UCLouvain	SINF2M 2024 - 2025	Master [120] in Computer Science

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 : **optional**
Activities on other sites : **NO**
Main study domain : **Sciences**
Organized by: **Louvain School of Engineering (EPL)**
Programme acronym: **SINF2M** - Francophone Certification Framework: 7

Table of contents

<div style="border:1px solid #6699cc; padding:10px; text-align:center">

SINF2M - Teaching profile

</div>

Learning outcomes

The computer science developers and designers of tomorrow face two major challenges:

- increasingly complex computer science systems
- ncreasingly varied areas of application

In order to meet these challenges, future diploma holders should

- master real computer science technologies but also keep up with their constant progress
- innovate by integrating in computer systems elements linked to artificial intelligence, software engineering, and security networks
- work as part of multidisciplinary teams that take into account non-technical issues, be open to social sciences and the humanities to help with this task.

This programme is based on research:

UCLouvain is a research university. The computer science research conducted at the institute ICTEAM is internationally recognised. Through the major courses offered in this Master's degree programme, students will be able to take advantage of cutting edge knowledge. In addition to providing fundamental knowledge, this programme is based on the in-depth understanding of concepts and the ability to think abstractly. These tools allow students to quickly adapt to the needs of companies. Moreover, this research may be continued through projects carried out at the doctoral level.

Applying concepts:

The application of concepts is a key part of this Master's degree programme. It is inconceivable that students can master theoretical concepts but not know how to apply them to a concrete problem. Thus, the programme includes a number of projects and studies, a large-scale graduation project and the possibility of completing an internship in a company.

International openness:

English is de facto the most used language in companies and those in the technical field in particular. This Master's degree programme is thus taught in English, which gives our students good speaking and writing skills. By offering a Master's degree in English, this programme demonstrates its international openness. The use of English allows the programme to welcome international students while at the same time immersing them in a French-speaking environment. It also increases the possibility of exchanges and dual diplomas with other (non-Belgian) universities.

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

1.demonstrate mastery of a solid body of knowledge in computer science allowing them to solve problems raised in their field of study

This Master's degree programme aims to provide students with advanced knowledge. A diversity of subjects are offered in the common curriculum and students specialise vria a major:

- security networks
- programming systems
- software engineering
- artificial intelligence
- Data Science and Applied Mathematics
- Business issues

2.organise and carry out the development of a computer system that meets the complex demands of a client

2.1.Analyse a problem to solve or the functional needs to be met and formulate a corresponding specifications note.
2.2.Model a problem and design one or more technical solutions in line with the specifications note.
2.3.Evaluate and classify the solutions in light of all the criteria included in the specifications note: efficiency, feasibility, quality, ergonomics and environmental security.
2.4. Implement and test the chosen solution.
2.5.Come up with recommendations to improve the operational nature of the solution.

3.organise and carry out a study to understand a new problem in the field

3.1. Document and summarize the existing body of knowledge in the area under consideration
3.2. Propose a model and/or an experimental device in order to simulate or test a hypotheses relating to the phenomenon being studied
3.3. Write a cumulative report that explains the potential of the theoretical or technical innovations resulting from the research project

4. contribute as part of a team to the planning and completion of a project while taking into account its objectives, allocated resources, and constraints

4.1. Frame and explain the project's objectives (in terms of performance indicators) while taking into account its issues and constraints
4.2. Collaborate on a work schedule, deadlines and roles
4.3. Work in a multidisciplinary environment with peers holding different points of view; manage any resulting disagreement or conflicts
4.4. Make team decisions and assume the consequences of these decisions (whether they are about technical solutions or the division of labour to complete a project)

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

The program consists of four parts:

- a common core (30 credits), including a final thesis (25 credits).
- a specialized focus, compulsory training (30 credits).
- one or more options allowing students to specialize in a field of IT (20-40 credits).
- elective courses (20-40 credits).

The graduation project is normally carried out in the last year. However, students may, depending on their training, conduct other courses in either the first or second year so long as they have completed the prerequisite courses. This is especially the case for students who have completed a portion of their studies abroad. The yearly allocation of course activities found in the detailed programme description is for information purposes only.

In general, this Master's degree will consist of a minimum of 120 credits spread over two years with 60 credits taken per year (regardless of the focus, major or elective courses selected).

SINF2M Programme

Detailed programme by subject

CORE COURSES [30.0]

					Year	
					1	2
FO2992	Graduation project/End of studies project *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.*			EN [q1+q2] [] [25 Credits] ⊕	x	x
○ LEPL2020	Professional integration work *The modules of LEPL2020 course are organized over the two annual blocks of the master's degree. It is strongly recommended that students take them from year 1, but they will only be able to register for the course at the earliest the year in which they present their final graduation project.* *Students who have other professional integration activities in their personal programme, or who can demonstrate an equivalent activity could be exempted from this course. This equivalence is at the discretion of the examination board. Another activity should then be chosen to reach the number of ECTS required for their graduation.*			EN [q1+q2] [30h+15h] [2 Credits] △ ⊕ > *French-friendly*	x	x

○ Computer science seminars

Students may choose 3 credits among
The student shall select 3 credits from amongst

⌛ LINFO2349	Networking and security seminar	Etienne Riviere Ramin Sadre	EN [q1] [30h] [3 Credits] ⊕ > *French-friendly*		x
⌛ LINFO2349					

OPTIONS EN SCIENCES INFORMATIQUES

MAJOR IN ARTIFICIAL INTELLIGENCE: BIG DATA, OPTIMIZATION AND ALGORITHMS

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.

    O 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]

					Year	
					1	2
⚔ LINMA2472	Algorithms in data science	Jean-Charles Delvenne (coord.) Benoît Legat (compensates Vincent Blondel)	EN [q1] [30h+22.5h] [5 Credits] 🌐 *> French-friendly*		x	x
⚔ LINFO2275	Data mining & decision making	Marco Saerens	EN [q2] [30h+15h] [5 Credits] 🌐 *> French-friendly*		x	x
⚔ LINFO2381	Health Informatics	Sébastien Jodogne	EN [q2][q20h+15h] [5 Credits]🌐 *> French-friendly*			x

OPTION IN DATA SCIENCE AND APPLIED MATHEMATICS

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.

O 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:

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

O 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

				Year 1	2
O LINFO2142	Computer networks: configuration and management	Olivier Bonaventure	[EN] [q1] [30h+30h] [5 Credits] 🌐 > *French-friendly*	x	x
O LINFO2146	Mobile and Embedded Computing	Ramin Sadre	[EN] [q2] [30h+15h] [5 Credits] 🌐 > *French-friendly*	x	x
O LINFO2315	Design of Embedded and real-time systems	Cristel Pelsser	[EN] [q2] [30h+30h] [5 Credits] 🌐 > *French-friendly*	x	x
O LINFO2355	Multicore programming	Etienne Riviere	[EN] [q2] [30h+15h] [5 Credits] 🌐 > *French-friendly*	x	x

o Elective courses in Networks and Systems

				Year 1	2
⊗ LINFO2347	Computer system security	Ramin Sadre	[EN] [q2] [30h+15h] [5 Credits] 🌐 > *French-friendly*	x	x
⊗ LINFO2145	Cloud Computing	Etienne Riviere	[EN] [q1] [30h+15h] [5 Credits] 🌐 > *French-friendly*	x	x
⊗ LINFO2144	Secured systems engineering	Charles-Henry Bertrand Van Ouytsel	[EN] [q2] [30h+15h] [5 Credits] 🌐 > *French-friendly*	x	x
⊗ LINFO2143	Concurrent systems : models and analysis	Charles Pecheur	[EN] [q1] [30h+15h] [5 Credits] 🌐 > *French-friendly*	x	x
⊗ LINFO2345	Languages and algorithms for distributed Applications	Peter Van Roy	[EN] [q1] [30h+15h] [5 Credits] 🌐 > *French-friendly*	x	x
⊗ LINFO2381	Health Informatics	Sébastien Jodogne	[EN] [q2] [30h+30h] [5 Credits] 🌐 > *French-friendly*	x	x
⊗ LELEC2760	Secure electronic circuits and systems	François-Xavier Standaert	[EN] [q2] [30h+30h] [5 Credits] 🌐 > *French-friendly*	x	x

OPTION EN INFORMATIQUE MÉDICALE

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.

O 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

Year
1 2

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	x
✿ LLSMS2037	Sourcing Strategy	Constantin Blome Michael Henke	EN [q1] [30h] [5 Credits] ⊕		x	x

✿

MAJOR IN INTERDISCIPLINARY PROGRAM IN ENTREPRENEURSHIP - INEO

Commune à la plupart des masters de l'EPL, cette option a pour objectif de familiariser l'étudiant·e avec les spécificités de l'entreprenariat 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 ».

O 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:

o Required courses

					Year 1	Year 2
O LINEO2001	Théorie de l'entrepreneuriat	Frank Janssen	[FR] [q1] [30h+20h] [5 Credits] 🌐		x	
O LINEO2002	Aspects juridiques, économiques et managériaux de la création d'entreprise	Yves De Cordt Marine Falize	[FR] [q1] [30h+15h] [5 Credits] 🌐		x	
O LINEO2003	Plan d'affaires et étapes-clefs de la création d'entreprise *Les séances du cours LINEO2003 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.*	Frank Janssen	[FR] [q2] [30h+15h] [5 Credits] 🌐			x
O LINEO2004	Séminaire d'approfondissement en entrepreneuriat	Frank Janssen	[FR] [q2] [30h+15h] [5 Credits] 🌐			

				Year 1	Year 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	Seminar of Entry to professional life in Dutch - Intermediate level	Isabelle Demeulenaere (coord.)	NL [q1 or q2] [30h] [3 Credits] ⊕	x	x
✢ LNEER2600	Seminar of entry to professional life in Dutch - Upper-Intermediate level	Isabelle Demeulenaere (coord.) Dag Houdmont			

Yves Deville

o **Cours alternatifs Calculabilité, logique et complexité**

L'étudiant·e choisit un cours parmi:

⊗ LINFO1123	Calculability, Logic and Complexity	Yves Deville	FR [q2] [30h+30h] [5 Credits] ⊕
⊗ LSINC1123	Calculability, Logic and Complexity	Yves Deville	

Course prerequisites

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

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

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. See selection criteria of the Access on the file.

University Bachelors

Diploma	Special Requirements	Access	Remarks
UCLouvain Bachelors			
Bachelor in Computer Science (Louvain-la-Neuve)		Direct access	
Bachelor in Computer Science (Charleroi)		Direct access	
Bachelor in Economics and Management Bachelor in Mathematics Bachelor in Engineering : Architecture	Minor in Computer Sciences	Access with additional training	maximum 60 additional credits integrated into their Master's degree programme If the UCLouvain Admissions Office considers the enrolment application sufficiently complete, it will submit the application to the faculty for a decision
Others Bachelors of the French speaking Community of Belgium			
Bachelor in computer science		Direct access	
Bachelors of the Dutch speaking Community of Belgium			
Bachelor in de informatica		Direct access	
Foreign Bachelors			
Bachelor in computer science		Access based on application	See "Personalized Access"

Non university Bachelors

> Find out more about links to the university

Diploma	Access	Remarks

Teaching method

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

The Master's degree in computer science may be followed by a doctoral programme in engineering sciences.

Most of the UCLouvain Master's degree programmes (generally 60) are open to UCLouvain Master's degree diploma holders. For example:

Different Master's degree programmes (60) in management (automatic admission based on written application): see this list

The Master's degree (60) in information and communication at Louvain-la-Neuve or the Master's degree (60) in information and communication at Mons.

Contacts

Curriculum Management

Entity

Structure entity	SST/EPL/INFO
Denomination	(INFO)
Faculty	Louvain School of Engineering (EPL)
Sector	Sciences and Technology (SST)
Acronym	INFO
Postal address	Place Sainte Barbe 2 - bte L5.02.01
	1348 Louvain-la-Neuve
	Tel: +32 (0) 10 47 31 50 - Fax: +32 (0) 10 45 03 45

Academic supervisor: Pierre Schaus

Jury

- Président du Jury: Claude Oestges
- Secrétaire du Jury: Cristel Pelsser

Useful Contact(s)

- Secrétariat: Vanessa Maons
- faculty secretariat: masters-epl-sinf@uclouvain.be