

At Louvain-la-Neuve - 120 credits - 2 years - Day schedule - In French

Dissertation/Graduation Project : **YES** - Internship : **NO**

Activities in English: **YES** - Activities in other languages : **YES**

Activities on other sites : **NO**

Main study domain : **Sciences**

MATH2M - Introduction

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

MATH2M - Teaching profile

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 aims at allowing the student to interact with other researchers in the context of a research project at doctoral level.

- Develop in an independent way his mathematical intuition by anticipating the expected results (formulating conjectures) and by verifying their consistency with already existing results.

- Gather material and summarise the current state of knowledge relating to a mathematical problem.
- Ask relevant and lucid questions on an advanced mathematical topic in an independent manner.

Finalité didactique - L'étudiant qui se destine à l'enseignement sera prêt à assumer des tâches professionnelles dans l'enseignement secondaire et à apporter ses compétences pédagogiques et disciplinaires.

- Mettre en relation les contenus mathématiques du programme de l'enseignement secondaire et ceux de la formation universitaire.
- Comparer et intégrer différentes approches possibles aux principaux sujets du programme de mathématique de l'école secondaire, identifier les étapes clef et les points délicats du programme.
- Mettre en place des dispositifs d'apprentissage adaptés, originaux et pertinents tant du point de vue de la rigueur que du point de vue de l'intuition.
- Proposer des problèmes provenant de différents domaines permettant d'introduire, illustrer et mettre en œuvre des notions mathématiques du programme.

7) **if the teaching focus is chosen**, bring together the skills needed to successfully begin the career of teacher of mathematics in upper secondary school and to make positive progress.

- Take action in the school setting, in partnership with other involved parties.
- Teach in real and observed situations.

In a more specific way, in regard to the teaching of mathematics, the graduate is able:

- To link the mathematical content of the secondary school teaching programme with that of university education.
- Compare and integrate different possible approaches to the main subjects of secondary school mathematics, identify the key stages and the sensitive points of the programme.
- Employ learning methods that are appropriate, original and relevant both from the point of view of precision and from that of intuition.
- Formulate interdisciplinary examples in the form of problems to introduce, illustrate and put into practice the mathematical concepts of the programme.
- Be self-critical and plan with continuous development in mind. For more details, see [Teacher training certificate \(upper secondary education\) \(Mathematics\)](#).

Depending on the chosen focus, he will be able to adapt to various professional contexts and he will be able to :

- Do a statistical analysis of large sets of data with the help of softwares.
- Master several fields of current probability and mathematical statistics and their problems.
- Use basic concepts and models in survival analysis, specific tools of biostatistics and techniques and standards of clinical tests.
- Exploit in an integrated way various know-hows in actuarial sciences and in financial mathematics in order to analyse complex problems in quantitative management of risks.
- Use fundamental tools of computing and programming in order to solve management problems involved in the financial impact of risks.

Programme structure

The programme for the Master in Mathematical Sciences is composed of:

- core subjects of 50 credits, of which 26 credits are for the dissertation;
- a focus of 30 credits;
- one option and selected courses for 40 credits.

Note here that:

- a part of the programme of study corresponding to around 30 credits (some of which may be involved in writing the dissertation) may be performed in the context of one of the international mobility programmes established by the Faculty.
- Courses already taken as part of the in-depth minor in mathematics may not be included in the student's Master programme
- With the agreement of the School of Mathematics, the student may defer to the second year an activity scheduled for the first year or bring forward to the first year an activity scheduled for the second year (with the exception of LMAT2997 and LMAT2999). In these cases, timetable clashes may arise. For a standard programme, this Master will total, whatever the focus, the options and/or the optional courses chosen, a minimum of 120 credits divided into two annual sections of 60 credits each.

MATH2M Programme

Detailed programme by subject



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

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

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

OPTION SCIENCES ACTUARIELLES

- Mandatory
 - ✘
-

Year

				1	2
⌘ LINMA2472	Algorithms in data science	Jean-Charles Delvenne (coord.) Benoit Legat (compensates Vincent Blondel)	EN [q1] [30h+22.5h] [5 Credits]  > French-friendly	x	x
⌘ LMAT2450	Cryptography	Olivier Pereira	EN [q1] [30h+15h] [5 Credits]  > French-friendly		

OPTION BIOSTATISTIQUE [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
- 🌐 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...)

UCL graduates in the Master in Mathematics with option in general statistics have access to the second year of the Master in Statistics with biostatistics orientation. Students will choose one course between LSTAT2130 and LSTAT2220. Students will choose one course from the following

Year

1 2

Content:

● LSTAT2020	Statistical softwares and basic statistical programming	Céline Bugli	1 [q1] [15h+15h] [3 Credits] 🌐	x	x
● LDATS2030					

⌘ LMAT1237

Int

on to logic: model theory

Enrico Vitale

📅 [q2] [30h+15h] [5 Credits] 🌐

> English-friendly

⌘ LMAT1241

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.

MATH2M - Information

[Access based on application](#)

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

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 https://uclouvain.be/fr/facultes/sc/math
Website	

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](#)

