MATH2M

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MATH2M - Introduction

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Introduction

Introduction

The Master 120 in Mathematics offers

- a thorough education in cutting-edge fundamental mathematics with an orientation towards either research or teaching;
- an interdisciplinary program in physics, statistics, probability, cryptography, information theory, financial mathematics, actuarial science, etc.;
- the possibility of including advanced courses from other universities within your programme of specialisation;
- teaching based on your personal learning history;
- the opportunity to carry out part of your programme abroad;
- the possibility of moving directly to the second year of the Master in statistics, biostatistics and actuarial science.

Your profile

You

- have a sense of the precision and rigour of reasoning
- wish to develop your analytical skills and apply your capacity for reasoning and your spirit of abstraction in order to understand, model and solve complex situations in every field of application of mathematics;
- are committed to research and wish to carry out a first project in collaboration with internationally renowned researchers;
- plan to teach mathematics in secondary school and wish to acquire a solid training in fundamental mathematics.

Your future job

Whatever his specialisation, the mathematician will be able to exercise his talents in a variety of very different professional sectors and to make the most of the powerful tools he has developed in situations that are often a long way from mathematics.

The disciplinary knowledge and skills of the mathematician can be exploited in fundamental mathematical research and in teaching mathematics. These skills also offer access to many professions in which mathematics interacts with other disciplines (particularly in research laboratories in the climatology sector, in meteorology and in astronomy, in research and development institutes in the biochemistry and pharmacology sectors, in analysis and development departments in the economics sector, in finance and insurance, in computer companies, in cryptography and in telecommunications).

Your programme

Together with the solid training in fundamental mathematics that will equip you with tools in the main mathematical disciplines, the Master offers the choice of two focuses, depending on whether you are oriented towards research or teaching. In both options, learning is completed by optional courses in your chosen fields in mathematics or in closely related fields (applied mathematics, physics, statistics and biostatistics, actuarial science, computing...).

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MATH2M - Teaching profile

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Learning outcomes

By the end of the course the student will have acquired the knowledge of the discipline and the transferable skills needed to practise the many professional activities that require substantial mathematical skills: research and teaching, but also highly varied professions in which mathematics interacts with other fields and mathematicians collaborate with people who come from different intellectual backgrounds.

The skills acquired during the course will allow him to adapt to different professional contexts (linked, for example, to economic sciences, to the engineering sciences, to health sciences) and to acquire rapidly the techniques specific to his profession.

The programme offers a general education in the important fields of fundamental mathematics, including recent advanced subjects, and allows the student to deal in depth with closely related fields that have already been introduced in the Bachelor in Mathematics (especially physics, but also statistics, actuarial science, and computing).

Depending on the choice of option, by the end of the course the graduate will also have acquired a deeper knowledge of a field of research (research focus) or the skills required to teach mathematics in secondary schools (teaching focus).

As with any UCL graduate, the graduate Master in Mathematics will be capable of taking a critical, constructive and innovative view of the present-day world and its problems, of acting as a responsible and competent citizen in society and in his professional milieu, of independently acquiring and using new knowledge and skills throughout his professional life, and of managing major projects in all their aspects, both individually and as part of a team.

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

Finalité spécialisée - Grâce aux cours de l'option choisie, les étudiants de deux options auront aussi acquis la capacité d'analyser, en profondeur et sous divers points de vue, un problème mathématique ou un système complexe relevant de disciplines scientifiques autres que les mathématiques, pour en extraire les points essentiels et les mettre en relation avec les outils théoriques les mieux adaptés.

pas d'acquis d'apprentissage détaillés

1) master the disciplinary knowledge and basic transferable skills whose acquisition began in the Bachelor programme. He will have expanded his basic disciplinary knowledge and skills.

• Choose and use the fundamental methods and tools of calculation to solve mathematical problems.
• Recognise the fundamental concepts of important current mathematical theories.
• Establish the main connections between these theories, analyse them and explain them through the use of examples.

2) show evidence of abstract thinking and of a critical spirit.

• Recognise the fundamental concepts of important current mathematical theories.
• Identify the unifying aspects of different situations and experiences.
• Argue within the context of the axiomatic method.
• Construct and draw up a proof independently, clearly and rigorously.

3) communicate in a scientific manner.

• Write a mathematical text in French according to the conventions of the discipline.
• Structure an oral presentation and adapt it to the listeners' level of understanding.
• Communicate in English (level C1 for reading comprehension, level B2 for listening comprehension and for oral and written expression, CEFR).

4) show evidence of independent learning.

• Find sources in the mathematical literature and assess their relevance.
• Correctly locate an advanced mathematical text in relation to knowledge acquired.
• Ask himself relevant and lucid questions on a mathematical topic in an independent manner.

5) analyse a mathematical problem and suggest appropriate tools for studying it in depth

  • Rédiger un texte mathématique selon les conventions de la discipline.
  • Structurer un exposé oral en l'adaptant au niveau d'expertise des interlocuteurs.

Finalité approfondie - L'étudiant qui se destine à la recherche aura acquis une connaissance plus approfondie d'un ou de plusieurs domaines des mathématiques actuelles et de ses problématiques. Ces connaissances visent à lui permettre d'interagir avec d'autres chercheurs dans le cadre d'une recherche de niveau doctoral.

  • Développer de façon autonome son intuition mathématique en anticipant les résultats attendus (formuler des conjectures) et en vérifiant la cohérence avec des résultats déjà existants.
  • Se documenter et résumer l'état des connaissances actuelles concernant un problème mathématique.
  • Poser de façon autonome des questions pertinentes et lucides sur un sujet avancé de mathématique.
  • Analyser un problème de recherche et proposer des outils adéquats pour l'étudier de façon approfondie et originale.

6) **if the research focus is chosen**, begin a research project thanks to a deeper knowledge of one or more fields and their problematic issues in current mathematics. This knowledge aimshe re-lows tTJ /F5 8 Tf 1 0fev2This knowledge aields and their problematic

CORE COURSES [50.0]

○ 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
🌐 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

○ Mémoire et séminaire (28 credits)

○ LMAT2997	Thesis tutorial	Ahmed Adrioueche Pedro Dos Santos Santana Forte Vaz	EN [q2] [15h] [2 Credits] 🌐

			Year	
			1	2
s and technics (sem)	Alexandre Guay (compensates Charles Pence) Hervé Jeanmart René Rezsohazy	FR [q2] [15h+15h] [2 Credits] 🌐		x
faith	Benoît Bourgine Paulo Jorge Dos Santos Rodrigues	FR [q1] [15h] [2 Credits] 🌐		

LIST OF FOCUSES

> Research Focus   *[en-prog-2024-math2m-lmath200a]*
> Teaching Focus   *[en-prog-2024-math2m-lmath200d]*

RESEARCH FOCUS [30.0]

In the research focus, the programme offers a general education in the major fields of fundamental mathematics and a deeper education in one of the research areas of the School of Mathematics. In seminar LMAT2160, a research project is set up by the students. With the agreement of the School, students may replace courses in the research focus by courses in research given in other universities, by courses chosen from the various options, or by courses in the Master in Physics.

O 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
🌐 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:*

				1	2
O LMAT2160	Training seminar for mathematical researchers	Pierre-Emmanuel Caprace Jean Van Schaftingen	[FR] [q1] [15h] [5 Credits] 🌐 > *English-friendly*	x	
O LMAT2165	Personal project in mathematics	Pierre Bieliavsky Pedro Dos Santos Santana Forte Vaz	[FR] [q2] [15h] [5 Credits] 🌐 > *English-friendly*	x	

TEACHING FOCUS [30.0]

IMPORTANT NOTE: In accordance with article 138 para. 4 of the decree of 7 November 2013 concerning higher education and the academic organisation of studies, teaching practice placements will not be assessed in the September session. Students are required to make every effort to successfully complete the teaching practice in the June session, subject to having to retake the year.

In the teaching focus, the programme offers general training for the secondary school teacher and specific training in teaching mathematics. The teaching focus confers on the student the title of qualified teacher for upper secondary education.

> **O** 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
> 🌐 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 **Séminaire d'observation et d'analyse de l'institution scolaire et de son contexte (en ce compris le stage d'observation) (4 credits)**

Choisir 1 des activités suivantes. Le cours et le séminaire doivent être suivis au même quadrimestre.

| ✕ LAGRE2120P | Observation et analyse de l'institution scolaire et de son contexte (en ce compris le stage d'observation) | |

				Year	
				1	2
⌗ LSCI2320	Didactics and epistemology of science	Myriam De Kesel (coord.) Marc de Wergifosse Gabriel Dias de Carvalho Junior	FR [q1] [22.5h] [2 Credits] ⊕	x	x

OPTIONS [40.0]

Whatever the focus followed, the student completes the programme to obtain 120 credits.

> Option in Statistics   *[en-prog-2024-math2m-lmath221o]*
> Option sciences actuarielles   *[en-prog-2024-math2m-lmath222o]*
> Option mathématiques appliquées   *[en-prog-2024-math2m-lmath101o]*
> Option biostatistique   *[en-prog-2024-math2m-lmath102o]*
> Autres cours au choix   *[en-prog-2024-math2m-lmath100o]*

OPTION IN STATISTICS

O Mandatory
⊗ Optional
△ Not offered in 2024-2025
⊘ Not offered in 2024-2025 but offered the following year
⊕

OPTION SCIENCES ACTUARIELLES Mandatory

O Mandatory
⊗ Optional

Year
1 2

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OPTION BIOSTATISTIQUE [30.0]

O Mandatory
⌗

AUTRES COURS AU CHOIX

O 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
🌐 Open to incoming exchange students
🌐 Not open to incoming exchange students
[FR]

⌗ LMAT1237	Introduction to logic: model theory		Enrico Vitale	FR [q2] [30h+15h] [5 Credits] ⊕ 🌐 > *English-friendly*
⌗ LMAT1241	Geometry II		Pierre Bieliavsky	FR [q2] [45h+30h] [6 Credits] 🌐 > *English-friendly*
⌗ LMAT1271	Calculation of probability and statistical analysis		Rainer von Sachs	FR [q2] [30h+30h] [6 Credits] 🌐 > *English-friendly*
⌗ LMAT1371	Probability Theory		Karim Barigou	FR [q2] [30h+22.5h] [5 Credits] 🌐
⌗ LMAT1151	Numerical analysis : tools and software of calculus		Jean Van Schaftingen	FR [q1] [30h+45h] [5 Credits] 🌐 > *English-friendly*
⌗ LMAT1351	Approximation: methods et theory		Tom Claeys	EN [q1] [30h+30h] [5 Credits] 🌐 > *French-friendly*

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 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.

Non university Bachelors

> Find out more about links to the university

Holders of a 2nd cycle University degree

Diploma	Special Requirements	Access	Remarks
"Licenciés"			
		Direct access	
Masters			
		Direct access	

Holders of a non-University 2nd cycle degree

Access based on validation of professional experience

> It is possible, under certain conditions, to use one's personal and professional experience to enter a university course without having the required qualifications. However, validation of prior experience does not automatically apply to all courses. Find out more about Validation of 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 in the procedure is to submit a file online (see https://uclouvain.be/en/study/inscriptions/futurs-etudiants.html).

Students who wish to be admitted on the basis of a dossier are invited to consult the criteria for the evaluation of application.

Admission and Enrolment Procedures for general registration

Specific professional rules

Successful completion of the master's course with **teaching focus** leads to the award of the master's degree with teaching focus and the title of secondary school education specialist.

The Réforme des Titres et Fonctions ("Titles and Functions Reform"), in force since 1 September 2016, is intended to harmonise the titles, functions and pay scales of basic and secondary education professionals in French Community of Belgium networks.

It also aims to guarantee the priority of preferred titles over minimum titles and to establish a regime for titles in short supply.

AESS holders can learn which functions they can carry out and the pay scales from which they can benefit by clicking here.

The university cannot be held responsible for any problems that students may encounter at a later date with a view to a teaching appointment in the French Community of Belgium.

Teaching method

Whenever possible, teachers in the School of Mathematics give priority to close supervision: small-group work, individual tuition, rapid and personalised feedback on activities, active participation of students in the School's teaching decisions. All the courses in the programme contribute to the acquisition of skills such as the capacity for abstract thinking and for reasoning. Other skills (aptitude for communication, independent learning, document research) are especially exercised in seminars specific to the focuses (where students are responsible for work progress), in work linked to the preparation of the dissertation and in the dissertation activity (the Thesis Tutorial, which specifically concentrates on scientific communication in English). The interdisciplinary character of the programme is reinforced by the presence in the options of courses taken from the Masters programmes in physics, in statistics and biostatistics, in actuarial science and in applied mathematics.

Students in the research focus may take introduction to research courses in neighbouring universities in order to learn about mathematical research subjects that are not offered by UCL. An additional teaching module in disciplines other than mathematics is possible for students in the teaching focus.

Evaluation

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

Assessment methods conform to academic regulations and procedures. More details on the methods employed in each teaching unit are available in their description sheet, under the heading 'Assessment methods for student learning'.

Different methods are in place in order to evaluate the knowledge and skills acquired in the course of the learning period; these are adapted to the following types of performance: continuous assessment, especially for practical exercises; assessment of individual work (reading, consultation of databases and bibliographical references, monograph and report writing); overall assessment (written and/or oral) during examination sessions; assessment of public presentations.

Whatever the teaching language of an activity, students may choose to present the corresponding assessment in English or in French. Exceptions are the Thesis Tutorial, philosophy courses and activities specific to the teaching focus.

Mobility and/or Internationalisation outlook

Students in the two focuses will have the opportunity of making an Erasmus, Mercator or other study period. The aim of such a study period is either to follow around 30 course credits, or to write the dissertation, while at the same time having the chance to discover another country and a different culture.

For students in the teaching focus it is preferable for the study period to take place at the end of the year. Partner universities are located in Dutch-speaking Belgium (in this case, the entire second year of the Master may take place outside UCL), in Europe (Italy, Spain, France, Denmark), in Australia, in Canada, in South Africa and in Japan. See https://uclouvain.be/fr/facultes/sc/programmes-d-echange-d-etudiants.html for a detailed presentation of the international mobility activities organised by the Faculty of Sciences. Courses LMAT2910 - Advanced topics 1, LMAT2920 - Advanced topics 2 and LMAT2930 - Advanced topics 3 are given by visiting professors from various Belgian and foreign institutions.The titles of these courses are generic in order to maintain the greatest flexibility and the best match with the development of research.

These courses are often taught in English.

Possible trainings at the end of the programme

Whatever the focus, the Master in Mathematics gives access to the doctorate in science.

The general statistics, biostatistics, and actuarial science options allow access to the second year of the corresponding Master, with a possible additional maximum of 15 credits in the second year programme of the corresponding Master.

Students who have earned a Master's degree in one of the focuses may gain a second Master in Mathematics in the other focus by means of a personalised one-year programme.

Contacts

Curriculum Management

Entity

Structure entity	SST/SC/MATH
Denomination	(MATH)
Faculty	Faculty of Science (SC)
Sector	Sciences and Technology (SST)
Acronym	MATH
Postal address	Chemin du Cyclotron 2 - bte L7.01.02
	1348 Louvain-la-Neuve
	Tel: +32 (0) 10 47 31 52 - Fax: +32 (0) 10 47 25 30
Website	https://uclouvain.be/fr/facultes/sc/math

Academic supervisor: Jean Van Schaftingen

Jury

- President: Tim Van der Linden
- Secretary and Study advisor: Heiner Olbermann
- Study advisor for the master's degree in teaching: Laure Ninove

Useful Contact(s)

- Administrative manager for the student's annual program: Catherine De Roy