



KATHOLIEKE UNIVERSITEIT
LEUVEN



Master of Science in Financial and Actuarial Engineering

Faculty of Business and Economics
Faculty of Science





Leuven

Leuven is a dynamic, vibrant city in the centre of Belgium, only a fifteen-minute train journey from the airport and a twenty-minute journey to Brussels, the capital of Belgium and seat of the European Union institutions. With Paris, London, Amsterdam and major German cities within easy reach, it is an ideal hub for the internationally inclined student. Leuven offers a wealth of cultural and recreational opportunities, including a lively gastronomic and social scene, state-of-the-art sports facilities and opportunities to hike and bike in the vast woodlands south of town. The humanities and social sciences campuses are scattered throughout the old town, Oxbridge style.

Connoisseurs will enjoy Leuven's architecture, which spans 10 centuries and includes a truly stunning fifteenth-century Gothic city hall, a UNESCO world-heritage beguinage, and a Renaissance-style castle set in a 3 square kilometre park. The population is highly educated; many alumni choose to stay in an around Leuven after graduation. Graduates work mostly in the service-based or knowledge-based sectors, but there is also a sizable hi-tech industrial presence (with 94 KU Leuven spin-offs employing 3,000 people) and one big traditional employer, Anheuser Bush Inbev, which has a large brewery and its headquarters in Leuven.

Catholic University of Leuven

KU Leuven is a modern university offering an ideal research and learning environment strongly rooted in tradition but with sights set firmly on the future. The aim of the university is not merely to train professional experts, but also to foster critical thinking, intellectual openness, a genuine taste for culture and a sense of civic responsibility. At present, KU Leuven caters to more than 38,000 students, around 14% of whom are international scholars from over 140 countries. KU Leuven is a charter member of the League of European Research Universities, together with Cambridge, Oxford, Leiden, Edinburgh, Geneva, Strasbourg, Heidelberg and others. In terms of scholarly output, KU Leuven is consistently ranked among the top ten European universities in European surveys. Recently, it was ranked 67th worldwide in the 'Times Higher Education Supplement'. QS places KU Leuven at the 68th spot worldwide. The university is ranked fourth worldwide in terms of research valorisation. Imec, the solid-state science lab on the Arenberg campus, employs about 1,700 academic researchers and designers, delivering cutting-edge work. And yes, rumours that the Big Bang theory originated at KU Leuven are correct. Likewise, external quality assessments show that KU Leuven's teaching is on par with internationally respected institutions. This academic reputation attracts students and scholars from across the globe, creating a vibrant, multicultural atmosphere. Leuven has a truly international outlook, and its alumni can be found all over the world.

Faculty of Business and Economics

As one of KU Leuven's 15 faculties, the Faculty of Business and Economics carries out education and research in five departments:

- Economics
- Marketing and Organisation Studies
- Accountancy, Finance and Insurance
- Managerial Economics, Strategy and Innovation
- Decision Sciences and Information Management

One of the faculty's most important assets is its vast national and international network. We maintain strong links with the business and financial community by organising regular workshops with industry leaders and the European Commission, situated only 30 minutes from our campus. Many of our alumni work at European institutions, and many of the department's staff members act as advisers to various European bodies and international companies. The student association, Ekonomika, is equally active via its Business-to-University lecture programme. Our Alumni network offers excellent communication channels and networking opportunities with leading figures in industry and politics.



We have a wide international student exchange network as well. Not only do we participate extensively in the (intra-EU) Erasmus programme (with 65 partners), we also have numerous agreements with leading universities outside the EU, e.g. the Wharton School of Business (University of Pennsylvania), the University of Chicago, Cornell University, the University of Illinois and Rochester University in the United States, the University of British Columbia, Queen's University, the University of Toronto and the Université de Montréal in Canada, the Indian Institutes of Management Calcutta and Bangalore in India, the Chinese University and the City University of Hong Kong, Beida, Tsinghua and Fudan in China, Chulalongkorn University in Thailand, National Taiwan University, Seoul National University in South-Korea, Queensland University of Technology Brisbane and the University of Sydney in Australia, Stellenbosch in South Africa, Insper in Brazil, Esan in Peru, the University of Monterrey in Mexico and the Singapore Management University.

Faculty of Science

The Faculty of Science is one of KU Leuven's oldest faculties. Close collaboration between its departments results in a research-oriented atmosphere. The Faculty of Science promotes high-quality teaching based on its interdisciplinary research tradition. The faculty awards approximately 90 PhD degrees each year. Currently, the faculty offers 8 Bachelor's programmes and 23 Master's programmes (11 in English, 12 in Dutch). These degree programmes are firmly grounded in research carried out in the Departments of Biology, Chemistry, Earth and Environmental Sciences, Mathematics, Physics and Astronomy. The faculty also maintains strong relationships with its alumni through the Science@Leuven Alumni Association.

Master of Science in Financial and Actuarial Engineering

Providing up-to-date, sound and advanced financial, actuarial and statistical skills, the Master of Science in Financial and Actuarial Engineering curriculum offers an intensive advanced one-year programme for university graduates interested in a career in the insurance sector. You will gain an understanding of current and future problems and solutions in insurance and banking. This discipline focuses on the application of quantitative methods to problems involving risk or uncertainty. You will be equipped with fundamental and conceptual knowledge of the mathematical and economic aspects of financial theory and insurance techniques. The programme provides advanced insights into the actuarial aspects of life insurance, general insurance, risk theory as well as into financial mathematics and the inter-

relationship and integration of actuarial sciences and finance. The programme draws on over sixty years of experience and international recognition. The research team that focuses on risk theory, finance and statistics has a strong research profile and is ranked in the world top in terms of actuarial research productivity. The programme is jointly offered by the Faculty of Business and Economics and the Faculty of Science at KU Leuven and in collaboration with Université Catholique de Louvain.

Admission requirements

Prior education requirements

- Applicants holding the degree of Master of Science in de verzekeringen from KU Leuven are admitted directly.
- Other applicants with one of the following degrees have to submit a complete application file, which is reviewed by the Admissions Board on the basis of information provided by the applicant (see required documents):
 - Master of Science in Insurance
 - Master of Science in Statistics
 - Master of Science in Mathematics
 - Master of Science in Physics
 - Master of Science in Economics
 - Master of Science in Business Economics
 - Master of Science in Applied Economics
 - Master of Science in Business Engineering
 - Master of Science in Business Engineering: Information Systems Engineering
 - Master of Science in Civil Engineering
 - Another university Master's degree in Economics, Business Studies or Mathematics

- All candidates should be thoroughly acquainted with the material discussed in:
 - Bowers, N.L.; Gerber, H.U.; Hickman, J.C.; Jones, D.A.; Nesbitt, C.J., (1986). Actuarial Mathematics. The Society of Actuaries, Itasca, Illinois. Chapters 3,4,5,6,7.
 - Ross, S.M. (2004). Introductory Statistics. Elsevier Academic Press. (Or a similar textbook appropriate for an undergraduate course in statistics).
 - Ross, S.M. (2009). A First Course in Probability (8th edition). Prentice Hall. (Or a similar textbook appropriate for an undergraduate course in probability).

Further operational knowledge of differential and integral calculus for one and several variables, as well as linear algebra and matrix calculations is required. For more information about the prerequisites for this programme, see www.econ.kuleuven.be/eng/edu/docs/mfae-prerequisites.pdf.

Proof of proficiency in English

- All applicants must submit a satisfactory score on one of the following internationally recognised tests of English language proficiency:
 - TOEFL (minimum score 575 paper-based, 233 computer-based, 90 internet-based)
 - IELTS (minimum score 7)
 No other proficiency tests will be accepted.
- An exemption from TOEFL or IELTS is only possible for applicants with a university degree or high school diploma earned in Australia, Canada, Ireland, New Zealand, United Kingdom or the United States: the certified diploma and transcripts suffice, provided they confirm that the entire study was completed in English.

Required documents

All applications should provide the following documents:

- certified **copies of degrees, transcripts** and, if available, also a **ranking indication**
- a **GMAT- or GRE-score**. A GRE- or a GMAT-test result above the 90th percentile on the quantitative part normally entails immediate admission, provided all other requirements are met as well;
- **two recommendation forms** (see www.econ.kuleuven.be/eng/edu/admissionrequirements) filled in, signed, and mailed in a closed envelope signed over the lid by the referee to the Faculty of Business and Economics. Forms not provided in a closed envelope signed across the lid by the referee will be regarded as void. The recommendation forms can also be mailed directly by the referee to fbe@econ.kuleuven.be;
- a **letter of motivation** written and signed by the applicant detailing the choice for Leuven and for this particular programme.

The Admissions Board evaluates all applications and has the final say on the admissibility of the student, taking the relevant information into account.

Incomplete application files will not be evaluated.

Application procedure

- Non-EEA citizens must submit a complete application file by 1 March. Non-EEA citizens (or EEA-citizens with a residence permit for Belgium) are strongly advised to submit their application file before 1 June but can apply until the end of August.
- Tuition fee: 2,800 EUR

For more information on how to apply, please visit www.econ.kuleuven.be/eng/edu/prospectivestudent.

Profile

Prospective students should be interested in a career in the actuarial and/or financial sector. Given the quantitative nature of actuarial sciences, a sound mathematical background is indispensable. Candidates should have sufficient knowledge of probability theory, statistics and scientific computing. As a result of its interdisciplinary approach, the curriculum is designed for students with a background in either mathematics or economics.

Programme

The programme starts mid-September. The academic year is divided into two semesters, each consisting of 13 teaching weeks, followed by exam revision and exams. In addition to the Master's thesis (15 credits), the programme consists of six core courses and five elective courses, from which students select two.

MASTER OF SCIENCE IN FINANCIAL AND ACTUARIAL ENGINEERING		60 credits
COURSE		CREDITS
Core courses		35
• Advanced Topics in Risk Management		6
• Advanced Non-Life Insurance Mathematics		6
• Fundamentals of Financial Mathematics		6
• Stochastic Finance in Insurance*		5
• Advanced Life Insurance Mathematics		6
• Statistics for Finance and Insurance		6
Master's Thesis		15
Electives (students have to choose 2 courses)		10-12
• Stochastic Models		5
• Financement des pensions*		5
• Health Insurance*		5
• Actuarial and Financial Models		6
• Reinsurance*		5
• Asset and Liability Management*		5
• Financial Engineering		6

For detailed descriptions of this programme's courses and for the course timetable, please consult www.kuleuven.be/coursecatalogue

*These courses are taught at UCL.

The MFAE programme has been a valuable addition to my education. It helped me to develop the strong mathematical and business skills required in actuarial practice. Another advantage is the possibility to combine coursework with an internship, which allows you to gain work experience in a particular area of actuarial practice. This really helped me make an informed career choice. While completing the MFAE programme, I also gained an understanding of other cultures, because participants represented many different nationalities. If you are considering enrolling, you should enjoy solving both mathematical and financial problems; you should also be able to work independently and as part of a team. You will certainly not regret choosing this programme.

Peggy Van de Perre, MFAE graduate, Infact N.V.

Career prospects

The programme addresses the rapidly changing needs resulting from the accelerating globalisation of the banking and insurance sector. As such, it provides a sound basis for a career in various areas of financial management and insurance. The main employers are insurance companies, whose financial stability depends on actuarial calculations (e.g. premiums, provisions, capital requirements, reinsurance policy). As an expert in the field of risk and uncertainty, you can also play an important role in banking and finance. The increasing convergence between the insurance and financial markets as well as the use of mathematically based instruments, such as options and futures, offers excellent career prospects. Graduates are well placed to find employment in banks, pension funds, reinsurance companies, or consulting and audit companies. The government also provides diverse career opportunities, for instance in social security or economic affairs departments. Graduates holding both the degree of Master of Science in Financial and Actuarial Engineering and 'Master in de verzekeringen' (Dutch-language initial master at KU Leuven) are eligible for membership in the professional body of actuaries in Belgium (IA|BE), and the international actuarial professional body (IAA).



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Learn more

www.kuleuven.be/ma/mfae

www.econ.kuleuven.be/eng/edu/prospectivestudent

General information

International programmes: www.kuleuven.be/internationalprogrammes

International Office: www.kuleuven.be/english

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This brochure provides the most complete and accurate information available concerning Master's programmes offered at KU Leuven. Amendments to the composition of this programme may, however, be approved at any time. The study load of many Master's programmes may increase from 60 to 120 credits in the future. Consequently, KU Leuven is in no way legally bound by the information provided in this brochure. The most recent information on all our academic programmes can be consulted at www.kuleuven.be/coursecatalogue

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