

**INFO2M**

2014 - 2015

**Master [120] in Computer Science and Engineering****At Louvain-la-Neuve - 120 credits - 2 years - Day schedule - In english**Dissertation/Graduation Project : **YES** - Internship : **optional**Activities in English: **YES** - Activities in other languages : **NO**Activities on other sites : **NO**Organized by: **Ecole Polytechnique de Louvain (EPL)**Programme code: **info2m** - European Qualifications Framework (EQF): 7**Table of contents**

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## INFO2M - Introduction

### Introduction

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#### 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 .

As a continuation to the Bachelor in Engineering Sciences, it offers versatility in engineering sciences through options in conjunction with other related disciplines such as applied mathematics or electronics and telecommunications.

#### Your profile

You

- aspire to **imagine, design, implement and deploy** the computer applications that will shape our future;
- **focus your engineering background to computer science** after having acquired during the bachelor a solid general training in science and technology (mathematics, mechanics, electricity, chemistry, ...);
- 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;
- possibly open your training to management or creation of small and medium enterprises;
- benefit from a training entirely in **English**.

#### 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:
  - in computer science : **software engineering and programming systems** , **artificial intelligence**, **networking and security** ;
  - at the frontier with electricity, applied mathematics or life science : **communication networks**, **cryptography and information security**, **computing and applied mathematics**, **biomedical engineering and bioinformatics** ;
  - or in **Management** or **SME creation**, as computer scientists have to manage projects, lead a team and focus on the socio-economic context.
- **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.

## INFO2M - Teaching profile

### 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,
- Software Engineering and Systems Programming,
- or cryptographie and information security.

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.

#### Openness to other engineering disciplines

Through various options, the program takes advantage of the **diversity of engineering programs** of the faculty. The student can select options related to telecommunication networks, applied mathematics or biomedical engineering. In addition, as the University of Louvain (UCL) is a comprehensive university, it is possible to steer his training to management or entrepreneurship.

#### 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**

- Facing a problem related to computer science, he **identifies the concepts, algorithms and data structures applicable** to solve it; and he uses them to decompose the problem into sub-problems and to develop computer based solutions.
- Confronted with a problem within its discipline, he **chooses the tools** ( eg development environment, programming language, libraries and software repositories ) best suited to achieve a correct and proper software solution .
- Confronted with the results of the reasoning and implementation of tools and concepts he mobilized, he takes the perspective necessary to verify the relevance, regarding the functionality and quality of the solution sought. In this context, he will develop relevant tests and checks which can **guarantee the quality of the solution** developed.

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

- Before working on the solution, he **explores and analyzes the dimensions of the problem** by using the documentation provided and discussing with the stakeholders and future users of the computer system to be developed. He reformulates the specifications, including not only the requirements for system functionalities, but also other constraints related to time or ease of operation for future users.
- In the design phase, he **models and imagines the architecture of the computer system to develop** in terms of functional components (subsystems) so as to facilitate and optimize the development. He takes advantage of available verification technologies and methods to ensure, from the design phase, the quality of the system or software to be implemented.
- In the analysis phase of the system (server, OS, software, ...), he **lists, evaluates and compares different technologies** (hardware, languages, algorithms, routing) in order to favor those that best meet the various performance and quality criteria explained in the specifications.
- In the implementation phase of the solution, he **demonstrates his mastery of the principles, techniques and development tools** at its disposal. It creates a prototype of software designed to check that the software matches the customer's expectations. It creates an environment and a battery of tests to ensure that the solution developed meets specifications. Applying the techniques of program validation and verification, he **identifies, locates bugs and corrects them**.

- Based on a development achieved at the level of a prototype, he **manages the evolution** of the system quality : monitoring, optimization, maintenance, fault detection, communication in case of failure, etc. He uses metrics and tools to evaluate / validate the **structural quality of a software system in terms of safety and maintainability**.

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

- Facing a problem related to computer science whose subject and background are new to him, he plans actions to **explore** this area and to obtain the information to **perform an inventory of the state of the art in this new domain** using multiple channels (library, Internet, researchers, industry, ...).
- In the master's thesis (possibly coupled with an internship) centered on the study of a new problem, he models the underlying phenomenon keeping in mind to solve the problem using a computer system. Based on this model, he **develops and experimentally tests various computer systems likely to address the problem** (eg computer processing of images generated by a scanner to facilitate a medical diagnosis).
- Once the experimental results are available, he synthesizes the findings in a research report, **highlighting the key parameters and their influence on the behavior of the phenomenon**. He extracts useful recommendations to **develop and implement innovative technical solutions** in concrete problems of the industrial environment considered.

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

- As a member of the team in charge of the project, he helps to explore the issues and the context in which the project is located in order to inventory the various stakeholders, issues and constraints involved. At the end of this inventory work, he helps to **write with colleagues specifications incorporating the key elements of project scope**: issues and stakeholders, objectives and performance indicators, risks, constraints of time and resources available ...
- Once the scope of the project is defined, he **contributes to plan** the related tasks. The team must agree and **engage collectively** on a plan of work, milestones, allocation of tasks, deliverables to be provided, and a schedule to meet the objectives of the project.
- He takes advantage on the strengths and expertises within the team to **collectively solve problems that inevitably arise during the project**: either technical problems or interpersonal difficulties. It takes the perspective needed to overcome the difficulties encountered or conflicts within the team.
- To respect the project scheduling, he warns his teammates on decisions to take in case of drift or blockage. During the steering meetings, he **contributes to decision making**, organizes (or reorganizes) the project in order to meet its objectives.

#### 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)

- Involved in a project of development of a computer system, it identifies and the stakeholders involved in the implementation and the operation of the system to be developed. **Discussing with the stakeholders**, he perceives the scope of the environment and the challenges of the project, he **makes them clarify their needs and expectations**, as well as constraints to be included in the specifications of the project, both system functionalities on operating conditions (interfaces with other applications, maintenance, evolution ...).
- In its communication, he **takes into account the fact that his interlocutors do not necessarily master the computer science concepts and terminology** and do not share his point of view on the issues and performance of the proposed solution.
- Critical phases of the project imply that critical choices are made collectively. To facilitate decision making, the graduate must be able to **provide his partners synthetic view of the current issues**. In this perspective, he is able to organize and communicate the required information **using diagrams or graphs** suited to the representation of the architecture of a computer system.
- He uses efficiently **reference books** or tutorials about computer language or software, both in English and French. He **understand technical presentations in English**.
- During the development of a computer system, he **ensures traceability** and he **documents the system** in a concise and precise language : specification, software and data structure, user's guide. He does be the same when he writes a **summary report describing and arguing choices** (design and technology) made during the project.

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

- In his discipline, he **masters the vocabulary and technical standards**; this allows him to easily decode a scientific or technical document or communicate with specialists in the discipline.
- Being concerned with the industrial reality of the applications he develops, he naturally takes into account the socio-economic context for the user and his environment - as soon as writing specifications - including for compatibility with the evolution of technology and ethics of the profession. Especially for the development of critical systems (eg ambulance management), he ensures robustness and reliability of the computer system testing hazards of the user work environment.
- Confronted with a new problem, he **demonstrates his autonomy to acquire and integrate information and tools** he will need, even if these topics have not been explicitly addressed in the curriculum.

## Programme structure

The Master of science in computer science and engineering programme includes:

- core curriculum, mainly the master's thesis (38 ECTS credits);
- focus, mandatory courses (30 ECTS credits);
- at least one option 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.

The whole programme is provided in English, except for the options in biomedical engineering, management and SME creation. For non-French-speaking students, alternatives to the compulsory courses in French will be proposed by the program committee on a case-by-case basis, according to the student's curriculum. In particular, for students who did not obtain their bachelor degree at UCL, the course in religious sciences may be replaced by a supplementary activity to the master thesis, under item FSA2993.

*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 curriculum](#) [ en-prog-2014-info2m-linfo220t.html ]

[> Professional focus](#) [ en-prog-2014-info2m-linfo220s ]

Options courses

- > [Options du master ingénieur civil en informatique](#) [ en-prog-2014-info2m-linfo904r.html ]
  - > [Artificial Intelligence](#) [ en-prog-2014-info2m-linfo221o.html ]
  - > [Software Engineering and Programming Systems](#) [ en-prog-2014-info2m-linfo222o.html ]
  - > [Networking and Security](#) [ en-prog-2014-info2m-linfo223o.html ]
  - > [Computing and Applied Mathematics](#) [ en-prog-2014-info2m-linfo224o.html ]
  - > [Option : Cryptography & Information Security](#) [ en-prog-2014-info2m-linfo230o.html ]
  - > [Communication Networks](#) [ en-prog-2014-info2m-linfo226o.html ]
  - > [Option in biomedical engineering](#) [ en-prog-2014-info2m-linfo227o.html ]
  - > [Business risks and opportunities](#) [ en-prog-2014-info2m-linfo228o.html ]
  - > [Option in launching of small and medium-sized companies](#) [ en-prog-2014-info2m-linfo229o.html ]
- > [Elective courses of the master's in computer science engineering](#) [ en-prog-2014-info2m-linfo225o.html ]

## INFO2M Detailed programme

## Programme by subject

### CORE COURSES [38.0]

● Mandatory

△ Courses not taught during 2014-2015

⊕ Periodic courses taught during 2014-2015

⊗ Optional

⊖ Periodic courses not taught during 2014-2015

⊞ Two years course

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

*The student shall select*

		Year	
		1	2
● LINGI2990	Graduation project/End of studies project	N.	28 Credits
			x

Year

1 2

○ LELEC2525	Introduction to electric and electronic circuits	Jean-Didier Legat, Michel Verleysen	30h+30h	5 Credits	1q Δ	x	x
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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

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, Pierre Schaus (compensates Yves Deville)	30h	3 Credits	2q		x
⊗ LINGI2379	Machine learning seminar	Yves Deville (compensates Pierre Dupont), Yves Deville (compensates Michel Verleysen), Pierre Dupont (coord.), Michel Verleysen	30h	3 Credits	2q		x

PROFESSIONAL FOCUS [30.0]

○ Mandatory

Δ Courses not taught during 2014-2015

⊕ Periodic courses taught during 2014-2015

⊗ Optional

⊖ Periodic courses not taught during 2014-2015

⊞ Two years course

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

The student shall take all the specialization courses

Year

1 2

o Computer science courses

○ LINGI2132	Languages and translators	Pierre Schaus	30h+30h	6 Credits	2q	x	
○ LINGI2255	Software development project	Kim Mens	15h+45h	6 Credits	1q	x	
○ LINGI2261	Artificial intelligence: representation and reasoning	Yves Deville	30h+30h	6 Credits	1q	x	
○ LINGI2172	Databases	Bernard Lambeau	30h+30h	6 Credits	2q	x	
○ LINGI1341	Computer networks: information transfer	Olivier Bonaventure	30h+30h	6 Credits	1q	x	

**OPTIONS [52.0]**

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

## Options du master ingénieur civil en informatique

- > Artificial Intelligence [ en-prog-2014-info2m-linfo221o ]
- > Software Engineering and Programming Systems [ en-prog-2014-info2m-linfo222o ]
- > Networking and Security [ en-prog-2014-info2m-linfo223o ]
- > Computing and Applied Mathematics [ en-prog-2014-info2m-linfo224o ]
- > Option : Cryptography & Information Security [ en-prog-2014-info2m-linfo230o ]
- > Communication Networks [ en-prog-2014-info2m-linfo226o ]
- > Option in biomedical engineering [ en-prog-2014-info2m-linfo227o ]
- > Business risks and opportunities [ en-prog-2014-info2m-linfo228o ]
- > Option in launching of small and medium-sized companies [ en-prog-2014-info2m-linfo229o ]
- > Elective courses of the master's in computer science engineering [ en-prog-2014-info2m-linfo225o ]

**OPTIONS DU MASTER INGÉNIEUR CIVIL EN INFORMATIQUE**

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

**ARTIFICIAL INTELLIGENCE**

Students completing successfully this option will be able to

- identify and implement a class of methods and techniques to design software able to solve complex problems which, if solved by a human beings, would require "intelligence" ;
- select and apply wisely methods and techniques related to artificial intelligence such as automated reasoning, heuristic search, acquisition and knowledge representation, machine learning, and constraint satisfaction problems ;
- identify types of applications where these methods and tools can be applied; master some of these applications and their specific techniques - for example, robotics, computer vision, planning, data mining, natural language processing and bioinformatics ;
- formalize and structure body of complex knowledge using a systematic and rigorous approach to develop quality "intelligent" systems.

● Mandatory

△ Courses not taught during 2014-2015

⊕ Periodic courses taught during 2014-2015

⊗ Optional

⊙ Periodic courses not taught during 2014-2015

⊞ Two years course

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

The student can select  
De 20 à 30 credits parmi

Year  
1 2

**● Compulsory courses in Artificial Intelligence**

● LINGI2262	<a href="#">Machine Learning :classification and evaluation</a>	Pierre Dupont	30h+30h	5 Credits	2q	x	x
● LINGI2263	<a href="#">Computational Linguistics</a>	Pierre Dupont, Cédric Fairon	30h+15h	5 Credits	1q	x	x
● LINGI2266	<a href="#">Advanced Algorithms for Optimization</a>	Pierre Schaus	30h+15h	5 Credits	1q	x	x
● LINGI2365	<a href="#">Constraint programming</a>	Yves Deville	30h+15h	5 Credits	2q	x	x

**⊗ Elective courses in Artificial Intelligence**

The student can select 10 credits amongst

⊗ LSINF2275	<a href="#">Data mining &amp; decision making</a>	Marco Saerens	30h+30h	5 Credits	2q	x	x
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						Year	
						1	2
⊗ LELEC2885	Image processing and computer vision	Christophe De Vleeschouwer (coord.), Laurent Jacques (compensates Christophe De Vleeschouwer), Benoît Macq	30h+30h	5 Credits	1q	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, Jean-Charles Delvenne (compensates Vincent Blondel)	30h +22.5h	5 Credits	2q	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	John Lee (compensates Michel Verleysen), Michel Verleysen	30h+30h	5 Credits	1q	x	x
⊗ LINMA2450	Combinatorial optimization	Jean-Charles Delvenne	30h +22.5h	5 Credits	1q	x	x
⊗ LINGI2264	Automated reasoning	N.	30h+15h	5 Credits	1q Δ	x	x



## SOFTWARE ENGINEERING AND PROGRAMMING SYSTEMS

Students completing successfully this option will be able to

- explain the problems encountered in the conduct of large software projects, as well as the critical impact of the choice of solutions throughout their lifecycle (design, validation, documentation, communication and management involving large teams as well as costs and deadlines) ;
- select and apply methods and tools of software engineering to develop complex software systems that meet strict criteria of quality: reliability, adaptability, scalability, performance, security, usability ... ;
- model the products and processes required to obtain such systems and analyze these models ;
- develop and implement programs of analysis, conversion and optimization of computer systems ;
- use properly and wisely different paradigms and programming languages, in particular with regard to functional, object-oriented and concurrent programming ;
- be awarded of challenges of different models of concurrent and distributed programming and select the appropriate template ;
- define a new language (syntax and semantics) suitable to a specific context.

○ Mandatory

△ Courses not taught during 2014-2015

⊕ Periodic courses taught during 2014-2015

⊗ Optional

⊙ Periodic courses not taught during 2014-2015

‡ Two years course

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

The student can 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	N.	30h+15h	5 Credits	1q	△	x
⊗ LINGI2365	Constraint programming	Yves Deville	30h+15h	5 Credits	2q	x	x
⊗ LINMA2111	Discrete mathematics II : Algorithms and complexity	Vincent Blondel, Jean-Charles Delvenne (compensates Vincent Blondel)	30h +22.5h	5 Credits	2q	x	x
⊗ LINGI2355	Software requirements & architecture	N.	30h+15h	5 Credits	2q	△	x
⊗ LINGI2339	Abstract interpretation	Baudouin Le Charlier	30h+15h	5 Credits	1q	⊙	x
⊗ LINGI2347	Computer system security	Gildas Avoine, Marco Canini (compensates Gildas Avoine)	30h+15h	5 Credits	2q	x	x

## NETWORKING AND SECURITY

This option may not be validated with the options "Cryptography and information security" or "Communication networks". Students are nonetheless allowed to select elective courses in these options.

Students completing successfully this option will be able to

- explain the processes and protocols used in computer networks ;
- design, configure and manage computer networks taking into account the application needs ;
- identify the main categories of distributed and parallel applications, the problems occurring with these application and propose solutions ;
- implement distributed applications selecting appropriate tools and techniques ;
- be awarded and explain the main features of distributed systems: parallelism, synchronization, communication, fault and threat models ;
- select and use suitable technics, algorithms and languages to design, model and analyze distributed applications ;
- implement and use efficiently techniques (cryptography, protocols, ...) to secure networks and distributed applications.

● Mandatory

△ Courses not taught during 2014-2015

⊕ Periodic courses taught during 2014-2015

⊗ Optional

⊖ Periodic courses not taught during 2014-2015

⊞ 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 Networking and Security

● LINGI2142	<a href="#">Computer networks: configuration and management</a>	<a href="#">Olivier Bonaventure</a>	30h+30h	5 Credits	2q	x	x
● LINGI2143	<a href="#">Concurrent systems : models and analysis</a>	<a href="#">Charles Pecheur</a>	30h+15h	5 Credits	1q	x	x
● LINGI2145	<a href="#">Cloud Computing</a>	<a href="#">Marco Canini</a>	30h+15h	5 Credits	1q	x	x
● LINGI2347	<a href="#">Computer system security</a>	<a href="#">Gildas Avoine, Marco Canini (compensates Gildas Avoine)</a>	30h+15h	5 Credits	2q	x	x

### ⊗ Elective courses in Networking and Security

*The student can select 10 credits amongst*

⊗ LINGI2315	<a href="#">Design of Embedded and real-time systems</a>	<a href="#">Jean-Didier Legat</a>	30h+30h	5 Credits	2q	x	x
⊗ LINGI2348	<a href="#">Information theory and coding</a>	<a href="#">Jérôme Louveaux, Benoît Macq (coord.), Olivier Pereira</a>	30h+15h	5 Credits	2q	x	x
⊗ LSINF2345	<a href="#">Languages and algorithms for distributed applications</a>	<a href="#">Peter Van Roy</a>	30h+15h	5 Credits	2q	x	x
⊗ LMAT2450	<a href="#">Cryptography</a>	<a href="#">Olivier Pereira</a>	30h+15h	5 Credits	1q	x	x
⊗ LINMA2470	<a href="#">Discrete stochastic models</a>	<a href="#">Philippe Chevalier</a>	30h +22.5h	5 Credits	2q	x	x
⊗ LINGI2144	<a href="#">Secured systems engineering</a>	<a href="#">Gildas Avoine</a>	30h+15h	5 Credits	1q	x	x
⊗ LINGI2146	<a href="#">Mobile and Embedded Computing</a>	<a href="#">Ramin Sadre</a>	30h+30h	6 Credits	2q	x	x

**COMPUTING AND APPLIED MATHEMATICS**

Students completing successfully this option will be able to

- apprehend engineering fields requiring a synergy between applied mathematics and computer science, such as algorithms, scientific computing, modeling of computer systems, optimization, machine learning and data mining ;
- apply wisely methods and techniques within advanced algorithms such as optimization methods, constraint programming, algorithmic graph, numerical or algorithmic analysis and design of algorithms ;
- identify and implement models and techniques relevant to statistics, machine learning and data mining; understand classes of applications such as the treatment of noisy data, pattern recognition or automatic information extraction in large data collections.

○ Mandatory

△ Courses not taught during 2014-2015

⊕ Periodic courses taught during 2014-2015

⊗ Optional

⊙ Periodic courses not taught during 2014-2015

‡ 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 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, Jean-Charles Delvenne (compensates 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	2q	x	x
⊗ LINGE1222	Multivariate Statistical Analysis	Johan Segers	30h+15h	4 Credits	2q	x	x
⊗ LSTAT2020	Statistical computing	Céline Bugli	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
⊗ 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

						Year	
						1	2
⊗ LMECA2300	Advanced Numerical Methods	Christophe Craeye, Jonathan Lambrechts, Vincent Legat, Vincent Legat (compensates Jean-François Remacle), Jean-François Remacle	30h+30h	5 Credits	2q	x	x
⊗ LMECA2170	Numerical Geometry	Vincent Legat, Vincent Legat (compensates Jean-François Remacle), Jean-François Remacle	30h+30h	5 Credits	1q	x	x

**OPTION : CRYPTOGRAPHY & INFORMATION SECURITY**

Common to masters in electrical engineering, computer science engineering and applied mathematics, this option provides the skills to address issues of information security from the point of view of their algorithmic and mathematical foundations, as well as the design and the implementation of solutions in the context of electronic circuits and computer systems.

This option may not be validated with the options "Networking and security" or "Communication networks".

Students are nonetheless allowed to select elective courses in these options.

○ Mandatory

△ Courses not taught during 2014-2015

⊕ Periodic courses taught during 2014-2015

⊗ Optional

⊖ Periodic courses not taught during 2014-2015

‡ Two years course

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

The student selects 15 to 30 credits in the following course list. For students following the master in computer engineering, the minimum is raised to 20 credits, and the validation of this option is not compatible with the validation of the "Networking and Security" and "Communication Networks" options.

De 15 à 30 credits parmi

Year

1 2

**○ Cours obligatoires ELEC,INFO et MAP**

○ LMAT2450	<a href="#">Cryptography</a>	<a href="#">Olivier Pereira</a>	30h+15h	5 Credits	1q	x	x
○ LINGI2347	<a href="#">Computer system security</a>	<a href="#">Gildas Avoine, Marco Canini</a> (compensates Gildas Avoine)	30h+15h	5 Credits	2q	x	x
○ LELEC2760	<a href="#">Secure electronic circuits and systems</a>	<a href="#">François-Xavier Standaert</a>	30h+30h	5 Credits	2q	x	x

**⊗ Cours au choix ELEC, INFO et MAP**

Pour être validés dans l'option, ces cours nécessitent la validation préalable des cours LELEC 2760, LINGI 2347 et LMAT 2450

⊗ LINGI2144	<a href="#">Secured systems engineering</a>	<a href="#">Gildas Avoine</a>	30h+15h	5 Credits	1q	x	x
⊗ LINGI2348	<a href="#">Information theory and coding</a>	<a href="#">Jérôme Louveaux, Benoît Macq (coord.), Olivier Pereira</a>	30h+15h	5 Credits	2q	x	x
⊗ LINMA2111	<a href="#">Discrete mathematics II : Algorithms and complexity</a>	<a href="#">Vincent Blondel, Jean-Charles Delvenne</a> (compensates Vincent Blondel)	30h +22.5h	5 Credits	2q	x	x
⊗ LELEC2620	<a href="#">Modeling and implementation of analog and mixed analog/digital circuits and systems on chip</a>	<a href="#">David Bol</a>	30h+30h	5 Credits	2q	x	x
⊗ LELEC2870	<a href="#">Machine Learning : regression, dimensionality reduction and data visualization</a>	<a href="#">John Lee</a> (compensates Michel Verleysen), <a href="#">Michel Verleysen</a>	30h+30h	5 Credits	1q	x	x
⊗ LMAT2440	<a href="#">Number theory</a>	<a href="#">Olivier Pereira, Jean-Pierre Tignol</a>	30h+15h	5 Credits	1q	x	x

**⊗ Cours au choix ELEC et MAP**

Pour être validé dans l'option, ce cours nécessite la validation préalable des cours LELEC2760, LINGI 2347 et LMAT 2450

⊗ LINGI1341	<a href="#">Computer networks: information transfer</a>	<a href="#">Olivier Bonaventure</a>	30h+30h	6 Credits	1q	x	x
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## COMMUNICATION NETWORKS

This option may be validated with the options Cryptography and information security or Communication networks. Students are nonetheless allowed to select elective courses in these options.

This option is available only to students with a major or minor in Electrical Engineering during their Bachelor's degree.

Students completing successfully this option will be able to

- master and implement the various devices and protocols used in fixed and mobile networks ;
- design, configure, and manage fixed and mobile networks taking into account the needs of applications (including multimedia) ;
- use efficiently coding techniques of information ;
- design of mobile wireless communication systems from the physical layer to the application level.

○ Mandatory

△ Courses not taught during 2014-2015

⊕ Periodic courses taught during 2014-2015

⊗ Optional

⊖ Periodic courses not taught during 2014-2015

‡ Two years course

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

In order to qualify for this option, INFO students must have chosen an ELEC major or minor in their Bachelor -s curriculum. ELEC students must have chosen an INFO major or minor in their Bachelor -s curriculum and shall select De 20 à 30 credits parmi

Year

1 2

### ○ Compulsory courses for ELEC and INFO Master -s students

○ LELEC2796	<a href="#">Wireless communications</a>	<a href="#">Claude Oestges</a> (coord.), <a href="#">Luc Vandendorpe</a>	30h+30h	5 Credits	1q	x	x
○ LELEC2920A	<a href="#">Communication networks</a>	<a href="#">Benoît Macq</a>	30h+30h	2 Credits	1q	x	x
○ LINGI2348	<a href="#">Information theory and coding</a>	<a href="#">Jérôme Louveaux</a> , <a href="#">Benoît Macq</a> (coord.), <a href="#">Olivier Pereira</a>	30h+15h	5 Credits	2q	x	x

### ○ Compulsory courses for ELEC Master's students

○ LINGI1341	<a href="#">Computer networks: information transfer</a>	<a href="#">Olivier Bonaventure</a>	30h+30h	6 Credits	1q	x	x
○ LINGI2349	<a href="#">Network and communication seminar</a>	<a href="#">Gildas Avoine</a> , <a href="#">Olivier Bonaventure</a> (compensates Gildas Avoine), <a href="#">Olivier Bonaventure</a>	30h	3 Credits	1q	x	x

### ○ Compulsory courses for INFO Master's students

○ LINGI2142	<a href="#">Computer networks: configuration and management</a>	<a href="#">Olivier Bonaventure</a>	30h+30h	5 Credits	2q	x	x
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### ⊗ Elective courses for ELEC and INFO Master's students

⊗ LINMA2470	<a href="#">Discrete stochastic models</a>	<a href="#">Philippe Chevalier</a>	30h +22.5h	5 Credits	2q	x	x
⊗ LSINF2345	<a href="#">Languages and algorithms for distributed applications</a>	<a href="#">Peter Van Roy</a>	30h+15h	5 Credits	2q	x	x
⊗ LINGI2144	<a href="#">Secured systems engineering</a>	<a href="#">Gildas Avoine</a>	30h+15h	5 Credits	1q	x	x
⊗ LINGI2347	<a href="#">Computer system security</a>	<a href="#">Gildas Avoine</a> , <a href="#">Marco Canini</a> (compensates Gildas Avoine)	30h+15h	5 Credits	2q	x	x
⊗ LMAT2450	<a href="#">Cryptography</a>	<a href="#">Olivier Pereira</a>	30h+15h	5 Credits	1q	x	x
⊗ LMAT2440	<a href="#">Number theory</a>	<a href="#">Olivier Pereira</a> , <a href="#">Jean-Pierre Tignol</a>	30h+15h	5 Credits	1q	x	x

Year

1 2

⌘ *Elective courses for INFO Master's students*

⌘ LELEC2795	Radiation and communication systems	Christophe Craeye, Danielle Janvier, Jérôme Louveaux, Claude Oestges, Luc Vandendorpe	30h+30h	5 Credits	1q	x	x
⌘ LELEC2900	Signal processing	Benoît Macq, Luc Vandendorpe	30h+30h	5 Credits	2q	x	x
⌘ LINMA1731	Stochastic processes : Estimation and prediction	Pierre-Antoine Absil, Luc Vandendorpe (coord.)	30h+30h	5 Credits	2q	x	x
⌘ LINGI2315	Design of Embedded and real-time systems	Jean-Didier Legat	30h+30h	5 Credits	2q	x	x

⌘ *Elective courses for ELEC Master's students*

⌘ LINGI2142	Computer networks: configuration and management	Olivier Bonaventure	30h+30h	5 Credits	2q	x	x
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## OPTION IN BIOMEDICAL ENGINEERING

This option is available only to students with a minor or major in biomedical engineering during the bachelor program.

This option is not available in English.

The biomedical engineering option aims to train engineers able to meet future technological challenges in scientific and technical areas related to biomedical engineering.

This option will provide students with basic knowledge of bioinformatics and several other fields of biomedical engineering including: bio-instrumentation, biomaterials, medical imaging, mathematical modeling, artificial organs and rehabilitation and biomechanics.

Through collaboration between the Ecole Polytechnique and the Faculty of Medicine, the curriculum aims to develop in students an interdisciplinary education where the art of engineering is applied to the biomedical domain, both complex and diverse.

○ Mandatory

△ Courses not taught during 2014-2015

⊕ Periodic courses taught during 2014-2015

⊗ Optional

⊙ Periodic courses not taught during 2014-2015

‡ Two years course

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

The student who has chosen this option shall select  
De 20 à 30 credits parmi

Year

1 2

### ○ Compulsory courses in biomedical engineering

Students who have chosen this option shall select at least 15 credits from amongst the following compulsory courses, except engineering Master's students in computer science who shall take 20 credits.

⊗ LGBIO2010	<a href="#">Bioinformatics</a>	<a href="#">Pierre Dupont,</a> <a href="#">Michel Ghislain</a>	30h+30h	5 Credits	2q	x	x
⊗ LGBIO2020	<a href="#">Bioinstrumentation</a>	<a href="#">André Mouraux,</a> <a href="#">Michel Verleysen</a>	30h+30h	5 Credits	1q	x	x
⊗ LGBIO2030	<a href="#">Biomaterials</a>	<a href="#">Sophie Demoustier,</a> <a href="#">Christine Dupont,</a> <a href="#">Gaëtane Leloup</a>	30h+30h	5 Credits	1q	x	x
⊗ LGBIO2040	<a href="#">Biomechanics</a>	<a href="#">François Henrotte</a> (compensates <a href="#">Emilie Marchandise</a> ), <a href="#">Emilie Marchandise</a>	30h+30h	5 Credits	2q	x	x
⊗ LGBIO2050	<a href="#">Medical Imaging</a>	<a href="#">Anne Bol,</a> <a href="#">John Lee,</a> <a href="#">Benoît Macq,</a> <a href="#">Frank Peeters</a>	30h+30h	5 Credits	1q	x	x
⊗ LGBIO2060	<a href="#">Modelling of biological systems</a>	<a href="#">Philippe Lefèvre</a>	30h+30h	5 Credits	1q	x	x
⊗ LGBIO2070	<a href="#">Artificial organs and rehabilitation</a>	<a href="#">Luc-Marie Jacquet,</a> <a href="#">Philippe Lefèvre,</a> <a href="#">Renaud Ronsse</a>	30h+30h	5 Credits	2q	x	x

### ⊗ Elective courses in biomedical engineering for ELEC students

⊗ LELEC2870	<a href="#">Machine Learning : regression, dimensionality reduction and data visualization</a>	<a href="#">John Lee</a> (compensates <a href="#">Michel Verleysen</a> ), <a href="#">Michel Verleysen</a>	30h+30h	5 Credits	1q	x	x
⊗ LELEC2885	<a href="#">Image processing and computer vision</a>	<a href="#">Christophe De Vleeschouwer</a> (coord.), <a href="#">Laurent Jacques</a> (compensates <a href="#">Christophe De Vleeschouwer</a> ), <a href="#">Benoît Macq</a>	30h+30h	5 Credits	1q	x	x



**BUSINESS RISKS AND OPPORTUNITIES**

This option is not open to students who selected the option "launching of small and medium-sized companies".

This option is not available in English.

The purpose of this option is to familiarize the engineer student with the basic principles of business management.

● Mandatory

△ Courses not taught during 2014-2015

⊕ Periodic courses taught during 2014-2015

⊗ Optional

⊖ Periodic courses not taught during 2014-2015

⊞ Two years course

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

*This option cannot be chosen along with the option relating to the launching of small and medium-sized companies. 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	Thomas Lambert (compensates Gerrit Sarens), Gerrit Sarens	30h+15h	4 Credits	2q	x	x
⊗ LFSA2202	Ethics and ICT	Maxime Lambrecht, Olivier Pereira	30h	3 Credits	2q	x	x
⊗ LFSA2245	Environment and Business	Thierry Bréchet	30h	3 Credits	1q	x	x
⊗ LFSA2210	Organisation and human resources	John Cultiaux	30h	3 Credits	1q	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 IN LAUNCHING OF SMALL AND MEDIUM-SIZED COMPANIES**

This option is not open to students who selected the option "Business risks and opportunities".

This option is not available in English.

The purpose of this option is to familiarize the engineer student with the specificities of SMEs, entrepreneurship and creation to develop the skills, knowledge and tools needed to create business. Access is restricted to a limited number of students; selection is performed on the basis of a motivation letter and individual interviews.

Application should be submitted before the beginning of the academic year of Master1 at:

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

Selected students will perform their master's thesis in the domain of business creation.

○ Mandatory

△ Courses not taught during 2014-2015

⊕ Periodic courses taught during 2014-2015

⊗ Optional

⊖ Periodic courses not taught during 2014-2015

‡ Two years course

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

Additional information relative to this option can be found at <http://www.uclouvain.be/cpme> . This option cannot be chosen along with that in management. The student who chooses this option shall select 20 to 25 credits from amongst De 20 à 25 crédits parmi

Year

1 2

**○ Compulsory courses**

○ LCPME2001	<a href="#">Entrepreneurship Theory (in French)</a>	<a href="#">Frank Janssen</a>	30h+20h	5 Credits	1q	x	
○ LCPME2003	<a href="#">Business plan of the creation of a company (in French)</a>	<a href="#">Frank Janssen</a>	30h+15h	5 Credits	2q		x
○ LCPME2002	<a href="#">Managerial, legal and economic aspects of the creation of a company (in French)</a>	<a href="#">Régis Coeurderoy,</a> <a href="#">Yves De Cordt</a>	30h+15h	5 Credits	1q	x	x
○ LCPME2004	<a href="#">Advanced seminar on Entrepreneurship (in French)</a>	<a href="#">Frank Janssen</a>	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	<a href="#">Venture creation financement and management I</a>	<a href="#">Régis Coeurderoy,</a> <a href="#">Olivier Giacomini,</a> <a href="#">Paul Vanzeveren</a>	30h+15h	5 Credits	1 + 2q	x	
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## ELECTIVE COURSES OF THE MASTER'S IN COMPUTER SCIENCE ENGINEERING

● Mandatory

△ Courses not taught during 2014-2015

⊕ Periodic courses taught during 2014-2015

⊗ Optional

⊙ Periodic courses not taught during 2014-2015

‡ Two years course

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

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

### ⊗ Company training periods (10 credits)

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	Company Internship	Claude Oestges	30h	10 Credits		x	x
⊗ LFSA2996	Company Internship	N.		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.

### ⊗ 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	David Bol, Laurent Francis	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, Thierry Van Effelterre	30h +22.5h	5 Credits	2q	x	x
⊗ LMAPR2648	Sustainable treatment of industrial and domestic waste: Case studies	Spyridon Agathos, Damien Debecker, Olivier Françoisse, Patricia Luis Alconero, Olivier Noiset	30h+15h	5 Credits	1q	x	x
⊗ LPHY2150	Physique et dynamique de l'atmosphère et de l'océan I	Michel Crucifix, Thierry Fichet	45h+9h	6 Credits	1q	x	x
⊗ LPHY2153	Introduction à la physique du système climatique et à sa modélisation	Hugues Goosse (compensates Jean-Pascal van Ypersele de Strihou), 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	Professional development seminar: Dutch - intermediate level	Isabelle Demeulenaere (coord.), Mariken Smit	30h	3 Credits	1 ou 2q	X	X
⌘ LNEER2600	Professional development seminar: Dutch - upper-intermediate level	Isabelle Demeulenaere, Marie-Laurence Lambrecht	30h	3 Credits	1 ou 2q	X	X
⌘ LALLE2500	Professional development seminar German	Caroline Klein, Ann Rinder (coord.)	30h	3 Credits	1 + 2q	X	X
⌘ LALLE2501	Professional development seminar-German	Caroline Klein, Ann Rinder (coord.)	30h	5 Credits	1 + 2q	X	X
⌘ LESPA2600	Professional development seminar - Spanish	Isabel Baeza Varela, Carmen Vallejo Villamor	30h	3 Credits	1 ou 2q	X	X
⌘ LESPA2601	Professional development seminar- Spanish	Paula Lorente Fernandez (coord.)	30h	5 Credits	1q	X	X

### ⌘ 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

## INFO2M - Information

### Admission

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

Any student who is not a bachelor in engineering (sciences de l'ingénieur, orientation ingénieur civil), with a major or minor in computer science, must fill in an application for admission to the School of Engineering, stating his detailed curriculum (degree, list of courses followed and grades obtained, year per year). The School of Engineering, consulting with the relevant programme commission, decides on the eligibility of the candidate, and may propose a personalised programme to the student, designed to fill any gap in his formation. To this end, the School of Engineering can impose to the student a volume of complementary courses. For some students, the School of Engineering may propose a one-year bridging programme giving access to the master.

- [University Bachelors](#)
- [Non university Bachelors](#)
- [Holders of a 2nd cycle University degree](#)
- [Holders of a non-University 2nd cycle degree](#)
- [Adults taking up their university training](#)
- [Personalized access](#)

### University Bachelors

Diploma	Special Requirements	Access	Remarks
<b>UCL Bachelors</b>			
<a href="#">Bachelors in engineering [180.0]</a>	Having completed a major or minor in computer science engineering [30.0]	Direct access	Students who have not previously completed the major in computer science engineering (or an equivalent option), but who have completed the minor in computer science engineering (or an equivalent option), propose a programme adapted to their situation to the programme commission. To adapt their programme, they can select 15 ECTS credits of elective courses from the master of science in computer science and engineering.
<a href="#">Bachelors in engineering [180.0]</a>		Access with additional training	Students who have not previously completed neither the major in computer science engineering (or an equivalent option), nor the minor in computer science engineering (or an equivalent option), submit a demand to the programme commission including a detailed curriculum (degree, list of courses followed and grades obtained, year per year). The programme commission will then suggest a programme adapted to the student's particular situation. The commission may decide to use part of the elective courses from the master of science in computer science and engineering to include up to 15 extra ECTS credits in addition to the 120 ECTS programme.

		Direct access	
<b>Others Bachelors of the French speaking Community of Belgium</b>			
Bachelors in engineering	To have completed options related to computer science in the institution of origin	Direct access	
Bachelors in engineering		Access with additional training	Students who have not previously completed any option related to computer science engineering at their university of origine submit a demand to the programme commission including a detailed curriculum (degree, list of courses followed and grades obtained, year per year). The programme commission will then suggest a programme adapted to the student's particular situation. The commission may decided to use part of the elective courses from the master of science in computer science and engineering to include up to 15 extra ECTS credits in addition to the 120 ECTS programme.
<b>Bachelors of the Dutch speaking Community of Belgium</b>			
Bachelor in ingenieurs wetenschappen	To have completed options related to computer science in the institution of origin.	Direct access	
Bachelor in ingenieurs wetenschappen		Access with additional training	Students who have not previously completed any option related to computer science engineering at their university of origine submit a demand to the programme commission including a detailed curriculum (degree, list of courses followed and grades obtained, year per year). The programme commission will then suggest a programme adapted to the student's particular situation. The commission may decided to use part of the elective courses from the master of science in computer science and engineering to include up to 15 extra ECTS credits in addition to the 120 ECTS programme.
<b>Foreign Bachelors</b>			
Bachelors in engineering	Bachelors from the Cluster network	Direct access	Same access conditions as for UCL bachelors in engineering
Bachelors in engineering	Other institutions	Access with additional training	The student must fill in an application for admission to the School of Engineering, stating his detailed curriculum (degree, list of courses followed and grades obtained, year per year). The School of Engineering, consulting with the relevant programme commission, decides on the eligibility of the candidate, and can propose a personalised programme to the student, designed to fill any gap in his formation. To this end, the School of Engineering can impose to the student a volume

		of complementary courses. For some students, the School of Engineering may propose a one-year bridging programme giving access to the master.
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## Non university Bachelors

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

The student must fill in an application for admission to the School of Engineering, stating his detailed curriculum (degree, list of courses followed and grades obtained, year per year). The School of Engineering, consulting with the relevant programme commission, decides on the eligibility of the candidate, and can propose a personalised programme to the student, designed to fill any gap in his formation. To this end, the School of Engineering can impose to the student a volume of complementary courses. For some students, the School of Engineering may propose a one-year bridging programme giving access to the master.

For certain categories of students (for example, students with a bachelor degree in industrial engineering), the School of Engineering can impose an additional preparatory year, corresponding to the 40 credits of the major leading to this master and courses from the core curriculum, before granting access to this master's programme.

> BA en sciences industrielles - type long	Accès au master moyennant réussite d'une année préparatoire de max. 60 crédits	Type long
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## Holders of a 2nd cycle University degree

Diploma	Special Requirements	Access	Remarks
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"Licenciés"

Engineers, bioengineers, and graduates in computer science, chemistry, physics, mathématiques, biology or geography, considered equivalent to corresponding Bachelor's.		Direct access	
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**Masters**

Master in engineering		Direct access	
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## Holders of a non-University 2nd cycle degree

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

> MA en sciences de l'ingénieur industriel (toutes finalités) > MA en sciences industrielles (toutes finalités)	Accès direct au master moyennant ajout éventuel de 15 crédits max	Type long
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## Adults taking up their university training

> See the website [Valorisation des acquis de l'expérience](#)

It is possible to gain admission to all masters courses via the validation of professional experience procedure.

## Personalized access

Reminder : all Masters (apart from Advanced Masters) are also accessible on file.

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## Admission and Enrolment Procedures for general registration

Specific procedures :

Any student who is not a bachelor in engineering (sciences de l'ingénieur, orientation ingénieur civil), with a major or minor in computer science, must fill in an application for admission to the School of Engineering, stating his detailed curriculum (degree, list of courses followed and grades obtained, year per year). The School of Engineering, consulting with the relevant programme commission, decides on the eligibility of the candidate, and may propose a personalised programme to the student, designed to fill any gap in his formation. To this end, the School of Engineering can impose to the student a volume of complementary courses. For some students, the School of Engineering may propose a one-year bridging programme giving access to the master.



## Teaching method

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### Active learning and soft skills

Pedagogy used in the master's program is in the continuation of the bachelor's program in engineering science: active learning, a balanced mix of group work and individual work, prominence to the development of soft skills, in particular, a pedagogy highlighting project activities (including a large-scale project involving student groups in semi-professional situation).

The student will encounter a variety of pedagogical devices: lectures, projects, exercises, problem-based learning, case studies, industry internships or research, group work, individual assignments, seminars, conferences by industry. This variety of situations will help students to build their knowledge in an iterative and progressive manner, while developing its autonomy, organizational skills, time management, communication skills ...

### 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.

The entire program is offered in English , except for the options in biomedical engineering management and SME creation.

### Interdisciplinarity

Students are encouraged to open their training to other engineering sciences and technologies , management , human science , ... 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. He will interact with colleagues carrying different perspectives on the projects. It is therefore imperative to expand his field of vision to other areas than computer science.

## Evaluation

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*The evaluation methods comply with the [regulations concerning studies and exams](#). More detailed explanation of the modalities specific to each learning unit are available on their description sheets under the heading "Learning outcomes evaluation method".*

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

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### 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 an 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](#).

EPL also takes part in the [TIME](#) programme which allows students to obtain, at the end of an adapted curriculum, two engineering degrees with a different specialisation in each institute.

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 the KULeuven (Belgium), 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

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-Accessible supplementary masters : not applicable.

-Accessible doctoral programmes:

The Master of science in computer science and engineering gives access to a PhD in Engineering Science, in the context of which doctoral students can partake in the doctoral courses of one or more of the thematic doctoral schools.

## Contacts

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## Curriculum Management

Entité de la structure INFO

Acronyme	<b>INFO</b>
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 ( <a href="#">SST</a> )
Faculté	Ecole Polytechnique de Louvain ( <a href="#">EPL</a> )
Commission de programme	Commission de programme - Sciences informatiques et ingénieur civil en informatique ( <a href="#">INFO</a> )

**Academic Supervisor :** [Kim MENS](#)

## Jury

Président du Jury : **Jean-Didier LEGAT**

Secrétaire du Jury : **Pierre SCHAUS**

## Usefull Contacts

Conseillère aux études : **Chantal PONCIN**

