



## SINF2M - Introduction

### Introduction

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#### Introduction

This Master's degree programme tries to strike a **balance between “soft skills” and scientific and technical knowledge, between excellence in research and the pragmatism of field work**. It offers:

- an approach to computer science based on fundamental **concepts** that keep up with the rapid pace of technological progress;
- a programme taught **entirely in English** in order to improve students' language skills, especially in technical English (both written and spoken);
- **exchange programmes** and dual degrees in Belgium, Europe and across the world.

#### Your profile

You would like to

- **Imagine, design, and implement** computer science systems that will shape the future;
- continue your education beyond the Bachelor's degree with a major in computer sciences (or the equivalent);
- improve your **theoretical knowledge** and develop your technical expertise in fields like artificial intelligence, computer networks, information security, software engineering and programming systems;
- improve your **interdisciplinary knowledge** in areas such as foreign languages, resource management, teamwork, autonomy and ethics.

#### Your future job

We train

- **scientists** who know how to investigate a sharp problematic using scientific literature in the field;
- **professionals** who will design computer systems that meet users' needs;
- **innovators** who can master a wide range of constantly evolving technologies;
- **specialists** capable of implementing software solutions with particular attention paid to product quality and its development process.

#### Your programme

This Master's degree programme consists of

- **required coursework** that seeks to give students the necessary skills to model and design complex applications (which is an indispensable part of the education of all university-trained computer scientists);
- **a major** selected by students that allows them to gain cutting edge knowledge in a field of their interest: software engineering and programming systems, artificial intelligence and big data, networks and security;
- **elective courses** that allow students to explore their interests whether it be computer science or another discipline (management, business creation, languages). As a comprehensive university, UCLouvain has numerous courses of study;
- a **graduation project** that makes up half of the programme during the last year. It offers students the possibility to study a subject in-depth and thanks to its size, introduces students to the professional life of a computer scientist or researcher; the topic of this project is selected in consultation with the programme supervisors and possibly a company.



**5. communicate effectively (orally or in writing) with the goal of carrying out assigned projects in the workplace (in English in particular)**

- 5.1. Identify the needs of the client or the user: question, listen and understand all aspects of their request and not just the technical aspects.
- 5.2. Present your arguments and adapt to the language of your interlocutors: technicians, colleagues, clients, superiors
- 5.3. Communicate through graphics and diagrams: interpret a diagram, present project results, structure information
- 5.4. Read and analyse different technical documents (rules, plans, specification notes)
- 5.5. Draft documents that take into account contextual requirements and social conventions
- 5.6. Make a convincing oral presentation using modern communication techniques.

**6. Demonstrate rigor, openness and critical thinking as well as a sense of ethics in your work**

- 6.1. Rigorously apply the standards of your discipline (terminology, measurement units, quality standards and security)
- 6.2. Find solutions that go beyond strictly technical issues by considering sustainable development and the socio-economic ethics of a project
- 6.3. Demonstrate critical awareness of a technical solution in order to verify its robustness and minimize the risks that may occur during implementation.
- 6.4. Evaluate oneself and independently develop necessary skills to remain knowledgeable in the field.

## Programme structure

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## OPTIONS EN SCIENCES INFORMATIQUES

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### MAJOR IN ARTIFICIAL INTELLIGENCE: BIG DATA, OPTIMIZATION AND ALGORITHMS

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#### Students completing the major in Artificial Intelligence: big data, optimization and algorithms will be able to:

- Identify and implement methods and techniques that allow software to solve complex problems that when solved by humans require "intelligence",
- Understand and put to good use methods and techniques relating to artificial intelligence such as automatic reasoning, research and heuristics, acquisition and representation of knowledge, automatic learning, problems associated with overcoming constraints,
- Identify applications and its methods and tools; understand a particular category of applications and its related techniques, for example robotics, computer vision, planning, data mining, computational linguistics and bioinformatics, big data processing,
- Formalise and structure a body of complex knowledge and use a systematic and rigorous approach to develop quality "intelligence" systems.

- Mandatory
- Optional
- Not offered in 2024-2025
- Not offered in 2024-2025 but offered the following year
- Offered in 2024-2025 but not the following year
- Not offered in 2024-2025 or the following year
- Activity with requisites
- Open to incoming exchange students
- Not open to incoming exchange students
- [FR] Teaching language (FR, EN, ES, NL, DE, ...)

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

From 20 to 30 credit(s)

Year

1 2

#### o Content:

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#### o Required courses in Artificial Intelligence: big data, optimization and algorithms

LINFO2263 Computational Linguistics





**MAJOR IN SOFTWARE ENGINEERING AND PROGRAMMING SYSTEMS****Students completing the major “Software engineering and programming systems” will be able to:**

- Understand and explain problems that come up during large scale software projects as well as the long-term critical impact that their choice of solutions may have (construction dimensions as well as validation, documentation, communication and management of a project involving large teams as well as costs and deadlines),
- Select and apply methods and tools of software engineering to develop complex software systems and meet strict quality standards: reliability, adaptability, scalability, performance, security, usefulness,
- Model the products and processes necessary to obtain such systems and analyse these models,
- Develop and implement analytical programmes focused on conversion and optimisation as well as computer representations,
- Put to good use different programming paradigms and languages, in particular those that deal with functional, object-oriented and competing programmes,
- Understand the issues associated with different and competing programming models and use the appropriate model,
- Define a new language (syntax and semantics) suitable to a specific context.

○ Mandatory

⊗ Optional

△ Not offered in 2024-2025

⊙ Not offered in 2024-2025 but offered the following year

⊕ Offered in 2024-2025 but not the following year

△ ⊕ Not offered in 2024-2025 or the following year

■ Activity with requisites

🌐 Open to incoming exchange students

🚫 Not open to incoming exchange students

[FR] Teaching language (FR, EN, ES, NL, DE, ...)

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

From 20 to 30credit(s)

Year

1 2

**o Content:****o Required courses in software engineering and programming systems**

○ LINFO2143

Concurrent systems : models and analysis

Charles Pecheur

EN

## ***OPTION IN DATA SCIENCE AND APPLIED MATHEMATICS***

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**Students completing the major “Data science and Applied Mathematics” must be able to:**

- Understand engineering fields requiring synergy between applied mathematics and computer science such as algorithms, scientific calculations, modelling computer systems, optimisation, machine learning or data mining;
- Understand and put to good use algorithms and techniques used in data science;


Year

1 2

⌘ LMECA2170

Numerical Geometry

Vincent Legat  
Jean-François Remacle

[q1] [30h+30h] [5 Credits]   
> *French-friendly*

x x

**OPTION EN CYBERSECURITY**

Students who have completed the "Cybersecurity and Information Technology" track should be able to:

- Understand areas of engineering that require synergy between computer security, networks, and systems, such as cryptography, data protection, application security, security architecture, or programming,
- Comprehend and appropriately apply methods and techniques related to cybersecurity, including prevention, detection, and response to cyber threats,
- Identify and implement security practices and standards to protect the infrastructure, systems, and data of organizations,
- Apply their knowledge to real-life scenarios through projects.

- Mandatory
- ⊗ Optional
- △ Not offered in 2024-2025
- ⊖ Not offered in 2024-2025 but offered the following year
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- 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 shall select 20 to 30 credits among:

Year

1 2

**o Content:**

Students shall select 20 to 30 credits among:

**o Required courses in Cybersecurity**

○ LINFO2347	Computer system security	Ramin Sadre	○ [q2] [30h+15h] [5 Credits] 🌐 > French-friendly	X	X
○ LINFO2145	Cloud Computing	Etienne Riviere	○ [q1] [30h+15h] [5 Credits] 🌐 > French-friendly	X	X
○ LINFO2144	Secured systems engineering	Charles-Henry Bertrand Van Ouytsel	○ [q2] [30h+15h] [5 Credits] 🌐 > French-friendly	X	X

## OPTION NETWORKS AND SYSTEMS

Students who have completed the "Networks and Systems" track should be able to:

- Understand and explain different devices and protocols used in computer and cellular networks;
- Design, configure and manage computer networks while taking into account application needs;
- Understand the operation of IoT and cellular networks;
- Explain the problems that affect cellular and IoT networks and develop solutions to cope with them;
- Understand how to optimise applications to efficiently use parallel cores;
- Understand, implement and use lock-free data structures;
- Understand the interactions between real-time operating systems and hardware;
- Design and implement applications running on embedded systems

- Mandatory
- ⊗ Optional
- △ Not offered in 2024-2025
- ⊙ Not offered in 2024-2025 but offered the following year
- ⊕ Offered in 2024-2025 but not the following year
- △ ⊕ Not offered in 2024-2025 or the following year
- Activity with requisites
- 🌐 Open to incoming exchange students
- 🚫 Not open to incoming exchange students
- (FR) Teaching language (FR, EN, ES, NL, DE, ...)

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

Students shall select 20 to 30 credits among:

Year

1 2

### o Content:

#### o Required courses in Networks and systems

○ LINFO2142	Computer networks: configuration and management	Olivier Bonaventure	FR [q1] [30h+30h] [5 Credits] 🌐 > French-friendly	X	X
○ LINFO2146	Mobile and Embedded Computing	Ramin Sadre	FR [q2] [30h+15h] [5 Credits] 🌐 > French-friendly	X	X
○ LINFO2315	Design of Embedded and real-time systems	Cristel Pelsser	FR [q2] [30h+30h] [5 Credits] 🌐 > French-friendly	X	X
○ LINFO2355	Multicore programming	Etienne Riviere	FR [q2] [30h+15h] [5 Credits] 🌐 > French-friendly	X	X

#### o Elective courses in Networks and Systems

⊗ LINFO2347	Computer system security	Ramin Sadre	FR [q2] [30h+15h] [5 Credits] 🌐 > French-friendly	X	X
⊗ LINFO2145	Cloud Computing	Etienne Riviere	FR [q1] [30h+15h] [5 Credits] 🌐 > French-friendly	X	X
⊗ LINFO2144	Secured systems engineering	Charles-Henry Bertrand Van Ouytsel			

## OPTION EN INFORMATIQUE MÉDICALE

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Students completing the major in "Health informatics" will be able to:

- Identify and use methods and techniques that provide software-based solutions to complex problems encountered in hospitals, in bio-pharmaceutical environments, in life sciences, or in digital health.
- Take part in multidisciplinary projects bringing together medical, biological and engineering expertise to the benefit of patient health.
- Understand and put to good use the methods and techniques pertaining to medical informatics and bioinformatics, such as artificial intelligence, health interoperability, clinical knowledge structuring, applied statistics, information security, software quality, as well as the effective management and processing of large volumes of data.
- Understand specific categories of applications where these methods and techniques can be applied, such as diagnostic support, therapeutic assistance, hospital information systems, medical and biomedical imaging, smart devices, clinical trials, health data mining, as well as automated processing of the medical language.
- Formalize and structure a body of complex knowledge by using a systematic and rigorous approach to the development of high-quality medical and biomedical information systems.

● Mandatory

✂ Optional

△ Not offered in 2024-2025

⊙ Not offered in 2024-2025 but offered the following year

⊕ Offered in 2024-2025 but not the following year

△ ⊕ Not offered in 2024-2025 or the following year

■ Activity with requisites

🌐 Open to incoming exchange students

🚫 Not open to incoming exchange students










[FR] Teaching language (FR, EN, ES, NL, DE, ...)

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

*Students shall select 20 to 30 credits among:*

Year

				1	2
⌘ LINFO2263	Computational Linguistics	Pierre Dupont	EN [q1] [30h+15h] [5 Credits]  > French-friendly	X	X
⌘ LINFO2347	Computer system security	Ramin Sadre	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
⌘ LINFO2401	Open Source strategy for software development	Lionel Dricot	EN [q1] [30h+15h] [5 Credits]  > French-friendly	X	X
⌘ LINMA2472	Algorithms in data science	Jean-Charles Delvenne (coord.) Benoit Legat (compensates Vincent Blondel)	EN [q1] [30h+22.5h] [5 Credits]  > French-friendly	X	X
⌘ LMAT2450	Cryptography	Olivier Pereira	EN [q1] [30h+15h] [5 Credits]  > French-friendly	X	X
⌘ WESP2123	Principles of clinical trials	Diego Castanares Zapatero Annie Robert (coord.) Xavier Stéphenne (compensates Françoise Smets)	EN [q1] [20h+10h] [4 Credits] 	X	X
⌘ WFARM2177	Biostatistics	Laure Elens	EN [q2] [20h+10h] [3 Credits] 	X	X
⌘ WSBIM2122	Omics data analysis	Laurent Gatto	EN [q1] [30h+10h] [3 Credits] 	X	X

Open Source Project

- Mandatory
- ⊗ Optional
- △ Not offered in 2024-2025
- ⊖ Not offered in 2024-2025 but offered the following year
- ⊕ Offered in 2024-2025 but not the following year
- △ ⊕ Not offered in 2024-2025 or the following year
- Activity with requisites
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Click on the course title to see detailed informations (objectives, methods, evaluation...)

Year

1 2

Content:

⊗ LINFO2401	Open Source strategy for software development	Lionel Dricot	EN [q1] [30h+15h] [5 Credits] 🌐 > French-friendly	X	X
⊗ LINFO2402	Open Source Project		EN [q1+q2] [0h] [5 Credits] 🌐 > French-friendly	X	X

OPTIONS ET COURS AU CHOIX EN CONNAISSANCES SOCIO-ÉCONOMIQUES

BUSINESS RISKS AND OPPORTUNITIES

- Mandatory
- ⊗ Optional
- △ Not offered in 2024-2025
- ⊖ Not offered in 2024-2025 but offered the following year
- ⊕ Offered in 2024-2025 but not the following year
- △ ⊕ Not offered in 2024-2025 or the following year
- Activity with requisites
- 🌐 Open to incoming exchange students
- 🚫 Not open to incoming exchange students
- (FR) Teaching language (FR, EN, ES, NL, DE, ...)

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

Les étudiant-es doivent réussir au moins 15 crédits pour valider l'option. Cette option ne peut être prise simultanément avec l'option « Formation interdisciplinaire en création d'entreprise - CPME ».

Year

1 2

Content:



● LEPL2211



Year

1 2

⌘ Cours en Sourcing and Procurement

⌘ LLSMS2036	Supply Chain Procurement	Per Joakim Agrell Antony Paulraj	EN [q1] [30h] [5 Credits] 	X	X
⌘ LLSMS2038	Procurement Organisation and Scope	Constantin Blome Canan Kocabasoglu Hillmer (compensates Constantin Blome)	EN [q1] [30h] [5 Credits] 	X	

## MAJOR IN INTERDISCIPLINARY PROGRAM IN ENTREPRENEURSHIP - INEO

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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 entrepreneuriat (INEO) 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 INEO 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 <https://uclouvain.be/fr/etudier/ineo>.

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 2024-2025
  - ⊖ Not offered in 2024-2025 but offered the following year
  - ⊕ Offered in 2024-2025 but not the following year
  - △ ⊕ Not offered in 2024-2025 or the following year
-

## COURS AU CHOIX EN CONNAISSANCES SOCIO-ÉCONOMIQUES

- Mandatory
- ⊗ Optional
- △ Not offered in 2024-2025
- ⊖ Not offered in 2024-2025 but offered the following year
- ⊕ Offered in 2024-2025 but not the following year
- △ ⊕ Not offered in 2024-2025 or the following year
- Activity with requisites
- 🌐 Open to incoming exchange students
- 🚫🌐 Not open to incoming exchange students
- (FR) Teaching language (FR, EN, ES, NL, DE, ...)


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

Year



1 2

### o Content:

⊗ LFSA2995	<a href="#">Company Internship</a>	Dimitri Lederer Jean-Pierre Raskin	(FR) [q1+q2] [30h] [10 Credits] 🌐	X	X
⊗ LINFO2399	<a href="#">Industrial seminar in computer science</a>	Yves Deville Bernard Geubelle	(EN) [q2] [30h] [3 Credits] 🌐 > French-friendly	X	X
⊗ LINFO2402	<a href="#">Open Source Project</a>		(EN) [q1+q2] [0h] [5 Credits] 🌐 > French-friendly	X	X
⊗ LEPL2021	<a href="#">Innovation classes for transition and sustainable development</a>	Benoît Macq Xavier Marichal (compensates) Benoît Raucent	(EN) [q1] [30h+15h] [5 Credits] 🌐	X	

ES [q1] [30h] [3 Credits] 

Year

				1	2
⊗ LESPA2600	Vocational Induction Seminar - Spanish (B2.2/C1)	Paula Lorente Fernandez (coord.)	ES [q1] [30h] [3 Credits] 	x	x
⊗ LESPA2601	Vocational Induction Seminar - Spanish (B2.2/C1)	Paula Lorente Fernandez (coord.)	ES [q1] [45h] [5 Credits] 	x	x
⊗ LNEER2500					





## 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.

## SINF2M - Information

### Access Requirements

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

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

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

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

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#### SUMMARY

- > [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](#)



BA en informatique de gestion - crédits supplémentaires entre 30 et 60

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

Les enseignements supplémentaires éventuels peuvent être consultés dans le [module complémentaire](#).

Type court

## Holders of a 2nd cycle University degree

Diploma	Special Requirements	Access	Remarks
<b>"Licenciés"</b>			
"Licencié en informatique"		-	
<b>Masters</b>			
Master in computer science		-	

## 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.

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

## Teaching method

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### **Active learning and non-technical skills**

You will play an active role in your training. The pedagogical approach is a well-balanced mix of lectures, exercises, and projects to be carried out alone or in a group. The teaching methods vary. Sometimes, you will discover concepts and techniques independently. At these times, the teaching team acts as a resource in the learning process. At other times, the pedagogy focuses on transmitting the knowledge necessary to complete future tasks.

Special emphasis is placed on non-technical skills (autonomy, organisation, time management, different modes of communication, etc.) In particular, by emphasising project-based activities (including a large scale project that puts students in a semi-professional situation), this programme develops students' critical thinking skills, which allows them to design, model, implement, and validate complex computing systems.

### **Languages**

The lingua franca of computer science is English. The use of English in the programme allows students to develop their mastery of this



