UCLouvain

ACTU2M

2025 - 2026

Master [120] in Actuarial Science

⚠ *The version you're consulting is not definitive. This programme still may change. The final version will be published on 1th June.*

At Louvain-la-Neuve - 120 credits - 2 years - Day schedule - In French
Dissertation/Graduation Project : **YES** - Internship : **optional**
Activities in English: **YES** - Activities in other languages : **NO**
Activities on other sites : **NO**
Main study domain : **Sciences**
Organized by: **Faculty of Science (SC)**
Programme acronym: **ACTU2M** - Francophone Certification Framework: 7

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ACTU2M - **Introduction**

Introduction

ACTU2M - Teaching profile

Learning outcomes

Graduates of the master's degree in actuarial sciences will be able to design and implement, using a scientific and multidisciplinary approach, processes for managing the financial impact of risks (Quantitative Risk Management) faced by economic agents.

During his training, the future graduate of the master's degree in actuarial sciences will acquire solid methodological foundations but also know-how thanks to tutorials, practical case studies and an obligatory internship in a company or in a research laboratory.

The future graduate of the master's degree in actuarial sciences will thus acquire the knowledge and skills necessary to become:

- a high-level professional capable of analyzing the financial consequences of risks weighing on an economic agent (Enterprise Risk Management) and providing operational solutions;
- a scientist capable of understanding and modeling complex financial systems and their multiple interactions;
- a specialist combining cutting-edge techniques from actuarial sciences and financial mathematics with various related disciplines, such as law, economics, accounting and taxation in order to analyze quantitative risk management problems in all their dimensions;
- an independent expert, understanding all the ethical, economic and social issues of the problems to be resolved and capable of communicating effectively with the various stakeholders;
- a specialist in data sciences applied to insurance.

On successful completion of this programme, each student is able to :

1. Exploiter de manière intégrée un corpus de savoirs en sciences actuarielles, en data science et en mathématiques financières pour agir avec expertise dans le domaine de la gestion quantitative des risques.

1.1

Maîtriser les développements fondamentaux en mathématiques actuarielles et financières.

1.2

Analyser et résoudre des problèmes et des situations pluridisciplinaires concrets et complexes de gestion de l'impact financier des risques selon une approche scientifique en tenant compte de leurs interactions dans une approche dynamique.

1.3

Utiliser les outils fondamentaux de calcul et de programmation dans la résolution de problèmes de gestion de l'impact financier des risques.

1.4

Gérer les risques souscrits par les entreprises d'assurance et de réassurance et déterminer le montant des provisions techniques ainsi que la politique de leur placement.

1.5

Tarifer les principaux instruments financiers (actions, obligations, produits dérivés et structurés) et développer des stratégies financières de couverture adaptées à l'appétit pour le risque de l'investisseur.

1.6

Identifier et proposer une politique optimale de gestion des risques (quantitative risk management et enterprise risk management) pesant sur un agent économique - individu, collectivité ou entreprise.

1.7

Faire preuve d'esprit critique vis-à-vis d'une solution technique en intégrant les enjeux sociaux et la dimension éthique d'un projet.

1.8

Appliquer les normes et règlementations en vigueur dans la discipline.

2.

Mobiliser des savoirs multiples, dans le domaine des sciences actuarielles et des mathématiques financières ainsi que dans les disciplines connexes, en vue d'analyser des problèmes complexes de gestion quantitative des risques et en concevoir des solutions innovantes dans une démarche scientifique rigoureuse.

2.1

Apporter un regard critique, constructif et novateur sur les savoirs et pratiques en matière de gestion de l'impact des risques financiers et assurantiels pesant sur les agents économiques - individus, collectivités ou entreprises - en faisant preuve d'indépendance intellectuelle dans le raisonnement.

2.2

Conseiller, décider et agir en intégrant des valeurs éthiques et d'intégrité, en prenant en considération les conséquences économiques et sociales de ses conseils, décisions et actes pour les différentes parties prenantes.

2.3

Maîtriser un socle de savoirs en sciences actuarielles et en finance mathématique lui permettant d'appréhender et de résoudre les problèmes actuels tout en développant de manière autonome les nouvelles connaissances nécessaires pour rester compétent tout au long de sa vie professionnelle.

2.4

Articuler des savoirs des différentes disciplines connexes (calcul des probabilités, statistique, droit, économie, comptabilité, fiscalité, etc.) afin de concevoir, individuellement et en équipe, des procédés de gestion de l'impact financier des risques, de les réaliser et de les communiquer aux parties prenantes.

2.5

Comprendre les enjeux de l'intégration des marchés, de la mondialisation et du développement durable, ainsi que le rôle joué par les experts universitaires dans ce cadre.

3.

Contribuer, en équipe, à la réalisation d'un projet en tenant compte des objectifs poursuivis, des ressources allouées et des contraintes qui le caractérisent, et en communiquer les résultats de manière claire, précise et rigoureuse.

3.1

Fonctionner dans un cadre pluridisciplinaire, collaborant avec des collègues d'autres formations avec différents points de vue.

3.2

Exprimer un message de façon claire et structurée, tant à l'oral qu'à l'écrit, en s'adaptant au public visé et en respectant les standards de communication propres au domaine.

3.3

Interagir et dialoguer efficacement avec des interlocuteurs variés, notamment les associations de consommateurs et les pouvoirs publics.

Programme structure

The master's program is structured as follows:

A possible upgrade based on the learner's previous training.

A core curriculum covering the specific aspects of actuarial science, including the financial valuation of actuarial liabilities and the actuarial mathematics of life, property and liability insurance. These courses are organised into two blocks, one devoted to the mathematical elements of insurance and the other to data science techniques applied to insurance.

A professional focus covering insurance mathematics, financial analysis of insurance commitments, asset liability management (ALM), quantitative risk management (QRM) and enterprise risk management (ERM), as well as cross-disciplinary courses on the annual accounts of insurance companies and the solvency of financial institutions.

The curriculum is completed by a matser thesis coupled with an internship in a company or within a university research team.

Optional courses: a wide range of elective courses allowing each student to delve deeper into various subjects linked to the desired professional orientation, ranging from additional mathematics to insurance law. Students also have the option of taking advanced courses at one of the other two universities training future actuaries in Belgium (KU Leuven and ULB).. The courses concerned will most often be taught in English (as indicated by their title).

Students establish a 120-credit program including a compulsory common core (70 credits), a specialized focus (30 credits) and elective courses (20 credits). The common core includes compulsory courses, additional courses set by the Jury according to the diploma giving access to the master's degree in actuarial sciences, and a dissertation coupled with an internship in a company or within a research laboratory. The specialized focus includes advanced courses in actuarial sciences and related disciplines. Elective courses will be selected based on the student's professional goals.

The dissertation will typically be motivated by practical problems and will study innovative methodological solutions by applying them to real data. It will be carried out as part of an internship in a company (project dissertation) or within a research laboratory (research dissertation). This internship will take place during the second annual block, after having validated the necessary prerequisites. It can be carried out in Belgium or abroad.

A program may contain courses outside the list proposed below provided that they are approved by the Jury.

ACTU2M Programme

Detailed programme by subject

CORE COURSES [70.0]

     ○ Mandatory
     ⊗ Optional
     △ Not offered in 2025-2026
     ⊘ Not offered in 2025-2026 but offered the following year
     ⊕ Offered in 2025-2026 but not the following year
     △ ⊕ Not offered in 2025-2026 or the following year
     🟨 Activity with requisites
     🌐 Open to incoming exchange students
     🌐 Not open to incoming exchange students
     [FR] Teaching language (FR, EN, ES, NL, DE, ...)

Click on the course title to see detailed informations (objectives, methods, evaluation...)

				Year
				1	2

○ Mémoire au choix (15 credits)

				1	2
⊗ LACTU2900	Master thesis : research 🟨		FR [q1 or q2] [] [15 Credits] 🌐		x
⊗ LACTU2910	Master Thesis : Project 🟨		FR [q1 or q2] [] [15 Credits] 🌐		x

○ Mathématiques de l'assurance (27 credits)

				1	2
○ LACTU2010	Property and casualty insurance actuarial science [M]		FR [q1] [45h+7.5h] [7 Credits] 🌐	x	
○ LACTU2030	Life insurance actuarial science	Donatien Hainaut	FR [q1] [30h+7.5h] [5 Credits] 🌐	x	
○ LACTU2040	Social security and pension actuarial science		FR [q2] [30h+7.5h] [5 Credits] 🌐	x	
○ LACTU2170	Financial valuation of actuarial liabilities		FR [q2] [45h+15h] [7 Credits] 🌐	x	
○ LACTU2280	Reinsurance and risk exchanges [M]	Philippe De Longueville	FR [q2] [15h] [3 Credits] 🌐		x

○ Data science (22 credits)

				1	2
○ LSTAT2020	Statistical softwares and basic statistical programming		FR [q1] [15h+15h] [4 Credits] 🌐	x	
○ LACTU2150	Statistical analysis of insurance data [M]	Karim Barigou	FR [q1] [30h+7.5h] [5 Credits] 🌐	x	
○ LACTU2160	Actuarial methods for segmentation	Michel Denuit	FR [q1] [45h] [7 Credits] 🌐	x	
○ LDATS2310	Deep learning for Insurance and Finance		FR [q2] [15h] [3 Credits] 🌐 > *English-friendly*		x
○ LACTU2310	Statistical learning methods for insurance	Karim Barigou	EN [q2] [15h] [3 Credits] 🌐 > *French-friendly*	x	

○ Risques émergents et enjeux de société (6 credits)

				1	2
○ LACTU2320	Emerging risks and societal challenges 1 [C]		FR [q1+q2] [15h] [3 Credits] ⊕ 🌐 > *English-friendly*	x	x
○ LACTU2330	Emerging risks and societal challenges 2 [C]		FR [q1+q2] [15h+0h] [3 Credits] ⊘ 🌐 > *English-friendly*	x	x

PROFESSIONAL FOCUS [30.0]

O Mandatory
⌘ Optional
△ Not offered in 2025-2026
⊘ Not offered in 2025-2026 but offered the following year
⊕ Offered in 2025-2026 but not the following year
△ ⊕ Not offered in 2025-2026 or the following year
🟨 Activity with requisites
🌐 Open to incoming exchange students
🌐 Not open to incoming exchange students
[FR] Teaching language (FR, EN, ES, NL, DE, ...)

Click on the course title to see detailed informations (objectives, methods, evaluation...)

				Year	
				1	**2**

O *Content:*

					Year 1	Year 2
O LACTU2210	Quantitative Risk Management		EN [q2] [30h] [5 Credits] 🌐 *> French-friendly*		x	
O LACTU2220	Asset and Liability Management	Jérôme Barbarin	EN [q2] [30h] [5 Credits] 🌐 *> French-friendly*			x
O LACTU2230	Health insurance actuarial science		FR [q2] [45h] [7 Credits] 🌐		x	
O LACTU2240	Actuarial Science in Finance: Advanced Processes and Life Insurance Engineering	Donatien Hainaut	FR [q1] [30h] [5 Credits] 🌐			x
O LACTU2260	Actuarial Enterprise Risk Management [M]	Philippe De Longueville	EN [q1] [15h] [3 Credits] 🌐			x
O LACTU2270	Actuarial aspects of insurance accounting and solvency	Cindy Courtois	FR [q1] [30h] [5 Credits] 🌐			x

OPTIONS

> Cours au choix   *[en-prog-2025-actu2m-lactu200o]*
> Optional courses   *[en-prog-2025-actu2m-lsc100o]*

COURS AU CHOIX [20.0]

O Mandatory
⌘ Optional
△ Not offered in 2025-2026
⊘ Not offered in 2025-2026 but offered the following year
⊕ Offered in 2025-2026 but not the following year
△ ⊕ Not offered in 2025-2026 or the following year
🟨 Activity with requisites
🌐 Open to incoming exchange students
🌐 Not open to incoming exchange students
[FR] Teaching language (FR, EN, ES, NL, DE, ...)

Click on the course title to see detailed informations (objectives, methods, evaluation...)

				Year	
				1	**2**

O *Content:*

⌘ Data science

				Year 1	Year 2
⌘ LDATS2030	Statistique et data sciences avec R: Programmation avancée	FR [q2] [15h+15h] [4 Credits] 🌐		x	x
⌘ LDATS2350	Data Mining	EN [q2] [15h+15h] [4 Credits] 🌐		x	x
⌘ LDATS2360	Seminar in data management: basic	EN [q1] [15h+10h] [4 Credits] 🌐		x	x
⌘ LINFO2275	Data mining & decision making	EN [q2] [30h+15h] [5 Credits] 🌐 *> French-friendly*		x	x

Year
1 2

⚙ Mathématiques de la finance

⚙ LSTAT2170	Times series		EN [q2] [30h+7.5h] [5 Credits] ⊕	x	x
⚙ LINMA2470	Stochastic modelling		EN [q2] [30h+22.5h] [5 Credits] ⊕ *> French-friendly*	x	x
⚙ LINMA2222	Stochastic Optimal Control and Reinforcement Learning [C]		EN [q1] [30h+22.5h] [5 Credits] ⊕	x	x

⚙ Finance

⚙ LLSMS2138	Big data in finance		EN [q2] [30h] [5 Credits] ⊕	x	x
⚙ LLSMS2226	Credit and interest rate risk	Frédéric Vrins	EN [q2] [30h] [5 Credits] ⊕	x	x

⚙ Droit des assurances

⚙ LDROP2021	Insurance Law	Bernard Dubuisson	FR [q2] [30h] [5 Credits] ⊕	x	x

OPTIONAL COURSES

O Mandatory
⚛ Optional
△ Not offered in 2025-2026
⊘ Not offered in 2025-2026 but offered the following year
⊕ Offered in 2025-2026 but not the following year
△ ⊕ Not offered in 2025-2026 or the following year
🟨 Activity with requisites
🌐 Open to incoming exchange students
🌐 Not open to incoming exchange students
[FR] Teaching language (FR, EN, ES, NL, DE, ...)

Click on the course title to see detailed informations (objectives, methods, evaluation...)

These credits are not counted within the 120 required credits.

					Year 1	2
o *Content:*						
⚛ LSST1001	IngénieuxSud	Stéphanie Merle Jean-Pierre Raskin	[FR] [q1+q2] [15h+45h] [5 Credits] 🌐		x	x
⚛ LSST1002M	Information and critical thinking - MOOC		[FR] [q2] [30h+15h] [3 Credits] 🌐		x	x

Supplementary classes

> **To access this Master, students must have a good command of certain subjects. If this is not the case, in the first annual block of their Masters programme, students must take supplementary classes chosen by the faculty to satisfy course prerequisites.**

O Mandatory
⚛ Optional
△ Not offered in 2025-2026
⊘ Not offered in 2025-2026 but offered the following year
⊕ Offered in 2025-2026 but not the following year
△ ⊕ Not offered in 2025-2026 or the following year
🟨 Activity with requisites
🌐 Open to incoming exchange students
🌐 Not open to incoming exchange students
[FR] Teaching language (FR, EN, ES, NL, DE, ...)

Click on the course title to see detailed informations (objectives, methods, evaluation...)

⚛ Cours de langue

⚛ LANGL1330	English intermediate level - 1st part	Stéphanie Brabant Estelle Dagneaux Jean-Luc Delghust Aurélie Deneumoustier Fanny Desterbecq Marie Duelz Claudine Grommersch Sandrine Mulkers (coord.) Marc Piwnik (coord.) Françoise Stas Anne-Julie Toubeau	[EN] [q1 or q2] [20h] [3 Credits] 🌐

Course prerequisites

The **table** below lists the activities (course units, or CUs) for which there are one or more prerequisites within the programme, i.e. the programme CU for which the learning outcomes must be certified and the corresponding credits awarded by the jury before registering for that CU.

These activities are also identified **in the detailed programme**: their title is followed by a yellow square.

Prerequisites and student's annual programme

As the prerequisite is for CU registration puposes only, there are no prerequisites within a programme year. Prerequisites are defined between CUs of different years and therefore influence the order in which the student will be able to register for the programme's CUs.

In addition, when the jury validates a student's individual programme at the beginning of the year, it ensures its coherence, meaning that it may:

- require the student to combine registration in two separate CUs which it considers necessary from a pedagogical point of view.
- transform a prerequisite into a corequisite if the student is in the final year of a degree course.

For more information, please consult the Academic Regulations and Procedures.

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Prerequisities list

LACTU2900 "Mémoire recherche" has prerequisite(s) LACTU2010 ET LACTU2030 ET LACTU2230 ET LACTU2170

- LACTU2010 - Property and casualty insurance actuarial science
- LACTU2030 - Life insurance actuarial science
- LACTU2230 - Health insurance actuarial science
- LACTU2170 - Financial valuation of actuarial liabilities

LACTU2910 "Mémoire projet" has prerequisite(s) LACTU2010 ET LACTU2030 ET LACTU2230 ET LACTU2170

- LACTU2010 - Property and casualty insurance actuarial science
- LACTU2030 - Life insurance actuarial science
- LACTU2230 - Health insurance actuarial science
- LACTU2170 - Financial valuation of actuarial liabilities

The programme's courses and learning outcomes

For each UCLouvain training programme, a reference framework of learning outcomes specifies the the skills expected of every graduate on completion of the programme. Course unit descriptions specify targeted learning outcomes, as well as the unit's contribution to reference framework of learning outcomes.

ACTU2M - Information

Access Requirements

Master course admission requirements are defined by the French Community of Belgium Decree of 7 November 2013 defining the higher education landscape and the academic organisation of courses.

General and specific admission requirements for this programme must be satisfied at the time of enrolling at the university.

Unless explicitly mentioned, the bachelor's, master's and licentiate degrees listed in this table or on this page are to be understood as those issued by an institution of the French, Flemish or German-speaking Community, or by the Royal Military Academy.

In the event of the divergence between the different linguistic versions of the present conditions, the French version shall prevail.

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SUMMARY

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Specific access requirements

In addition to fulfilling the access conditions described below, candidates must provide proof of a sufficient command of the French language (level B1 of the Common European Framework of Reference).

Students who wish to be admitted on the basis of a dossier (see tables below) are invited to consult the criteria for the evaluation of application.

University Bachelors

Diploma	Special Requirements	Access	Remarks
UCLouvain Bachelors			
Bachelor : Business Engineering (Louvain-la-Neuve)		Direct access	
Bachelor : Business Engineering (Mons)		Direct access	
Bachelor : Business Engineering (Bruxelles Saint-Louis)		Direct access	
Bachelor : Business Engineering (French-English) (Bruxelles Saint-Louis)		Direct access	
Bachelor : Business Engineering (French-Dutch-English) (Bruxelles Saint-Louis)		Direct access	
Bachelor of Science in Business Engineering (Bruxelles Saint-Louis)		Direct access	
Bachelor in Engineering		Direct access	
Bachelor in Engineering : Architecture		Direct access	
Bachelor in Mathematics		Direct access	
Bachelor in Physics		Direct access	
Bachelor in Economics and Management Bachelor in Computer Science	Direct access if they have succeded the Minor in Statistics, Actuarial Sciences and Data Sciences.	-	In some cases, the UCLouvain Enrolment Office, after reviewing their online enrolment or re-enrolment application, will ask the students concerned to provide an enrolment authorisation from the faculty/ school.

Others Bachelors of the French speaking Community of Belgium	
Bachelor in Business Engineering Bachelor in Engineering Bachelor in Engineering: Architecture Bachelor in Mathematics Bachelor in Physics	Direct access
Bachelors of the Dutch speaking Community of Belgium	
Bachelor in ingenieurswetenschappen, oriëntatie civieltechniek Bachelor in de wiskundige wetenschappen Bachelor in de fysische wetenschappen	Access based on application
Foreign Bachelors	
Bachelor in Business Engineering Bachelor in Engineering Bachelor in Mathematics Bachelor in Physics	Access based on application

Non university Bachelors

> Find out more about links to the university

Holders of a 2nd cycle University degree

Diploma	Special Requirements	Access	Remarks
"Licenciés"			
"Licenciés" in Engineering, Mathematics, Physics, Statistics		Direct access	
Masters			
Master in Business engineering Master in Biomedical Engineering Master in Chemical and Materials Engineering Master in Civil Engineering Master in Computer Science and Engineering Master in Electrical Engineering Master in Electro-mechanical Engineering Master in Mathematical Engineering Master in Mechanical Engineering Master in Physical Engineering Master in Mathematics Master in Physics Master in Statistics		Direct access	
Master in Management Master in Economics Master in Computer Science	Direct access if they have completed the Minor in Statistics, Actuarial Sciences and Data Sciences.	-	In some cases, the UCLouvain Enrolment Office, after reviewing your online enrolment or re-enrolment application, will ask you to provide an enrolment authorisation from your faculty/school.

Holders of a non-University 2nd cycle degree

Access based on validation of professional experience

> It is possible, under certain conditions, to use one's personal and professional experience to enter a university course without having the required qualifications. However, validation of prior experience does not automatically apply to all courses. Find out more about Validation of priori experience.

Entry to all Masters (with the exception of Advanced Masters) can be gained through the special procedure for accrediting prior learning and experience known as VAE (validation des acquis de l'expérience).

Access based on application

Access based on application : access may be granted either directly or on the condition of completing additional courses of a maximum of 60 ECTS credits, or refused.

Foreign students who have completed a university education (minimum 3 years) with strong quantitative connotation and who have obtained at least 70% (or 14/20) of average for all successful university years in their home university, without the slightest failure in mathematics courses, calculation of probabilities and statistics, have the possibility to apply for admission to the program of the Master in Actuarial Science (120 ECTS).

Moreover students who wish to be admitted on the basis of a dossier are invited to consult the criteria for the evaluation of application.

Admission and Enrolment Procedures for general registration

Students must draw up their individual programmes and submits it to the Jury who is responsible for accrediting prior learning and experience.

Specific professional rules

Graduates of UCLouvain's ACTU2M program have direct access to the Belgian professional association (Institut des Actuaires en Belgique - IABE, www.iabe.be) and are authorized to use the title of actuary.

The ACTU2M program is certified as Global Center of Insurance Excellence (GCIE) by the International Insurance Society (IIS), recognizing universities and colleges with outstanding Risk Management and Insurance programs. It ranks in the top 5 worldwide, both in terms of education and fundamental research in actuarial science.

Teaching method

In addition to strong methodological contents, the cursus includes case studies, personal projects and an internship (optional) in an insurance or reinsurance company, consulting firm, pension fund.

Evaluation

The evaluation methods comply with the regulations concerning studies and exams. More detailed explanation of the modalities specific to each learning unit are available on their description sheets under the heading "Learning outcomes evaluation method".

Depending on the course, the exam may be oral or written and may include a personal project. The master thesis is defended publicly.

Mobility and/or Internationalisation outlook

If they wish, students can include in their program specialized courses from the actuarial sciences programs at ULB and KU Leuven.

Students can carry out their internship in a company abroad (Luxembourg, London or Paris, for example). Given the high degree of specialization of the Master's program, with no equivalent abroad, international mobility within the framework of the Master's degree in actuarial sciences is limited to the internship.

Since its creation in 1939, the Institute of Actuarial Sciences, which has today joined the School of Statistics, Biostatistics and Actuarial Sciences (LSBA) within the Faculty of Sciences of UCLouvain, has awarded a significant number of degrees to students from French-speaking Africa and Latin America as well as a significant number of students from the European Union. UCLouvain thus trained the first actuaries from several emerging countries, who now actively contribute to local economic development. In addition, UCLouvain professors regularly participate in training programs abroad.

Finally, let us mention that, in recent years, foreign students (Canadians, in particular) are regularly welcomed into the actuarial sciences program for a semester as part of international exchanges.

Possible trainings at the end of the programme

Advanced Masters
The Master in Actuarial Science is not a requirement for any particular Advanced Masters.

Doctoral programme
Holders of a Master in Actuarial Science may enrol for the doctoral programme in Actuarial Science, subject to some conditions (e.g. higher level pass).

Certificates

In addition to the master in actuarial science, CPD activities are organized as University certificates, under the auspices of the University Institute for Continuing Education (Institut universitaire de formation continue - IUFC).

Contacts

Curriculum Management

Entity

Structure entity   SST/SC/LSBA
Denomination   (LSBA)
Faculty   Faculty of Science (SC)
Sector   Sciences and Technology (SST)
Acronym   LSBA
Postal address   Voie du Roman Pays 20 - bte L1.04.01
                                                             1348 Louvain-la-Neuve
                                                             Tel: +32 (0) 10 47 43 14 - Fax: +32 (0) 10 47 30 32
Website   https://uclouvain.be/fr/facultes/sc/lsba

Academic supervisor: Michel Denuit

Jury

- President: Donatien Hainaut
- Secretary ot the jury: Karim Barigou
- Study advisor: Michel Denuit

Useful Contact(s)

- Secretary of The Louvain School of Statistics, Biostatistics and Actuarial Sciences: Sophie Malali