

**SINF2M1**

2015 - 2016

Master [60] in Computer Science

**At Louvain-la-Neuve - 60 credits - 1 year - Day schedule - In english**Dissertation/Graduation Project : **YES** - Internship : **NO**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: **sinf2m1** - Francophone Certification Framework: 7**Table of contents**

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## SINF2M1 - Introduction

### Introduction

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#### Introduction

The objective of this Master's degree programme is to train computer science professionals capable of understanding and analysing the complex needs of a company, of designing computing systems that meet those needs, of mastering the rapidly evolving technological tools in this area, of implementing solutions, of assuring quality products and procedures in a company.

#### Your profile

This Master's degree programme is particularly well-suited for students for who consider the Master's degree programme (120) too burdensome.

With a preparatory year, this programme offers students from professional schools (Hauts Ecoles), who already have a Bachelor's degree in computer science, the opportunity to complete their university education in 2 years and earn a Master's degree.

#### You would like to

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

#### Your future job

We train

- professionals who will design computer systems that meet users' needs;
- innovators who can master a wide range of constantly evolving technologies;
- specialists capable of implementing software solutions with particular attention paid to product quality and its development process.

#### Your programme

This Master's degree programme consists of

- a core curriculum aiming to provide the knowledge and skills necessary to model and design complex applications. Topics covered include artificial intelligence, computer networking, software engineering, compilers and data bases;
- general knowledge courses such as classes in management and human resources an elective course (as a comprehensive university, UCL offers numerous general knowledge courses according to student interest);
- a graduation project that offers students the possibility to study a subject in-depth and thanks to its size, introduces students to the professional life of a computer scientist or researcher; the topic of this project is selected in consultation with the programme supervisors and possibly a company.

## SINF2M1 - Teaching profile

### Learning outcomes

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

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

In order to meet these challenges, future diploma holders should:

- master real computer science technologies but also keep up with their constant progress
- work as part of multidisciplinary teams that take into account non-technical issues

The future diploma holder in computer science will acquire the knowledge and skills to become:

- scientists who know how to understand and analyse the complex requirements that a computer system must meet;
- professionals who will design computer systems that meet users' needs;
- specialists capable of implementing software solutions with particular attention paid to product quality and its development process;

This Master's degree programme (60) provides an in-depth understanding of concepts and emphasises abstract thinking. This theoretical approach is complemented by the application of these concepts. The programme thus includes numerous projects and studies.

Apart from certain exceptions outlined in the detailed course programme, all courses in the programme are given in English. Thus the mastery of this language is indispensable in the area of computer science. This offers Francophone students the opportunity to intensively practice their English throughout their training.

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

- 1.démontrer la maîtrise d'un solide corpus de connaissances en informatique, lui permettant de résoudre les problèmes qui relèvent de sa discipline
- 2.organiser et de mener à son terme une démarche de développement d'un système informatique répondant aux besoins généralement complexes d'un client
- 3.contribuer en équipe à la conduite d'un projet et de le mener à son terme en tenant compte des objectifs, des ressources allouées et des contraintes qui le caractérisent
- 4.communiquer efficacement oralement et par écrit en vue de mener à bien les projets qui lui sont confiés dans son environnement de travail (en particulier en anglais).
- 1.demonstrate mastery of a solid body of knowledge in computer science allowing them to solve problems raised in their field of study

This Master's degree programme aims to provide students with advanced knowledge and is based on the fundamentals of computer science acquired in the Bachelor's degree programme. A diversity of subjects are offered in the common curriculum:

- Networking;
- Programming languages;
- Software engineering;
- Artificial intelligence .

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

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

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

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

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

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

5. demonstrate rigor, openness and critical thinking as well as a sense of ethics in your work

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

## Programme structure

The Master's degree programme (60) in computer science consists of a minimum of 60 credits spread over one year (under certain conditions). It consists of a core curriculum (55 credits) and an elective course (5 credits).

This programme may vary depending on students' prior course of study. If during their previous studies, students have already taken a required class or completed an equivalent activity, they may substitute this course with an activity of their choice from the Master's degree programme (120) in computer science (provided they follow the programme guidelines). They will also verify that the minimum number of required credits for their diploma has been obtained.

Such programmes will be submitted to the appropriate programme commission for approval.

The majority of courses in this programme are offered in English. For non-Francophone students, alternative courses will be suggested by the programme commission as substitutes for required courses taught in French. This will be done on a case by case basis depending on the student's curriculum. Specifically, for students who have a Bachelor's degree from another university, classes in religious sciences may be replaced by a complementary activity or thesis (course FSA2993).

It is always possible for students to speak in French in class or during evaluations. Specifically, the graduation thesis/project may be written and defended in either English or French.

[> Core Curriculum for the Master's degree programme \(60\) in computer science \[en-prog-2015-sinf2m1-lsinf221t.html\]](#)

## SINF2M1 Detailed programme

## Programme by subject

### CORE COURSES

○ Mandatory

△ Courses not taught during 2015-2016

⊕ Periodic courses taught during 2015-2016

⊗ Optional

⊖ Periodic courses not taught during 2015-2016

■ Activity with requisites

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

### Specialised courses in computer science

|             |                           |               |         |           |    |
|-------------|---------------------------|---------------|---------|-----------|----|
| ○ LINGI2132 | Languages and translators | Pierre Schaus | 30h+30h | 6 Credits | 2q |
|-------------|---------------------------|---------------|---------|-----------|----|

|             |                                                       |              |         |           |      |
|-------------|-------------------------------------------------------|--------------|---------|-----------|------|
| ○ LINGI2241 | Architecture and performance of computer systems      | Ramin Sadre  | 30h+30h | 6 Credits | 1q   |
| ○ LINGI2261 | Artificial intelligence: representation and reasoning | Yves Deville | 30h+30h | 6 Credits | 1q   |
| ○ LSINF2255 | Software Development Project                          | Kim Mens     | 15h+45h | 6 Credits | 1q Δ |

### ○ Interdisciplinary courses in the humanities and social sciences

|             |                            |                                                                         |     |           |    |
|-------------|----------------------------|-------------------------------------------------------------------------|-----|-----------|----|
| ○ LLSMG2004 | Human Resources Management | Alain Eraly<br>(compensates Evelyne L&eacute;onard),<br>Evelyne Léonard | 30h | 5 Credits | 1q |
|-------------|----------------------------|-------------------------------------------------------------------------|-----|-----------|----|

### ○ Courses in information systems

|             |           |                 |         |           |    |
|-------------|-----------|-----------------|---------|-----------|----|
| ○ LINGI2172 | Databases | Bernard Lambeau | 30h+30h | 6 Credits | 2q |
|-------------|-----------|-----------------|---------|-----------|----|

### ○ Elective courses (8 credits)

Cours au choix dans le porte-feuille de l'UCL avec accord de la commission de programme et pour 8 crédits au moins.

### ○ Religion courses for students in natural sciences

Select 2 credits from among  
The student shall select

|             |                                                                    |                         |     |           |    |
|-------------|--------------------------------------------------------------------|-------------------------|-----|-----------|----|
| ⊗ LTECO2100 | Questions of religious sciences: Biblical readings                 | Hans Ausloos            | 15h | 2 Credits | 1q |
| ⊗ LTECO2200 | Questions of religious sciences: reflections about Christian faith | Dominique Martens       | 15h | 2 Credits | 2q |
| ⊗ LTECO2300 | Questions of religious sciences: questions about ethics            | Marcela Lobo Bustamante | 15h | 2 Credits | 1q |

### ○ Master Thesis (15 credits)

|             |                                           |    |  |            |  |
|-------------|-------------------------------------------|----|--|------------|--|
| ○ LSINF2991 | Graduation project/End of studies project | N. |  | 15 Credits |  |
|-------------|-------------------------------------------|----|--|------------|--|

## The programme's courses and learning outcomes

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For each UCL training programme, a [reference framework of learning outcomes](#) specifies the competences expected of every graduate on completion of the programme. You can see the contribution of each teaching unit to the programme's reference framework of learning outcomes in the document "In which teaching units are the competences and learning outcomes in the programme's reference framework developed and mastered by the student?"

The document is available by clicking [this link](#) after being authenticated with UCL account.

## SINF2M1 - Information

### Admission

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

Any student who does not hold a Bachelor's degree in computer science must fill out an application for admission for the Louvain School of Engineering, stating their detailed curriculum (degree, list of courses and grades awarded, year by year). The jury, consulting with the relevant programme commission, decides on the eligibility of the candidate and may propose a personalised programme for the student, designed to fill any gap in their training. To this end, the jury can impose supplemental credits or may suggest enrolment in the Bachelor's degree programme in computer science.

- [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="#">Bachelor in Computer Science</a>                        |                      | Direct access |         |
|                                                                     |                      | Direct access |         |
| <b>Others Bachelors of the French speaking Community of Belgium</b> |                      |               |         |
| Bachelier en sciences informatiques                                 |                      | Direct access |         |
|                                                                     |                      | Direct access |         |
| <b>Bachelors of the Dutch speaking Community of Belgium</b>         |                      |               |         |
| Bachelor in de informatica                                          |                      | Direct access |         |
|                                                                     |                      | Direct access |         |
| <b>Foreign Bachelors</b>                                            |                      |               |         |
|                                                                     |                      | Direct access |         |

#### — Non university Bachelors

| Diploma                                                             | Access                                                                                                                                        | Remarks    |
|---------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|------------|
| > Find out more about <a href="#">links</a> to the university       |                                                                                                                                               |            |
| > BA en sciences industrielles - type long                          | Accès au master moyennant ajout de maximum 60 crédits d'enseignements supplémentaires obligatoires au programme. Voir 'Module complémentaire' | Type long  |
| > BA en informatique de gestion<br>> BA en informatique et systèmes | Accès au master moyennant ajout de maximum 60 crédits d'enseignements supplémentaires obligatoires au programme. Voir 'Module complémentaire' | Type court |
| > Spécialisation en informatique médicale                           | Accès direct au master moyennant ajout éventuel de 15 crédits max                                                                             | Type court |

**— Holders of a 2nd cycle University degree**

| Diploma            | Special Requirements | Access        | Remarks |
|--------------------|----------------------|---------------|---------|
| <b>"Licenciés"</b> |                      |               |         |
|                    |                      | Direct access |         |
| <b>Masters</b>     |                      |               |         |
|                    |                      | Direct access |         |

**— Holders of a non-University 2nd cycle degree**

| Diploma                                                                                                                                                                                                           | Access                                                            | Remarks   |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------|-----------|
| > Find out more about <a href="#">links</a> to the university                                                                                                                                                     |                                                                   |           |
| > MA en sciences de l'ingénieur industriel finalités automatisation, électricité, électromécanique, électronique, informatique, mécanique<br>> MA en sciences industrielles, finalités électronique, informatique | Accès direct au master moyennant ajout éventuel de 15 crédits max | Type long |

**Adults taking up their university training**

> See the website [www.uclouvain.be/en-vaе](http://www.uclouvain.be/en-vaе)

Tous les masters peuvent être accessibles selon la procédure de valorisation des acquis de l'expérience.

**Personalized access**

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

**Admission and Enrolment Procedures for general registration**

Specific procedures :

Tout étudiant qui n'est pas bachelier en sciences informatiques introduit un dossier de demande d'admission auprès de l'Ecole Polytechnique de Louvain mentionnant son curriculum détaillé (diplômes, liste des cours suivis et points obtenus, année par année). La faculté, en concertation avec le jury INGI, se prononce sur l'admissibilité du candidat étudiant, et peut proposer à l'étudiant un programme personnalisé visant à combler d'éventuelles lacunes de formation. A cet effet, elle peut imposer à l'étudiant des crédits supplémentaires. Pour certains étudiants, la faculté pourrait proposer l'accès en bachelier en sciences informatiques.



## Supplementary classes

To enrol for this Masters, the student must have a good command of certain subjects. If this is not the case, they must add preparatory modules to their Master's programme.

- Mandatory  
 Courses not taught during 2015-2016  
 Periodic courses taught during 2015-2016
- Optional  
 Periodic courses not taught during 2015-2016  
 Activity with requisites

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

|                                  |                                                                                |                                                                                                                                |             |           |    |
|----------------------------------|--------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------|-------------|-----------|----|
| <input type="radio"/> LINGI1101A | <a href="#">Discrete mathematics: logical foundations of computing science</a> | N.                                                                                                                             | 30h+30h     | 5 Credits | 1q |
| <input type="radio"/> LINGI1122  | <a href="#">Program conception methods</a>                                     | Charles Pecheur                                                                                                                | 30h+30h     | 5 Credits | 2q |
| <input type="radio"/> LINGI1123  | <a href="#">Computability and complexity</a>                                   | Yves Deville                                                                                                                   | 30h+30h     | 5 Credits | 2q |
| <input type="radio"/> LINGI1131  | <a href="#">Computer language concepts</a>                                     | Peter Van Roy                                                                                                                  | 30h+30h     | 5 Credits | 2q |
| <input type="radio"/> LINGI1341  | <a href="#">Computer networks</a>                                              | Olivier Bonaventure                                                                                                            | 30h+30h     | 5 Credits | 1q |
| <input type="radio"/> LSINF1121  | <a href="#">Algorithmics and data structures</a>                               | Pierre Schaus                                                                                                                  | 30h+30h     | 5 Credits | 1q |
| <input type="radio"/> LBIR1203   | <a href="#">Probabilities and statistics (I)</a>                               | Patrick Bogaert                                                                                                                | 30h+15h     | 4 Credits | 1q |
| <input type="radio"/> LECGE1115  | <a href="#">Political Economics</a>                                            | Paul Belleflamme,<br>Etienne De Callatay<br>(compensates Jean Hindriks),<br>Pierre Dehez,<br>Jean Hindriks,<br>Rigas Oikonomou | 45h+15h     | 5 Credits | 1q |
| <input type="radio"/> LFSAB1509  | <a href="#">Project 4 (in Computer Science)</a>                                | Yves Deville,<br>Marc Lainez<br>(compensates Yves Deville)                                                                     | 22.5h+22.5h | 4 Credits | 2q |

### Cours de langues. (3 credits)

En fonction de son niveau, l'étudiant choisit un des deux cours de langue suivants.

|                                 |                                                 |                                                      |     |           |    |
|---------------------------------|-------------------------------------------------|------------------------------------------------------|-----|-----------|----|
| <input type="radio"/> LANGL1370 | <a href="#">English: reading comprehension</a>  | Dominique François,<br>Céline Gouverneur<br>(coord.) | 30h | 3 Credits | 2q |
| <input type="radio"/> LANGL1372 | <a href="#">English for Computer Scientists</a> | Marc Piwnik                                          | 30h | 3 Credits | 2q |

## Teaching method

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### Active learning and non-technical skills

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

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

### Languages

The lingua franca of computer science is English. The use of English in the programme allows students to develop their mastery of this language, which facilitates their integration into professional life. All course material and course supervision are in English. However, students may always ask or respond to exam questions in French if desired.

Moreover, the programme allows students to attend language courses at the university's Language Institute (ILV) and to take part in exchange programmes.

## 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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### International Openness (for UCL students)

This Master's degree programme (6) does not allow for Erasmus/Socrates/Mercator exchange programmes. Students interested in international exchanges are urged to enrol in the 120 credit Master's degree programme in computer science.

### International attraction (for foreign students)

The entire Master's degree programme is offered in English and knowledge of French is not necessary. Except for rare exceptions, courses are given in English. For non-Francophone students, alternative courses will be suggested by the programme commission as substitutes for required courses taught in French. This will be done on a case by case basis depending on the student's curriculum.

## Possible trainings at the end of the programme

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The 120 credit Master's degree programmes-accessible

The 60 credit Master's degree programme in computer science may be followed by the 120 credit Master's degree programme in computer science

## Contacts

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## Curriculum Management

Entite 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<br>1348 Louvain-la-Neuve<br>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

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