINMA2710 | Numerical algorithms   | Paul Van Dooren  | 30h<br>+22.5h | 5 Credits  | 2q        | x    | x |
| ⊗ LINMA2720 | Mathematical modelling of physical systems                     | Roland Keunings  | 30h<br>+22.5h | 5 Credits  | 2q        | x    | x |
| ⊗ LINMA2725 | Financial mathematics  | Pierre Devolder  | 30h<br>+22.5h | 5 Credits  | 1q        | x    | x |
| ⊗ LINMA2875 | System Identification  | Julien Hendrickx   | 30h+30h       | 5 Credits  | 2q        | x    | x |
| ⊗ LMAT2130  | Partial differential equations : Poisson and Laplace equations | Augusto Ponce,<br>Jean Van Schaftingen   | 30h+30h       | 5 Credits  | 1q        | x    | x |
| ⊗ LMAT2450  | Cryptography   | Olivier Pereira  | 30h+15h       | 5 Credits  | 1q        | x    | x |
| ⊗ LMECA1120 | Introduction to finite element methods.                        | Vincent Legat  | 30h+30h       | 5 Credits  | 2q        | x    | x |
| ⊗ LFSA2995  | Company Internship   | Claude Oestges,<br>Jean-Pierre Raskin  | 30h           | 10 Credits | 1 +<br>2q | x    | x |
| ⊗ LFSA2996  | Company Internship   | N.   |               | 5 Credits  | 1 +<br>2q | x    | x |

### ⊗ In-depth courses for the Master's degree programme in Applied Mathematics

Students are advised that the classes in this major that are not taken as such may be taken as elective courses.

|            |                                      |  |         |           |    |   |   |
|------------|--------------------------------------|--|---------|-----------|----|---|---|
| ⊗ LMAT2110 | Éléments de géométrie différentielle | Luc Haine  | 30h+30h | 5 Credits | 1q | x | x |
| ⊗ LMAT2160 | Mathematics seminar                  | Pedro Dos Santos<br>Santana Forte Vaz,<br>Marino Gran,<br>Tim Van der Linden | 15h+30h | 6 Credits | 2q | x | x |

### ⊗ Languages

Students may select from any language course offered at the ILV for a maximum of 3 credits out of the 120 core credits needed for their Master's degree. Special attention is placed on the following seminars in professional development:

Students may include in their electives any language course of the Institute of Modern Languages (ILV) for a maximum of 3 credits within the 120 basic credits of their Master's. Their attention is drawn to the following professional insertion seminars:

|             |  |  |     |           |            |   |   |
|-------------|--|--|-----|-----------|------------|---|---|
| ⊗ LNEER2500 | Professional development seminar: Dutch - intermediate level       | Isabelle Demeulenaere (coord.),<br>Mariken Smit              | 30h | 3 Credits | 1 ou<br>2q | x | x |
| ⊗ LNEER2600 | Professional development seminar: Dutch - upper-intermediate level | Isabelle Demeulenaere (coord.),<br>Marie-Laurence Lambrecht  | 30h | 3 Credits | 1 ou<br>2q | x | x |
| ⊗ LALLE2500 | Professional development seminar German                            | Caroline Klein,<br>Ann Rinder                                | 30h | 3 Credits | 1 +<br>2q  | x | x |
| ⊗ LALLE2501 | Professional development seminar-German                            | Caroline Klein,<br>Ann Rinder                                | 30h | 5 Credits | 1 +<br>2q  | x | x |
| ⊗ LESPA2600 | Professional development seminar- Spanish                          | Carmen Vallejo Villamor                                      | 30h | 3 Credits | 1 ou<br>2q | x | x |
| ⊗ LESPA2601 | Professional development seminar- Spanish                          | Begona Garcia Migura,<br>Paula Lorente<br>Fernandez (coord.) | 30h | 5 Credits | 1q         | x | x |

### ⌘ Short-term exchanges (2 credits)

Students may include in their curriculum any BEST or ATHENS course subject to approval by the programme committee. These courses are worth 2 credits.

Students may include in their curriculum any BEST or ATHENS subject to approval by the Diploma committee. These courses are worth 2 credits

### ⌘ General knowledge courses

Students can also include in their curriculum any course given at UCL, KULeuven or the Van Karman Institute subject to approval of the Programme committee.

Students can also include in their curriculum any course given at UCL or FIW / KULeuven subject to approval of the Diploma committee.

### ⌘ Humanities and social sciences

Students may choose a maximum of 6 credits of humanities and social science courses. However, this option is not available to students who have already taken 6 credits of humanities and social sciences as part of their major.

### ⌘ Supplemental module in financial mathematics

Students taking 15 credits in this module as well as LINMA2725, LACTU 2020, LACTU2030 and LACTU2070, will be automatically admitted to the second year of the Master's degree programme in actuarial sciences. This module is intended only for students who plan to use the financial mathematics major to eventually enrol in the actuarial sciences programme.

|             |                      |                      |         |           |    |   |   |
|-------------|----------------------|----------------------|---------|-----------|----|---|---|
| ⌘ LACTU2010 | NON LIFE INSURANCE 1 | Michel Denuit        | 30h+15h | 5 Credits | 1q | x | x |
| ⌘ LACTU2040 | PENSION FUNDING      | Pierre Devolder      | 30h+15h | 5 Credits | 2q | x | x |
| ⌘ LACTU2060 | LIFE INSURANCE 2     | Michel Denuit        | 30h     | 5 Credits | 2q | x | x |
| ⌘ LACTU2080 | REINSURANCE          | Jean-François Walhin | 30h     | 5 Credits | 2q | x | x |

### ⌘ Supplemental module in economics and econometrics

Students taking 15 credits in this module as well as LINMA2415, LECON2011, and LECON2021 as well as one of the two courses LECON2031 or LECON2033, will be automatically admitted to the second year of the Master's degree programme in general economics. This module is intended only for students who plan to use the economics-econometrics major to eventually enrol in the general economics programme.

|             |  |  |     |           |    |   |   |
|-------------|--|--|-----|-----------|----|---|---|
| ⌘ LECON2041 | International Trade                          | Gonzague Vannoorenberg   | 30h | 5 Credits | 2q | x | x |
| ⌘ LECON2051 | Labour, unemployment and Politics            | Muriel Dejemeppe,<br>Bruno Van der Linden  | 30h | 5 Credits | 2q | x | x |
| ⌘ LECON2061 | Philosophy and epistemology of the economics | Christian Arnsperger,<br>Laurent de Briey<br>(compensates Christian Arnsperger)        | 30h | 5 Credits | 2q | x | x |
| ⌘ LECON2421 | History of Economic and Social Development   | Isabelle Cassiers,<br>Jean-<br>Christophe Defraigne<br>(compensates Isabelle Cassiers) | 30h | 5 Credits | 1q | x | x |
| ⌘ LECON2372 | Economics of Competition Policy              | Elisabeth Van Hecke  | 30h | 5 Credits | 1q | x | x |

### ⌘ It is recommended that students take LECON2031 before enrolling in the following courses:

|             |  |                   |     |           |    |   |   |
|-------------|--|-------------------|-----|-----------|----|---|---|
| ⌘ LECON2311 | Business cycle analysis and short-term macroeconomic forecasts | Vincent Bodart    | 30h | 5 Credits | 2q | x | x |
| ⌘ LECON2312 | Macroeconomics of the development                              | Frédéric Docquier | 30h | 5 Credits | 2q | x | x |
| ⌘ LECON2314 | Economic Geography   | Florian Mayneris  | 30h | 5 Credits | 2q | x | x |
| ⌘ LECON2382 | Seminar on Contemporary Economic Issues III                    | Bernard Delbecque | 30h | 5 Credits | 1q | x | x |
| ⌘ LECON2310 | Topics in Economic Growth: Theory and Applications             | Fabio Mariani     | 30h | 5 Credits | 2q | x | x |

### ⌘ LECON2033 is recommended for these courses

|             |   |                  |     |           |    |   |   |
|-------------|---|------------------|-----|-----------|----|---|---|
| ⌘ LECON2350 | Public Management                             | Jean Hindriks    | 30h | 5 Credits | 2q | x | x |
| ⌘ LECON2352 | Methods for the evaluation of public policies | William Parienté | 30h | 5 Credits | 1q | x | x |

|             |  |                     |     |           |    | Year |   |
|-------------|--|---------------------|-----|-----------|----|------|---|
|             |  |                     |     |           |    | 1    | 2 |
| ⌘ LECON2370 | Industrial Organization and Competition Policy | Elisabeth Van Hecke | 30h | 5 Credits | 1q | x    | x |

### ⌘ Company internships (10 credits)

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

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

|            |                    |                                       |     |            |           |   |   |
|------------|--------------------|---------------------------------------|-----|------------|-----------|---|---|
| ⌘ LFSA2995 | Company Internship | Claude Oestges,<br>Jean-Pierre Raskin | 30h | 10 Credits | 1 +<br>2q | x | x |
| ⌘ LFSA2996 | Company Internship | N.                                    |     | 5 Credits  | 1 +<br>2q | x | x |



## Course prerequisites

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A document entitled [en-prerequis-2015-map2m.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

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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.

## MAP2M - Information

### Admission

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

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 degree 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.

- [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](#)

### University Bachelors

| Diploma   | Special Requirements                  | Access                          | Remarks  |
|---|---------------------------------------|---------------------------------|--|
| <b>UCL Bachelors</b>  |                                       |                                 |  |
| Bachelor in engineering [180.0]   | Major or minor in applied mathematics | Direct access                   |  |
| Bachelor in engineering [180.0]   |                                       | Access with additional training | Students who have neither majored nor minored in the field of their civil engineering Master's degree, must submit a written application in which they list their detailed course curriculum (list of course work and marks year by year) to the programme commission. The commission will then suggest a programme in keeping with the student's previous course of study with the possible addition of a maximum of 15 supplemental credits. |
| Bachelor in physics [180.0]<br>Bachelor in mathematics [180.0]<br>Bachelor in computer science [180.0]<br>Bachelor in chemistry [180.0]<br>Bachelor in biology [180.0]<br>Bachelor in geography [180.0]<br>Bachelor in bioengineering [180.0] | Minor in applied mathematics          | Access with additional training | The jury may admit candidates with excellent academic records and training on the basis of their written application provided that they integrate a maximum of 60 additional credits into their Master's degree programme.<br><a href="#">A minor in engineering sciences (Applied mathematics)</a> is considered an advantage for candidates seeking this type of admission   |

| Others Bachelors of the French speaking Community of Belgium  |   |                                 |  |
|---|---|---------------------------------|--|
| Bachelor in engineering [180.0]   | Major or minor in applied mathematics               | Direct access                   |  |
| Bachelor in engineering [180.0]   |   | Access with additional training | Students with a Bachelor's degree in engineering sciences (with a focus on mathematics engineering) who have not taken the equivalent of a <a href="#">minor in mathematics</a> must submit a written application to the mathematics programme commission in which they list their detailed course curriculum (list of course work and marks year by year). The jury will suggest a programme in keeping with the student's previous course of study with the possible addition of a maximum of 15 supplemental credits. |
| Bachelor in physics, mathematics, computer science, chemistry, biology, geography, bioengineering [180.0] | Option in applied mathematics at former institution | Access with additional training | The jury may admit candidates with excellent academic records and training on the basis of their written application provided that they integrate a maximum of 60 additional credits into their Master's degree programme.<br><br>A minor in engineering sciences (applied mathematics) is considered an advantage for candidates seeking this type of admission   |
| Bachelors of the Dutch speaking Community of Belgium  |   |                                 |  |
| Bachelor in ingenieurs wetenschappen  | Option in applied mathematics at former institution | Direct access                   |  |
| Bachelor in ingenieurs wetenschappen  |   | Access with additional training | Students who have no specialisation in applied mathematics must submit a written application to the programme commission in applied mathematics engineering in which they list their detailed course curriculum (list of course work and marks year by year). The jury will suggest a programme in keeping with the student's previous course of study with the possible addition of a maximum of 15 supplemental credits.   |
| Bachelor's degree equivalent to one of those required from graduates of the French-speaking community     | Option in applied mathematics at former institution | Access with additional training | Students without a Bachelor's degree in engineering sciences (with a focus on applied mathematics engineering) must submit a written application to EPL in which they list their detailed course curriculum (list of course work and marks year by year). The jury will determine whether  |

the student may be admitted (based solely on the common Bachelor's degree training for engineering sciences (with a focus on applied mathematics engineering) and their decision will be in keeping with the rules pertaining to bridge years. When necessary, the jury may suggest a programme in keeping with the student's previous course of study with the possible addition of a maximum of 15 supplemental credits.

### Foreign Bachelors

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

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### Non university Bachelors

| Diploma | Access | Remarks |
|---------|--------|---------|
|---------|--------|---------|

> Find out more about [links](#) to the university

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### HOLDERS of a 2nd cycle University degree

| Diploma            | Special Requirements | Access | Remarks |
|--------------------|----------------------|--------|---------|
| <b>"Licenciés"</b> |                      |        |         |

Engineers, bioengineers, and graduates in computer science, chemistry, physics, mathématiques, biology or geography, considered equivalent to corresponding Bachelor's.

Direct access

### Masters

|                       |  |               |  |
|-----------------------|--|---------------|--|
| Master in engineering |  | Direct access |  |
|-----------------------|--|---------------|--|

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

| Diploma   | Access | Remarks |
|---|--------|---------|
| > Find out more about <a href="#">links</a> to the university |        |         |

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## Adults taking up their university training

> See the website [Valorisation des acquis de l'expérience](#)

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

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## Personalized access

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

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

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

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## Admission and Enrolment Procedures for general registration

Specific procedures :

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.

## Supplementary classes

*To enrol for this Masters, the student must have a good command of certain subjects. If this is not the case, they must add preparatory modules to their Master's programme.*

● Mandatory

△ Courses not taught during 2015-2016

⊕ Periodic courses taught during 2015-2016

⊗ Optional

⊖ Periodic courses not taught during 2015-2016

■ Activity with requisites

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

|   |                                       |    |  |         |  |
|---|---------------------------------------|----|--|---------|--|
| ○ | <a href="#">Supplementary classes</a> | N. |  | Credits |  |
|---|---------------------------------------|----|--|---------|--|

## Teaching method

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### . 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 (Signal and information processing, modelling and simulation of physical phenomena) and offered by other academic departments (financial mathematics, biomedical engineering, economics and econometrics, statistics); 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.

### .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 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. The project has an interdisciplinary focus and groups of three students, ideally from different faculties, may collaborate on a business creation project.

## Evaluation

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*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

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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

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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's degree [120] in actuarial sciences (UCL)

Students who have taken at least 35 credits as part of the financial mathematics major have automatic access to the second year of the Master's degree programme [120] in actuarial sciences at UCL.

### 2.Master's degree [120] in general economics (UCL)

Students who have taken at least 35 credits as part of the Economics and econometrics major have automatic access to the second year of the Master's degree programme [120] in general economics at UCL (specialisation possible).

### 3.Master's degree [120] in general statistics (UCL)

Students who have taken at least 25 credits as part of the Statistics major have automatic access to the second year of the Master's degree programme [120] in general statistics at UCL (specialisation possible).

Furthermore, most of the UCL Master's degree programmes (generally 60) are open to UCL Master's degree diploma 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 (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://www.uclouvain.be/sites/socn/>).

## Contacts

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### Curriculum Management

Entite de la structure MAP

|                         |  |
|-------------------------|--|
| Acronyme                | <b>MAP</b>   |
| Dénomination            | Commission de programme - Ingénieur civil en mathématiques appliquées                                    |
| Adresse                 | Avenue Georges Lemaître 4-6 bte L4.05.01<br>1348 Louvain-la-Neuve<br>Tél 010 47 25 97 - Fax 010 47 21 80 |
| Secteur                 | Secteur des sciences et technologies ( <a href="#">SST</a> )   |
| Faculté                 | Ecole Polytechnique de Louvain ( <a href="#">EPL</a> )   |
| Commission de programme | Commission de programme - Ingénieur civil en mathématiques appliquées ( <a href="#">MAP</a> )            |

**Academic Supervisor :** [Pierre-Antoine ABSIL](#)

**Jury:**

Président du Jury : [Jean-Didier LEGAT](#)

Secrétaire du Jury : [Raphaël JUNGERS](#)

### Usefull Contacts

Secrétariat : [Nathalie PONET](#)



