

**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 de l'ingénieur et technologie**Organized by: **Louvain School of Engineering (EPL)**Programme acronym: **DATE2M** - Francophone Certification Framework: 7**Table of contents**

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## DATE2M - Introduction

### Introduction

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#### 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.

## DATE2M - 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.

### Programme structure

The 120-credit programme of the Master's degree in Data Science consists of :

- A core curriculum of at least 45 credits of:
  - Data structures and algorithms for data analysis
  - Machine learning and data mining
  - Statistics
- a specialized 30-credit mandatory courses including the Master Thesis and an industrial seminar,
- at least one major (Numerical Methods and Optimization or Computer Systems),
- elective courses to achieve at least 120 credits.

An additional teaching module may be added to the 120-credit programme for students who do not have all the prerequisites for the Master's degree. These teaching units will be selected with the study advisor.

For a typical programme, this Master's degree will total, whatever the purpose, options and/or elective courses selected, a minimum of 120 credits spread over two annual blocks corresponding to 60 credits each.

*For a programme-type, and regardless of the focus, options/or elective courses selected, this master will carry a minimum of 120 credits divided over two annual units, corresponding to 60 credits each.*

[> Tronc commun](#) [ en-prog-2021-date2m-tronc\_commun ]

Liste au choix de finalités DATE2M

[> Professional Focus](#) [ en-prog-2021-date2m-ldate200s ]

[> List of electives](#) [ en-prog-2021-date2m-options ]

Majors in data science

- [> Major in computer systems](#) [ en-prog-2021-date2m-lдати220o ]
- [> Major in numerical methods and optimization](#) [ en-prog-2021-date2m-lдати221o ]
- [> Major in Cryptography and information security](#) [ en-prog-2021-date2m-lmap234o ]
- [> Cours au choix disciplinaires](#) [ en-prog-2021-date2m-lдати237o ]

Options et cours au choix en connaissances socio-économiques

- [> Business risks and opportunities](#) [ en-prog-2021-date2m-lдати231o ]
- [> Major in small and medium sized business creation](#) [ en-prog-2021-date2m-lдати232o ]
- [> Cours au choix en connaissances socio-économiques](#) [ en-prog-2021-date2m-lдати200o ]

Others elective courses

- [> Others elective courses](#) [ en-prog-2021-date2m-lдати223o ]

Preparatory Module (only for students who qualify for the course via complementary coursework)

- [> Master \[120\] in Data Science Engineering](#) [ en-prog-2021-date2m-module\_complementaire ]

## DATE2M Detailed programme

### Programme by subject

#### CORE COURSES

● Mandatory

△ Courses not taught during 2021-2022

⊕ Periodic courses taught during 2021-2022

⊗ Optional

⊙ Periodic courses not taught during 2021-2022

■ Activity with requisites

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

Year

1 2

### o Data structures and algorithms for data analysis

o LINFO2172	Databases	Siegfried Nijssen	30h+30h	6 Credits	q2	x	x
o LINMA2472	Algorithms in data science	Vincent Blondel Jean-Charles Delvenne (coord.)	30h +22.5h	5 Credits	q1	x	x
o LDATA2010	Information visualisation	John Lee	30h+30h	5 Credits	q1	x	x

### o Machine learning

o LINFO2262	Machine Learning :classification and evaluation	Pierre Dupont	30h+30h	5 Credits	q2	x	x
o LELEC2870	Machine learning : regression, deep networks and dimensionality reduction	John Lee Michel Verleysen	30h+30h	5 Credits	q1	x	x
o LINFO2275	Data mining & decision making	Marco Saerens	30h+15h	5 Credits	q2	x	x
o LINFO2364	Mining Patterns in Data	Siegfried Nijssen	30h+15h	5 Credits	q2	x	x

### o Statistics

o LSTAT2120	Linear models	Christian Hafner	30h+7.5h	5 Credits	q1	x	x
o LSTAT2130	Introduction to Bayesian statistics	Philippe Lambert	15h+5h	4 Credits	q2	x	x

**PROFESSIONAL FOCUS**

○ Mandatory

△ Courses not taught during 2021-2022

⊕ Periodic courses taught during 2021-2022

⊗ Optional

⊖ Periodic courses not taught during 2021-2022

■ Activity with requisites

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

Year

1 2

**Content:**

L'étudiant.e sélectionne 30 crédits parmi:

⊗ LINFO2399	Industrial seminar in computer science	Yves Deville Bernard Geubelle	30h	3 Credits	q2	x	x
⊗ LINFO2369	Artificial intelligence and machine learning seminar		30h	3 Credits	q1	x	x
⊗ LINMA2120	Applied mathematics seminar	Pierre-Antoine Absil Frédéric Crevecoeur (coord.) Jean-Charles Delvenne François Glineur Julien Hendrickx Laurent Jacques Raphaël Jungers Anthony Papavasiliou	30h	3 Credits	q1+q2	x	x
⊗ LSTAT2390	Applied statistics workshops	Catherine Legrand Christian Ritter	15h	3 Credits	q1+q2	x	x
○ LDATE2990	Master thesis in data analytics			25 Credits		x	x
○ LEPL2020	Professional integration work « 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. »		30h+15h	2 Credits	q1+q2	x	x

**OPTIONS**

The student completes his program to reach at least 60 technical credits (in the Masters EPL or with a STAT acronym) not including the Master thesis and the eventual complements taken by some students who would lack basic knowledge. It is not compulsory to validate an option.

Majors in data science

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- > Major in computer systems [ en-prog-2021-date2m-ldati220o ]
- > Major in numerical methods and optimization [ en-prog-2021-date2m-ldati221o ]
- > Major in Cryptography and information security [ en-prog-2021-date2m-lmap234o ]
- > Cours au choix disciplinaires [ en-prog-2021-date2m-ldati237o ]

Options et cours au choix en connaissances socio-économiques

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- > Business risks and opportunities [ en-prog-2021-date2m-ldati231o ]
- > Major in small and medium sized business creation [ en-prog-2021-date2m-ldati232o ]
- > Cours au choix en connaissances socio-économiques [ en-prog-2021-date2m-ldati200o ]

Others elective courses

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- > Others elective courses [ en-prog-2021-date2m-ldati223o ]

## MAJORS IN DATA SCIENCE

## MAJOR IN COMPUTER SYSTEMS

● Mandatory

△ Courses not taught during 2021-2022

⊕ Periodic courses taught during 2021-2022

⊗ Optional

⊖ Periodic courses not taught during 2021-2022

■ Activity with requisites

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

Year

1 2

## o Content:

## o Compulsory courses :

● LINFO2145	Cloud Computing	Etienne Riviere	30h+15h	5 Credits	q1	x	x
● LINFO2241	Architecture and performance of computer systems	Ramin Sadre	30h+30h	6 Credits	q1	x	x

## o Elective courses

⊗ LINFO2347	Computer system security	Ramin Sadre	30h+15h	5 Credits	q2	x	x
⊗ LINFO2143	Concurrent systems : models and analysis	Charles Pecheur	30h+15h	5 Credits	q1	x	x
⊗ LINFO2349	Networking and security seminar	Etienne Riviere Ramin Sadre	30h	3 Credits	q1	x	x
⊗ LINFO2146	Mobile and Embedded Computing	Ramin Sadre	30h+15h	5 Credits	q2	x	x
⊗ LINFO2355	Multicore programming	Etienne Riviere	30h+15h	5 Credits	q2	x	x

**MAJOR IN NUMERICAL METHODS AND OPTIMIZATION**

● Mandatory

△ Courses not taught during 2021-2022

⊕ Periodic courses taught during 2021-2022

⊗ Optional

⊖ Periodic courses not taught during 2021-2022

■ Activity with requisites

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

Year

1 2

**o Content:****o Compulsory courses**

● LINMA2471	<a href="#">Optimization models and methods II</a>	François Glineur	30h +22.5h	5 Credits	q1	x	x
● LINMA2380	<a href="#">Matrix computations</a>	Raphaël Jungers	30h +22.5h	5 Credits	q1	x	x

**o One course between**

⊗ LINFO2266	<a href="#">Advanced Algorithms for Optimization</a>	Pierre Schaus	30h+15h	5 Credits	q1	x	x
⊗ LINMA2450	<a href="#">Combinatorial optimization</a>	Jean-Charles Delvenne Julien Hendrickx	30h +22.5h	5 Credits	q1	x	x

**⊗ Elective courses**

⊗ LINMA2470	<a href="#">Stochastic modelling</a>	Philippe Chevalier	30h +22.5h	5 Credits	q2	x	x
⊗ LINMA2491	<a href="#">Operational Research</a>	Anthony Papavasiliou	30h +22.5h	5 Credits	q2	x	x
⊗ LINMA2171	<a href="#">Numerical Analysis : Approximation, Interpolation, Integration</a>	Pierre-Antoine Absil	30h +22.5h	5 Credits	q1	x	x
⊗ LINMA2875	<a href="#">System Identification</a>	Julien Hendrickx	30h+30h	5 Credits	q2	x	x
⊗ LINFO2365	<a href="#">Constraint programming</a>	Pierre Schaus	30h+15h	5 Credits	q2	x	x
⊗ LINMA2460	<a href="#">Optimization : Nonlinear programming</a>		30h +22.5h	5 Credits	q2	x	x
⊗ LINMA2120	<a href="#">Applied mathematics seminar</a>	Pierre-Antoine Absil Frédéric Crevecoeur (coord.) Jean-Charles Delvenne François Glineur Julien Hendrickx Laurent Jacques Raphaël Jungers Anthony Papavasiliou	30h	3 Credits	q1+q2	x	x
⊗ LINMA2360	<a href="#">Project in mathematical engineering</a>	Pierre-Antoine Absil Anthony Papavasiliou	30h +22.5h	5 Credits	q1+q2	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

△ Courses not taught during 2021-2022

⊕ Periodic courses taught during 2021-2022

⊗ Optional

⊖ Periodic courses not taught during 2021-2022

■ Activity with requisites

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

Year

1 2

○ **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	<a href="#">Secure electronic circuits and systems</a>	François-Xavier Standaert	30h+30h	5 Credits	q2	x	x
⊗ LINFO2144	<a href="#">Secured systems engineering</a>		30h+15h	5 Credits	q2	x	x
⊗ LINFO2347	<a href="#">Computer system security</a>	Ramin Sadre	30h+15h	5 Credits	q2	x	x
⊗ LINGI2348	<a href="#">Information theory and coding</a>	Jérôme Louveaux Benoît Macq Olivier Pereira	30h+15h	5 Credits	q2	x	x
⊗ LMAT2440	<a href="#">Number theory</a>	Olivier Pereira	30h+15h	5 Credits	q1	x	x
⊗ LMAT2450	<a href="#">Cryptography</a>	Olivier Pereira	30h+15h	5 Credits	q1	x	x
⊗ LELEC2770	<a href="#">Privacy Enhancing technology</a>	Olivier Pereira (coord.) François-Xavier Standaert	30h+30h	5 Credits	q1	x	x

● Mandatory

△ Courses not taught during 2021-2022

⊕ Periodic courses taught during 2021-2022

⊗ Optional

⊖ Periodic courses not taught during 2021-2022

■ Activity with requisites

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

Year

1 2

## o Content:

### ⊗ Statistics

⊗ LSTAT2200	Survey and Sampling	Marie-Paule Kestemont	15h+5h	4 Credits	q2	x	x
⊗ LSTAT2380	Statistical consulting	Christian Ritter	30h	5 Credits	q1+q2	x	x
⊗ LSTAT2390	Applied statistics workshops	Catherine Legrand Christian Ritter	15h	3 Credits	q1+q2	x	x
⊗ LSTAT2150	Nonparametric statistics: smoothings methods	Rainer von Sachs	15h+5h	4 Credits	q1	x	x

### ⊗ Machine learning, vision and artificial intelligence

⊗ LELEC2885	Image processing and computer vision	Christophe De Vleeschouwer (coord.) Laurent Jacques	30h+30h	5 Credits	q1	x	x
⊗ LGBIO2010	Bioinformatics	Pierre Dupont	30h+30h	5 Credits	q1	x	x
⊗ LINFO2263	Computational Linguistics	Pierre Dupont	30h+15h	5 Credits	q1	x	x
⊗ LINGI2348	Information theory and coding	Jérôme Louveaux Benoît Macq Olivier Pereira	30h+15h	5 Credits	q2	x	x
⊗ LINFO2369	Artificial intelligence and machine learning seminar		30h	3 Credits	q1	x	x

### ⊗ Data structures and algorithms for data analysis

⊗ LINFO2345	Languages and algorithms for distributed Applications	Peter Van Roy	30h+15h	5 Credits	q1	x	x
⊗ LELEC2770	Privacy Enhancing technology	Olivier Pereira (coord.) François- Xavier Standaert	30h+30h	5 Credits	q1	x	x
⊗ LINFO1361	Artificial intelligence	Yves Deville	30h+30h	5 Credits	q2	x	x

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

### BUSINESS RISKS AND OPPORTUNITIES

○ Mandatory

△ Courses not taught during 2021-2022

⊕ Periodic courses taught during 2021-2022

⊗ Optional

⊖ Periodic courses not taught during 2021-2022

■ Activity with requisites

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

Year

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#### o Content:

○ LEPL2211	<a href="#">Business issues introduction</a>	<a href="#">Benoît Gailly</a>	30h	3 Credits	q2	x	x
○ LEPL2212	<a href="#">Financial performance indicators</a>		30h+5h	4 Credits	q2	x	x
○ LEPL2214	<a href="#">Law, Regulation and Legal Context</a>	<a href="#">Vincent Cassiers</a>	30h+5h	4 Credits	q1	x	x

#### o One course between

From 3 to 5 credits

⊗ LEPL2210	<a href="#">Ethics and ICT</a>	<a href="#">Axel Gosseries Olivier Pereira</a>	30h	3 Credits	q2	x	x
⊗ LLSMS2280	<a href="#">Business Ethics and Compliance Management</a>	<a href="#">Carlos Desmet</a>	30h	5 Credits	q1	x	x

#### o Cours de fondements en marketing

Les cours [MLSMM2136 Tendances en Digital Marketing](#) Ou [MLSMM2134 E-comportement du consommateur](#) sont optionnels suite à la réussite du cours [MGEST1220](#) lors du premier bloc annuel.

○ MGEST1220	<a href="#">Marketing</a>	<a href="#">Nadia Sinigaglia</a>	45h+20h	5 Credits	q1	x	
⊗ MLSMM2136	<a href="#">Trends in Digital Marketing</a>	<a href="#">Ingrid Poncin</a>	30h	5 Credits	q2		x
⊗ MLSMM2134	<a href="#">e-Consumer Behavior</a>	<a href="#">Karine Charry</a>	30h	5 Credits	q2		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**

● Mandatory

△ Courses not taught during 2021-2022

⊕ Periodic courses taught during 2021-2022

⊗ Optional

⊖ Periodic courses not taught during 2021-2022

■ Activity with requisites

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

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**Content:****Required courses for the major in small and medium sized businesses**

● LCPME2001	<a href="#">Entrepreneurship Theory (in French)</a>	Frank Janssen	30h+20h	5 Credits	q1	x	
● LCPME2002	<a href="#">Managerial, legal and economic aspects of the creation of a company (in French)</a>	Yves De Cordt Marine Falize	30h+15h	5 Credits	q1	x	
● LCPME2003	<a href="#">Business plan of the creation of a company (in French)</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>	Frank Janssen	30h+15h	5 Credits	q2		x
● LCPME2004	<a href="#">Advanced seminar on Entrepreneurship (in French)</a>	Frank Janssen	30h+15h	5 Credits	q2	x	

**⊗ Prerequisite CPME courses**

Student who have not taken management courses during their previous studies must enroll in LCPME2000.

● LCPME2000	<a href="#">Venture creation financement and management I</a>	Yves De Rongé Olivier Giacomin	30h+15h	5 Credits	q1	x	
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**COURS AU CHOIX EN CONNAISSANCES SOCIO-ÉCONOMIQUES [3.0]**

● Mandatory

△ Courses not taught during 2021-2022

⊕ Periodic courses taught during 2021-2022

⊗ Optional

⊖ Periodic courses not taught during 2021-2022

■ Activity with requisites

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

Year

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● **Content:**

						1	2
⊗ LEPL2211	Business issues introduction	Benoît Gailly	30h	3 Credits	q2	x	x
⊗ LFSA2995	Company Internship	Dimitri Lederer Jean-Pierre Raskin	30h	10 Credits	q1+q2	x	x
⊗ LFSA2212	Innovation classes	Benoît Macq Jean-Pierre Raskin Benoît Raucent	30h+15h	5 Credits	q1	x	x
⊗ LSTAT2380	Statistical consulting	Christian Ritter	30h	5 Credits	q1+q2	x	x
⊗ LSTAT2390	Applied statistics workshops	Catherine Legrand Christian Ritter	15h	3 Credits	q1+q2	x	x
⊗ LINMA2360	Project in mathematical engineering	Pierre-Antoine Absil Anthony Papavasiliou	30h +22.5h	5 Credits	q1+q2	x	x
⊗ LINMA2120	Applied mathematics seminar	Pierre-Antoine Absil Frédéric Crevecoeur (coord.) Jean-Charles Delvenne François Glineur Julien Hendrickx Laurent Jacques Raphaël Jungers Anthony Papavasiliou	30h	5 Credits	q1+q2	x	x
⊗ LACTU2170	STOCHASTIC FINANCE	Donatien Hainaut	30h	5 Credits	q2	x	x
⊗ LACTU2030	LIFE INSURANCE	Donatien Hainaut	45h	7 Credits	q1	x	x
⊗ LLSMS2034	Supply Chain Planning (in English)	Marc Foret Mathieu Van Vyve	30h	5 Credits	q2	x	x
⊗ LINFO2399	Industrial seminar in computer science	Yves Deville Bernard Geubelle	30h	3 Credits	q2	x	x
⊗ LINFO2402	Open Source Project		0h	5 Credits	q1+q2	x	x

## OTHERS ELECTIVE COURSES

## OTHERS ELECTIVE COURSES

● Mandatory

△ Courses not taught during 2021-2022

⊕ Periodic courses taught during 2021-2022

⊗ Optional

⊖ Periodic courses not taught during 2021-2022

■ Activity with requisites

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.)	30h	3 Credits	q1+q2	x	x
⊗ LALLE2501	Professional development seminar-German	Caroline Klein (coord.)	30h	5 Credits	q1+q2	x	x
⊗ LESPA2600	Vocational Induction Seminar - Spanish (B2.2/C1)	Paula Lorente Fernandez (coord.)	30h	3 Credits	q1	x	x
⊗ LESPA2601	Vocational Induction Seminar - Spanish (B2.2/C1)	Paula Lorente Fernandez (coord.)	30h	5 Credits	q1	x	x
⊗ LNEER2500	Seminar of Entry to professional life in Dutch - Intermediate level	Isabelle Demeulenaere (coord.) Marie-Laurence Lambrecht	30h	3 Credits	q1 or q2	x	x
⊗ LNEER2600	Seminar of entry to professional life in Dutch - Upper-Intermediate level	Isabelle Demeulenaere (coord.)	30h	3 Credits	q1 or q2	x	x

### ⊗ Group dynamics

⊗ LEPL2351	Group dynamics - Q1		15h+30h	3 Credits	q1	x	x
⊗ LEPL2352	Group dynamics - Q2		15h+30h	3 Credits	q2	x	x

### ⊗ Autres UEs hors-EPL

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

## Course prerequisites

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There are no prerequisites between course units (CUs) for this programme, i.e. the programme activity (course unit, CU) whose learning outcomes are to be certified and the corresponding credits awarded by the jury before registration in another CU.

## The programme's courses and learning outcomes

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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.

## DATE2M - 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.

**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. The student is supposed to have at least a B2 level in the European Framework of Reference. A certificate is required for the holders of a non-Belgian degree, see [selection criteria](#) of the personalized access.

## University Bachelors

Diploma	Special Requirements	Access	Remarks
<b>UCLouvain Bachelors</b>			
<a href="#">Bachelor in Engineering</a>		Direct access	Students who have neither major nor minor in the field of their civil engineering Master's degree may have an adapted programme.
<b>Others Bachelors of the French speaking Community of Belgium</b>			
Bachelor in Engineering		Direct access	Students with a Bachelor's degree in engineering sciences who have not taken the equivalent of a Minor in the field of their civil engineering master degree may have an adapted master programme.
<b>Bachelors of the Dutch speaking Community of Belgium</b>			
Bachelor in Engineering		Access with additional training	Students who have no specialisation in the field of their civil engineering master degree may have an adapted master programme with up to 60 additional credits.
<b>Foreign Bachelors</b>			
Bachelor in Engineering	Bachelor degree of Cluster Institution	Direct access	Students with a Bachelor's degree in engineering sciences who have not taken the equivalent of a minor in the field of their civil engineering master degree may have an adapted master programme.



Bachelor in Engineering

For others institutions

Access based on application

See "Personalized access"

## Non university Bachelors

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

## Holders of a 2nd cycle University degree

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

### Masters

Master ingénieur civil

Direct access

## 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

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

## Supplementary classes

**To access this Master, students must have a good command of certain subjects. If this is not the case, they must add supplementary classes at the beginning of their Master's programme in order to obtain the prerequisites for these studies.**

○ Mandatory

△ Courses not taught during 2021-2022

⊕ Periodic courses taught during 2021-2022

⊗ Optional

⊖ Periodic courses not taught during 2021-2022

■ Activity with requisites

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>	François Glineur Roland Keunings	45h+37.5h	7 Credits	q1
○ LINFO1112	<a href="#">Algebra</a>	Christophe Craeye Enrico Vitale	30h+30h	5 Credits	q2

#### ⊗ Module 2

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

### ○ Probabilités et statistique

L'étudiant choisit un des modules suivants :

#### ⊗ Module 1

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

#### ⊗ Module 2

○ LEPL1108	<a href="#">Mathématiques discrètes et probabilité</a>	Jean-Charles Delvenne Olivier Pereira	30h+30h	5 Credits	q1
○ LEPL1109	<a href="#">Statistics and data sciences</a>	Donatien Hainaut Laurent Jacques	30h+30h	5 Credits	q1

### ○ Programmation et informatique

○ LINFO1101	<a href="#">Introduction à la programmation</a>	Kim Mens Siegfried Nijssen Charles Pecheur	30h+30h	5 Credits	q1
○ LINFO1104	<a href="#">Concepts des langages de programmation</a>	Peter Van Roy	30h+30h	5 Credits	q2
○ LEPL1402	<a href="#">Informatique 2</a>	Ramin Sadre Pierre Schaus	30h+30h	5 Credits	q1

#### ○ Un cours parmi :

⊗ LINMA2111	<a href="#">Discrete mathematics II : Algorithms and complexity</a>	Vincent Blondel Jean-Charles Delvenne	30h+22.5h	5 Credits	q1
⊗ LINFO1121	<a href="#">Algorithmique et structures de données</a>	Pierre Schaus	30h+30h	5 Credits	q1

### ⊗ Systèmes informatiques :

○ LINFO1341	<a href="#">Réseaux informatiques</a>	Olivier Bonaventure	30h+30h	5 Credits	q2
○ LINFO1252	<a href="#">Systèmes informatiques</a>	Etienne Riviere	30h+30h	5 Credits	q1

### ⊗ Méthodes numériques et optimisation :

○ LINMA1702	<a href="#">Optimization models and methods I</a>	François Glineur	30h+22.5h	5 Credits	q2
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**○ Un cours parmi :**

○ LEPL1104	Méthodes numériques	Vincent Legat	30h+30h	5 Credits	q2
○ LINFO1113	Algorithmique numérique	Loïc Quertenmont	30h+30h	6 Credits	q1

**⌘ 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.*

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## Evaluation

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**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".**

## Contacts

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### Curriculum Management

Entity

Structure entity

Denomination

Faculty

Sector

Acronym

Postal address

SST/EPL/DATA

(DATA)

Louvain School of Engineering (EPL)

Sciences and Technology (SST)

DATA

Rue Archimède 1 - bte L6.11.01

1348 Louvain-la-Neuve

Academic supervisor: [Jean-Charles Delvenne](#)

Jury

- Président: [Jean-Didier Legat](#)
- Secrétaire du Jury: [Siegfried Nijssen](#)

Useful Contact(s)

- Secrétariat: [Pascale Premereur](#)

