

**At Louvain-la-Neuve - 120 credits - 2 years - Day schedule - In English**

 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: **Louvain School of Engineering (EPL)**

 Programme acronym: **DATI2M** - Francophone Certification Framework: 7

**Table of contents**

Introduction .....	2
Teaching profile .....	3
Learning outcomes .....	3
Programme .....	4
Detailed programme by subject .....	4
Supplementary classes .....	15
Course prerequisites .....	17
The programme's courses and learning outcomes .....	17
Information .....	18
Access Requirements .....	18
Evaluation .....	20
Contacts .....	20

## DATI2M - Introduction

### Introduction

---

#### Introduction

The digital transformation of society has led to explosive growth in the volume of data available. Most of the players in society now place great importance on using this data to help make objective decisions and develop their disciplinary focus. These specific needs have resulted in the emergence of **new data-oriented careers**.

The engineering master's in data science offers a course in **scientific methods and technology tools** for answering social or scientific questions based on **the processing of frequently massive data sets** ("big data"). This discipline usually requires a structured model of the problem in question to be combined with statistics and mathematics to deliver a rigorous, quantitative, operational solution to the question posed. Computer infrastructure and complex calculation algorithms thus complement scientific methods in structuring and processing the data.

The **fields of application** of data science are extremely varied: political and security decision-making, real-time online advertising, e-commerce, processing network data, processing financial and industrial production data, biomedical research based on omics or imaging data.

#### Your future job

Your degree in data science prepares you for the posts of data scientist, data analyst, data and analytics manager or data engineer and equips you to take on responsibilities in these areas.

#### Your programme

The data science programme draws on four common foundations:

- Data structures and data processing algorithms.
- Theories of learning, data mining and viewing multidimensional data.
- Statistical inference and modelling.
- Applications.

## DATI2M - Teaching profile

### Learning outcomes

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

1. Démontrer la maîtrise d'un solide corpus de connaissances en sciences des données, lui permettant de résoudre les problèmes qui relèvent de sa discipline
  - 1.1. Les structures de données et algorithmes pour l'analyse de données
  - 1.2. Les théories de l'apprentissage, la fouille de données et la visualisation de données de grande dimension
  - 1.3. L'inférence statistique, la modélisation et l'informatique statistique. L'étudiant dans l'orientation technologies de l'information se spécialise via des cours obligatoires ou au choix
  - 1.4. Les aspects industriels et entrepreneuriaux de la science des données. L'étudiant dans l'orientation en technologies de l'information se spécialise via une option
  - 1.5. Les systèmes informatiques, y compris le calcul distribué, le calcul embarqué, les réseaux et la sécurité
  - 1.6. Les méthodes numériques et l'optimisation, y compris la programmation par contraintes, la recherche opérationnelle, l'identification et les mathématiques appliquées
2. Organiser et de mener à son terme une démarche de développement d'un système d'exploitation des données répondant aux besoins généralement complexes d'un client.
  - 2.1. Analyser le problème à résoudre ou les besoins fonctionnels à rencontrer et formuler le cahier des charges correspondant.
  - 2.2. Formaliser et modéliser le problème et concevoir une ou plusieurs solutions techniques originales répondant à ce cahier des charges.
  - 2.3. Evaluer, justifier et classer les solutions au regard de l'ensemble des critères figurant dans le cahier de charges : efficacité, faisabilité, qualité, pertinence et sécurité.
  - 2.4. Implémenter, tester et valider la solution retenue et en interpréter les résultats.
  - 2.5. Formuler des recommandations pour améliorer le caractère opérationnel de la solution.
3. Organiser et de mener à son terme un travail de recherche pour appréhender une problématique inédite liée à l'exploitation de données selon une méthodologie ou dans un environnement nouveau.
  - 3.1. Se documenter et résumer l'état des connaissances actuelles dans le domaine considéré.
  - 3.2. Proposer une modélisation et/ou un dispositif expérimental permettant de simuler et de tester des hypothèses relatives au problème étudié.
  - 3.3. Mettre en forme un rapport de synthèse visant à décrire la méthodologie avec rigueur et expliciter les potentialités d'innovation théoriques et/ou techniques résultant de ce travail de recherche.
4. Contribuer en équipe à la conduite d'un projet d'exploitation de données et le mener à son terme en tenant compte des objectifs, des ressources allouées et des contraintes qui le caractérisent.
  - 4.1. Cadrer et expliciter les objectifs d'un projet (en y associant des indicateurs de performance) compte tenu des enjeux et des contraintes qui caractérisent l'environnement du projet.
  - 4.2. S'engager collectivement sur un plan de travail, un échéancier et des rôles à tenir.
  - 4.3. Fonctionner dans un environnement pluridisciplinaire, conjointement avec d'autres acteurs porteurs de différents points de vue : gérer des points de désaccord ou des conflits.
  - 4.4. Prendre des décisions en équipe lorsqu'il y a des choix à faire : que ce soit sur les solutions techniques ou sur l'organisation du travail pour faire aboutir le projet.
5. Communiquer efficacement oralement et par écrit en vue de mener à bien les projets qui lui sont confiés dans son environnement de travail (en particulier en anglais).
  - 5.1. Identifier clairement les besoins du « client » ou de l'utilisateur : questionner, écouter et comprendre toutes les dimensions de sa demande et pas seulement les aspects techniques.
  - 5.2. Argumenter et convaincre en s'adaptant au langage de ses interlocuteurs : techniciens, collègues, clients, supérieurs hiérarchiques.
  - 5.3. Communiquer sous forme graphique et schématique ; interpréter un schéma, présenter les résultats d'un travail, structurer des informations.
  - 5.4. Lire, analyser et exploiter des documents techniques (diagrammes, manuels, cahiers de charge...).
  - 5.5. Rédiger des documents écrits en tenant compte des exigences contextuelles et des conventions sociales en la matière.
  - 5.6. Faire un exposé oral convaincant en utilisant les techniques modernes de communication.
6. Faire preuve à la fois de rigueur, d'ouverture, d'esprit critique et d'éthique dans son travail.
  - 6.1. Appliquer les normes en vigueur dans les disciplines de la science des données (terminologie, mesures de qualité, ...).
  - 6.2. Trouver des solutions qui vont au-delà des enjeux strictement techniques, en intégrant les enjeux de dimension éthique d'un projet (y compris la confidentialité des données et la protection de la vie privée) et de développement durable
  - 6.3. Faire preuve d'esprit critique vis-à-vis d'une solution technique pour en vérifier la robustesse et minimiser les risques qu'elle présente au regard du contexte de sa mise en Œuvre.
  - 6.4. S'autoévaluer et développer de manière autonome les connaissances nécessaires pour rester compétent dans son domaine.

## DATI2M Programme

### Detailed programme by subject

#### CORE COURSES

- Mandatory
- ⊗ Optional
- △ Not offered in 2022-2023
- ⊖ Not offered in 2022-2023 but offered the following year
- ⊕ Offered in 2022-2023 but not the following year
- △ ⊕ Not offered in 2022-2023 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 Data structures and algorithms for data analysis

○ LINFO2172	Databases	Siegfried Nijssen	EN [q2] [30h+30h] [6 Credits] 🌐 > French-friendly	X	X
○ LINMA2472	Algorithms in data science	Jean-Charles Delvenne (coord.) Gautier Krings (compensates Vincent Blondel)	EN [q1] [30h+22.5h] [5 Credits] 🌐 > French-friendly	X	X
○ LDATA2010	Information visualisation	John Lee	EN [q1] [30h+30h] [5 Credits] 🌐 > French-friendly	X	X

#### o Machine learning

○ LINFO2262	Machine Learning :classification and evaluation	Thibault Helleputte (compensates Pierre Dupont)	EN [q2] [30h+30h] [5 Credits] 🌐 > French-friendly	X	X
○ LELEC2870	Machine learning : regression, deep networks and dimensionality reduction	John Lee Michel Verleysen	EN [q1] [30h+30h] [5 Credits] 🌐 > French-friendly	X	X
○ LINFO2275	Data mining & decision making	Marco Saerens	EN [q2] [30h+15h] [5 Credits] 🌐 > French-friendly	X	X
○ LINFO2364	Mining Patterns in Data	Siegfried Nijssen	EN [q2] [30h+15h] [5 Credits] 🌐 > French-friendly	X	X

#### o Statistics

○ LSTAT2120	Linear models	Christian Hafner	EN [q1] [30h+7.5h] [5 Credits] 🌐 > French-friendly	X	X
○ LSTAT2130	Introduction to Bayesian statistics	Philippe Lambert	EN [q2] [22.5h+7.5h] [4 Credits] 🌐	X	X

## PROFESSIONAL FOCUS

- Mandatory
- ⊗ Optional
- △ Not offered in 2022-2023
- ⊙ Not offered in 2022-2023 but offered the following year
- ⊕ Offered in 2022-2023 but not the following year
- △ ⊕ Not offered in 2022-2023 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

### Content:

L'étudiant-e sélectionne 30 crédits parmi:

⊗ LINFO2399	<a href="#">Industrial seminar in computer science</a>	Yves Deville Bernard Geubelle	EN [q2] [30h] [3 Credits] 	X	X
⊗ LINFO2369	<a href="#">Artificial intelligence and machine learning seminar</a>	Sébastien Jodogne Siegfried Nijssen	EN [q1] [30h] [3 Credits] 	X	X
⊗ LINMA2120	<a href="#">Applied mathematics seminar</a>	Pierre-Antoine Absil Gianluca Bianchin Frédéric Crevecoeur (coord.) Jean-Charles Delvenne François Glineur Julien Hendrickx Laurent Jacques Raphaël Jungers Estelle Massart (compensates) Anthony Papavasiliou Geovani Nunes Grapiglia	EN [q1+q2] [30h] [3 Credits] 	X	X
⊗ LSTAT2390	<a href="#">Applied statistics workshops</a>	Catherine Legrand Christian Ritter	EN [q1+q2] [15h] [3 Credits] 	X	X
○ LDATI2990	<a href="#">Master thesis in data analytics</a> <i>The graduation project can be written and presented in French or English, in consultation with the supervisor. It may be accessible to exchange students by prior agreement between the supervisors and/or the two universities.</i>		EN [q1+q2] [] [25 Credits] 	X	X
○ LEPL2020	<a href="#">Professional integration work</a> <i>Les modules du cours LEPL2020 sont organisés sur les deux blocs annuels du master. Il est fortement recommandé à l'étudiant.e de les suivre dès le bloc annuel 1, mais il.elle ne pourra inscrire le cours que dans son programme de bloc annuel 2.</i>	Myriam Banaï Francesco Contino (coord.) Delphine Ducarme Jean-Pierre Raskin	EN [q1+q2] [30h+15h] [2 Credits] 	X	X

## OPTIONS

L'étudiant-e complète son programme pour arriver à min. 90 crédits disciplinaires (dispensés dans les Masters EPL ou sigle STAT, y compris le TFE) en ce non compris les éventuels compléments pris par certains étudiants qui manqueraient de base. Il n'est pas obligatoire de valider une option.

Dans la rubrique "Options et cours au choix en connaissances socioéconomiques", l'étudiant-e valide une des deux options ou choisit obligatoirement au minimum 3 crédits parmi les cours au choix ou les cours de l'option en enjeux de l'entreprise.

Majors in Data Science: Information technology

[> Major in computer systems](#) [ en-prog-2022-dati2m-ldati220o ]

[> Major in numerical methods and optimization](#) [ en-prog-2022-dati2m-ldati221o ]

- > [Major in Cryptography and information security](#) [ en-prog-2022-dati2m-lmap234o ]
- > [Cours au choix disciplinaires](#) [ en-prog-2022-dati2m-lдати237o ]

Options et cours au choix en connaissances socio-économiques

- > [Business risks and opportunities](#) [ en-prog-2022-dati2m-lдати231o ]
- > [Major in small and medium sized business creation](#) [ en-prog-2022-dati2m-lдати232o ]
- > [Cours au choix en connaissances socio-économiques](#) [ en-prog-2022-dati2m-lдати200o ]

Others elective courses

- > [Others elective courses](#) [ en-prog-2022-dati2m-lдати223o ]

MAJORS IN DATA SCIENCE: INFORMATION TECHNOLOGY

MAJOR IN COMPUTER SYSTEMS

- Mandatory
- ⊗ Optional
- △ Not offered in 2022-2023
- ⊖ Not offered in 2022-2023 but offered the following year
- ⊕ Offered in 2022-2023 but not the following year
- △ ⊕ Not offered in 2022-2023 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:

o Compulsory courses :

● LINFO2145	<a href="#">Cloud Computing</a>	Etienne Riviere	EN [q1] [30h+15h] [5 Credits] 🌐 > French-friendly	X	X
● LINFO2241	<a href="#">Architecture and performance of computer systems</a>	Tom Barbette	EN [q1] [30h+30h] [6 Credits] 🌐 > French-friendly	X	X

o Elective courses

⊗ LINFO2347	<a href="#">Computer system security</a>	Ramin Sadre	EN [q2] [30h+15h] [5 Credits] 🌐 > French-friendly	X	X
⊗ LINFO2143	<a href="#">Concurrent systems : models and analysis</a>	Charles Pecheur	EN [q1] [30h+15h] [5 Credits] 🌐 > French-friendly	X	X
⊗ LINFO2349	<a href="#">Networking and security seminar</a>	Etienne Riviere Ramin Sadre	EN [q1] [30h] [3 Credits] 🌐 > French-friendly	X	X
⊗ LINFO2146	<a href="#">Mobile and Embedded Computing</a>	Ramin Sadre	EN [q2] [30h+15h] [5 Credits] 🌐 > French-friendly	X	X
⊗ LINFO2355	<a href="#">Multicore programming</a>	Etienne Riviere	EN [q2] [30h+15h] [5 Credits] 🌐 > French-friendly	X	X

**MAJOR IN NUMERICAL METHODS AND OPTIMIZATION**

- Mandatory
- ⊗ Optional
- △ Not offered in 2022-2023
- ⊖ Not offered in 2022-2023 but offered the following year
- ⊕ Offered in 2022-2023 but not the following year
- △ ⊕ Not offered in 2022-2023 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:****o Compulsory courses**

○ LINMA2471	Optimization models and methods II	François Glineur Geovani Nunes Grapiglia	EN [q1] [30h+22.5h] [5 Credits] 🌐 > French-friendly	X	X
○ LINMA2380	Matrix computations	Jean-Charles Delvenne (compensates Raphaël Jungers)	EN [q1] [30h+22.5h] [5 Credits] 🌐 > French-friendly	X	X

**o One course between**

⊗ LINFO2266	Advanced Algorithms for Optimization	Pierre Schaus	EN [q1] [30h+15h] [5 Credits] 🌐 > French-friendly	X	X
⊗ LINMA2450	Combinatorial optimization	Julien Hendrickx Geovani Nunes Grapiglia	EN [q1] [30h+22.5h] [5 Credits] 🌐 > French-friendly	X	X

**⊗ Elective courses**

⊗ LINMA2470	Stochastic modelling	Philippe Chevalier Mehdi Madani (compensates Philippe Chevalier)	EN [q2] [30h+22.5h] [5 Credits] 🌐 > French-friendly	X	X
⊗ LINMA2491	Operational Research	Mehdi Madani (compensates Anthony Papavasiliou)	EN [q2] [30h+22.5h] [5 Credits] 🌐 > French-friendly	X	X
⊗ LINMA2171	Numerical Analysis : Approximation, Interpolation, Integration	Pierre-Antoine Absil	EN [q1] [30h+22.5h] [5 Credits] 🌐 > French-friendly	X	X
⊗ LINMA2875	System Identification	Gianluca Bianchin	EN [q2] [30h+30h] [5 Credits] 🌐 > French-friendly	X	X
⊗ LINFO2365	Constraint programming	Pierre Schaus	EN [q2] [30h+15h] [5 Credits] 🌐 > French-friendly	X	X
⊗ LINMA2460	Optimization : Nonlinear programming	Geovani Nunes Grapiglia	EN [q2] [30h+22.5h] [5 Credits] 🌐 > French-friendly	X	X
⊗ LINMA2120	Applied mathematics seminar	Pierre-Antoine Absil Gianluca Bianchin Frédéric Crevecoeur (coord.) Jean-Charles Delvenne François Glineur Julien Hendrickx Laurent Jacques Raphaël Jungers Estelle Massart (compensates Anthony Papavasiliou) Geovani Nunes Grapiglia	EN [q1+q2] [30h] [3 Credits] 🌐 > French-friendly	X	X
⊗ LINMA2360	Project in mathematical engineering	Pierre-Antoine Absil Laurent Jacques (compensates Anthony Papavasiliou)	EN [q1+q2] [30h+22.5h] [5 Credits] 🌐 > French-friendly	X	X





**MAJOR IN CRYPTOGRAPHY AND INFORMATION SECURITY**

As with the Master's degree engineering programmes in electricity, computer sciences and applied mathematics, this major provides students with the knowledge of fundamental algorithms and mathematics in order to better understand information security as well as the design and implementation of solutions for problems related to electronic circuits and information systems.

- Mandatory
- ⌘ Optional
- △ Not offered in 2022-2023
- ⊖ Not offered in 2022-2023 but offered the following year
- ⊕ Offered in 2022-2023 but not the following year
- △ ⊕ Not offered in 2022-2023 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:****⌘ Elective courses**

In order to validate this option INFO and MAP students have to take at least 20 credits and the ELEC, DATE and DATI students have to take at least 15 credits among:

⌘ LELEC2760	Secure electronic circuits and systems	François-Xavier Standaert	FR [q2] [30h+30h] [5 Credits] 🌐 > French-friendly	X	X
⌘ LINFO2144	Secured systems engineering	Axel Legay	FR [q2] [30h+15h] [5 Credits] 🌐 > French-friendly	X	X
⌘ LINFO2347	Computer system security	Ramin Sadre	FR [q2] [30h+15h] [5 Credits] 🌐 > French-friendly	X	X
⌘ LINGI2348	Information theory and coding	Jérôme Louveaux Benoît Macq Olivier Pereira	FR [q2] [30h+15h] [5 Credits] 🌐 > French-friendly	X	X
⌘ LMAT2440	Number theory	Pierre-Emmanuel Caprace Olivier Pereira	FR [q1] [30h+15h] [5 Credits] 🌐 > English-friendly	X	X
⌘ LMAT2450	Cryptography	Olivier Pereira	FR [q1] [30h+15h] [5 Credits] 🌐 > French-friendly	X	X
⌘ LELEC2770	Privacy Enhancing technology	Olivier Pereira François-Xavier Standaert	FR [q1] [30h+30h] [5 Credits] 🌐 > French-friendly	X	X

- Mandatory
- ⊗ Optional
- △ Not offered in 2022-2023
- ⊙ Not offered in 2022-2023 but offered the following year
- ⊕ Offered in 2022-2023 but not the following year
- △ ⊕ Not offered in 2022-2023 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

## Content:

### Statistics

⊗ LSTAT2200	Survey and Sampling	Marie-Paule Kestemont	FR [q2] [15h+5h] [4 Credits] 🌐	X	X
⊗ LSTAT2380	Statistical consulting	Christian Ritter	EN [q1+q2] [30h] [5 Credits] 🌐 > French-friendly	X	X
⊗ LSTAT2390	Applied statistics workshops	Catherine Legrand Christian Ritter	EN [q1+q2] [15h] [3 Credits] 🌐 > French-friendly	X	X
⊗ LSTAT2150	Nonparametric statistics: smoothings methods	Rainer von Sachs	EN [q1] [15h+5h] [4 Credits] 🌐	X	X
⊗ LSTAT2450	Statistical learning. Estimation, selection and inference	Eugen Pircalabelu	EN [q1] [30h+7.5h] [5 Credits] 🌐	X	X

### Machine learning, vision and artificial intelligence

⊗ LELEC2885	Image processing and computer vision	Christophe De Vleeschouwer (coord.) Laurent Jacques	EN [q1] [30h+30h] [5 Credits] 🌐 > French-friendly	X	X
⊗ LGBIO2010	Bioinformatics	Vincent Branders (compensates Pierre Dupont)	EN [q1] [30h+30h] [5 Credits] 🌐 > French-friendly	X	X
⊗ LINFO2263	Computational Linguistics	Anaïs Tack (compensates Pierre Dupont)	EN [q1] [30h+15h] [5 Credits] 🌐 > French-friendly	X	X
⊗ LINGI2348	Information theory and coding	Jérôme Louveaux Benoit Macq Olivier Pereira	EN [q2] [30h+15h] [5 Credits] 🌐 > French-friendly	X	X
⊗ LINFO2369	Artificial intelligence and machine learning seminar	Sébastien Jodogne Siegfried Nijssen	EN [q1] [30h] [3 Credits] 🌐 > French-friendly	X	X

### Data structures and algorithms for data analysis

⊗ LINFO2345	Languages and algorithms for distributed Applications	Peter Van Roy	EN [q1] [30h+15h] [5 Credits] 🌐 > French-friendly	X	X
⊗ LELEC2770	Privacy Enhancing technology	Olivier Pereira François- Xavier Standaert	EN [q1] [30h+30h] [5 Credits] 🌐 > French-friendly	X	X
⊗ LINFO1361	Artificial intelligence	Yves Deville	EN [q2] [30h+30h] [5 Credits] 🌐	X	X

## OPTIONS ET COURS AU CHOIX EN CONNAISSANCES SOCIO-ÉCONOMIQUES [3.0]

### BUSINESS RISKS AND OPPORTUNITIES

- Mandatory
- ⊗ Optional
- △ Not offered in 2022-2023
- ⊙ Not offered in 2022-2023 but offered the following year
- ⊕ Offered in 2022-2023 but not the following year
- △ ⊕ Not offered in 2022-2023 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

#### Content:

Course Code	Course Title	Instructor	Language	Duration	Credits	Open to incoming exchange students	Year 1	Year 2
● LEPL2211	<a href="#">Business issues introduction</a>	Benoît Gailly	EN [q2] [30h] [3 Credits] 🌐	> French-friendly			X	X
● LEPL2212	<a href="#">Financial performance indicators</a>	André Nsabimana	EN [q2] [30h+5h] [4 Credits] 🌐	> French-friendly			X	X
● LEPL2214	<a href="#">Law, Regulation and Legal Context</a>	Vincent Cassiers Werner Derycke	FR [q1] [30h+5h] [4 Credits] 🌐				X	X

#### One course between

From 3 to 5 credit(s)

⊗ LEPL2210	<a href="#">Ethics and ICT</a>	Axel Gosseries Olivier Pereira	EN [q2] [30h] [3 Credits] 🌐	> French-friendly			X	X
⊗ LLSMS2280	<a href="#">Business Ethics and Compliance Management</a>	Carlos Desmet	EN [q1] [30h] [5 Credits] 🌐				X	X

#### ⊗ Cours en marketing

⊗ MGEST1108	<a href="#">Marketing</a>	Nadia Sinigaglia	FR [q2] [45h+20h] [6 Credits] 🌐				X	X
⊗ MLSMM2136	<a href="#">Trends in Digital Marketing</a> ■	Ingrid Poncin	FR [q2] [30h] [5 Credits] 🌐					X
⊗ MLSMM2134	<a href="#">e-Consumer Behavior</a> ■	Karine Charry	FR [q2] [30h] [5 Credits] 🌐					X

#### ⊗ Cours en Sourcing and Procurement

⊗ LLSMS2036	<a href="#">Supply Chain Procurement</a>	Constantin Blome Antony Paulraj (compensates Per Joakim Agrell)	EN [q1] [30h] [5 Credits] 🌐				X	X
⊗ LLSMS2038	<a href="#">Procurement Organisation and Scope</a>	Constantin Blome	EN [q1] [30h] [5 Credits] 🌐				X	X
⊗ LLSMS2037	<a href="#">Sourcing Strategy</a>	Constantin Blome Michael Henke	EN [q1] [30h] [5 Credits] 🌐				X	X

#### ⊗ Alternative to the major in business risks and opportunities for computer science students

Computer science students who have already taken courses in this field while pursuing their Bachelor's degree may choose between 16-20 credits from the courses offered in the management minor for computer sciences.

## MAJOR IN SMALL AND MEDIUM SIZED BUSINESS CREATION

Commune à la plupart des masters de l'EPL, cette option a pour objectif de familiariser l'étudiant-e avec les spécificités de l'entrepreneuriat et de la création d'entreprise afin de développer chez lui les aptitudes, connaissances et outils nécessaires à la création d'entreprise.

Cette option rassemble des étudiants de différentes facultés en équipes interdisciplinaires afin de créer un projet entrepreneurial. La formation interdisciplinaire en création d'entreprise (CPME) est une option qui s'étend sur 2 ans et s'intègre dans plus de 30 Masters de 9 facultés/écoles de l'UCLouvain. Le choix de l'option CPME implique la réalisation d'un mémoire interfacultaire (en équipe) portant sur un projet de création d'entreprise. L'accès à cette option, ainsi qu'à chacun des cours, est limité aux étudiant-es sélectionnés sur dossier. Toutes les informations sur [www.uclouvain.be/cpme](http://www.uclouvain.be/cpme).

L'étudiant.e qui choisit de valider cette option doit sélectionner au minimum 20 crédits et au maximum 25 crédits. Cette option n'est pas accessible en anglais et ne peut être prise simultanément avec l'option « Enjeux de l'entreprise ».

- Mandatory
- ⊗ Optional
- △ Not offered in 2022-2023
- ⊖ Not offered in 2022-2023 but offered the following year
- ⊕ Offered in 2022-2023 but not the following year
- △ ⊕ Not offered in 2022-2023 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:

#### o Required courses for the major in small and medium sized businesses

○ LCPME2001	<a href="#">Théorie de l'entrepreneuriat</a>	<a href="#">Frank Janssen</a>	○ [q1] [30h+20h] [5 Credits] ⊕	X	
○ LCPME2002	<a href="#">Aspects juridiques, économiques et managériaux de la création d'entreprise</a>	<a href="#">Yves De Cordt</a> <a href="#">Marine Falize</a>	○ [q1] [30h+15h] [5 Credits] ⊕	X	
○ LCPME2003	<a href="#">Plan d'affaires et étapes-clefs de la création d'entreprise</a> <i>Les séances du cours LCPME2003 sont réparties sur les deux blocs annuels du master. L'étudiant doit les suivre dès le bloc annuel 1, mais ne pourra inscrire le cours que dans son programme de bloc annuel 2.</i>	<a href="#">Frank Janssen</a>	○ [q2] [30h+15h] [5 Credits] ⊕		X
○ LCPME2004	<a href="#">Séminaire d'approfondissement en entrepreneuriat</a>	<a href="#">Frank Janssen</a>	○ [q2] [30h+15h] [5 Credits] ⊕	X	

#### ⊗ Prerequisite CPME courses

Student who have not taken management courses during their previous studies must enroll in LCPME2021.

○ LCPME2021	<a href="#">Financer son projet</a>	<a href="#">Yves De Rongé</a>	○ [q2] [30h+15h] [5 Credits] ⊕	X	
-------------	-------------------------------------	-------------------------------	--------------------------------	---	--

**COURS AU CHOIX EN CONNAISSANCES SOCIO-ÉCONOMIQUES**

- Mandatory
- ⊗ Optional
- △ Not offered in 2022-2023
- ⊖ Not offered in 2022-2023 but offered the following year
- ⊕ Offered in 2022-2023 but not the following year
- △ ⊕ Not offered in 2022-2023 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:**

⊗ LFSA2995	Company Internship	Dimitri Lederer Jean-Pierre Raskin	(FR) [q1+q2] [30h] [10 Credits] 🌐	X	X
⊗ LFSA2212	Innovation classes	Benoît Macq Jean-Pierre Raskin Benoît Raucent	(FR) [q1] [30h+15h] [5 Credits] 🌐 > French-friendly	X	X
⊗ LSTAT2380	Statistical consulting	Christian Ritter	(EN) [q1+q2] [30h] [5 Credits] 🌐 > French-friendly	X	X
⊗ LSTAT2390	Applied statistics workshops	Catherine Legrand Christian Ritter	(EN) [q1+q2] [15h] [3 Credits] 🌐 > French-friendly	X	X
⊗ LINMA2360	Project in mathematical engineering	Pierre-Antoine Absil Laurent Jacques (compensates Anthony Papavasiliou)	(EN) [q1+q2] [30h+22.5h] [5 Credits] 🌐 > French-friendly	X	X
⊗ LINMA2120	Applied mathematics seminar	Pierre-Antoine Absil Gianluca Bianchin Frédéric Crevecoeur (coord.) Jean-Charles Delvenne François Glineur Julien Hendrickx Laurent Jacques Raphaël Jungers Estelle Massart (compensates Anthony Papavasiliou) Geovani Nunes Grapiglia	(EN) [q1+q2] [30h] [5 Credits] 🌐 > French-friendly	X	X
⊗ LACTU2170	STOCHASTIC FINANCE	Donatien Hainaut	(FR) [q2] [30h] [5 Credits] 🌐	X	X
⊗ LACTU2030	LIFE INSURANCE	Donatien Hainaut	(FR) [q1] [45h] [7 Credits] 🌐	X	X
⊗ LLSMS2034	Supply Chain Planning	Marc Foret Mathieu Van Vyve	(EN) [q2] [30h] [5 Credits] 🌐	X	X
⊗ LINFO2399	Industrial seminar in computer science	Yves Deville Bernard Geubelle	(EN) [q2] [30h] [3 Credits] 🌐 > French-friendly	X	X
⊗ LINFO2402	Open Source Project		(EN) [q1+q2] [0h] [5 Credits] 🌐 > French-friendly	X	X

## OTHERS ELECTIVE COURSES

Les cours au choix recommandés et accessibles aux étudiant-es du master ingénieur en sciences des données ou du master en sciences des données sont listés ci-dessus, dans les options et autres listes de cours au choix. L'étudiant-e est également libre de proposer d'autres cours des programmes de Masters EPL qui seraient pertinentes à son parcours personnel, pour autant que cela respecte les règles de constitution de programme du Master. Ces cours doivent être approuvés par le jury restreint.

## OTHERS ELECTIVE COURSES

- Mandatory
- ⊗ Optional
- △ Not offered in 2022-2023
- ⊙ Not offered in 2022-2023 but offered the following year
- ⊕ Offered in 2022-2023 but not the following year
- △ ⊕ Not offered in 2022-2023 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:

The elective courses being recommended and available for Master students in Data Sciences Engineering are listed here above, in the majors and other lists of elective courses. However, a student can further suggest other courses that would be relevant for his/her personal curriculum, pending that this is compliant with the rules for setting up a personal Master program.

## ⊗ Languages

Students may select from any language course offered at the ILV. Special attention is placed on the following seminars in professional development:

⊗ LALLE2500	Professional development seminar German	Caroline Klein (coord.)	DE [q1+q2] [30h] [3 Credits] 🌐	X	X
⊗ LALLE2501	Professional development seminar-German	Caroline Klein (coord.)	DE [q1+q2] [30h] [5 Credits] 🌐	X	X
⊗ LESPA2600	Vocational Induction Seminar - Spanish (B2.2/C1)	Rocio Cuberos Vicente Paula Lorente Fernandez (coord.)	ES [q1] [30h] [3 Credits] 🌐	X	X
⊗ LESPA2601	Vocational Induction Seminar - Spanish (B2.2/C1)	Rocio Cuberos Vicente Paula Lorente Fernandez (coord.)	ES [q1] [30h] [5 Credits] 🌐	X	X
⊗ LNEER2500	Seminar of Entry to professional life in Dutch - Intermediate level	Marie-Laurence Lambrecht (coord.)	NL [q1 or q2] [30h] [3 Credits] 🌐	X	X
⊗ LNEER2600	Seminar of entry to professional life in Dutch - Upper-Intermediate level	Dag Houdmont Marie-Laurence Lambrecht (coord.)	NL [q1 or q2] [30h] [3 Credits] 🌐	X	X

## ⊗ Group dynamics

⊗ LEPL2351	Group dynamics - Q1	Delphine Ducarme Claude Oestges (coord.) Thomas Pardoën Benoît Raucent	FR [q1] [15h+30h] [3 Credits] 🌐	X	X
⊗ LEPL2352	Group dynamics - Q2	Delphine Ducarme Claude Oestges (coord.) Thomas Pardoën Benoît Raucent	FR [q2] [15h+30h] [3 Credits] 🌐	X	X

## ⊗ Autres UEs hors-EPL

L'étudiant-e peut choisir maximum 8 ects de cours hors EPL considérés comme non-disciplinaires par la commission de diplôme

## 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.**

- Mandatory
- ⊗ Optional
- △ Not offered in 2022-2023
- ⊖ Not offered in 2022-2023 but offered the following year
- ⊕ Offered in 2022-2023 but not the following year
- △ ⊕ Not offered in 2022-2023 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...)

### ⊗ Mathématique - Analyse et algèbre linéaire

L'étudiant choisit un des modules suivants :

#### ⊗ Module 1

○ LINFO1111	<a href="#">Analysis</a>	Pierre-Antoine Absil François Glineur	FR [q1] [45h+37.5h] [7 Credits] 🌐
○ LINFO1112	<a href="#">Algebra</a>	Christophe Craeye Enrico Vitale	FR [q2] [30h+30h] [5 Credits] 🌐

#### ⊗ Module 2

○ LINGE1114	<a href="#">Mathematics I: analysis</a>	Heiner Olbermann	FR [q1] [30h+30h] [5 Credits] 🌐
○ LINGE1121	<a href="#">Mathematics II: algebra and matrix calculus</a>	Tom Claeys	FR [q2] [30h+30h] [5 Credits] 🌐

### ○ Probabilités et statistique

L'étudiant choisit un des modules suivants :

#### ⊗ Module 1

○ LBIR1315	<a href="#">Probability and statistics II</a>	Patrick Bogaert	FR [q1] [22.5h+22.5h] [3 Credits] 🌐
○ LBIR1212	<a href="#">Probabilities and statistics (I)</a>	Patrick Bogaert	FR [q1] [30h+15h] [4 Credits] 🌐

#### ⊗ Module 2

○ LEPL1108	<a href="#">Discrete mathematics and probability</a>	Jean-Charles Delvenne Olivier Pereira	FR [q1] [30h+30h] [5 Credits] 🌐
○ LEPL1109	<a href="#">Statistics and data sciences</a>	Donatien Hainaut Laurent Jacques	FR [q1] [30h+30h] [5 Credits] 🌐

### ○ Programmation et informatique

○ LINFO1101	<a href="#">Introduction to programming</a>	Kim Mens Siegfried Nijssen Charles Pecheur	FR [q1] [30h+30h] [5 Credits] 🌐
○ LINFO1104	<a href="#">Programming language concepts</a>	Peter Van Roy	FR [q2] [30h+30h] [5 Credits] 🌐
○ LEPL1402	<a href="#">Informatics 2</a>	Sébastien Jodogne Ramin Sadre Pierre Schaus	FR [q1] [30h+30h] [5 Credits] 🌐

#### ○ Un cours parmi :

⊗ LINMA2111	<a href="#">Discrete mathematics II : Algorithms and complexity</a>	Jean-Charles Delvenne Jean-Charles Delvenne (compensates Vincent Blondel)	FR [q1] [30h+22.5h] [5 Credits] 🌐 > French-friendly
⊗ LINFO1121	<a href="#">Algorithms and data structures</a>	Pierre Schaus	FR [q1] [30h+30h] [5 Credits] 🌐

### ⌘ Systèmes informatiques :

○ LINFO1341	Computer networks	Olivier Bonaventure	FR [q2] [30h+30h] [5 Credits] 🌐
○ LINFO1252	Informatic Systems	Etienne Riviere	FR [q1] [30h+30h] [5 Credits] 🌐

### ⌘ Méthodes numériques et optimisation :

○ LINMA1702	Optimization models and methods I	François Glineur	FR [q2] [30h+22.5h] [5 Credits] 🌐
-------------	-----------------------------------	------------------	-----------------------------------

#### ○ Un cours parmi :

○ LEPL1104	Numerical methods	Vincent Legat	FR [q2] [30h+30h] [5 Credits] 🌐
○ LINFO1113	Numerical algorithmic	Estelle Massart Loïc Quertenmont	FR [q2] [30h+30h] [6 Credits] 🌐

### ⌘ Other EU to be determined with the Study Advisor

Depending on his / her previous academic background, the student (in consultation with the study advisor) can add other UEs in order to acquire the necessary prerequisites for the program.

---



## 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 purposes 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](https://uclouvain.be/fr/decouvrir/rgee.html) (<https://uclouvain.be/fr/decouvrir/rgee.html>).

---

### # Prerequisites list

**MLSMM2134** "E-comportement du consommateur" has prerequisite(s) MGEST1108

- MGEST1108 - [Marketing](#)

**MLSMM2136** "Tendances en Digital Marketing" has prerequisite(s) MGEST1108

- MGEST1108 - [Marketing](#)

## The programme's courses and learning outcomes

---

For each UCLouvain training programme, a [reference framework of learning outcomes](#) specifies 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.

## DATI2M - 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.**

#### SUMMARY

- > [General access requirements](#)
- > [Specific access requirements](#)
- > [University Bachelors](#)
- > [Non university Bachelors](#)
- > [Holders of a 2nd cycle University degree](#)
- > [Holders of a non-University 2nd cycle degree](#)
- > [Access based on validation of professional experience](#)
- > [Access based on application](#)
- > [Admission and Enrolment Procedures for general registration](#)

### Specific access requirements

This programme is taught in English with no prerequisite in French. A certificate is required for the holders of a non-Belgian degree, see selection criteria of the Access on the file.

#### University Bachelors

Diploma	Special Requirements	Access	Remarks
<b>UCLouvain Bachelors</b>			
<a href="#">Bachelor in Computer Science</a>		Direct access	
<a href="#">Bachelor in Engineering</a>		Direct access	
Other Bachelor	Have acquired skills equivalent to those of the <a href="#">minor in computer science</a> or the <a href="#">minor in applied mathematics</a> .	Access based on application	Maximum 60 <a href="#">additional credits</a> integrated into their Masters's degree programme.
<b>Others Bachelors of the French speaking Community of Belgium</b>			
Bachelor in Computer Sciences		Direct access	
Bachelor in Engineering Sciences		Direct access	
Other Bachelor	Have acquired skills equivalent to those of the <a href="#">minor in computer science</a> or the <a href="#">minor in applied mathematics</a> .	Access based on application	See "Personalized access"
<b>Bachelors of the Dutch speaking Community of Belgium</b>			
Bachelor in Computer Sciences		Direct access	
Bachelor in Engineering Sciences		Direct access	
Other Bachelors	Have acquired skills equivalent to those of the <a href="#">minor in computer science</a> or the <a href="#">minor in applied mathematics</a> .	Access based on application	See "Personalized access"
<b>Foreign Bachelors</b>			
Bachelor in Computer Sciences		Access based on application	See "Personalized access"

## Non university Bachelors

> Find out more about [links](#) to the university

Diploma	Access	Remarks
BA en informatique de gestion - crédits supplémentaires entre 30 et 60	Les enseignements supplémentaires éventuels peuvent être consultés dans <a href="#">le module complémentaire</a> .	Type court
BA en informatique et systèmes, orientation informatique industrielle - crédits supplémentaires entre 30 et 60		
BA en informatique et systèmes, orientation réseaux et télécommunications - crédits supplémentaires entre 30 et 60		
BA en informatique et systèmes, orientation sécurité des systèmes - crédits supplémentaires entre 30 et 60		
BA en informatique et systèmes, orientation technologie de l'informatique - crédits supplémentaires entre 30 et 60		
BA en informatique, orientation développement d'applications - crédits supplémentaires entre 30 et 60		
BA en informatique, orientation informatique industrielle - crédits supplémentaires entre 30 et 60		
BA en informatique, orientation réseaux et télécommunications - crédits supplémentaires entre 30 et 60		
BA en informatique, orientation sécurité des systèmes - crédits supplémentaires entre 30 et 60		
BA en informatique, orientation technologies de l'informatique - crédits supplémentaires entre 30 et 60		

## Holders of a 2nd cycle University degree

Diploma	Special Requirements	Access	Remarks
<b>"Licenciés"</b>			

## Masters

## 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](#).

### 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.

Admission on the basis of a submitted dossier may be granted either directly or on the condition of completing [additional coursework](#) of a maximum of 60 ECTS credits, or refused.

The first step of the admission procedure requires to submit an application online : <https://uclouvain.be/en/study/inscriptions/futurs-etudiants.html>

[Selection criteria are summarized here](#) (contact : [epl-admission@uclouvain.be](mailto:epl-admission@uclouvain.be)).

## Admission and Enrolment Procedures for general registration

## Evaluation

---

*The evaluation methods comply with the **regulations concerning studies and exams** (<https://uclouvain.be/fr/decouvrir/rgee.html>). More detailed explanation of the modalities specific to each learning unit are available on their description sheets under the heading "Learning outcomes evaluation method".*

## Contacts

---

### Curriculum Management

Entity

Structure entity

Denomination

Faculty

Sector

Acronym

Postal address

Website

Academic supervisor: Jean-Charles Delvenne

Jury

- Claude Oestges
- Siegfried Nijssen

Useful Contact(s)

- Pascale Premereur

SST/EPL/DACS

(DACS)

Louvain School of Engineering (EPL)

Sciences and Technology (SST)

DACS

Avenue Georges Lemaître 4-6 - bte L4.05.01

1348 Louvain-la-Neuve

[www.uclouvain.be/epl](http://www.uclouvain.be/epl)

