



MA-MATH | 2023-2024

# Master in Mathematics

## Programme mnemonic

MA-MATH

> Focus *Research* : M-MATHA

> Focus *Teaching* : M-MATHD

## Studies level

Master 120 credits

## Learning language

french

## Schedule

office hours

## Studies category / subcategory

Sciences and technics / Sciences

## Campus

Plaine

## Programme's added value

The Master benefits enormously from the internationally renowned research teams at the Mathematics Department. Moreover, active collaborations with the Economics, Computer Science, and Physics Departments, as well as agreements with neighbouring universities, broaden the range of courses available to students (some of which are given in Dutch or English). The programme is designed so that the student may develop their interests in various mathematical disciplines, chosen from a large range on offer. Research is conducted within the department in algebra and combinatorics, differential geometry, analysis of PDEs, mechanics and applied mathematics, probability, statistics, actuarial sciences, and mathematics teaching.

While most courses consist in lecture classes, a significant part of the programme relies on individual assignments based on material that reaches beyond what is covered during the lectures. Students who choose the research focus, for instance, will receive an introduction to research in mathematics, and gain experience in scientific communication. Students who pick the teaching focus will spend time in classrooms. In both cases, the dissertation plays an important part in the programme (30 credits) and gives students an opportunity to master a subject of their choosing, to present a summary of various techniques and theories, and even perhaps to make an original contribution themselves. Graduates are well placed to tackle new problems, such as those encountered in pure research, in the industrial sector, or in other applications of mathematics.

Whilst comprised mainly of lecture courses, the programme has a large component which is based on individual work of the student done over and above that which is seen in lectures. The student who chooses an in-depth specialisation in mathematics, for example, will get an introduction to carrying out research in mathematics as well as experience of scientific communication. The student specialising in teaching of mathematics will spend time in classrooms. In both specialisations, the memoir plays an important role (30 ECTS) and gives the student the opportunity to master a subject of their choice, to present a synthesis of various techniques and theories and even perhaps to make an original contribution themselves. The finishing student will be well placed to attack new problems, such as those encountered in pure research, in industry or in other applications of mathematics.

## Programme objectives

Mathematics plays a fundamental role in our technologically advanced society. The discipline is in constant evolution, with new discoveries made at an increasing pace. These answer either questions that were generated by internal progress in mathematics, or problems raised in other disciplines (scientific, industrial, business, etc.). Mathematics has proven to be indispensable in all branches of science and technology: cryptography and codes, medical imagery, telecommunications, theory of fundamental particles, space research, bioengineering, meteorology, ecological modelling, economy and finance, etc. This programme aims to train mathematicians who are ready to contribute to both the theoretical development of the discipline and the solution to problems from various origins. Our Master programme develops the students' ability to reason abstractly and rigorously, but also with invention and imagination. Graduates are also able to use existing powerful mathematical techniques as well as to develop new ones. Through the choices made during the Master programme, our students can direct their learning towards a career in research, in the private sector, or in teaching.



## Teaching methods

The majority of classes involve lectures in tandem with activities in which students take an active part (e.g. lab classes, reading seminars, talks, etc.).

While writing their dissertation and other personal assignments, students develop their creativity and even have a chance to contribute original research.

## Succeed in your studies

### Choose

The information and guidance counsellors at the InfOR-études [<https://www.ulb.be/en/studies-info-desk-1>] service will help you choose your studies throughout the year.

### Succeed

Take part in preparatory courses [<https://www.ulb.be/en/studies-info-desk-1>] or get help to succeed [<https://www.ulb.be/en/studies-info-desk-1>], before or during your studies.

### Get help

Apply for financial aid, look for accommodation or a student job, get support [<https://www.ulb.be/fr/aides-services-et-accompagnement/aid-services-and-support-1>] for your specific needs.

## International/Openness

During either the first or second year, students may spend one or two terms in another university or institute of higher education. This can be done inside or outside of Europe, under the Erasmus programme or by taking advantage of the many different agreements ULB has concluded with other universities.

A partnership with mathematics departments in French-speaking Belgian universities, as well as universities in North of France, gives access to Master programmes at the Université Catholique de Louvain, the Université de Liège, the Université de Mons, the Université de Namur, and the universities of Artois, Lille 1, Littoral-Côte-d'Opale, Valenciennes, and Hainaut-Cambrésis. This programme also includes courses offered at VUB, and students can choose up to 30 additional credits in other disciplines

in higher education), 36% are pursuing a career in research (either in a university or another institution), and 42% are working in a wide variety of jobs in the private sector (banks, pharmaceutical industry, etc.).

While the demand for mathematics teachers remains high, options for graduates of a Master in Mathematics are particularly varied and include: high-level positions in financial organisations, conducting studies in statistics or bio-statistics, consulting in network management, etc.

Careers open to graduates of this programme are extremely varied. In a survey of our graduates who received their diploma between 1997 and 2012:

- 51.4% worked in the private sector or as civil servants (29.4% in finance, 10.3% in consulting, 2.5% in the pharmaceutical industry, 2% in computer science, and 7.2% in a variety of other careers).
- 26% worked in research or teaching at a university (9.3% were professors or permanent researchers, 5.4% were postdoctoral researchers, and 11.3% were studying for a PhD).
- 19% worked as teachers (11.2% in secondary schools in Belgium, 2.5% in secondary schools in Luxembourg, and 5.4% in higher education).
- Of the remaining graduates, 1% were voluntarily not employed and 2.5% were seeking employment.

The need for mathematics teachers remains extremely high, but this is more than matched by the demand for skilled mathematicians in a variety of roles in the private sector, including high-ranking positions in financial organisations, carrying out biostatistical studies, analysing large networks (e.g. in telecommunications or social media), and so on. Mathematicians play an increasingly important role in business and industry.

### Contacts

✉ [ma-math@ulb.be](mailto:ma-math@ulb.be)

☎ +32 2 650 58 64

🌐 <https://sciences.ulb.be/departement-mathematique>

## Job opportunities

Graduates of the Master in Mathematics go on to work in a wide variety of careers. Ten years after graduation, 7% are pursuing further studies, 15% are teaching (either in secondary schools or

### Jury President

Joel FINE

### Jury Secretary

Antoine GLORIA



# Master in Mathematics

## Focus Research

### Research focus

The research oriented masters programme gives you complete freedom to specialise in those parts of advanced mathematics which excite you the most. The only obligatory courses are two projects, where you are free to choose the subject. If you already have an idea of a potential career, either in the private sector or in research, we can guide you in an appropriate choice of courses.

The first project (in bloc 1) is called "Initiation in research and scientific communication". Here you will learn how to carry out research: find and interpret originally sources yourself, write a synthesis, communicate a subject to your audience. The second project (in bloc 2) is the Masters Thesis. It is a large project in which you will arrive at or maybe even go beyond the cutting edge of current mathematical research. The possible topics are limited only by your imagination, from a research problem in abstract foundational mathematics to a concrete application to solve a specific problem in a private company, anything and everything is possible!

The remainder of your programme will be made up of optional courses. We offer a wide range of subjects which fall more-or-less in four large groups:

- > Discrete geometry, combinatorics and algebra
- > Analysis and partial differential equations
- > Differential geometry and topology
- > Statistics, probability and applied mathematics.

It should be stressed that this division into "themes" is often artificial and there are many interactions between these areas. In fact, these strong connections between different fields of mathematics, which at first sight are unrelated, are amongst the most profound discoveries in modern mathematics.

### Teaching focus

The teaching oriented masters programme will put you in position to train the scientists of the future ! There obligatory courses in pedagogie, stages and teaching. You will also have two projects to do. The first (in bloc 1) focuses on secondary school mathematics. It is in two parts. For the first part you will create a mathematical workshop which can be run in a secondary school. You will learn how to motivate and inspire the students ! The second part involves a written text which will explain a topic from university mathematics to a strong student in 5th or 6th year. Thanks to this exercise, you will get a good understanding of the difference between school and university mathematics and learn how to give the students a taste of the subject, as you have yourself.

The second project (in bloc 2) is the Masters Thesis. Here you can chose a research oriented topic, just as in the research oriented masters programme, or you can carry out a research project in mathematical education.

You have complete freedom to choose the remainder of your programme. You can choose from the wide range of advanced mathematical courses as well as all the other courses on offer in the Faculty of Sciences. In this way, you will have the chance to master the theory and techniques of modern mathematics as well as witness their powerful applications in the other sciences, an experience which will serve you well as you transmit your passion for mathematics to your students !

## Bloc 1 | M-MATHA | MA-MATH

### Cours obligatoires

MATH-F430 [Initiation à la recherche et à la communication scientifique](#) | Joel FINE (Coordinator)  
⌚ 15 credits [project: 180h] 📅 second term 🗨 French









































### Cours à choisir

30 to 45 credits chosen from the following

#### Analyse et équations aux dérivées partielles

MATH-F411 (optional) [Analyse fonctionnelle](#) | Antoine GLORIA (Coordinator)  
⌚ 5 credits [lecture: 24h, tutorial classes: 12h] 📅 first term 🗨 French

MATH-F412 (optional) [Méthodes variationnelles et équations aux dérivées partielles](#) | Antoine GLORIA (Coordinator), Colette De Coster and Bruno PREMOSELLI  
⌚ 5 credits [lecture: 24h, tutorial classes: 12h] 📅 second term 🗨 French

|                                 |  |
|---------------------------------|--|
| MATH-F425<br>(optional)         | <b>Ondelettes et applications</b><br>5 credits [lecture: 24h, tutorial classes: 12h]  second term  French  |
| MATH-F431<br>(optional)         | <b>Optimisation, algorithmes et applications</b>   Ignace LORIS (Coordinator)<br>5 credits [lecture: 24h, tutorial classes: 12h]  first term  French   |
| MATH-F433<br>(optional)         | <b>Topics in the analysis of partial differential equations</b>   Denis BONHEURE (Coordinator) and Mitia Duerinckx<br>5 credits [lecture: 24h, tutorial classes: 12h]  second term  French<br>Ce cours n'est pas donné en 2022-23, 2024-25, etc. |
| MATH-F502<br>(optional)         | <b>Imagerie et problèmes inverses</b>   Ignace LORIS (Coordinator)<br>5 credits [lecture: 24h, tutorial classes: 12h]  second term  French   |
| MATH-F520<br>(optional)         | <b>Interplay between PDE and probability</b>   Antoine GLORIA (Coordinator)<br>5 credits [lecture: 24h, tutorial classes: 12h]  second term  French  |
| <b>Géométrie différentielle</b> |  |
| MATH-F413<br>(optional)         | <b>Géométrie riemannienne</b>   Joel FINE (Coordinator)<br>5 credits [lecture: 24h, tutorial classes: 12h]  second term  French  |
| MATH-F417<br>(optional)         | <b>Groupes et algèbres de Lie</b>   Simone GUTT (Coordinator)<br>5 credits [lecture: 24h, tutorial classes: 12h, project: 60h]  first and second terms  French   |
| MATH-F419<br>(optional)         | <b>Algebraic Topology</b>   Andriy Haydys (Coordinator)<br>5 credits [lecture: 24h, tutorial classes: 12h]  first term  English  |
| MATH-F420<br>(optional)         | <b>Differential geometry II</b>   Mélanie BERTELSON (Coordinator)<br>5 credits [lecture: 24h, tutorial classes: 12h, project: 24h]  first term  English  |
| MATH-F511<br>(optional)         | <b>Global analysis</b>   Andriy Haydys (Coordinator)<br>5 credits [lecture: 24h, tutorial classes: 12h]  second term  English  |
| MATH-F512<br>(optional)         | <b>Géométrie symplectique</b>   Mélanie BERTELSON (Coordinator)<br>5 credits [lecture: 24h, tutorial classes: 12h, project: 12h]  second term  French<br>Ce cours n'est pas donné en 2022-23, 2024-25, etc.                                  |
| MATH-F513<br>(optional)         | <b>Riemann surfaces</b>   Joel FINE (Coordinator)<br>5 credits [lecture: 24h, tutorial classes: 12h]  second term  English<br>Ce cours n'est pas donné en 2022-23, 2024-25 etc.  |
| <b>Algèbre et combinatoire</b>  |  |
| MATH-F406<br>(optional)         | <b>Groupes et géométries</b>   Dimitri LEEMANS (Coordinator)<br>5 credits [lecture: 24h, tutorial classes: 12h]  second term  French   |
| MATH-F407<br>(optional)         | <b>Groupes, algèbres et représentations</b>   Joost VERCRUYSE (Coordinator)<br>5 credits [lecture: 24h, tutorial classes: 12h]  first term  French   |
| MATH-F408<br>(optional)         | <b>Convex polytopes</b>   Samuel FIORINI (Coordinator)<br>5 credits [lecture: 24h, tutorial classes: 12h]  first term  English<br>Ce cours n'est pas donné en 2022-23, 2024-25 etc.  |
| MATH-F427<br>(optional)         | <b>Algèbre combinatoire</b><br>5 credits [lecture: 24h, tutorial classes: 12h]  second term  French  |
| MATH-F429<br>(optional)         | <b>Géométrie convexe et discrète</b>   Samuel FIORINI (Coordinator)<br>5 credits [lecture: 24h, tutorial classes: 12h]  first term  French   |
| MATH-F506<br>(optional)         | <b>Géométrie d'incidence</b>   Dimitri LEEMANS (Coordinator)<br>5 credits [lecture: 24h, tutorial classes: 12h]  first term  French<br>Ce cours n'est pas donné en 2022-23,2024-25,etc.  |
| MATH-F519<br>(optional)         | <b>Algèbre catégorique</b>   Joost VERCRUYSE (Coordinator)<br>5 credits [lecture: 24h, tutorial classes: 12h]  first term  French  |
| MATH-F525<br>(optional)         | <b>Algebraic geometry</b>   Špela SPENKO (Coordinator)<br>5 credits [lecture: 24h, tutorial classes: 12h]  first term  English   |

## Statistique

|                         |  |
|-------------------------|--|
| STAT-F404<br>(optional) | <b>Graduate statistics</b>   Thomas VERDEBOUT (Coordinator) and Davy PAINDAVEINE<br>⌚ 5 credits [lecture: 24h] 📅 first term 💬 English  |
| STAT-F406<br>(optional) | <b>Modèles de régression</b>   Davy PAINDAVEINE (Coordinator)<br>⌚ 5 credits [lecture: 24h, tutorial classes: 12h] 📅 second term 💬 French  |
| STAT-F415<br>(optional) | <b>Calcul stochastique</b>   Griselda DEELSTRA (Coordinator)<br>⌚ 5 credits [lecture: 24h] 📅 second term 💬 French  |
| STAT-F420<br>(optional) | <b>Topics in mathematical statistics</b>   Thomas VERDEBOUT (Coordinator)<br>⌚ 5 credits [lecture: 24h, tutorial classes: 12h] 📅 first term 💬 English  |
| STAT-F421<br>(optional) | <b>Topics in probability theory</b>   Yves-Caoimhin SWAN (Coordinator)<br>⌚ 5 credits [lecture: 24h, tutorial classes: 12h] 📅 second term 💬 English<br>Ce cours n'est pas donné en 2024-2025, 2026-2027 etc. |

## Advanced Topics

|                         |   |
|-------------------------|---|
| MATH-F521<br>(optional) | <b>Advanced topics in Mathematics I</b>   Joel FINE (Coordinator)<br>⌚ 5 credits [lecture: 60h] 📅 first term 💬 English    |
| MATH-F522<br>(optional) | <b>Advanced topics in Mathematics II</b>   Joel FINE (Coordinator)<br>⌚ 5 credits [lecture: 60h] 📅 first term 💬 English   |
| MATH-F523<br>(optional) | <b>Advanced topics in Mathematics III</b>   Joel FINE (Coordinator)<br>⌚ 5 credits [lecture: 60h] 📅 second term 💬 English |
| MATH-F524<br>(optional) | <b>Advanced topics in Mathematics IV</b>   Joel FINE (Coordinator)<br>⌚ 5 credits [lecture: 60h] 📅 second term 💬 English  |

## Formation complémentaire

Au besoin choisir un ou des cours dans la liste suivante jusqu'à 15 ECTS maximum, afin d'arriver à un total de 60 ECTS parmi les cours des masters suivants :

Master en statistique  
Master en physique  
Master en informatique  
Master en bioinformatique et modélisation  
Master en Sciences mathématiques de la VUB  
Master en sciences mathématiques de l'UCL  
Masters de la SBS-EM et de l'EPB  
ou n'importe quel autre cours (y compris hors ULB) moyennant l'approbation du jury

*Up to 15 credits chosen from the following*

*One course chosen from the following*

|                         |   |
|-------------------------|---|
| TEMP-0000<br>(optional) | <b>Cours extérieurs au programme</b><br>⌚ 5 credits 📅 academic year 💬 French  |
| TEMP-0000<br>(optional) | <b>Cours extérieurs au programme</b><br>⌚ 10 credits 📅 academic year 💬 French |
| TEMP-0000<br>(optional) | <b>Cours extérieurs au programme</b><br>⌚ 15 credits 📅 academic year 💬 French |

# Master in Mathematics

## Focus Research

### Bloc 2 | M-MATHA | MA-MATH

## Mémoire

MEMO-F522

**Mémoire** | Joel FINE (Coordinator)

🕒 30 credits [mfe/tfe: 360h] 📅 first and second terms

## Cours à choisir

15 to 30 credits chosen from the following

### Analyse et équations aux dérivées partielles

MATH-F411  
(optional)

**Analyse fonctionnelle** | Antoine GLORIA (Coordinator)

🕒 5 credits [lecture: 24h, tutorial classes: 12h] 📅 first term 🗣 French

MATH-F412  
(optional)

**Méthodes variationnelles et équations aux dérivées partielles** | Antoine GLORIA (Coordinator), Colette De Coster and Bruno PREMOSELLI

🕒 5 credits [lecture: 24h, tutorial classes: 12h] 📅 second term 🗣 French

MATH-F425  
(optional)

**Ondelettes et applications**

🕒 5 credits [lecture: 24h, tutorial classes: 12h] 📅 second term 🗣 French

MATH-F431  
(optional)

**Optimisation, algorithmes et applications** | Ignace LORIS (Coordinator)

🕒 5 credits [lecture: 24h, tutorial classes: 12h] 📅 first term 🗣 French

MATH-F433  
(optional)

**Topics in the analysis of partial differential equations** | Denis BONHEURE (Coordinator) and Mitia Duerinckx

🕒 5 credits [lecture: 24h, tutorial classes: 12h] 📅 second term 🗣 French

Ce cours n'est pas donné en 2022-23, 2024-25, etc.

MATH-F433  
(optional)

**Topics in the analysis of partial differential equations** | Denis BONHEURE (Coordinator) and Mitia Duerinckx

🕒 5 credits [lecture: 24h, tutorial classes: 12h] 📅 second term 🗣 French

Ce cours n'est pas donné en 2022-23, 2024-25, etc.

MATH-F502  
(optional)

**Imagerie et problèmes inverses** | Ignace LORIS (Coordinator)

🕒 5 credits [lecture: 24h, tutorial classes: 12h] 📅 second term 🗣 French

MATH-F520  
(optional)

**Interplay between PDE and probability** | Antoine GLORIA (Coordinator)

🕒 5 credits [lecture: 24h, tutorial classes: 12h] 📅 second term 🗣 French

### Géométrie différentielle

MATH-F413  
(optional)

**Géométrie riemannienne** | Joel FINE (Coordinator)

🕒 5 credits [lecture: 24h, tutorial classes: 12h] 📅 second term 🗣 French

MATH-F417  
(optional)

**Groupe et algèbres de Lie** | Simone GUTT (Coordinator)

🕒 5 credits [lecture: 24h, tutorial classes: 12h, project: 60h] 📅 first and second terms 🗣 French

MATH-F419  
(optional)

**Algebraic Topology** | Andriy Haydys (Coordinator)

🕒 5 credits [lecture: 24h, tutorial classes: 12h] 📅 first term 🗣 English

MATH-F420  
(optional)

**Differential geometry II** | Mélanie BERTELSON (Coordinator)

🕒 5 credits [lecture: 24h, tutorial classes: 12h, project: 24h] 📅 first term 🗣 English

MATH-F511  
(optional)

[Global analysis](#) | Andriy Haydys (Coordinator)

5 credits [lecture: 24h, tutorial classes: 12h] second term English

MATH-F512  
(optional)

[Géométrie symplectique](#) | Mélanie BERTELSON (Coordinator)

5 credits [lecture: 24h, tutorial classes: 12h, project: 12h] second term French

Ce cours n'est pas donné en 2022-23, 2024-25, etc.

MATH-F513  
(optional)

[Riemann surfaces](#) | Joel FINE (Coordinator)

5 credits [lecture: 24h, tutorial classes: 12h] second term English

Ce cours n'est pas donné en 2022-23, 2024-25 etc.

## Algèbre et combinatoire

MATH-F406  
(optional)

[Groupes et géométries](#) | Dimitri LEEMANS (Coordinator)

5 credits [lecture: 24h, tutorial classes: 12h] second term French

MATH-F407  
(optional)

[Groupes, algèbres et représentations](#) | Joost VERCRUYSE (Coordinator)

5 credits [lecture: 24h, tutorial classes: 12h] first term French

MATH-F408  
(optional)

[Convex polytopes](#) | Samuel FIORINI (Coordinator)

5 credits [lecture: 24h, tutorial classes: 12h] first term English

Ce cours n'est pas donné en 2022-23, 2024-25 etc.

MATH-F427  
(optional)

[Algèbre combinatoire](#)

5 credits [lecture: 24h, tutorial classes: 12h] second term French

MATH-F429  
(optional)

[Géométrie convexe et discrète](#) | Samuel FIORINI (Coordinator)

5 credits [lecture: 24h, tutorial classes: 12h] first term French

MATH-F506  
(optional)

[Géométrie d'incidence](#) | Dimitri LEEMANS (Coordinator)

5 credits [lecture: 24h, tutorial classes: 12h] first term French

Ce cours n'est pas donné en 2022-23, 2024-25, etc.

MATH-F519  
(optional)

[Algèbre catégorique](#) | Joost VERCRUYSE (Coordinator)

5 credits [lecture: 24h, tutorial classes: 12h] first term French

MATH-F525  
(optional)

[Algebraic geometry](#) | Špela SPENKO (Coordinator)

5 credits [lecture: 24h, tutorial classes: 12h] first term English

## Statistique

STAT-F404  
(optional)

[Graduate statistics](#) | Thomas VERDEBOUT (Coordinator) and Davy PAINDAVEINE

5 credits [lecture: 24h] first term English

STAT-F406  
(optional)

[Modèles de régression](#) | Davy PAINDAVEINE (Coordinator)

5 credits [lecture: 24h, tutorial classes: 12h] second term French

STAT-F415  
(optional)

[Calcul stochastique](#) | Griselda DEELSTRA (Coordinator)

5 credits [lecture: 24h] second term French

STAT-F420  
(optional)

[Topics in mathematical statistics](#) | Thomas VERDEBOUT (Coordinator)

5 credits [lecture: 24h, tutorial classes: 12h] first term English

STAT-F421  
(optional)

[Topics in probability theory](#) | Yves-Caoimhin SWAN (Coordinator)

5 credits [lecture: 24h, tutorial classes: 12h] second term English

Ce cours n'est pas donné en 2024-2025, 2026-2027 etc.

## Advanced Topics

MATH-F521  
(optional)

[Advanced topics in Mathematics I](#) | Joel FINE (Coordinator)

5 credits [lecture: 60h] first term English

MATH-F522  
(optional)

[Advanced topics in Mathematics II](#) | Joel FINE (Coordinator)

5 credits [lecture: 60h] first term English

MATH-F523  
(optional)

[Advanced topics in Mathematics III](#) | Joel FINE (Coordinator)

5 credits [lecture: 60h] second term English



MATH-F524  
(optional)

Advanced topics in Mathematics IV | Joel FINE (Coordinator)

⌚ 5 credits [lecture: 60h] 📅 second term 💬 English

## Formation complémentaire

Au besoin choisir un ou des cours dans la liste suivante jusqu'à 15 ECTS maximum, afin d'arriver à un total de 60 ECTS:

- > les cours du Master en statistique
- > les cours du Master en physique
- > les cours du Master en informatique
- > les cours du Master en bioinformatique et modélisation
- > les cours du Master en Sciences mathématiques de la VUB
- > les cours du Master en Sciences mathématiques de l'UCL
- > les cours des programmes de master de la SBS-EM et de l'EPB
- > ou n'importe quel autre cours (y compris hors ULB) moyennant l'approbation du jury

*Up to 15 credits chosen from the following*

*One course chosen from the following*

TEMP-0000  
(optional)

**Cours extérieurs au programme**

⌚ 5 credits 📅 academic year 💬 French

TEMP-0000  
(optional)

**Cours extérieurs au programme**

⌚ 10 credits 📅 academic year 💬 French

TEMP-0000  
(optional)

**Cours extérieurs au programme**

⌚ 15 credits 📅 academic year 💬 French



# Master in Mathematics

## Focus Teaching

### Research focus

The research oriented masters programme gives you complete freedom to specialise in those parts of advanced mathematics which excite you the most. The only obligatory courses are two projects, where you are free to choose the subject. If you already have an idea of a potential career, either in the private sector or in research, we can guide you in an appropriate choice of courses.

The first project (in bloc 1) is called "Initiation in research and scientific communication". Here you will learn how to carry out research: find and interpret originally sources yourself, write a synthesis, communicate a subject to your audience. The second project (in bloc 2) is the Masters Thesis. It is a large project in which you will arrive at or maybe even go beyond the cutting edge of current mathematical research. The possible topics are limited only by your imagination, from a research problem in abstract foundational mathematics to a concrete application to solve a specific problem in a private company, anything and everything is possible!

The remainder of your programme will be made up of optional courses. We offer a wide range of subjects which fall more-or-less in four large groups:

- > Discrete geometry, combinatorics and algebra
- > Analysis and partial differential equations
- > Differential geometry and topology
- > Statistics, probability and applied mathematics.

It should be stressed that this division into "themes" is often artificial and there are many interactions between these areas. In fact, these strong connections between different fields of mathematics, which at first sight are unrelated, are amongst the most profound discoveries in modern mathematics.

### Teaching focus

The teaching oriented masters programme will put you in position to train the scientists of the future ! There obligatory courses in pedagogie, stages and teaching. You will also have two projects to do. The first (in bloc 1) focuses on secondary school mathematics. It is in two parts. For the first part you will create a mathematical workshop which can be run in a secondary school. You will learn how to motivate and inspire the students ! The second part involves a written text which will explain a topic from university mathematics to a strong student in 5th or 6th year. Thanks to this exercise, you will get a good understanding of the difference between school and university mathematics and learn how to give the students a taste of the subject, as you have yourself.

The second project (in bloc 2) is the Masters Thesis. Here you can chose a research oriented topic, just as in the research oriented masters programme, or you can carry out a research project in mathematical education.

You have complete freedom to choose the remainder of your programme. You can choose from the wide range of advanced mathematical courses as well as all the other courses on offer in the Faculty of Sciences. In this way, you will have the chance to master the theory and techniques of modern mathematics as well as witness their powerful applications in the other sciences, an experience which will serve you well as you transmit your passion for mathematics to your students !

## Bloc 1 | M-MATHD | MA-MATH

### Cours obligatoires

|           |  |
|-----------|--|
| MATH-F421 | <b>Didactique des mathématiques (du secondaire et du supérieur)</b>   Thierry Libert (Coordinator)<br>🕒 5 credits [lecture: 24h, practical work: 24h] 📅 academic year 🗨 French |
| PEDA-E510 | <b>Pédagogie et didactique, aspects généraux</b>   Thomas BARRIER (Coordinator), Maud Delepière and Nathanaël FRIANT<br>🕒 5 credits [lecture: 60h] 📅 first term 🗨 French       |
| STAG-F020 | <b>Stages et pratique réflexive I</b>   Thierry Libert (Coordinator)<br>🕒 5 credits [work placement: 54h] 📅 first and second terms 🗨 French                                    |

### Travaux personnels

|           |  |
|-----------|--|
| MATH-F432 | <b>Travail de réflexion sur les mathématiques scolaires</b>   Joel FINE (Coordinator)<br>🕒 15 credits [project: 180h] 📅 second term 🗨 French |
|-----------|--|

### Formation avancée en mathématique, statistique ou actuariat

Choisir entre 15 et 30 crédits parmi les cours du master en sciences mathématiques à finalité approfondie, les cours du master en statistique ou du master en sciences actuarielles, en respectant les pré- et co-requis qui y sont indiqués.

15 to 30 credits chosen from the following

One course chosen from the following

|                         |   |
|-------------------------|---|
| TEMP-0000<br>(optional) | <b>Cours extérieurs au programme</b><br>⌚ 15 credits 📅 academic year 💬 French |
| TEMP-0000<br>(optional) | <b>Cours extérieurs au programme</b><br>⌚ 20 credits 📅 academic year 💬 French |
| TEMP-0000<br>(optional) | <b>Cours extérieurs au programme</b><br>⌚ 25 credits 📅 academic year 💬 French |
| TEMP-0000<br>(optional) | <b>Cours extérieurs au programme</b><br>⌚ 30 credits 📅 academic year 💬 French |

## Formation complémentaire

Au besoin choisir un ou des cours dans la liste suivante jusqu'à 15 crédits maximum, afin d'arriver à un total de 60 crédits:

- > les cours du Master en Sciences mathématiques de la VUB
- > les cours du Master en physique
- > les cours du Master en informatique
- > les cours du Master en bioinformatique et modélisation
- > les cours des programmes de master de la SBS-EM et de l'EPB
- > ou n'importe quel autre cours (y compris hors ULB) moyennant l'approbation du jury

Up to 15 credits chosen from the following

One course chosen from the following

|                         |   |
|-------------------------|---|
| TEMP-0000<br>(optional) | <b>Cours extérieurs au programme</b><br>⌚ 5 credits 📅 academic year 💬 French  |
| TEMP-0000<br>(optional) | <b>Cours extérieurs au programme</b><br>⌚ 10 credits 📅 academic year 💬 French |
| TEMP-0000<br>(optional) | <b>Cours extérieurs au programme</b><br>⌚ 15 credits 📅 academic year 💬 French |

# Master in Mathematics

## Focus Teaching

### Bloc 2 | M-MATHD | MA-MATH

## Cours obligatoires

- EDUC-E520 [Aspects socio-historiques, psychologiques, culturels, éthiques et de neutralité de l'enseignement](#) | Jose-Luis WOLFS (Coordinator), Sylviane BACHY, Camille Tilleul and Philippe VIENNE  
⌚ 5 credits [lecture: 60h] 📅 first and second terms 💬 French
- STAG-F021 [Stages et pratique réflexive II](#) | Thierry Libert (Coordinator)  
⌚ 10 credits [work placement: 72h] 📅 first and second terms 💬 French
- ### Mémoire
- MEMO-F523 [Mémoire](#) | Joel FINE (Coordinator)  
⌚ 30 credits [mfe/tfe: 360h] 📅 first and second terms

## Cours libres

Choisir des cours dans la liste suivante jusqu'à 15 crédits, afin d'arriver à un total de 60 crédits:

- > les cours du master en sciences mathématiques à finalité approfondie
- > les cours du Master en statistique
- > les cours du Master en sciences actuarielles
- > les cours du Master en physique
- > les cours du Master en informatique
- > les cours du Master en bioinformatique et modélisation
- > les cours du Master en Sciences mathématiques de la VUB
- > les cours des programmes de master de la SBS-EM et de l'EPB
- > ou n'importe quel autre cours (y compris hors ULB) moyennant l'approbation du jury

*Up to 15 credits chosen from the following*

*One course chosen from the following*

- TEMP-0000 (optional) [Cours extérieurs au programme](#)  
⌚ 5 credits 📅 academic year 💬 French
- TEMP-0000 (optional) [Cours extérieurs au programme](#)  
⌚ 10 credits 📅 academic year 💬 French
- TEMP-0000 (optional) [Cours extérieurs au programme](#)  
⌚ 15 credits 📅 academic year 💬 French