



FACULTY OF SCIENCE,  
TECHNOLOGY AND  
MEDICINE



Bachelor,  
Master and PhD

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# Mathematics



## We develop talents

FSTM has a key mission: attract and train the talents that Luxembourg and the world will need in the STEM fields (Science, Technology, Engineering and Mathematics) as well as in Health and Life Sciences.

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# The Faculty of Science, Technology and Medicine (FSTM) at a glance

The Faculty of Science, Technology and Medicine (FSTM) contributes multidisciplinary expertise in the fields of Mathematics, Physics, Engineering, Computer Science, Life Sciences and Medicine. Through its dual mission of teaching and research, the FSTM seeks to generate and disseminate knowledge and train new generations of responsible citizens, in order to better understand, explain and advance society and environment we live in.



**1**

Faculty

**5**

Departments

**3**

Campus sites



**5**

Disciplines

**41**

Study programmes

**3**

Official languages



**2500**

Students

**130**

Countries

**56 %**

International students





## Why study Mathematics?

### A trip to the frontiers of human knowledge

#### CREATIVITY

Mathematics is a rigorous and demanding intellectual pursuit, where creativity and the ability to think outside the box play crucial roles. Enjoyed for its clarity, it is both exciting and challenging. One of the first things you learn as a student is how broad and varied it is. As you learn more, you develop a taste for certain branches or types of mathematics. Mathematicians, when describing what they work on, will often speak of beauty and elegance. Studying mathematics is a trip to the frontiers of human knowledge, and becoming a mathematician allows you to be part of an expanding and fascinating discipline.

#### DEEP KNOWLEDGE

Learning mathematics is much more than acquiring a body of knowledge. It is also learning how to think deeply, how to reason analytically, how to think quantitatively, and how to work in a problem solving environment. Mathematicians develop a knack for identifying hidden structures in natural, scientific or social environments. As

a tool, mathematics is used across science and, increasingly, in a variety of other areas such as in business, finance, engineering, sociology, and even in art. It also teaches one to be precise in thoughts and words and these are invaluable skills that are useful anywhere.

#### BEAUTY OF MATHEMATICS

Mathematicians say that mathematics is more of an art than a science, which may take so many different forms and has so many different facets that each mathematician has their own point of view.



## Excellent opportunities Join our University!

By joining us, you will benefit from many advantages:

#### MANY OPPORTUNITIES

Luxembourg is a small but dynamic country situated in the heart of Europe. Studying in Luxembourg gives you access to its ever expanding job market which is always in need of qualified individuals with analytic and quantitative skill sets. It is both the most cosmopolitan and the fastest growing economy in western Europe, making it a true land of opportunities.

#### EXCELLENT ENVIRONMENT

Our department consists of world-renowned mathematicians working in diverse fields of mathematics. The low student to teacher ratio ensures that students have a unique opportunity to interact and learn alongside professors who are among the best in the world at what they do. In addition, the activity of the department is deeply rooted in Luxembourg's economical, social and cultural environment. Our flexible study programmes allow students to flourish in accordance with their personal and professional projects. The University of Luxembourg provides an exceptional learning environment. The mathematics department is world class. It is simply a no-brainer.

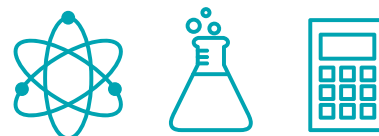


# Our study programmes overview



**Bachelor en  
Mathématiques**

180 ECTS



**Master in  
Mathematics**

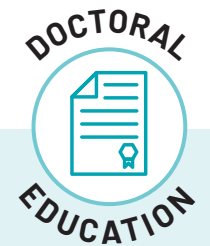
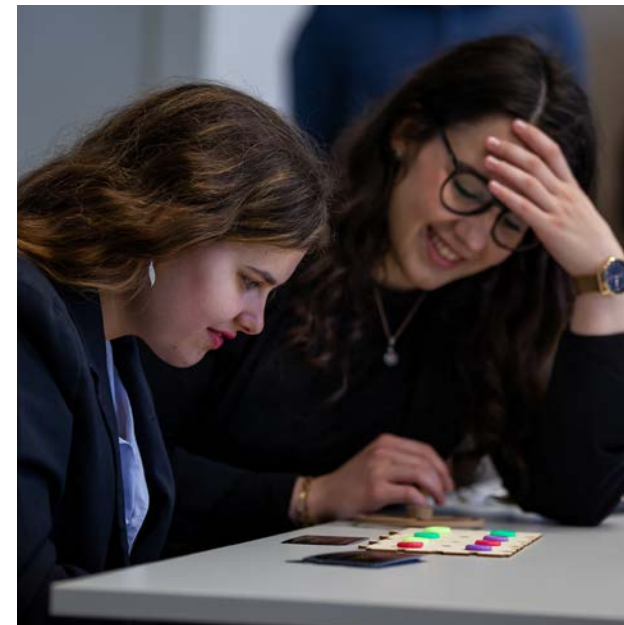
120 ECTS

**Master in Secondary  
Education - Mathematics**

120 ECTS

**Master in Data Science**

120 ECTS



**Doctoral Programme  
in Mathematics and  
Applications**

RESEARCH  
+ 20 ECTS

# Bachelor en Mathématiques

180 ECTS

Ce bachelor permet d'acquérir les connaissances de base dans les domaines fondamentaux des mathématiques (algèbre, analyse, géométrie, probabilités) ainsi que des notions provenant de disciplines intimement liées aux mathématiques, telles que la physique, l'informatique ou la didactique des mathématiques.

## ATOUTS

- Nombreux modules optionnels chaque semestre
- Forte interaction entre enseignement et recherche
- Cours préparatoires

## CONDITIONS D'ADMISSION (60 PLACES)

- Diplôme: diplôme de fin d'études secondaires
- Langues: B2 en français et B1 en anglais

## OPPORTUNITÉS D'ÉTUDES

- Master en Mathématiques ou domaine lié



## Programme en un coup d'œil

- Durée: 3 ans à temps plein/ 6 semestres (180 ECTS)
- Langues: français (75%), anglais (25%)
- Frais d'inscription: 400€/semestre
- Places disponibles: 60
- Périodes d'inscription:
  - > Étudiants UE: Février - août
  - > Étudiants non UE: Février - avril

## Information complémentaire

### CONTACT

bmath@uni.lu

### CAMPUS

Belval



bmath.uni.lu

## Programme

### COURS ECTS

#### Semestre 1

Algèbre linéaire	9
Analyse	10
Structures mathématiques	6
<i>Options (cours de langue, didactique, programming, etc.)</i>	5
<b>Total requis</b>	<b>30</b>

#### Semestre 2

Algèbre linéaire	7
Analyse	7
Géométrie euclidienne et non euclidienne	6
<i>Options (physique, géophysique, didactique, programming, etc.)</i>	10
<b>Total requis</b>	<b>30</b>

#### Semestre 3

Algèbre	7
Analyse	7
Probabilités	5
Topologie générale	5
<i>Options (physique, didactique, astronomie, etc.)</i>	6
<b>Total requis</b>	<b>30</b>

#### Semestre 4

Algèbre	6
Analyse complexe	5
Probabilités avancées et statistiques	6
<i>Options (analyse, géométrie, cryptographie, etc.)</i>	13
<b>Total requis</b>	<b>30</b>

#### Semestre 5

Semestre de mobilité	30
<b>Total requis</b>	<b>30</b>

#### Semestre 6

Mémoire	12
<i>Options (analyse, algèbre, géométrie, probabilités, etc.)</i>	18
<b>Total requis</b>	<b>30</b>

“The Bachelor in Mathematics gave me a solid basis in the core areas of mathematics. I especially liked the small class size which allows for a lot of interaction between lecturers and students. Moreover, the supporting structure for doing an exchange semester is really well developed. I spent five months at one of the best universities in Japan.”

Tara Trauthwein,  
Postdoctoral researcher, University of Oxford



# Master in Mathematics

120 ECTS



This Master offers a high standard programme with a flexible curriculum in three career-driven tracks: Financial Mathematics, General Mathematics, and Mathematical Modelling & Computational Sciences, preparing the students for their future career.

## STRENGTHS

- Curricula designed in cooperation with representatives from industry and banks
- Small classes, individual mentoring and refresher courses
- Excellent preparation for the first job and the jobs of the future

## ADMISSION REQUIREMENTS (50 PLACES)

- Degree: Bachelor in mathematics or related field
- Language: B2 in English

## STUDY & CAREER OPPORTUNITIES

- Risk analyst, business analyst, consultant, actuary, research engineer, researcher
- PhD in mathematics



## EXAMPLES OF ALUMNI CAREERS

- Senior analyst, Booking.com
- Modelling engineer, Sparc Industries
- Manager, Deloitte
- Business analyst, Orange
- Product owner, Post
- Research engineer, ArcelorMittal
- Quantitative financial risk analyst, Banque Centrale du Luxembourg
- Quantitative risk officer, The World Bank

# Financial Mathematics

## Programme

### COURSES

### ECTS

#### Semester 1

Discrete-time stochastic processes	6
Probabilistic models in finance	6
Stochastic analysis	6
<i>Electives (functional analysis, mathematical modelling, numerical analysis, Python, seminar, etc.)</i>	

**Total required 30**

#### Semester 2

Advanced stochastic models and financial applications	5
Continuous time models in mathematical finance	8
<i>Electives (High dimensional statistics, numerical linear algebra, seminar, etc.)</i>	

**Total required 30**

#### Semester 3

American options	5
Continuous-time stochastic calculus and interest rate models	5
Numerical methods in finance	5
<i>Electives (advanced econometrics, Bayesian statistics, data science, project, internship, etc.)</i>	

**Total required 30**

#### Semester 4

Master thesis (with internship)	30
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**Total 30**

## Programme at a glance

- Duration: 2 year full-time programme/ 4 semesters (120 ECTS)
- Language: English
- Registration fees: 400€/semester
- Available places: 50
- Application period:
  - > For EU students: February-August
  - > For non-EU students: February-April

## Additional information

### CONTACT

mmath@uni.lu

### CAMPUS

Belval


[mmath.uni.lu](https://mmath.uni.lu)

“The mathematical studies have helped me develop my analytical skills, problem solving ability, made me more detail-oriented and helped me understand any complex financial product or concept presented to me. Having a mathematical background helped me to work in the financial industry.”

Monika Zlopaša, Risk Manager, UBS



# General Mathematics

## Programme

COURSES	ECTS	
<b>Semester 1</b>		
Commutative algebra	8	
Riemannian geometry	8	
<i>Electives (algorithmic number theory, didactics, functional analysis, graph theory, probability, project, etc.)</i>		
<b>Total required</b>	<b>30</b>	
<b>Semester 2 (all courses optional)</b>		
Advanced graph theory	6	
Algebraic number theory	6	
Algebraic topology	8	
Didactics	5	
Mathematical statistics	5	
Numerical linear algebra	5	
Partial differential equations	8	
Riemann surfaces	8	
Seminar	2	
Other options available		
<b>Total required</b>	<b>30</b>	
<b>Semester 3 (all courses optional)</b>		
Algebraic geometry	6	
Didactics	5	
Arithmetic geometry	6	
Combinatorial geometry	6	
Data science	5	
Gaussian processes and applications	5	
Internship	5	
Project	4	
Other options available		
<b>Total required</b>	<b>30</b>	
<b>Semester 4</b>		
Master thesis	30	
<b>Total</b>	<b>30</b>	

“I liked that I had the possibility to choose between different classes and different topics for the master thesis. I appreciated that the number of students in each class was low and that the teachers were able to answer questions from every student. Also, I am glad that I could spend an Erasmus semester abroad.”

Sarah Schouten,  
Sales Forecasting Analyst, Enovos

# Mathematical Modelling & Computational Sciences

## Programme

COURSES	ECTS	
<b>Semester 1</b>		
Functional analysis	6	
Mathematical modelling	5	
Numerical analysis	6	
Partial differential equations	7	
Scientific Python	1	
<i>Electives (computational science, probability, project, seminar, etc.)</i>		
<b>Total required</b>	<b>30</b>	
<b>Semester 2</b>		
Numerical linear algebra	5	
Numerical solution of partial differential equations	6	
Sustainable scientific software	3	
Introduction to machine learning methods and data mining	5	
<i>Electives (HPC, machine learning, statistical modelling, project, etc.)</i>		
<b>Total required</b>	<b>30</b>	
<b>Semester 3</b>		
Advanced discretization methods	5	
Numerical methods for variational problems	5	
Selected topics in mathematical modelling	5	
<i>Electives (data science, internship, problem solving, project, etc.)</i>		
<b>Total required</b>	<b>30</b>	
<b>Semester 4</b>		
Master thesis (with internship)	30	
<b>Total</b>	<b>30</b>	

“During the last year of my Master, I had the opportunity to spend a 6-month internship at ArcelorMittal, which not only developed my skills but above all enriched my professional career. At the end of the internship, I joined the performance team as a junior analyst and since then, my career has been evolving assuming different responsibilities.”

Cristina Barbolan,  
Performance Controller, ArcelorMittal





# Master in Secondary Education Mathematics

120 ECTS



This Master prepares students to become highly qualified teaching professionals in the Luxembourg school system. Students are enabled to further their knowledge in mathematics and to develop the skills needed for teaching in various classroom settings.

## STRENGTHS

- Focus on reflective teaching, educational sciences, sociology and psychology
- Internships in secondary schools (6 weeks)
- Compatibility with the reduction to 1 year of the Luxembourgish postgraduate education
- Several options for mathematical courses
- Dedicated preparation for the national "Concours de recrutement"

## ADMISSION REQUIREMENTS (25 PLACES)

- Degree: Bachelor in mathematics or related field
- Languages: B2 in French and German, B1 in English

## CAREER OPPORTUNITIES

- Teacher in mathematics
- Jobs requiring mathematical skills
- PhD studies

## Programme at a glance

- Duration: 2 year full-time programme/ 4 semesters (120 ECTS)
- Languages: English (70%), French (15%), German (15%)
- Registration fees: 400€/semester
- Available places: 25
- Application period:
  - > For EU students: February-August
  - > For non-EU students: February-April

## Additional information

### CONTACT

mse.math@uni.lu

### CAMPUS

Belval



mse-math.uni.lu

## Programme

### COURSES

### ECTS

#### Semester 1

Commutative algebra	8
Digitale Didaktik	4
Einführung in die Schulpädagogik	3
Key notions of mathematical didactics	2
Planning a mathematical lesson: objectives and challenges	3
<i>Electives (functional analysis, partial differential equations, probability, Python, etc.)</i>	

**Total required 32**

#### Semester 2

Learning and teaching mathematics	2
Mehrsprachigkeit im Sprach- und Fachunterricht	3
Reflective teaching	3
<i>Electives (advanced graph theory, algebraic topology, statistics, project, seminar, etc.)</i>	

**Total required 28**

#### Semester 3

Allgemeine Didaktik	6
Didactical settings for mathematics in Luxembourg	2
Einführung in die pädagogische Psychologie	3
Evaluation methods and supporting mathematical learning	3
Testing children with special educational needs	3
<i>Electives (algebraic geometry, combinatorial geometry, data science, project, etc.)</i>	

**Total required 34**

#### Semester 4

Learning and teaching mathematics	2
Master thesis	20
Professionell Auftreten	1
Reflective teaching	3

**Total 26**

"This Master provided me with a strong basis in pure mathematics and a solid preparation for the national exam. Several courses favoured a deep analysis of hands-on experiences, presented by professionals that work in the field, along with preplanned internships that allowed me to experience working in front of a class for the first time."

Florence Zeyen,  
Mathematics Teacher, Lycée Michel Lucius



# Master in Data Science

120 ECTS

This Master provides high-level multidisciplinary training conducted by renowned research teams from Luxembourg and abroad. Based on a multidisciplinary approach, students are trained as both mathematicians and computer scientists and will acquire the necessary skills to solve complex problems with data in different contexts.

## STRENGTHS

- Multidisciplinary approach
- Broad spectrum of skills
- Variety of pedagogical tools

## ADMISSION REQUIREMENTS (25 PLACES)

- Degree: Bachelor in mathematics, physics, engineering or information technology
- Language: B2 in English

## STUDY & CAREER OPPORTUNITIES

- Data scientist
- Data engineer
- PhD in mathematics or related fields



## EXAMPLES OF ALUMNI CAREERS

- Programme Manager, Amazon
- Data Scientist, Doctena
- Data Scientist, Bayezian
- Junior underwriter, Dennemeyer
- Analyst Support & Development, Cargolux Airlines
- Algorithm Engineer IEE
- Data Engineer Circu Li-ion
- Software Engineer, John Deere
- Research Assistant, LISER
- PhD student, INRIA

## Programme

### COURSES

ECTS

#### Semester 1

Applied philosophy of science and data ethics	3
Data visualisation	3
Introduction to graph theory	3
NoSQL databases and cloud computing	5
Optimization and numerical probabilities	5
Probability	5
Programming with R and PYTHON	5
Signal processing	3

**Total required 30**

#### Semester 2

Big data analytics	5
Fundamentals of statistical learning	5
High dimensional statistics	5
Introduction to machine learning methods and data mining	5
Mathematical statistics	5
<i>Electives (biology, deep learning)</i>	5

**Total required 30**

#### Semester 3

Workshops	10
Environnemental Data Analytics	5
Practical data science for the public sector: reproducible pipelines and time series forecasting	5

#### *Selection of 4 courses:*

Advanced topics in applied machine learning	5
Advanced statistics	5
Analysis of complex networks	5
Bayesian statistics	5
Computational methods	5
Fundamentals of causal learning	5
Introduction to deep learning for image analysis and computer vision	5
Natural language processing in data science	5
Network analysis in life sciences	5
Nonparametric statistics	5
Parallel and grid computing	5

**Total required 30**

#### Semester 4

Internship or Master thesis	30
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**Total required 30**

## Programme at a glance

- Duration: 2 year full-time programme/ 4 semesters or 4 year part-time/ 8 semesters (120 ECTS)
- Language: English
- Registration fees: 400€/semester
- Available places: 25
- Application period:
  - > For EU students: February-July
  - > For non-EU students: February-April

## Additional information

### CONTACT

mads@uni.lu

### CAMPUS

Belval


[mads.uni.lu](https://mads.uni.lu)

“The Master aims to build a strong foundation in mathematics, computer science and applications to be able to continue learning in the growing field of data science. The low class size and the close contact to the professors not only allowed me to diligently study foundations and state-of-the-art methods, but also make the rather intense learning journey an enjoyable one. I felt prepared for both careers in academia and industry.”

Max Sinner,  
Data Scientist, Circu Li-ion



# Doctoral Programme in Mathematics and Applications

This programme offers research training at an internationally competitive level in various disciplines reflecting the strengths of the Department of Mathematics.

## STRENGTHS

- Personal supervision by internationally leading scientists
- Immediate integration into research groups and projects
- Broad offer of transferable skills training

## ADMISSION REQUIREMENTS

- Degree: Master in mathematics or related field
- Language: B2 in English

## CAREER OPPORTUNITIES

- Postdoctoral researcher, research scientist, research associate, associate professor
- Consultant, data scientist, manager



## EXAMPLES OF ALUMNI CAREERS

- Assistant professor, Sorbonne Université
- Assistant professor, University of Pisa
- Assistant professor, University of California Riverside
- Postdoctoral researcher, Arizona State University
- Postdoctoral researcher, National University of Singapore
- Risk manager officer, EIB
- Data manager, PwC

## Programme at a glance

- Duration: 3 to 4 years
- Language: English
- Registration fees: 400€/semester
- Number of doctoral candidates: 27

## Additional information

### CONTACT

dpma@uni.lu

### CAMPUS

Belval



dpma.uni.lu







## Our department Mathematics

### DMATH at a glance

During the last half of the 20th century, striking applications of mathematics appeared in all natural sciences, even in behavioural and social sciences. Mathematics is a universal tool to gain insight into highly complex systems. But mathematics is also a science of its own. It is highly alive, powered by its internal driving forces and by inspirations coming from new challenges in other fields. The Department of Mathematics (DMATH) carries out research in mathematics, both on its fundamental and its applied aspects.

#### MEMBERS

- 16 professors
- 23 post-docs
- 28 doctoral candidates
- 2 administrative staff

#### FUNDING AND COLLABORATIONS

- €3.4 million acquired in new research projects
- FNR-funded doctoral programme DTU GRACE (€1.7 million)

#### PUBLICATIONS (2018-2024)

- More than 400 peer-reviewed publications

### Additional information

#### CONTACT

dmath@uni.lu

#### CAMPUS

Belval



● dmath.uni.lu



## Research areas

The department (DMATH) carries out research activities around six thematic axes:

#### ALGEBRA & NUMBER THEORY

At its foundation algebra is concerned with polynomial equations and their solutions. Mathematicians use these to model and study objects with a very rich and deep structure, like varieties and groups in algebraic and arithmetic geometry, modular forms in number theory, or operads. They study invariants, symmetries, and deformations of these algebraic structures to understand how they behave under various transformations and how they are related to one another. They regularly combine these more abstract questions with computational tools and real-life applications in cryptography. The research often involves aspects of representation theory and topology.

#### DISCRETE AND GEOMETRIC ANALYSIS

Researchers apply analysis to investigate discrete structures and geometries. It covers some areas of combinatorial geometry, harmonic analysis, functional equations, and convexity, among other aspects. They also contribute to current developments in geometric analysis, where questions of differential geometry – such as the properties of minimal surfaces – are studied using analytical techniques.

#### GEOMETRY AND TOPOLOGY

Modern geometry and topology can take many forms, from understanding simple shapes to more abstract manifolds and higher structures. Beyond their intrinsic beauty, these geometric and topological worlds often become model spaces for other sciences. Mathematicians study a plethora of geometric objects and how they deform, including moduli spaces, hyperbolic and Riemannian manifolds, and algebraic curves and varieties.

#### PARTIAL DIFFERENTIAL EQUATIONS AND MODELLING

Partial Differential Equations (PDEs) are equations where the unknown is a function-or sometimes a vector field-depending on several variables, often time and space. These equations involve one or more partial derivatives of the unknown. PDEs are ubiquitous in mathematically oriented scientific fields, including biology, physics, and engineering. On the theoretical side, key questions concern the existence, uniqueness, regularity, and stability of solutions. From a more applied perspective, an important challenge is to efficiently approximate solutions using numerical methods and computer simulations.

#### PROBABILITY AND STOCHASTIC ANALYSIS

Probability theory analyses random events and the mathematical rules that govern their outcome. Stochastic analysis is the branch of probability theory focusing on the study of random phenomena driven by a random process, such as Brownian motion, using stochastic calculus, for example Itô's or Malliavin calculus. Researchers use the full strength of probability theory and stochastic analysis to understand and predict the behaviour of complex systems, ranging from financial markets to physical systems.

#### STATISTICS AND DATA SCIENCE

Statistics is the branch of mathematics that is devoted to the study of data. It is closely related to the branch of probability since statisticians interpret data as outcomes of random variables. Statisticians develop models and strategies from observed data in order to make predictions, estimations, and decisions on rational grounds. They study the mathematical properties of statistical procedures, assess their risks, and improve the state of the art by creating new ones. Statistics provides tools and techniques that feed into the broader field of data science.





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Studying  
at our University  
**Young, dynamic  
and international**

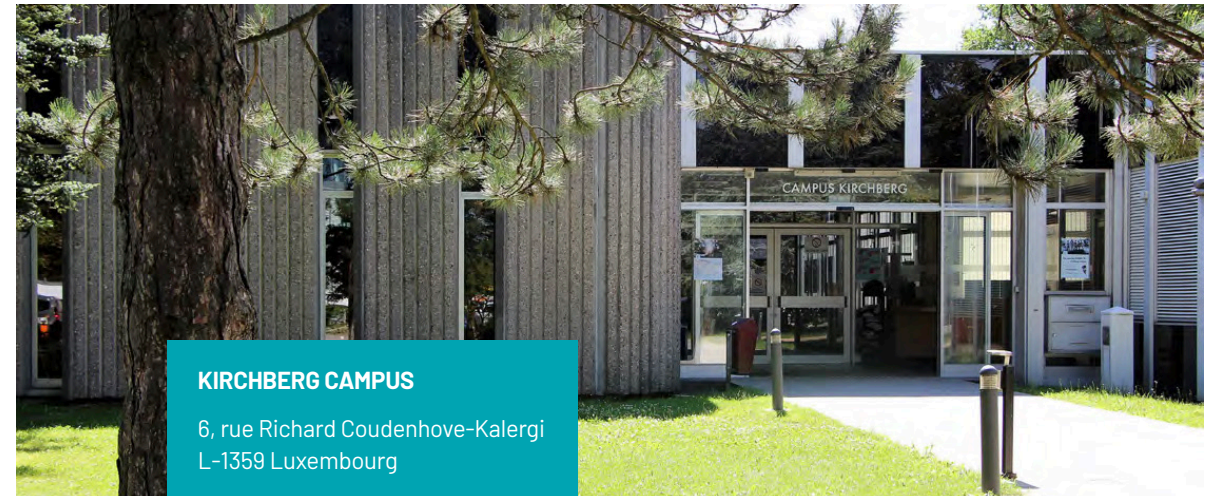
# UNIVERSITY OF LUXEMBOURG

With more than 6,200 students from all over the world, the University of Luxembourg has an international and multilingual character that offers its students a higher research-oriented education.

## Three campus sites



**BELVAL CAMPUS**  
2, Place de l'Université  
L-4365 Esch-sur-Alzette



**KIRCHBERG CAMPUS**  
6, rue Richard Coudenhove-Kalergi  
L-1359 Luxembourg



**LIMPERTSBERG CAMPUS**  
162 A, avenue de la Faïencerie  
L-1511 Luxembourg





visitluxembourg.com

## Discover Luxembourg Great place to live and work



Located in the heart of Europe, the Grand Duchy of Luxembourg boasts a colourful history, stunning landscape, multicultural environment and multilingual population. The thousand year old capital and five regions each have their own unique flavour and discoveries to be made. Experience contemporary and historic culture, explore the country's hiking and cycling trails, and taste world-class cuisine and local wine.





## Contact

### University of Luxembourg

Faculty of Science, Technology  
and Medicine (FSTM)

[fstm.uni.lu](http://fstm.uni.lu)

### Campus Belval

2, place de l'Université  
L-4365 Esch-sur-Alzette

### Campus Kirchberg

6, rue Richard Coudenhove-Kalergi  
L-1359 Luxembourg

### Campus Limpertsberg

162 A, avenue de la Faïencerie  
L-1511 Luxembourg

03 - 2025

## Stay in touch

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TECHNOLOGY AND  
MEDICINE