FACULTÉ DES SCIENCES, DE LA TECHNOLOGIE ET DE LA COMMUNICATION

Master in Mathematics

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Master académique

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General Mathematics - Financial Mathematics

UNIVERSITÉ DU LUXEMBOURG

The numbers of left and right spirals of a sunflower are consecutive numbers of the Fibonacci sequence 0, 1, 1, 2, 3, 5, 8, 13, 21, 34, 55, ...

A research-centered institution with a personal atmosphere and international, multicultural flair.

A dynamic and multidisciplinary Faculty.

University of Luxembourg,
Campus Kirchberg

Proceeding to the forefront of knowledge in one of the major fields of Mathematics.

During the last half of the twentieth century, striking applications of Mathematics appeared in all natural, even in behavioral and social sciences. From Life Sciences (DNA studies) to Information Technologies (cellular phone, microprocessor, internet, GPS devices), from Theoretical Physics (fundamental structure of matter, gravitation, cosmos) to Geology (oil reserves), from Medical Technology (computerized axial tomography scanners) to Economics (stochastic and economic processes, finance markets), Mathematics had an ineradicable imprint on every part of modern science. This "unreasonable effectiveness of pure Mathematics in the natural sciences" is almost a topic by itself. Eminent scientists, Nobel Price Winners and Fields Medalists were joining in the discussion. Most agree that essentially Mathematics is not created but discovered, that it is part of the "nature of the World".

Objectives

The Master in Mathematics at the University of Luxembourg provides a broad education and a strong background in Mathematics. It enables our students to proceed to the forefront of knowledge in one of the major fields of present-day Mathematics. With the expertise gained, graduates will be able to use and adapt mathematical methods, to recognize and analyze mathematical structures, to efficiently communicate mathematical information, and to approach other areas of knowledge. They will be capable of working collaboratively and functioning professionally in Mathematics related positions.

Because student needs and interests vary, a flexibility is inherent to the curriculum, which allows students to perform the programme following different career perspectives.

Direction des études
Course directors

Prof. Dr. Norbert Poncin
(course director - Master in Mathematics)

Prof. Dr. Anton Thalmaier
(course director - track "Financial Mathematics")

Testimonials

Personal report by a graduate (2010)

Gilles Moris
Secondary School Professor Aspirant

Personal contact between professors and students plays an important part in choosing the Master in Mathematics at the University of Luxembourg. Students at this university find it easy to talk to a professor, ask questions and address problems. This quite informal atmosphere is not merely due to the small working groups, but also to the course offer. For instance, the university offers "reading courses" in which a previously chosen book is discussed in class, promoting dialogue between professor and students and often leading to exciting discussions.

Even before classes begin, the University of Luxembourg is interested in knowing about a student's future plans and takes these into account when planning courses for the master programme. Students interested in research are offered courses that cover different fields in pure mathematics. Those who wish to enter into the field of teaching are offered internships in schools and didactics classes, recommendable to all future teachers.

Moreover, the students have a say in the organisation of classes and are given the opportunity to bring their own ideas to the curriculum. Teachers listen to the students' suggestions and thus give them the feeling that their views are important.

Personal report by a graduate (2010)

Tiffany Covolo
PhD Student at the University of Luxembourg

The Master in Mathematics at the University is a fairly recent, though much in demand course of studies and one of the few that is taught in English, which I think gives you an edge in research. I chose this Master degree because it offered the exact classes I was looking for. In general, only few students used to choose to do math, therefore universities don't offer a great variety of courses. The University of Luxembourg proved to be flexible and offered courses from very specific fields in math even when only few students requested these.

The University took care of all of us well, and it actively supported us in transitioning from studies to a job or scientific career, for example by helping us with internships in secondary schools and banks or contacts with researchers at the University.

A unique environment and an innovative approach to promote interaction and knowledge sharing.

Studying in Luxembourg

The University of Luxembourg, founded in 2003, offers an inspiring international multilingual learning environment with innovative course formats and a high degree of interaction due to small student groups.

As Luxembourg is one of the most important finance places of Europe with increasing needs of highly qualified staff, the Master in Mathematics with the option Mathematical Finance offered by the University of Luxembourg is unique in this respect. Students can make their internship and Master thesis in close cooperation with Luxembourg's financial institutions.

Due to close contacts of the Mathematics Research Unit with the system of secondary education in Luxembourg, a study at the University of Luxembourg has considerable advantages for prospective teachers. Special courses in Applied Didactics of Mathematics (partially given by practitioners) and internships in secondary schools in Luxembourg City aim at coaching students for the entrance examination on the biennial practical work placement.

Career opportunities

The programme is designed for students who wish to prepare for careers related to Mathematics. It enables these students to acquire expertise and professional qualification

- to work in the financial sector
- to work in other private or public sector companies
- to become professors in secondary education
- to work in public research and higher education

Due to attractive options and specialisations, e.g. in Mathematics Education or in Financial Mathematics, along with the practical orientation of the programme (including industrial cooperation and internships in secondary schools, banks or companies in Luxembourg), graduates are well-prepared for a diversified job-market.

For students with the career goal secondary school professor, the Master programme offers (together with a Bachelor degree) the required 5-year academic education.

Course programme

The first year of the curriculum concentrates on deepening the mathematical skills. The second year allows a specialization in different options

- **General Mathematics**

  This study track focuses on new techniques and concepts of Pure and Applied Mathematics. It provides a high level of mathematical training and facilitates access to a broad spectrum of careers in industry, education, and research. This direction is also intended for prospective secondary school professors. It supplies these students (via optional activities) with a solid theoretical and practical background in Mathematics and Mathematics Education.

- **Financial Mathematics**

  This option intends to prepare students with mathematical skills for a wide range of career opportunities in the financial industry. Special emphasis lies on modern stochastic methods used in areas such as financial modelling, derivatives pricing, hedging, risk management, stochastic optimization and control.

Programme outline

Duration

The programme has a standard duration of 4 terms (2 years – 120 ECTS) and ends with the Master of Science in Mathematics degree.

Language

The University of Luxembourg provides a multilingual environment. The language of instruction of the Master in Mathematics is English.

Courses and training strategy

The curriculum consists of core courses which are compulsory for all students and others which are compulsory within the chosen specialization. Beside these restrictions, the highest possible flexibility in choosing optional courses is intended. The training strategies motivate students through an inquiry-based approach. Credits can be obtained not only from lecture courses, but also from reading courses, supervised student projects, student seminars, internships...

Master Thesis

The Master Thesis is written in a selected area of specialization during the fourth semester. For students with the specialization in Financial Mathematics a financial industry internship ("stage") is compulsory. Also for the option General Mathematics a Master Thesis in collaboration with industry is possible. The Master Thesis may be combined with the internship and (co-) supervised by a member of the institution where the internship is performed.

Start of the programme

Each September

Programme evaluation

An evaluation by the students of the Master's degree programme in Mathematics is organised each semester.

Application requirements

A necessary condition for admission to the programme is a first academic degree (e.g. a Bachelor degree) in Mathematics or in a related subject.

Application

Online registration will be possible on www.uni.lu in the students' section, starting at the beginning of each calendar year. The "Service des Études et de la Vie Étudiante" (SEVE) provides enrolment and individual support to students:

seve.infos@uni.lu
T. + 352 466644-6060

Contacts

The programme is organised by the Mathematics Research Unit of the University of Luxembourg.

Mathematics Research Unit
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Campus Kirchberg
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L-1359 Luxembourg City
Grand-Duchy of Luxembourg

http://math.uni.lu

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Updated information about the programme will appear regularly on the homepage of the Master: http://mathmaster.uni.lu

UNIVERSITÉ DU LUXEMBOURG

Master in Mathematics

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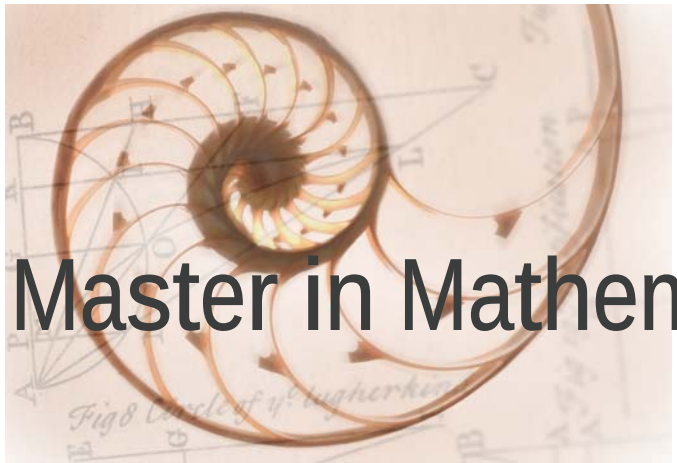
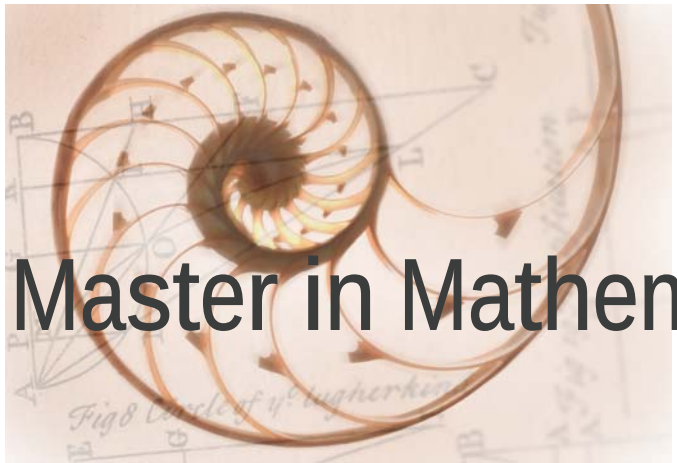
UNIVERSITÉ DU LUXEMBOURG



Master in Mathematics

Math‘s everywhere...

... not only at school! Study Mathematics and qualifiy for a broad range of careers in business, finance, industry, research, and education



Master in Mathematics

- We prepare for careers in the financial sector, in private and public companies
- We facilitate access to teaching positions, research, and jobs in higher education
- We organise internships in financial institutions in Luxembourg, as well as cooperations with the local industry
- We offer close contact with research inside the Mathematics Research Unit
- We propose courses taught in English - on request in French or German

Master in Mathematics at the UL

Semestre 1

Compulsory courses	Hours / ECTS
Commutative Algebra	45 / 5
Differential Geometry	45 / 5
Partial Differential Equations (I)	45 / 5
Probability (Martingale Theory)	45 / 5
Student Project as part of one optional course	2 ECTS
Optional courses (the students are requested to choose 2 of the following courses)	**Hours / ECTS**
Applied Didactics of Mathematics (II)	30 / 4
Basics of Discrete Mathematics	30 / 4
Algorithmic Number Theory	30 / 4
Probabilistic Models in Finance	30 / 4

Master in Mathematics at the UL

Semestre 2

Compulsory courses	Hours / ECTS
Complex Manifolds	45 / 5
Hyperfunctions and linear PDE	45 / 5
Partial Differential Equations (II)	45 / 5
Probability (Stochastic Analysis)	45 / 5
Mathematics Seminar	20 / 2
Optional courses (the students are requested to choose 2 of the following courses)	**Hours / ECTS**
Algebraic Topology and Homological Algebra	30 / 4
Introduction to Graph Theory	30 / 4
Introduction to continuous time models in mathematical finance	30 / 4

Master in Mathematics at the UL

Semestre 3 (General Mathematics)

Compulsory courses	Hours / ECTS
Harmonic Analysis and Representation Theory	30 / 5
Riemannian Surfaces and Algebraic Curves	30 / 5
Supergeometry	30 / 5
Optional activities (the students are requested to choose activities for 15 ECTS)	**Hours / ECTS**
Applied Didactics of Mathematics (II)	30 / 5
Continuous-time stochastic calculus and interest rate models	30 / 5
Geometry of PDEs and applications	30 / 5
Internship in a Secondary School	60 / 10

Master in Mathematics at the UL

Semestre 3 (Financial Mathematics)

Compulsory courses	Hours / ECTS
Continuous-time stochastic calculus and interest rate models	30 / 5
Advanced Stochastic Modeling and Financial Applications	30 / 5
Risk measures	30 / 5
Optional activities	
The students are requested to choose two lecture courses (60 h, 10 ECTS) of the curriculum ‘Master in Mathematics’ - Study Track ‘General Mathematics’, as well as lecture courses corresponding to at least 5 ECTS credit points in the curriculum ‘Master of Science in Banking and Finance’ organized by the Luxembourg School of Finance.	

Master in Mathematics at the UL

Semestre 4 (General Mathematics)

Compulsory courses	Hours / ECTS
Algebraic Operads (Lecture course)	30 / 5
Infinite Dimensional Lie Algebras (Reading course)	30 / 5
Research project	ECTS
Master Thesis	20

Master in Mathematics at the UL

Semestre 4 (Financial Mathematics)

Compulsory and optional courses (students are requested to choose one of the optional courses)	Hours / ECTS
Algebraic Operads (Lecture course, optional)	30 / 5
Infinite Dimensional Lie Algebras (Reading course, optional)	30 / 5
Stochastic analysis, fractional processes and applications to finance (Lecture course, compulsory)	30 / 5
Research project	ECTS
Master Thesis	20