



MAP2M

2024 - 2025

MAP2M - Introduction

Introduction

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

MAP2M - Teaching profile

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 :

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

PROFESSIONAL FOCUS [30.0]

- Mandatory
 - ✘ Optional
 - △ Not offered in 2024-2025
 - ⊙ Not offered in 2024-2025 but offered the following year
 - ⊕ Offered in 2024-2025 but not the following year
 - △ ⊕ Not offered in 2024-2025 or the following year
 - Activity with requisites
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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
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- △ ⊕ Not offered in 2024-2025 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 20 to 30credit(s)

Year

1 2

Content:

⊗ LGBIO2060	Modelling of biological systems	Hari Teja Kalidindi (compensates Philippe Lefèvre) Laurent Opsomer (compensates Philippe Lefèvre)	[q1] [30h+30h] [5 Credits] 🌐
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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.

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- Activity with requisites
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From 20 to 30credit(s)

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

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.

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 - Activity with requisites
 - 🌐 Open to incoming exchange students
 - 🚫🌐 Not open to incoming exchange students
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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.

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From 15 to 30credit(s)

Year

1 2

o Content:

o 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.

⌘ LGBIO2010	Bioinformatics	Vincent Branders (compensates)
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Year

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○ **Content:**

⌘ **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

MAJOR IN INTERDISCIPLINARY PROGRAM IN ENTREPRENEURSHIP - INEO

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 entrepreneuriat (INEO) 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 INEO 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 <https://uclouvain.be/fr/etudier/ineo>.

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 ».

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- △ ⊕ Not offered in 2024-2025 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...)

Year

1 2

o Content:

o Required courses

● LINEO2001	Théorie de l'entrepreneuriat	
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OTHERS ELECTIVE COURSES

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Year

1 2

o 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.

o Languages

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

⊗ LALLE2500	Professional development seminar German	Caroline Klein (coord.) Mélanie Mottin (compensates Caroline Klein)	DE [q1+q2] [30h] [3 Credits] 🌐	X	X
⊗ LALLE2501	Professional development seminar-German	Caroline Klein (coord.) Mélanie Mottin (compensates Caroline Klein)	DE [q1+q2] [30h] [5 Credits] 🌐	X	X
⊗ LESPA2600	Vocational Induction Seminar - Spanish (B2.2/C1)	Paula Lorente Fernandez (coord.)	ES [q1] [30h] [3 Credits] 🌐	X	X

Course prerequisites

There are no prerequisites between course units (CUs) for this programme, i.e. the programme activity (course unit, CU) whose learning outcomes are to be certified and the corresponding credits awarded by the jury before registration in another CU.

The programme's courses and learning outcomes

For each UCLouvain training programme, a [reference framework of learning outcomes](#) specifies 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.

MAP2M - Information

Bachelor in Engineering	For others institutions	Access based on application	degree may have an adapted master programme. See personalized access
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Non university Bachelors

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

Holders of a 2nd cycle University degree

Diploma	Special Requirements	Access	Remarks
"Licenciés"			

Masters

Master in Engineering	Direct access
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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 priori 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>

[Selection criteria](#) are summarized here (epl-admission@uclouvain.be).

Admission and Enrolment Procedures for general registration

Teaching method

Interdisciplinary methods

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] in Actuarial Science (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 [120] in Statistics: Biostatistics (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 [120] in Statistics: General (UCLouvain)

Students who take 30 credits in the Module en statistique générale et mathématique will be able to complete in one year the Master [120] 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)
- The [Master \[60\] in Information and Communication](#) at Louvain-la-Neuve or the [Master \[60\] 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

Denomination

Faculty

Sector

Acronym

Postal address

SST/EPL/MAP

(MAP)

Louvain School of Engineering (EPL)

Sciences and Technology (SST)

MAP

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Jury

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- Secrétaire du Jury: [Geovani Nunes Grapiglia](#)

Useful Contact(s)

- Secrétariat: [Pascale Premereur](#)

