

# 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 twoprojects to do. The first (in bloc 1) focuses on secondary school mathematics. It is in twoparts. 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 strongstudent 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 orientedtopic, just as in the research oriented masters programme, or you can carry out a researchproject in mathematical education.

You have complete freedom to choose the remainder of your programme. You can choosefrom 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 theoryand 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) and Bruno PREMOSSELLI  
 ⌚ 5 credits [lecture: 24h, tutorial classes: 12h] 📅 second term 🗨️ French

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



**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) 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
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- MATH-F419 (optional) **Algebraic Topology** | Andriy Haydys (Coordinator)  
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 5 credits [lecture: 24h, tutorial classes: 12h, project: 24h] first term English

MATH-F511 (optional)	<b>Global analysis</b>   Andriy Haydys (Coordinator) ⌚ 5 credits [lecture: 24h, tutorial classes: 12h] 📅 second term 🗨 English
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MATH-F521 (optional)	<b>Advanced topics in Mathematics I</b>   Joel FINE (Coordinator) ⌚ 5 credits [lecture: 60h] 📅 first term 🗨 English
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MATH-F523 (optional)	<b>Advanced topics in Mathematics III</b>   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
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- > 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

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

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### 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) 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 (optional) **Cours extérieurs au programme**  
⌚ 15 credits 📅 academic year 🗨 French

TEMP-0000 (optional) **Cours extérieurs au programme**  
⌚ 20 credits 📅 academic year 🗨 French

TEMP-0000 (optional) **Cours extérieurs au programme**  
⌚ 25 credits 📅 academic year 🗨 French

TEMP-0000 (optional) **Cours extérieurs au programme**  
⌚ 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 (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

### 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), Alain COLSOUL, Philippe VIENNE and Pascal VREBOS

🕒 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