



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

Tarifier 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 réglementations 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 master 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 (69 credits), a specialized focus (30 credits) and elective courses (21 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 [64.0]

- Mandatory
- ⊗ Optional
- △ Not offered in 2024-2025
- ⊖ Not offered in 2024-2025 but offered the following year
- ⊕ Offered in 2024-2025 but not the following year
- △ ⊕ Not offered in 2024-2025 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 Mémoire au choix (15 credits)

⊗ LACTU2900	Master thesis : research ■		(FR) [q1 or q2] [] [15 Credits] 🌐		X
⊗ LACTU2910	Master Thesis : Project ■		(FR) [q1 or q2] [] [15 Credits] 🌐		X

o Mathématiques de l'assurance (27 credits)

○ LACTU2010	Property and casualty insurance actuarial science	Michel Denuit	(FR) [q1] [45h] [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	Pierre Devolder	(FR) [q2] [30h+7.5h] [5 Credits] 🌐		X
○ LACTU2170	Financial valuation of actuarial liabilities	Donatien Hainaut	(FR) [q2] [45h+15h] [7 Credits] 🌐		X
○ LACTU2280	Reinsurance and risk exchanges	Philippe De Longueville	(FR) [q1] [15h] [3 Credits] 🌐		X

o Data science (22 credits)

○ LSTAT2020	Statistical softwares and basic statistical programming	Céline Bugli	(FR) [q1] [15h+15h] [4 Credits] 🌐		X
○ LACTU2150	Statistical analysis of insurance data	Farim Barigou	(FR) [q1] [30h] [5 Credits] 🌐		X
○ LACTU2160	Actuarial methods for segmentation	Michel Denuit	(FR) [q1] [45h] [7 Credits] 🌐		X
○ LDATS2310	Deep learning for Insurance and Finance				

				Year	
				1	2
⌘ LDATS2360	Seminar in data management: basic	Céline Bugli	⌘ [q1] [15h+10h] [4 Credits] 🌐	x	x
⌘ LINFO2275	Data mining & decision making				

OPTIONAL COURSES

- Mandatory
- ⊗ Optional
- △ Not offered in 2024-2025
- ⊙ Not offered in 2024-2025 but offered the following year
- ⊕ Offered in 2024-2025 but not the following year
- △ ⊕ Not offered in 2024-2025 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, ...)

Year

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

These credits are not counted within the 120 required credits.

Year

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.

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
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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
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Foreign Bachelors

Bachelor in Business Engineering Bachelor in Engineering Bachelor in Mathematics Bachelor in Physics	Access based on application
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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 Actuairens 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.

Entity

Structure entity

Denomination

Faculty

SST/SC/LSBA

(LSBA)

Faculty of Science (SC)

