UCLouvain

ACTU2M

2023 - 2024

Master [120] in Actuarial Science

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 : **YES**
Main study domain : **Sciences**
Organized by: **Faculty of Science (SC)**
Programme acronym: **ACTU2M** - Francophone Certification Framework: 7

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ACTU2M - Introduction

Introduction

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Learning outcomes

This Master programme offers students specialized courses in actuarial science for becoming a qualified actuary, starting a career in the financial sector (banking, insurance, pension funds, brokerage, auditing and so on).

Although actuarial science is now a specific discipline with its own area of knowledge, modern actuarial training needs to develop multidisciplinary skills in probability, statistics. law, accounting, economics and finance. The Master programme reflects this by combining specific actuarial and insurance courses with related disciplines. This multidisciplinary approach, which brings together exact sciences and human sciences, is a key feature of the programme.

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

1.

Exploiter de manière intégrée un corpus de savoirs en sciences actuarielles 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 et de la mondialisation, 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 (économistes, juristes, etc.), 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

Students must follow a programme of 120 credits comprising compulsory core subjects (69 credits), a specialized focus (30 credits) and elective courses (21 credits). The core subjects includes compulsory subjects, additional subjects determined by the Jury according to the degree held by the applicant, and a master thesis with or without an internship (15 credits). The specialized focus consists in advanced courses of actuarial science and related disciplines.

Thanks to an active collaboration between KULeuven, ULB and UCLouvain actuarial master programmes, UCLouvain students attend advanced classes in KULeuven or ULB, and vice-versa. The courses shared by the three universities are taught in English, the rest of the UCLouvain programme being taught in French.

A maximum of 50 credits may be accredited to students who already have a second cycle degree or who are working professionally and who have a good foundation and/or professional experience in actuarial science.

ACTU2M Programme

Detailed programme by subject

CORE COURSES [69.0]

- Mandatory
- Optional
- Not offered in 2023-2024
- Not offered in 2023-2024 but offered the following year
- Offered in 2023-2024 but not the following year
- Not offered in 2023-2024 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...)

Mémoire au choix (15 credits)

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

				Year 1	Year 2

Data science (10 credits)

				1	2
LACTU2110	Modélisation prédictive et apprentissage statistique en assurance	Michel Denuit Florian Pechon (compensates Michel Denuit)	FR [q2] [45h] [7 Credits]	x	
LDATS2310	Data science for insurance and finance	Donatien Hainaut	EN [q1] [15h] [3 Credits]		x

Mathématiques de l'assurance (22 credits)

				1	2
LACTU2010	NON LIFE INSURANCE	Michel Denuit	FR [q1] [45h] [7 Credits]	x	
LACTU2030	LIFE INSURANCE	Donatien Hainaut	FR [q1] [45h] [7 Credits]	x	
LACTU2040	PENSION FUNDING	Pierre Devolder	FR [q2] [30h+15h] [5 Credits]	x	
LACTU2280	Reinsurance and Alternative Risk Transfers	Philippe De Longueville	EN [q1] [15h] [3 Credits]		x

Mathématiques de la finance (17 credits)

				1	2
LACTU2020	Fixed income mathematics	Pierre Devolder	FR [q1] [45h+15h] [7 Credits]	x	
LACTU2170	STOCHASTIC FINANCE	Donatien Hainaut	FR [q2] [30h] [5 Credits]	x	
LINMA2725	Financial mathematics	Pierre Devolder	FR [q1] [30h+22.5h] [5 Credits]	x	

Droit des assurances (5 credits)

				1	2
LDROP2021	Insurance Law	Bernard Dubuisson	FR [q2] [30h] [5 Credits]		x

PROFESSIONAL FOCUS [30.0]

- Mandatory
- Optional
- Not offered in 2023-2024
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- [FR] Teaching language (FR, EN, ES, NL, DE, ...)

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

Content:

				Year 1	Year 2
LACTU2210	Quantitative Risk Management	Christian Hafner	EN [q2] [30h] [5 Credits] > French-friendly	x	
LACTU2220	Asset and Liability Management	Jérôme Barbarin	EN [q2] [30h] [5 Credits] > French-friendly		x
LACTU2230	Health Insurance	Michel Denuit	FR [q2] [45h] [7 Credits]	x	
LACTU2240	Stochastic Finance in Insurance	Pierre Ars Pierre Devolder	EN [q2] [30h] [5 Credits] > French-friendly		x
LACTU2260	Actuarial Enterprise Risk Management	Philippe De Longueville	EN [q2] [15h] [3 Credits]		x
LACTU2270	Aspects actuariels des normes de solvabilité et comptables	Cindy Courtois	FR [q1] [30h] [5 Credits]		x

OPTIONS

> Cours au choix [en-prog-2023-actu2m-lactu200o]
> Optional courses [en-prog-2023-actu2m-lsc100o]

COURS AU CHOIX [21.0]

- Mandatory
- Optional
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- Offered in 2023-2024 but not the following year
- Not offered in 2023-2024 or the following year
- Activity with requisites
- Open to incoming exchange students
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- [FR] Teaching language (FR, EN, ES, NL, DE, ...)

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

Students choose 21 credits of courses of which 10 credits KU Leuven or ULB courses.

Content:

Data science

				Year 1	Year 2
LDATS2030	Statistique et data sciences avec R: Programmation avancée	Anouar El Ghouch	FR [q2] [15h+15h] [4 Credits]		x
LDATS2350	Data Mining	Robin Van Oirbeek	EN [q2] [15h+15h] [4 Credits]		x
LDATS2360	Seminar in data management: basic	Céline Bugli	FR [q1] [15h+10h] [4 Credits]	x	x

				Year 1	Year 2
LINFO2275	Data mining & decision making	Marco Saerens	EN [q2] [30h+15h] [5 Credits] > French-friendly		x

Mathématiques de l'assurance

EACTU2410	Solvency of financial institutions (KUL-DOR58B)		EN [q2] [39h] [6 Credits]		x
EACTU2420	Foundations of Quantitative Risk Measurement (KUL-DOR57B)		EN [q1] [39h] [6 Credits]		x
EACTU2440	Actuarial and Financial Valuation Principles (KUL-DON57A)		EN [q1] [39h] [6 Credits]		x

Mathématiques de la finance

EACTU2450	Financial Engineering (KUL-GOQ22A)		EN [q2] [26h+13h] [6 Credits]		x
EACTU2470	Statistical Tools for Quantitative Risk Management (KUL-GOQ24A)		EN [q1] [39h] [6 Credits]		x
LMAT2470	Processus stochastiques (statistique)	Donatien Hainaut	FR [q2] [30h] [5 Credits] > English-friendly		x
LSTAT2170	Times series	Rainer von Sachs	EN [q2] [30h+7.5h] [5 Credits]		x

Finance

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

OPTIONAL COURSES

- Mandatory
- Optional
- Not offered in 2023-2024
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- Not offered in 2023-2024 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.

Content:

				Year 1	Year 2
LSST1001	IngénieuxSud	Stéphanie Merle Jean-Pierre Raskin (coord.)	FR [q1+q2] [15h+45h] [5 Credits]	x	x
LSST1002M	Information and critical thinking - MOOC	Myriam De Kesel Jean-François Rees	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, students must take supplementary classes chosen by the faculty to satisfy course prerequisites.

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- Optional
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- 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...)

UE supplémentaires

Pour les étudiants possédant un diplôme de 1er ou de 2ème cycle en sciences mathématiques ou physiques, un master en statistique ou en sciences des données, ou un diplôme de 1er ou de 2ème cycle en sciences de l'ingénieur, et qui n'auraient pas suivi de cours équivalents dans le cadre de ces programmes :

LECGE1212	Macroeconomics	Etienne De Callatay Fabio Mariani	FR [q1 or q2] [45h+15h] [5 Credits]
LESPO1122	Foundations of Law	Pierre Bazier Nicolas Bonbled Arnaud Hoc Thibaut Slingeneyer de Goeswin	FR [q1 or q2] [40h] [5 Credits]

UE supplémentaire de statistique

Pour les étudiants possédant un diplôme de 1er ou de 2ème cycle en ingénieur de gestion et qui n'auraient pas suivi de cours équivalent dans le cadre de ce programme :

LSTAT2020	Statistical softwares and basic statistical programming	Céline Bugli	FR [q1] [15h+15h] [4 Credits]

Cours de langue

En outre, le Jury appréciera la maîtrise de l'anglais par l'étudiant. Le cas échéant, le cours ci-dessous sera rajouté à son programme.

LANGL1330	English intermediate level - 1st part	Stéphanie Brabant Estelle Dagneaux Jean-Luc Delghust Aurélie Deneumoustier Fanny Desterbecq Marie Duelz Claudine Grommersch Adrien Kefer (compensates Sandrine Mulkers) Marc Piwnik (coord.) Françoise Stas Anne-Julie Toubeau Marine Volpe	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.

 # Prerequisities list

LACTU2900 "Mémoire recherche" has prerequisite(s) LACTU2110 ET LACTU2170 ET LACTU2210 ET LACTU2230

- LACTU2110 - Modélisation prédictive et apprentissage statistique en assurance
- LACTU2170 - STOCHASTIC FINANCE
- LACTU2210 - Quantitative Risk Management
- LACTU2230 - Health Insurance

LACTU2910 "Mémoire projet" has prerequisite(s) LACTU2010 ET LACTU2030 ET LACTU2040

- LACTU2010 - NON LIFE INSURANCE
- LACTU2030 - LIFE INSURANCE
- LACTU2040 - PENSION FUNDING

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 hiher 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.

SUMMARY

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		Direct access	
Bachelor in Engineering		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 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	

Diploma	Special Requirements	Access	Remarks
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 60% (or 12/20) 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.

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

Besides the active collaboration with the KULeuven and ULB master in actuarial studies, the optional internship may take place abroad (Paris, London or Luxembourg, for instance).

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 and Study advisor: Pierre Devolder
- Secretary of the jury: Donatien Hainaut

Useful Contact(s)

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