

SINF2M

2013 - 2014

Master [120] in Computer Science

At Louvain-la-Neuve - 120 credits - 2 years - Day schedule - In englishDissertation/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: **Ecole Polytechnique de Louvain (EPL)**Programme code: **sinf2m** - European Qualifications Framework (EQF): 7**Table of contents**

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SINF2M - Introduction

Introduction

The program tries to maintain a **balance between soft skills and scientific/technical skills, between striving for excellence and pragmatism**. It offers :

- an approach based basic **concepts** in computer science which remain valid beyond the rapidly changing technology ;
- a program **entirely in English** to improve your skills both in written and spoken technical English ;
- **exchange programs** and dual degrees in Belgium, Europe and worldwide .

Your profile

You

- aspire to **imagine, design, implement and deploy** the computer applications that will shape our future;
- have a bachelor degree with a specialization in computer science;
- want to improve your **theoretical knowledge** and develop your **practical skills** in disciplines such as artificial intelligence, computer networks, information security, software engineering and programming systems;
- would like to build up **soft skills** such as foreign languages, management of resources, team work and communication, work discipline and ethics.

Your future job

We train

- **scientists** who can understand and analyze the complex requirements to be met by a software system in its environment;
- **professionals** who will design computer systems which encounter customer needs;
- **innovators** who master a broad range of technologies and their continuous evolution;
- **specialists** able to implement software solutions with a particular attention to quality of the product and of its development process.

Your programme

The training includes

- a **mandatory part**, to acquire the skills necessary to model, design complex applications, which completes the required training to all university computer scientists;
- at least one **option** that you choose, to acquire advanced skills in a field of interest: software engineering and programming systems , artificial intelligence, networking and security ;
- **elective courses** that allow you to focus your training to your interests , whether computer science or any other discipline (management, entrepreneurship , foreign languages ...); as the UCL is a wide university , many opportunities are offered;
- an **master's thesis**, half the workload of the last year , offers the possibility of treating a subject in depth and its magnitude is a true introduction to life as a computer scientist; the subject of this work is chosen in consultation between you, the program committee and possibly an industry.

SINF2M - Admission

For the specific conditions of this program : refer to the French version

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

SINF2M - Information

Learning outcomes

Training based on research

The UCL is a place for teaching and research. The research conducted in the field of Computer Science within the ICTEAM Institute is internationally recognized. Through the options of the Master's program, students benefit from this cutting-edge knowledge in the fields of

- Artificial Intelligence,
- Networking and Security
- or Software Engineering and Systems Programming.

Beyond the mere acquisition of knowledge, training is based on a **deep understanding of concepts, reflection and abstraction**. These skills enable graduates to adapt quickly to the demands of employers. Furthermore, these studies can be extended to research activities and lead to a PhD.

Concepts to their application

The adaptability of graduates is further enhanced by the importance attributed to the application of concepts in the curriculum. **It is inconceivable to master concepts at a theoretical level and not to be able to apply them while facing a practical problem.** Therefore, the program contains many projects, assignments, a master's thesis and the possibility to perform an internship.

International perspective

English is the language most widely used in business and in particular in the technical field. The **Master's program is taught in English**. It enables non English native students to acquire good skills both oral and written in this language. Furthermore, teaching in English enables to welcome and host foreign students in good conditions, while allowing them to be immersed in a French environment. It also expands the possibilities for exchange programs and joint degrees with well-known universities.

Offering a master's program in English is definitely a position with an **international outlook**.

Regarding learning outcomes ...

On successful completion of this programme, each student is able to :
demonstrate mastery of a solid body of knowledge in computer science, enabling him to solve problems within its discipline

The master's program develops **advanced skills** in the computer science field. Various areas are addressed in the core curriculum and the student then **specialized through an option**:

- Networks and distributed systems;
- Programming languages;
- Software engineering;
- Artificial Intelligence.

organize and carry out every step of the software development process, meeting the generally complex needs of a customer

1. **analyze** the problem or functional requirements, to meet and formulate the corresponding **specification**.
2. **model** the problem and **design** one or more original technical solutions that meet these specifications.
3. **assess and classify** solutions in terms of the criteria expressed in the specifications: effectiveness, feasibility, quality, ergonomics and safety to the environment.
4. implement and test the solution.
5. make **recommendations** to improve the **operational features** of the solution.

organize and carry out research to understand a new problem within its discipline

1. **document** and summarize the **state of the art** in this field.
2. propose a **modeling** and/or an **experimental device** to simulate and test assumptions about the problem.
3. deliver a **summary report** to explain the theoretical and/or technical **potential innovation** resulting from this research

contribute in a team, to plan and bring a project to completion, taking into account the objectives, resources and other constraints

1. set and explain the **objectives of a project** (involving performance indicators) in the light of the challenges and constraints that characterize the project environment.
2. **engage collectively** on a work plan, timeline and roles of each team member.

3. operate in a **multidisciplinary environment**, together with colleagues carrying **different perspectives**, thus managing disagreements or conflicts.
4. **make decisions as a team** when choices are to be made, whether on technical solutions or work organization

communicate, both orally and in writing to carry out the projects entrusted to him in his work environment, and improve its foreign language skills (e.g. French and English)

1. clearly identify the needs of the **customer** or user: **ask questions, listen and understand** all aspects of the request and **not just the technical aspects**.
2. argue and convince, adapting the **language to suit the potential audience**: technicians, colleagues, clients, superiors.
3. use and interpret **graphics and diagrams** as an efficient communication medium to present results or to structure information.
4. read, analyze and **use technical documents** (standards, diagrams, user's guides, specifications ...).
5. **prepare written documents taking** into account the **contextual requirements** and social conventions in this field.
6. make **persuasive oral presentations** using modern communication techniques

demonstrate both rigor, openness, critical thinking and ethics in his work.

1. apply the **standards** in their discipline (terminology, units of measurement, standards of quality and safety ...).
2. find solutions that go **beyond purely technical issues**, integrating sustainable development issues and the ethical dimension of a project.
3. demonstrate **critical thinking** regarding a technical solution to verify its robustness and minimize its risks in relation to the context of its implementation.
4. **self-assess and individually develop knowledge** to remain competent in his field.

Teaching method

Active learning and soft skills

You will play an active role in your training. The pedagogical approach is a well-balanced mix of lectures, exercises, projects to be carried alone or in a group. The teaching methods vary. At times, you will be led to discover the concepts and techniques independently, the teaching team is then seen as a resource rather at your disposal to support your learning. At other times, teaching is more transmissive and provides the necessary keys to perform later practical tasks.

An important place is reserved for non-technical skills (autonomy, organizational skills, time management, communication, etc.). In particular, by putting an emphasis on project activities (including a large-scale project putting the students in a semi-professional situation), the pedagogical approach develops in the students a critical mind capable of designing, modelling, implementing, maintaining and validating complex computing systems.

Foreign languages

Globalisation imposes on any society to open its doors towards foreign markets. Moreover, English is by far the most commonly used language in computer science. The use of English during the entire curriculum allows students to develop their mastery of the English language, which will ease their integration in foreign universities and companies. All course material and supervision are in English but the student can always ask questions or answer his exams in French if desired.

Moreover, the programme allows for attending language courses at the university's Language Institute ([ILV](#)) and for taking part in foreign exchange programmes.

Interdisciplinarity

Computer scientist, especially with a master degree, will be brought during his career to project and team management, and he will be concerned by the complex socio-economic context in which computer applications belong. It's therefore suggested to open your training to other disciplines through elective courses or options such as the option in "management" or "creation of small and medium-sized enterprises."

Evaluation

The learning activities are assessed according to the rules of the University (see [exam regulations](#)), that is through written and oral exams, personal or group assignments, public presentation of projects and defence of the graduation thesis. For the courses given in English, questions will be expressed in English by the teacher, but the student may choose to answer in French. For the courses given in French, the questions will be expressed in French by the teacher, but the student may ask for help in translation and choose to answer in English.

Some activities such as projects during the semester under the supervision of the teaching staff and in collaboration with other students are not reorganized outside the period prescribed for the course. They are not re-evaluated at a later session.

Evaluation methods specific to each course are communicated to students by teachers at the beginning of the semester.

Mobility and/or Internationalisation outlook

Outgoing students

The Louvain School of Engineering (EPL) participates since their inception in the various existing mobility programmes at the European as well as worldwide levels.

The students' interest in internationalisation and mobility is aroused as of the end of their bachelor programmes, notably through the existence of intensive study programmes such as the [ATHENS](#) or [BEST](#) networks. These networks are also accessible in the master programme and allow the students to get a first contact with international mobility.

In addition, in the context of the Erasmus and Mercator exchange programmes, students have the possibility of performing and extended stay of typically 5 months (first semester of the second master year) at a partner university. To this extent, the Louvain School of Engineering (EPL) participates in several networks.

- In Belgium, EPL maintains a privileged partnership with the [Faculteit Ingenieurswetenschappen of the Katholieke Universiteit Leuven](#) with which it has developed an exchange programme covering the first year of the master.
- At the European level, EPL was particularly involved in the [CLUSTER](#). CLUSTER provides a guarantee of quality, both in terms of education and in terms of hosting for exchange students. Moreover, the CLUSTER partners have signed a convention of mutual recognition of their bachelor programmes. This convention implies that all bachelors of the CLUSTER institutions benefit, in each institution of the network, of the same accessibility conditions to the masters as the local students.
- Outside of Europe, EPL is a partner of the [Magalhães](#) network which associates fifteen European universities with the best universities in science and technology of Latin America.

Alongside these network partnerships, the Louvain School of Engineering has also signed a number of individual agreements with various universities in Europe, in North America and elsewhere in the world. The list of these agreements can be found on [UCL's International Relations Administration website](#).

Moreover, several dual master agreements have been set up and allow, after two years of master (one at UCL, the other in a host university), to obtain engineering degrees from both universities. In computer science engineering, such agreements have been established with UPC (Barcelona, Spain) and Grenoble (France). Others are currently being negotiated.

The students are informed about the various exchange programmes at the start of their second bachelor year. They are invited to prepare in time, especially at the linguistic level, through the courses of UCL's Language Institute (ILV).

Beyond exchange programmes, an internship may be conducted in a research laboratory or in an enterprise abroad.

More information about [mobility programmes](#).

Incoming students

In the context of the Cluster network, foreign students benefit at UCL from exactly the same status and conditions as local students, which facilitates Erasmus exchanges for students coming from institutes in this network.

The whole programme is offered in English and can be followed without prior knowledge of French, except for the options in biomedical engineering, management and creation of small and medium-sized enterprises. All courses, but a few exceptions, are given in English. For non-French-speaking students, alternatives to the courses in French will be proposed by the programme commission on a case-by-case basis, according to the student's curriculum.

More information about [mobility programmes](#).

Possible trainings at the end of the programme

-Accessible supplementary masters : not applicable.

-Accessible doctoral programmes:

The master in computer science engineering opens access to a Doctorate in Engineering (doctorat en sciences appliquées). In this context, doctoral students are enrolled in one of the thematic doctoral schools.

SINF2M - Contacts

Curriculum Managment

Entite de la structure INFO

Acronyme	INFO
Dénomination	Commission de programme - Sciences informatiques et ingénieur civil en informatique
Adresse	Place Sainte Barbe, 2 bte L5.02.01 1348 Louvain-la-Neuve Tél 010 47 31 50 - Fax 010 45 03 45
Secteur	Secteur des sciences et technologies (SST)
Faculté	Ecole Polytechnique de Louvain (EPL)
Commission de programme	Commission de programme - Sciences informatiques et ingénieur civil en informatique (INFO)

Academic Supervisor : [Kim MENS](#)

Jury

Président du Jury : **Piotr SOBIESKI**

Secrétaire du Jury : **Marc LOBELLE**

Usefull Contacts

Conseillère aux études : **Chantal PONCIN**

SINF2M - Detailed programme

Programme structure

The Master in Computer Science programme includes:

- core courses, mainly the master's thesis (38 ECTS credits);
- focus, mandatory courses (30 ECTS credits);
- one or more options to specialize in one computer science domain (20 to 52 ECTS credits),
- some optional courses (0 to 52 ECTS credits).

A master's thesis is conducted during the last year. On the other hand, as long as it suits his/her educational project and the prerequisites are respected, courses can be placed at will by the student in the first or second year. This is particularly true in the case of a student carrying out part of his studies abroad. Consequently, the years to which activities are assigned in the detailed programme are only indicative.

In addition, the student with a coherent project has the potential to open widely his training to non-technical disciplines through elective courses.

Whatever the focus or the options chosen, the programme of this master shall totalize 120 credits, spread over two years of studies each of 60 credits.

Core study

> [Tronc commun du master en sciences informatiques.](#) [en-prog-2013-sinf2m-lsinf220t.html]

> [Professional focus](#) [en-prog-2013-sinf2m-lsinf220s]

Options courses

> [Options en sciences informatiques](#) [en-prog-2013-sinf2m-lsinf901r.html]

> [Artificial Intelligence](#) [en-prog-2013-sinf2m-lsinf223o.html]

> [Option en ingénierie logicielle et systèmes de programmation / Software Engineering and programming Systems](#) [en-prog-2013-sinf2m-lsinf224o.html]

> [Networking and Security](#) [en-prog-2013-sinf2m-lsinf225o.html]

> [Option en informatique et mathématiques appliquées](#) [en-prog-2013-sinf2m-lsinf226o.html]

> [Business risks and opportunities](#) [en-prog-2013-sinf2m-lsinf230o.html]

> [Option interfacultaire en création de petites et moyennes entreprises](#) [en-prog-2013-sinf2m-lsinf227o.html]

> [Cours au choix en sciences informatiques](#) [en-prog-2013-sinf2m-lsinf221o.html]

Programme by subject

Core courses

● Mandatory

△ Courses not taught during 2013-2014

⊕ Periodic courses taught during 2013-2014

⊗ Optional

⊖ Periodic courses not taught during 2013-2014

⊞ Two years course

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

					Year	
					1	2
● LSINF2990	Travail de fin d'études (120)	N.	28 Credits			x
● Cours de polyvalence en sciences humaines						
● LLSMG2004	Human Resources Management	Evelyne Léonard	30h	5 Credits	x	x

Year

1 2

o Computing seminars

The student shall select 3 credits from amongst

The student shall select 3 credits from amongst

⊗ LINGI2359	Software engineering seminar	Kim Mens	30h	3 Credits	2q		x
⊗ LINGI2349	Network and communication seminar	Gildas Avoine, Olivier Bonaventure (compensates Gildas Avoine), Olivier Bonaventure	30h	3 Credits	1q		x
⊗ LINGI2369	Artificial intelligence seminar	Yves Deville	30h	3 Credits	2q		x
⊗ LINGI2379	Machine learning seminar	Pierre Dupont (coord.), Michel Verleysen	30h	3 Credits	2q		x

o Religion courses for student in exact sciences

The student shall select 2 credits from amongst

The student shall select

⊗ LTECO2100	Questions of religious sciences: biblical readings	Hans Ausloos	15h	2 Credits	1q	x	x
⊗ LTECO2200	Questions of religious sciences: reflections about christian faith	Dominique Martens	15h	2 Credits	2q	x	x
⊗ LTECO2300	Questions of religious sciences: questions about ethics	Philippe Cochinaux	15h	2 Credits	1q	x	x

Professional focus [30.0]

○ Mandatory

△ Courses not taught during 2013-2014

⊕ Periodic courses taught during 2013-2014

⊗ Optional

⊖ Periodic courses not taught during 2013-2014

⊠ Two years course

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

Year

1 2

o Cours d'informatique

○ LINGI2132	Languages and translators	Pierre Schaus	30h+30h	6 Credits	2q	x	
○ LINGI2141	Computer networks: information transfer	Olivier Bonaventure	30h+30h	6 Credits	1q	x	
○ LINGI2172	Databases	Bernard Lambeau	30h+30h	6 Credits	2q	x	
○ LINGI2261	Artificial intelligence: representation and reasoning	Yves Deville	30h+30h	6 Credits	1q	x	
○ LSINF2255	Software Development Project	Kim Mens	15h+45h	6 Credits	1q	x	

Options

L'étudiant complète son programme avec des options et/ou des cours au choix. Il sélectionne 52 crédits parmi

Options en sciences informatiques

- > [Artificial Intelligence](#) [en-prog-2013-sinf2m-lsinf223o]
- > [Option en ingénierie logicielle et systèmes de programmation / Software Engineering and programming Systems](#) [en-prog-2013-sinf2m-lsinf224o]
- > [Networking and Security](#) [en-prog-2013-sinf2m-lsinf225o]
- > [Option en informatique et mathématiques appliquées](#) [en-prog-2013-sinf2m-lsinf226o]
- > [Business risks and opportunities](#) [en-prog-2013-sinf2m-lsinf230o]
- > [Option interfacultaire en création de petites et moyennes entreprises](#) [en-prog-2013-sinf2m-lsinf227o]
- > [Cours au choix en sciences informatiques](#) [en-prog-2013-sinf2m-lsinf221o]

OPTIONS EN SCIENCES INFORMATIQUES

L'étudiant doit choisir une ou plusieurs options parmi les suivantes.

ARTIFICIAL INTELLIGENCE

Les étudiants ayant suivi l'option "Artificial Intelligence" devront être capables de:

- Identifier et mettre en oeuvre une classe de méthodes et de techniques permettant à un logiciel de résoudre des problèmes complexes qui, résolus par un être humain, nécessitent de l'"intelligence",
- Comprendre et appliquer à bon escient des méthodes et techniques relevant de l'intelligence artificielle telles que raisonnement automatisé, recherche et heuristiques, acquisition et représentation de connaissances, apprentissage automatique, problèmes de satisfaction de contraintes,
- Identifier des classes d'applications où ces méthodes et outils peuvent être appliqués; appréhender des classes particulières d'applications et leurs techniques spécifiques - par exemple, robotique, vision par ordinateur, planification, fouille de données, traitement de la langue naturelle et de données bioinformatiques,
- Formaliser et structurer des corps de connaissances complexes en utilisant une approche systématique et rigoureuse pour développer des systèmes "intelligents" de qualité.

● Mandatory

△ Courses not taught during 2013-2014

⊕ Periodic courses taught during 2013-2014

⊗ Optional

⊙ Periodic courses not taught during 2013-2014

‡ Two years course

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

The student shall select
 De 20 à 30 crédits parmi

Year
 1 2

● Compulsory courses in Artificial intelligence

Course ID	Course Title	Instructor	Hours	Credits	Year 1	Year 2
● LINGI2262	Machine Learning :classification and evaluation	Pierre Dupont	30h+30h	5 Credits	1q	x x
● LINGI2263	Computational Linguistics	Pierre Dupont, Cédric Fairon	30h+15h	5 Credits	2q	x x
● LINGI2264	Automated reasoning	Charles Pecheur	30h+15h	5 Credits	1q △	x x
● LINGI2365	Constraint programming	Yves Deville	30h+15h	5 Credits	2q	x x

⊗ Elective courses in Artificial Intelligence

The student can select 10 credits amongst

⊗ LSINF2275	Data mining & decision making	Marco Saerens	30h+30h	5 Credits	2q	x x
⊗ LELEC2885	Image processing and computer vision	Christophe De Vleeschouwer (coord.), Laurent Jacques (compensates Benoît Macq), Benoît Macq	30h+30h	5 Credits	1q	x x

						Year	
						1	2
⊗ LINGI2368	Computational biology	N.	30h+15h	5 Credits	1q Δ	x	x
⊗ LGBIO2010	Bioinformatics	Pierre Dupont, Michel Ghislain	30h+30h	5 Credits	2q	x	x
⊗ LINMA1702	Applied mathematics : Optimization I	Vincent Blondel, François Glineur (compensates Vincent Blondel), François Glineur (coord.)	30h +22.5h	5 Credits	2q	x	x
⊗ LINMA1691	Discrete mathematics - Graph theory and algorithms	Vincent Blondel, Jean-Charles Delvenne (compensates Vincent Blondel)	30h +22.5h	5 Credits	1q	x	x
⊗ LINMA2111	Discrete mathematics II : Algorithms and complexity	Vincent Blondel	30h +22.5h	5 Credits	2q Δ	x	x
⊗ LSTAT2320	Design of experiment.	Patrick Bogaert, Bernadette Govaerts	22.5h +7.5h	5 Credits	2q	x	x
⊗ LELEC2870	Machine Learning : regression, dimensionality reduction and data visualization	Michel Verleysen	30h+30h	5 Credits	1q	x	x
⊗ LINMA2450	Combinatorial optimization	Jean-Charles Delvenne	30h +22.5h	5 Credits	1q	x	x

OPTION EN INGÉNIERIE LOGICIELLE ET SYSTÈMES DE PROGRAMMATION / SOFTWARE ENGINEERING AND PROGRAMMING SYSTEMS

Les étudiants ayant suivi l'option "Software engineering and programming systems" devront être capables de :

- Comprendre et expliquer les problèmes rencontrés dans la conduite de gros projets logiciels, ainsi que l'impact critique du choix de solutions tout au long de leur cycle de vie (dimensions de construction, de validation, de documentation, de communication et de gestion de projet impliquant de grosses équipes ainsi que des coûts et délais à respecter),
- Choisir et appliquer des méthodes et outils d'ingénierie de systèmes logiciels complexes répondant à des critères stricts de qualité: fiabilité, adaptabilité, évolutivité, performance, sécurité, utilisabilité...,
- Modéliser les produits et processus nécessaires à l'obtention de tels systèmes et analyser ces modèles,
- Concevoir et réaliser des programmes d'analyse, de conversion et d'optimisation de représentations informatiques,
- Utiliser à bon escient différents paradigmes et langages de programmation, en particulier en ce qui concerne la programmation fonctionnelle, orientée-objet et concurrente,
- Comprendre les enjeux des différents modèles de programmation concurrente et répartie et utiliser le modèle approprié,
- Définir un nouveau langage (syntaxe et sémantique) approprié à un contexte spécifique.

○ Mandatory

△ Courses not taught during 2013-2014

⊕ Periodic courses taught during 2013-2014

⊗ Optional

⊙ Periodic courses not taught during 2013-2014

‡ Two years course

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

The student shall select

De 20 à 30 credits parmi

Year

1 2

○ Compulsory courses in Software Engineering and Programming Systems

Course ID	Course Title	Instructor	Hours	Credits	Period	Year 1	Year 2
○ LSINF2224	Programming methods	Charles Pecheur	30h+15h	5 Credits	2q	x	x
○ LINGI2252	Software Engineering : Measures and Maintenance	Kim Mens	30h+15h	5 Credits	1q	x	x
○ LSINF2345	Languages and algorithms for distributed applications	Peter Van Roy	30h+15h	5 Credits	2q	x	x
○ LINGI2251	Software engineering: development methods	Charles Pecheur	30h+30h	5 Credits	2q	x	x

⊗ Elective courses in Software Engineering and Programming Systems

The student can select 10 credits amongst

⊗ LSINF2335	Programming paradigms : theory, practice and applications	Kim Mens	30h+15h	5 Credits	2q	x	x
⊗ LSINF2382	Computer supported collaborative work	Jean Vanderdonckt	30h+15h	5 Credits	2q	x	x
⊗ LINGI2143	Concurrent systems : models and analysis	Charles Pecheur	30h+15h	5 Credits	1q	x	x
⊗ LINGI2264	Automated reasoning	Charles Pecheur	30h+15h	5 Credits	1q △	x	x
⊗ LINGI2346	Distributed application design	Marc Lobelle	30h+15h	5 Credits	1q	x	x
⊗ LINGI2365	Constraint programming	Yves Deville	30h+15h	5 Credits	2q	x	x
⊗ LINMA2111	Discrete mathematics II : Algorithms and complexity	Vincent Blondel	30h +22.5h	5 Credits	2q △	x	x
⊗ LINGI2355	Software requirements & architecture	N.	30h+15h	5 Credits	2q △	x	x
⊗ LINGI2339	Abstract interpretation	Baudouin Le Chartier	30h+15h	5 Credits	1q △ ⊕	x	x
⊗ LINGI2347	Computer system security	Gildas Avoine, Marco Canini (compensates Gildas Avoine)	30h+15h	5 Credits	2q	x	x

NETWORKING AND SECURITY

Les étudiants ayant suivi l'option "Networking and security" devront être capables de :

- Comprendre et expliquer les différents dispositifs et protocoles utilisés dans les réseaux informatiques,
- Concevoir, configurer et gérer des réseaux informatiques en prenant en compte les besoins des applications,
- Identifier les grandes classes d'applications réparties et parallèles, les problèmes suscités et les solutions à apporter,
- Réaliser des applications réparties en mettant en oeuvre des moyens et des techniques appropriées,
- Comprendre les caractéristiques des systèmes répartis : parallélisme, synchronisation, communication, modèles de fautes et de menaces,
- Savoir utiliser les techniques, algorithmes et langages appropriés pour concevoir, modéliser et analyser des applications réparties,
- Comprendre et mettre en oeuvre les mécanismes (cryptographie, protocoles...) permettant de sécuriser des réseaux et systèmes répartis.

● Mandatory

△ Courses not taught during 2013-2014

⊕ Periodic courses taught during 2013-2014

⊗ Optional

⊙ Periodic courses not taught during 2013-2014

‡ Two years course

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

The student shall select
De 20 à 30 credits parmi

Year

1 2

o Compulsory courses in Networking and Security

● LINGI2142	Computer networks: configuration and management	Olivier Bonaventure	30h+30h	5 Credits	2q	x	x
● LINGI2143	Concurrent systems : models and analysis	Charles Pecheur	30h+15h	5 Credits	1q	x	x
● LINGI2346	Distributed application design	Marc Lobelle	30h+15h	5 Credits	1q	x	x
● LINGI2347	Computer system security	Gildas Avoine, Marco Canini (compensates Gildas Avoine)	30h+15h	5 Credits	2q	x	x

⊗ Elective courses in Networking and Security

The student can select 10 credits amongst

⊗ LINGI2315	Design of Embedded and real-time systems	Jean-Didier Legat, Marc Lobelle	30h+30h	5 Credits	2q	x	x
⊗ LINGI2348	Information theory and coding	Jérôme Louveaux, Benoît Macq (coord.), Olivier Pereira	30h+15h	5 Credits	2q	x	x
⊗ LSINF2345	Languages and algorithms for distributed applications	Peter Van Roy	30h+15h	5 Credits	2q	x	x
⊗ LMAT2450	Cryptography	Olivier Pereira	30h+15h	5 Credits	1q	x	x
⊗ LINMA2470	Discrete stochastic models	Philippe Chevalier	30h +22.5h	5 Credits	2q	x	x
⊗ LINGI2144	Secured systems engineering	Gildas Avoine	30h+15h	5 Credits	1q	△	x

OPTION EN INFORMATIQUE ET MATHÉMATIQUES APPLIQUÉES

Cette option n'est offerte qu'aux étudiants ingénieur civil ou aux étudiants ayant suivi une mineure en mathématiques ou en mathématiques et leurs applications.

Les étudiants ayant suivi l'option "Computing and Applied Mathematics" devront être capables de :

- Appréhender des domaines de l'ingénierie nécessitant une synergie entre mathématiques appliquées et informatique, tels que l'algorithmique, le calcul scientifique, la modélisation de systèmes informatiques, l'optimisation, l'apprentissage automatique ou la fouille de données,
- Comprendre et appliquer à bon escient des méthodes et techniques relevant de l'algorithmique avancée telles que des méthodes d'optimisation, de programmation par contraintes, d'algorithmique des graphes, d'algorithmique numérique ou d'analyse et de conception d'algorithmes,
- Identifier et mettre en oeuvre des modèles et des techniques relevant des statistiques, de l'apprentissage automatique et de la fouille de données;
- Appréhender des classes d'applications telles que le traitement de données bruitées, la reconnaissance des formes ou l'extraction automatique d'informations dans de grandes collections de données.

○ Mandatory

△ Courses not taught during 2013-2014

⊕ Periodic courses taught during 2013-2014

⊗ Optional

⊖ Periodic courses not taught during 2013-2014

‡ Two years course

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

*The student shall select
De 20 à 30 crédits parmi*

Year

1 2

○ Compulsory courses in computing and applied mathematics

○ LINMA2710	Numerical algorithms	Paul Van Dooren	30h +22.5h	5 Credits	2q	x	x
○ LINMA2111	Discrete mathematics II : Algorithms and complexity	Vincent Blondel	30h +22.5h	5 Credits	2q △	x	x
○ LINMA1702	Applied mathematics : Optimization I	Vincent Blondel, François Glineur (compensates Vincent Blondel), François Glineur (coord.)	30h +22.5h	5 Credits	2q	x	x
○ LINGI2365	Constraint programming	Yves Deville	30h+15h	5 Credits	2q	x	x

⊗ Elective courses in computing and applied mathematics

The student can select 10 credits amongst

⊗ LINMA1170	Numerical analysis	Pierre-Antoine Absil, Paul Van Dooren (coord.)	30h +22.5h	5 Credits	1q	x	x
⊗ LINMA1691	Discrete mathematics - Graph theory and algorithms	Vincent Blondel, Jean-Charles Delvenne (compensates Vincent Blondel)	30h +22.5h	5 Credits	1q	x	x
⊗ LINMA2450	Combinatorial optimization	Jean-Charles Delvenne	30h +22.5h	5 Credits	1q	x	x
⊗ LINMA2470	Discrete stochastic models	Philippe Chevalier	30h +22.5h	5 Credits	2q	x	x
⊗ LINMA2471	Optimization models and methods	François Glineur	30h +22.5h	5 Credits	1q	x	x
⊗ LMAT2450	Cryptography	Olivier Pereira	30h+15h	5 Credits	1q	x	x
⊗ LINGI2262	Machine Learning :classification and evaluation	Pierre Dupont	30h+30h	5 Credits	1q	x	x
⊗ LINGE1222	Multivariate Statistical Analysis	Johan Segers	30h+15h	4 Credits	2q	x	x
⊗ LSTAT2020	Statistical computing	Céline Bugli (compensates Bernadette Govaerts), Bernadette Govaerts	20h+20h	6 Credits	1q	x	x
⊗ LSINF2275	Data mining & decision making	Marco Saerens	30h+30h	5 Credits	2q	x	x
⊗ LSINF2224	Programming methods	Charles Pecheur	30h+15h	5 Credits	2q	x	x

						Year	
						1	2
⊗ LINGI2339	Abstract interpretation	Baudouin Le Charlier	30h+15h	5 Credits	1q △ ⊕	x	x
⊗ LINGI2348	Information theory and coding	Jérôme Louveaux, Benoît Macq (coord.), Olivier Pereira	30h+15h	5 Credits	2q	x	x
⊗ LINGI2143	Concurrent systems : models and analysis	Charles Pecheur	30h+15h	5 Credits	1q	x	x
⊗ LMECA2300	Advanced Numerical Methods	Christophe Craeye, Jonathan Lambrechts, Vincent Legat, Jean-François Remacle	30h+30h	5 Credits	2q	x	x
⊗ LMECA2170	Numerical Geometry	Vincent Legat, Jean-François Remacle	30h+30h	5 Credits	1q	x	x

BUSINESS RISKS AND OPPORTUNITIES

Cette option n'est pas accessible aux étudiants ayant sélectionné l'option création des petites et moyennes entreprises.

Cette option n'est pas offerte en anglais.

L'objectif de cette option est de familiariser l'étudiant avec les principes de base de la gestion des entreprises.

● Mandatory

△ Courses not taught during 2013-2014

⊕ Periodic courses taught during 2013-2014

⊗ Optional

⊙ Periodic courses not taught during 2013-2014

‡ Two years course

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

The student who chooses this option shall select

De 16 à 20 credits parmi

						Year	
						1	2
⊗ LFSA2140	Elements of law for industry and research	Fernand De Visscher, Werner Derijcke, Bénédicte Inghels	30h	3 Credits	1q	x	x
⊗ LFSA2230	Introduction to management and to business economics	Benoît Gailly	30h+15h	4 Credits	2q	x	x
⊗ LFSA1290	Introduction to financial and accounting management	Gerrit Sarens	30h+15h	4 Credits	2q	x	x
⊗ LFSA2202	Ethics and ICT	Axel Gosseries, Olivier Pereira	30h	3 Credits	2q	x	x
⊗ LFSA2245	Environment and Enterprise	Thierry Bréchet	30h	3 Credits	1q	x	x
⊗ LFSA2210	Organisation and human resources	John Cultiaux	30h	3 Credits	1+2q	x	x

⊗ Alternative to the "Business risks and opportunities" for computer science students

Computer science students who have already followed various courses of this discipline during their Bachelor's curriculum can select between 16 and 20 credits in the program "mineure en gestion pour les sciences informatiques" <http://www.uclouvain.be/xprog-2013-min-lgesc100i>

OPTION INTERFACULTAIRE EN CRÉATION DE PETITES ET MOYENNES ENTREPRISES

Cette option n'est pas accessible aux étudiants ayant sélectionné l'option en gestion.

Cette option n'est pas offerte en anglais.

L'objectif de cette option est de familiariser l'étudiant avec les spécificités des P.M.E., de l'entrepreneuriat et de la création afin de développer chez lui les aptitudes, connaissances et outils nécessaires à la création d'entreprise. L'accès en est réservé uniquement à un nombre restreint d'étudiants sélectionnés sur base d'un dossier de motivation et d'interviews individuelles.

Les dossiers de motivation pour cette filière doivent être introduites avant la rentrée académique auprès du :

Secrétariat CPME – Place des Doyens 1
1348 Louvain-la-Neuve (tél 010/47 84 59).

Les étudiants sélectionnés remplaceront le mémoire prévu dans le tronc commun par un mémoire spécifique en création d'entreprise (nombre de crédits inchangé).

● Mandatory

△ Courses not taught during 2013-2014

⊕ Periodic courses taught during 2013-2014

⊗ Optional

⊖ Periodic courses not taught during 2013-2014

‡ Two years course

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

De 20 à 25 crédits parmi

Year

1 2

● Compulsory courses

Course ID	Course Title	Instructor	Hours	Credits	Period	Year 1	Year 2
● LCPME2001	Entrepreneurship Theory (in French)	Frank Janssen	30h+20h	5 Credits	1q	x	
● LCPME2003	Business plan of the creation of a company (in French)	Frank Janssen	30h+15h	5 Credits	2q		x
● LCPME2002	Managerial, legal and economic aspects of the creation of a company (in French)	Régis Coeurderoy, Yves De Cordt	30h+15h	5 Credits	1q	x	x
● LCPME2004	Advanced seminar on Entrepreneurship (in French)	Frank Janssen	30h+15h	5 Credits	2q	x	x

⊗ Prerequisite CPME course

Students who have not taken a management course within their former curriculum shall include LCPME2000 in their current curriculum.

● LCPME2000	Venture creation financing and management I	Régis Coeurderoy, Olivier Giacomini (compensates Régis Coeurderoy), Paul Vanzeveren	30h+15h	5 Credits	1+2q	x	
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COURS AU CHOIX EN SCIENCES INFORMATIQUES

● Mandatory

△ Courses not taught during 2013-2014

⊕ Periodic courses taught during 2013-2014

⊗ Optional

⊖ Periodic courses not taught during 2013-2014

‡ Two years course

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

						Year	
						1	2
⊗ LFSA2351A	Group dynamics	Piotr Sobieski	15h+30h	3 Credits	1q	x	x
⊗ LFSA2351B	Group dynamics	Piotr Sobieski	15h+30h	3 Credits	2q	x	x
⊗ LFSA2202	Ethics and ICT	Axel Gosseries, Olivier Pereira	30h	3 Credits	2q	x	x
⊗ LINGI2325	Graphic systems and applications	N.	30h+15h	5 Credits	2q △	x	x

⊗ Company training periods

Students may include in their curriculum a company training period worth 10 credits. However, if this activity is related to their final thesis, they shall choose the 5-credit LFSA 2996 course.

Students may include in their curriculum a company training period worth 10 credits. However, if this activity is related to their final thesis, they shall choose the 5-credit FSA 2996 course.

⊗ LFSA2995	Stage en entreprise	Claude Oestges	30h	10 Credits		x	x
⊗ LFSA2996	Stage en entreprise	Claude Oestges		5 Credits		x	x

⊗ Advanced courses

Students should note that any course appearing in the options of their Master -s, but not selected as such, remains a possible elective.

Students should note that any course appearing in the options of their Master -s, but not selected as such, remains a possible elective.

⊗ Short term exchanges

Students may include in their curriculum any BEST or ATHENS courses subject to approval by the Program committee. These courses are worth 2 credits

Students may include in their curriculum any BEST or ATHENS subject to approval by the Diploma committee. These courses are worth 2 credits

⊗ General knowledge courses

Students can also include in their curriculum any course given at UCL, KULeuven or Von Karman Institute subject to approval of the program committee.

Students can also include in their curriculum any course given at UCL or FIW / KULeuven subject to approval of the Diploma committee.

⊗ LMECA2645	Major technological hazards in industrial activity.	Denis Dochain, Alexis Dutrieux	30h	3 Credits	2q	x	x
⊗ LDROP2063	Environmental Law	Nicolas de Sadeleer, Damien Jans	30h	5 Credits	2q	x	x
⊗ LECGE1223	Production and Operations Management	Pierre Semal	30h	4 Credits	1q	x	x
⊗ LELEC2811	Instrumentation and sensors	Laurent Francis, Ernest Matagne	30h+30h	5 Credits	1q	x	x
⊗ LINMA2671	Automatic : Theory and implementation	Julien Hendrickx	30h+30h	5 Credits	1q	x	x
⊗ LMAPR2018	Rheometry and Polymer Processing	Christian Bailly, Evelyne Van Ruymbeke	30h +22.5h	5 Credits	2q	x	x
⊗ LMAPR2510	Mathematical ecology	Eric Deleersnijder, Emmanuel Hanert	30h +22.5h	5 Credits	2q	x	x
⊗ LMAPR2680	Treatments of gaseous wastes	Jacques Devaux, Olivier Françoisse	30h+7.5h	4 Credits	1q	x	x
⊗ LPHY2150	Physique et dynamique de l'atmosphère et de l'océan I	Michel Crucifix, Thierry Fichetef	45h+9h	6 Credits	1q	x	x
⊗ LPHY2153	Introduction à la physique du système climatique et à sa modélisation	Hugues Goosse, Jean-Pascal van Ypersele de Strihou	30h+15h	5 Credits	1q	x	x

⌘ Languages

Students may include in their electives any language course of the Institute of Modern Languages (ILV) for a maximum of 3 credits within the 120 basic credits of their Masters. Their attention is drawn to the following professional insertion seminars:

Students may include in their electives any language course of the Institute of Modern Languages (ILV) for a maximum of 3 credits within the 120 basic credits of their Master's. Their attention is drawn to the following professional insertion seminars:

⌘ LNEER2500	Seminar of professional integration: Dutch - intermediate level	Isabelle Demeulenaere (coord.), Mariken Smit	30h	3 Credits		x	x
⌘ LNEER2600	Seminar of professional integration: Dutch - upper-intermediate level	Isabelle Demeulenaere	30h	3 Credits		x	x
⌘ LALLE2500	German - Seminar of professional integration, intermediate level	Caroline Klein, Ann Rinder (coord.)	30h	3 Credits	1+2q	x	x
⌘ LALLE2501	German - Seminar of professional integration, intermediate level	Caroline Klein, Ann Rinder (coord.)	30h	5 Credits	1+2q	x	x
⌘ LESPA2600	Séminaire d'insertion professionnelle - espagnol	Isabel Baeza Varela, Carmen Vallejo Villamor (compensates Isabel Baeza Varela)	30h	3 Credits	1q	x	x
⌘ LESPA2601	Spanish - Seminar of professional integration	Paula Lorente Fernandez (coord.)	30h	5 Credits	1q	x	x

