UCLouvain - Université catholique de Louvain

SINF1BA - Introduction

# SINF1BA - Teaching profile

# Learning outcomes

#### General objectives

This bachelor's programme offers a general approach to computer science in the context of basic university training. The bachelor's programme leads to the title of "Bachelor of Computer Science" and upon completion of this first cycle of studies, the student will be granted access to the master's programme in Computer Science.

This university-level training in computer science prepare future specialists capable of creating and elaborating complex and efficient computing systems that satisfy the numerous and ever-increasing needs in our society. It thus trains "software creators" rather than pure programmers. More specifically, the bachelor's programme in computer science aims at the acquisition of the following technical competences and skills :

- · Gaining an in-depth understanding of the basic essentials needed to design and implement simple software systems;
- Mastering the underlying foundations of computer science;
- Developing the reasoning and abstraction abilities necessary for the creation of such systems;
- Mastering the mathematical skills needed to carry out such reasoning;
- Acquisition of the knowledge and skills necessary for the future "master's in computer science" which will be orientated towards the
  engineering of more complex software system;
- Acquisition of a lasting 'know-how', readily adaptable to the continuously evolving field of computer science; learning how to learn.

Computer science comprises the theoretical knowledge and practical skills needed to develop and understand complex software systems. In addition to this technical and more applied knowledge, to become a professional computer scientist, the student has to develop some extra skills such as a creative ability and critical mindset. These studies also train students to become responsible young professionals, capable of apprehending the complex socio-economic world into which computing science is embedded, and to take decisions which are both technically sound and humanly responsible. The bachelor's programme in computer science thus aims at the acquisition of other competences, such as :

- Understanding the mechanisms which govern the socio-economic and/or technical environment in which a given computer system has to be deployed;
- Integration of the acquired technical competences and skills in a multidisciplinary context;
- Developing an intellectual curiosity, an analytic mind, a capacity for critical reflection, sound communication skills and the ability to organise and manage one's studies.

#### Objectives of the foundation studies

The objective of the basic university-level studies is to allow the student to acquire essential competences and skills in the areas of computer science, mathematics, science and technology, economics and management, human sciences and English.

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

1. demonstrate a solid basic knowledge of computer science, which, being supplemented by a solid education in other areas, allows him to solve problems within his discipline

The bachelor's program aims the acquisition of knowledge in :

- Discrete structures;
- Programming Fundamentals;
- Algorithms and Complexity;
- Architecture of computers and operating systems;
- Program Design Method;
- Information management.

Moreover, the bachelor's program is open to other disciplines. A solid basic education is offered in the following areas:

- Mathematics to model a situation and prove the accuracy of a statement;
- Statistics to be able to make a quantitative analysis of data;
- Economics, management and humanities to understand the socio-economic world in which IT tools are inserted.

2. to organize and carry out successfully the development process of a "classic" computer system with medium complexity in order to meet the customer's needs

- Analyse the problem, identify the functional requirements and formulate the corresponding specifications;
- Model the problem and design one or more technical solutions to meet these specifications;
- Assess and classify these solutions in the light of all the criteria listed in the specifications: effectiveness, feasibility;
- Implement and test the selected solution.

3. contribute in team to a project taking into account the objectives, allocated resources and constraints on feature

- Crop and clarify the objectives of a project in collaboration with customers;
- Commit collectively on a work plan, schedule and roles to keep;

• Make decisions as a team when there is a choice to make: either on technical solutions or on the organization of work to make the project.

4. communicate effectively in French orally and in writing to carry out the projects, use cleverly technical documents in English and understand the information transmitted orally in English

• Identify the needs of the customer who has a basic computer science culture: questioning, listening and understanding the client, keeping in mind the existence of non-technical dimensions;

- Argue and convince while adapting his communication to the language of the interlocutors: colleagues, clients, superiors;
- Communicate in graphical and schematic form, interpret a diagram, present the results of a task, structuring information;
- Read, analyse and use technical documentation (diagrams, tutorials, ...);

• Prepare written documents taking into account contextual requirements and social conventions (manual, documentation, project report);

• Make a persuasive oral presentation using modern communication techniques.

5. demonstrate both rigorous, open and critical mind in his work

- Apply the standards of its discipline (terminology, quality standards in terms of documentation and programming methods, ...);
- Demonstrate critical attitude with respect to a technical solution, checking robustness and relevance in its context of use;
- Develop autonomously learning to remain competent in his field.

#### **Programme structure**

The student who enrols in the bachelor's programme in Computer Science will follow a programme of 180 credits, usually spread over 3 years. This programme includes a major of 150 credits and a minor of 30 credits.

- The major consists of a set of polyvalent courses of 79 credits in total and a set of Computer Science courses of 71 credits. The general polyvalent formation comprises a solid training in Economics, Management and Human Sciences (28 credits) as well as in Mathematics (32 credits).
- Regarding the minor, UCL university proposes a large variety of minors in sciences (statistics, scientific culture,...) as well as in human sciences (philosophy, economy,...). For more details, please consult the following web-page : https://uclouvain.be/ programme-mineures.html. Whereas, some minors are freely accessible by any student, some others are subject to certain accessibility conditions. When a student would like to access a minor but encounters certain problems, he or she is advised to contact his or her student counsellor.



o Core study

#### • General and training (79 credits)

I

> Mathematics	> Mathematics (32 credits)				
<b>O</b> LBIR1212	Probabilities and statistics (I) 📕	Patrick Bogaert	1612 [q1] [30h+15h] [4 Credits] 🐘	х	
• LEPL1109	Statistics and data sciences	Donatien Hainaut Laurent Jacques	ER [q1] [30h+30h] [5 Credits] 🚇		x
	1				

Year

Year

				1	2	3
<b>O</b> LINFO1115	Reasoning about a highly connected world: graph theory, game theory and networks	Peter Van Roy	EN [q2] [30h+30h] [5 Credits] ∰ > French-friendly			)
O LINFO1101	Introduction to programming	Kim Mens Siegfried Nijssen Charles Pecheur	EE [q1] [30h+30h] [5 Credits] 🛞	x		
<b>O</b> LINFO1103	Introduction to algorithms	Cuillaume Derval (compensates Pierre Dupont)	EE [q2] [30h+30h] [5 Credits] 🛞	x		
O LINFO1104	Programming language concepts 📕	Peter Van Roy	1812 [q2] [30h+30h] [5 Credits]		х	
O LINFO1121	Algorithms and data structures 📃	Pierre Schaus	ER [q1] [30h+30h] [5 Credits] 🚇			)
O LINFO1252	Informatic Systems 📃	Etienne Riviere	ER [q1] [30h+30h] [5 Credits] 🚇			>
O LINFO1123	Calculability, Logic and Complexity					



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x

Year

# List of available minors

Besides the core study, students will choose:

- the Additionnal module in Computer Science
- or one of the minors in the list below.

> Minor in Law (access) [en-prog-2023-minadroi]
> Minor in Urban Architecture [en-prog-2023-minarch]
> Minor in Information and Communication [en-prog-2023-mincomu]
> Minor in Culture and Creation [ en-prog-2023-mincucrea ]
> Minor in Scientific Culture [en-prog-2023-mincults]
> Minor in Development and Environment [en-prog-2023-mindenv]
> Minor : Issues of Transition and Sustainable Development (*) [en-prog-2023-mindd]
> Minor in Economics [en-prog-2023-minecon]
> Minor in European Studies [en-prog-2023-mineuro]
> Minor in Gender Studies [en-prog-2023-mingenre]
> Minor in Geography [en-prog-2023-mingeog]
> Minor in Management (ESPO students) [en-prog-2023-minagest]
> Minor in Human and Social Sciences [en-prog-2023-minhuso]
> Minor in Philosophy [en-prog-2023-minfilo]
> Minor in Linguistics [en-prog-2023-minling]
> Minor in Literary Studies [en-prog-2023-minlitt]
> Minor in entrepreneurship (*) [en-prog-2023-minmpme]
> Minor in Musicology [en-prog-2023-minmusi]
> Minor in Law (openness) [ en-prog-2023-minodroi ]
> Additional module in computer science [en-prog-2023-appsinf]
> Minor in Statistics, Actuarial Sciences and Data Sciences [en-prog-2023-minstat]
> Minor in Dutch Studies (*) [en-prog-2023-minneer]

(\*) This programme is the subject of access criteria

https://uclouvain.be/en-prog-2023-sinf1ba

#### SINF1BA - 1ST ANNUAL UNIT

O Mandatory
🗱 Optional
$\Delta$ Not offered in 2023-2024
Ø Not offered in 2023-2024 but offered the following year
$\oplus$ Offered in 2023-2024 but not the following year
$\Delta \oplus$ Not offered in 2023-2024 or the following year
Activity with requisites
Open to incoming exchange students
In the second se
[FR] Teaching language (FR, EN, ES, NL, DE,)
Click on the course title to see detailed informations (objectives methods evaluation)

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

#### o Core study

#### o General and training

0	Mathematics			
	O LINFO1111	Analysis	Pierre-Antoine Absil Guillaume Berger François Glineur	[45h +37.5h] [7 Credits] (7)
	O LINFO1112	Algebra	Christophe Craeye Enrico Vitale	[30h +30h] [5 Credits] 🖗

#### **O** Scientific and technical Courses

O LINFO1140	Electronic basics of computing	Olivier Bonaventure	[q2] [30h +30h] [5 Credits] @
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#### **O** Human Sciences, Economy, and Managment Courses

O LCOPS1115	Economic Policy	Tanguy Isaac Arastou Khatibi	1012 [q1] [45h +15h] [5 Credits] ∰
<b>O</b> LESPO1113	Sociology and Anthropology of the Contemporary Worlds	Jean De Munck Hugues Draelants	ER [q1 or q2] [40h] [5 Credits] ∰
O LESPO1122	Foundations of Law	Pierre Bazier Nicolas Bonbled Arnaud Hoc Thibaut Slingeneyer de Goeswin	FR [q1 or q2] [40h] [5 Credits] ∰
O LCOPS1124	Philosophy	Sylvain Camilleri Nathalie Frogneux Yoann Malinge	FR [q2] [30h] [5 Credits] (#)

#### O Cours de langues

#### O English Courses

01	LANGL1181	English for Computer Scientists I A placement test is organized at the beginning of the annual unit 1 and 2. Depending on the obtained mark, the students follow an adapted course. The students with a mark gretaer or equal to 16/20 keep their mark and could take an additional language course (out of the 180 credits); this additional course will only affect their average mark if credited (mark greater or equal to 10/20)	Jean-Luc Delghust (coord.) Lucille Meyers (coord.)	[12h] [2 Credits] (1)		
t D	© Dutch courses					

SINEER1300	General and academic Dutch - intermediate level	Hilde Bufkens (coord.)	NL [q1
			or q2]
			[30h] [2
			Credits]

SI LALLE1101	German beginner's level 1st part (0-A1)	Fanny Desterbecq (compensates Ann Rinder)	DIE [q1 or q2] [45h] [2 Credits] ∰
Stalle1102	German beginner's level 2nd part (A1 - A2)	Caroline Klein (coord.)	[q2] [45h] [2 Credits] ∰

#### Spanish Courses

<sup>I LESPA1101</sup>	Spanish beginner's level 1st part (0-A1)	Lara Marina Nuñez Muslera Fernando Juan San Basilio Pardo (compensates Begona Garcia Migura) Alicia Maria Tirado Fernandez (coord.)	(15) [q1 or q2] [45h] [2 Credits] (17)
SESPA1102	Spanish (beginner¿s level) 2nd part (A1 - A2)	Alicia Maria Tirado Fernandez (coord.)	<pre>88 [q1 or q2] [45h] [2 Credits] @</pre>

• Computer science training En bloc annuel 3, l'étudiant peut choisir soit LEPL1509 soit LSST1001 dans son programme de 180 crédits en bachelier. Le cours LSST1001 reste ouvert sur candidature et après sélection uniquement.

O LINFO1101	Introduction to programming	Kim Mens Siegfried Nijssen Charles Pecheur	<pre>ER [q1] [30h +30h] [5 Credits] </pre>
O LINFO1103	Introduction to algorithms	Guillaume Derval (compensates Pierre Dupont)	[q2] [30h +30h] [5 Credits] ∰
O LINFO1001	IT projects 1	Cristel Pelsser	[q1] [30h +30h] [6 Credits] ∰

#### SINF1BA - 2ND ANNUAL UNIT

O Mandatory
🕱 Optional
△ Not offered in 2023-2024
⊘ Not offered in 2023-2024 but offered the following year
$\oplus$ Offered in 2023-2024 but not the following year
$\Delta \oplus$ Not offered in 2023-2024 or the following year
Activity with requisites
Open to incoming exchange students
It is the second sec
[FR] Teaching language (FR, EN, ES, NL, DE,)
Click on the course title to see detailed informations (objectives, methods, evaluation)

#### o Core study

#### o General and training

Probabilities and statistics (I)

#### O Mathematics

• LBIR1212

Patrick Bogaert

# • Religion courses for students in exact sciences The students select one course between:

Streco2100	Sociétés, cultures, religions : Biblical readings	Hans Ausloos	ER [q1]

#### SINF1BA - 3RD ANNUAL UNIT

O Mandatory
🗱 Optional
△ Not offered in 2023-2024
⊘ Not offered in 2023-2024 but offered the following year
$\oplus$ Offered in 2023-2024 but not the following year
$\Delta \oplus$ Not offered in 2023-2024 or the following year
Activity with requisites
Open to incoming exchange students
🖲 Not open to incoming exchange students
[FR] Teaching language (FR, EN, ES, NL, DE,)
Click on the course title to see detailed informations (chiestives, matheds, evaluation, )

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

#### o Core study

#### o General and training

0	Mathematics
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O LEPL1109	Statistics and data sciences	Donatien Hainaut Laurent Jacques	[30h +30h] [5 Credits] ∰

#### **O** Scientific and technical Courses

+15h] Credits]	O LELEC1930	Intoduction to telecommunication 📕	Jérôme Louveaux	[q2] [30h +15h] [5 Credits] @
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#### O Human Sciences, Economy, and Managment Courses

<b>O</b> LEPL1805	People management	Bauduin Auquier Philippe Henrotaux Renaud Ronsse	[22.5h +15h] [3 Credits] ∰
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#### O Cours de langues

#### **O** English Courses

O LANGL1383	English for Computer Scientists III	Ahmed Adrioueche	EN [q1]
		(coord.)	[30h] [2
		Ariane Halleux	Credits] 🛞
		Charlotte Peters (coord.)	

#### • Computer science training

En bloc annuel 3, l'étudiant peut choisir soit LEPL1509 soit LSST1001 dans son programme de 180 crédits en bachelier. Le cours LSST1001 reste ouvert sur candidature et après sélection uniquement.

O LINFO1115	Reasoning about a highly connected world: graph theory, game theory and networks	Peter Van Roy	<pre>EN [q2] [30h +30h] [5 Credits] ∰ &gt; French- friendly</pre>
O LINFO1121	Algorithms and data structures 📕	Pierre Schaus	[30h +30h] [5 Credits] @
O LINFO1252	Informatic Systems 📃	Etienne Riviere	[q1] [30h +30h] [5 Credits] ∰
O LINFO1341	Computer networks 📃	Olivier Bonaventure	[q2] [30h +30h] [5 Credits] ∰
₿ LEPL1509	Project 4 (in informatics) 📕	Marc Lainez (compensates	

₿LSST1001	IngénieuxSud	Stéphanie Merle Jean-Pierre Raskin (coord.)	[q1+q2] [15h +45h] [5 Credits] (#)
O LINFO1361	Artificial intelligence	Eric Piette (compensates Yves Deville)	[q2] [30h +30h] [5 Credits] ∰

#### o Minor or additional module

The student completes his formation with the additional module in computer sciences or a minor. Maximum 1 element(s)

## SINF1BA - Information

# Access Requirements

Decree of 7 November 2013 defining the landscape of higher education and the academic organization of studies. The admission requirements must be met prior to enrolment in the University.

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

SUMMARY

- General access requirements
- Specific access requirements
- Access based on validation of professional experience
- Special requirements to access some programmes

# **General access requirements**

Except as otherwise provided by other specific legal provisions, admission to undergraduate courses leading to the award of a Bachelor's degree will be granted to students with one of the following qualifications :

1. A Certificate of Upper Secondary Education issued during or after the 1993-1994 academic year by an establishment offering fulltime secondary education or an adult education centre in the French Community of Belgium and, as the case may be, approved if it was issued by an educational institution before 1 January 2008 or affixed with the seal of the French Community if it was issued after this date, or an equivalent certificate awarded by the Examination Board of the French Community during or after 1994;

2. A Certificate of Upper Secondary Education issued no later than the end of the 1992-1993 academic year, along with official documentation attesting to the student's ability to pursue higher education for students applying for a full-length undergraduate degree programme;

3. A diploma awarded by a higher education institution within the French Community that confers an academic degree issued under the above-mentioned Decree, or a diploma awarded by a university or institution dispensing full-time higher education in accordance with earlier legislation;

4. A higher education certificate or diploma awarded by an adult education centre;

5. A pass certificate for one of the <u>entrance examinations</u> (https://uclouvain.be/fr/etudier/inscriptions/examens-admission.html) organized by higher education institutions or by an examination board of the French Community; this document gives admission to studies in the sectors, fields or programmes indicated therein;

6. A diploma, certificate of studies or other qualification similar to those mentioned above, issued by the Flemish Community of Belgium, the German Community of Belgium or the Royal Military Academy;

7. A diploma, certificate of studies or other qualification obtained abroad and deemed equivalent to the first four mentioned above by virtue of a law, decree, European directive or international convention;

Note:

Requests for equivalence must be submitted to the Equivalence department (Service des équivalences) of the Ministry of Higher Education and Scientific Research of the French Community of Belgium in compliance with the official deadline.

The following two qualifications are automatically deemed equivalent to the Certificate of Upper Secondary Education (Certificat d'enseignement secondaire supérieur – CESS):

- European Baccalaureate issued by the Board of Governors of a European School,

- International Baccalaureate issued by the International Baccalaureate Office in Geneva.

8. Official documentation attesting to a student's ability to pursue higher education (diplôme d'aptitude à accéder à l'enseignement supérieur - DAES), issued by the Examination Board of the French Community.

# Specific access requirements

- Access to bachelor programmes for candidates of nationality outside the European Union who are not assimilated to Belgian nationals is subject to the following criteria:
  - not have obtained a secondary education diploma for more than 3 years maximum. Example: for an admission application for the academic year 2023-2024, you must have obtained your diploma during the academic years 2020-2021, 2021-2022 ou 2022-2023. In the French Community of Belgium, the academic year runs from September 14 to September 13
     not already hold an undergraduate degree
- Candidates, whatever their nationality, with a secondary school diploma from a country outside the European Union, must have
  obtained an average of 13/20 minimum or, failing that, have obtained this average, have passed one year of study in Belgium (for
  example special Maths / sciences). A non-successful year will not be taken into consideration.

- For any secondary school diploma **from a European Union country**, the admission request must contain the equivalence of your diploma or, at the very least, proof of the filing of the equivalence request with the Wallonia-Brussels Federation (French Community of Belgium). For any information relating to obtaining an equivalence, please refer to the following site.
- For any secondary school diploma from a country outside the European Union, the admission application must contain the equivalence of your diploma issued by the Wallonia-Brussels Federation (French Community of Belgium). If you have a restrictive equivalence for the programme of your choice, in addition of it, you must have either the DAES or a certificate of successful completion of the examination giving access to 1<sup>st</sup> cycle studies when you submit your application

# Access based on validation of professional experience

Admission to undergraduate studies on the basis of accreditation of knowledge and skills obtained through professional or personal experience (Accreditation of Prior Experience)

Subject to the general requirements laid down by the authorities of the higher education institution, with the aim of admission to the undergraduate programme, the examination boards accredit the knowledge and skills that students have obtained through their professional or personal experience.

This experience must correspond to at least five years of documented activity, with years spent in higher education being partially taken into account: 60 credits are deemed equivalent to one year of experience, with a maximum of two years being counted. At the end of an assessment procedure organized by the authorities of the higher education institution, the Examination Board will decide whether a student has sufficient skills and knowledge to successfully pursue undergraduate studies.

After this assessment, the Examination Board will determine the additional courses and possible exemptions constituting the supplementary requirements for the student's admission.

# Special requirements to access some programmes

#### Admission to undergraduate studies in engineering: civil engineering and architect

Pass certificate for the <u>special entrance examination for undergraduate studies in engineering: civil engineering and architect</u> (https://uclouvain.be/fr/facultes/epl/examenadmission.html).

Admission to these courses is always subject to students passing the special entrance examination. Contact the faculty office for the programme content and the examination arrangements.

 $\bullet$  Admission to undergraduate studies in veterinary medicine

Admission to undergraduate studies in veterinary medicine is governed by the Decree of 16 June 2006 regulating the number of students in certain higher education undergraduate courses (non-residents) (https://uclouvain.be/en/study/inscriptions/etudes-contingentees.html).

Admission to undergraduate studies in physiotherapy and rehabilitation
 Admission to undergraduate studies in physiotherapy and rehabilitation is governed by the Decree of 16 June 2006 regulating the
 number of students in certain higher education undergraduate courses (non-residents). (https://uclouvain.be/en/study/inscriptions/
 etudes-contingentees.html)

• Admission to undergraduate studies in psychology and education: speech and language therapy

Admission to undergraduate studies in psychology and education: speech and language therapy is governed by the Decree of 16 June 2006 regulating the number of students in certain higher education undergraduate courses (non-residents) (https://uclouvain.be/en/study/inscriptions/etudes-contingentees.html).

Admission to undergraduate studies in medicine and dental science

Admission to undergraduate studies in medecine and dental science is governed by the Decree of 16 June 2006 regulating the number of students in certain higher education undergraduate courses (non-residents). (https://uclouvain.be/en/study/inscriptions/ etudes-contingentees.html)

Note: students wishing to enrol for a **Bachelor's degree in Medicine** or a **Bachelor's degree in dental science** must first sit <u>an</u> <u>aptitude test (fr)</u> (https://uclouvain.be/en/study/inscriptions/etudes-contingentees.html).

# **Teaching method**

A significant part of the courses in Computer Science will focus on learning techniques through problem solving. Amongst others, two integrated computer science projects will enable the students to integrate the various course topics and expose them to the problem of realizing small-scale projects (via laboratory sessions in the first year), or medium-scale projects (via a project during the second quadrimester of the third year).

# **Evaluation**

The evaluation methods comply with the <u>regulations concerning studies and exams</u> (https://uclouvain.be/fr/decouvrir/ rgee.html). 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 course content and activities are evaluated in accordance with the prevailing rules of the University (see the exam regulations). Most of the courses include at least one evaluation during the course of the quadrimester (ongoing evaluation), in addition to a final examination during the exam sessions (in January, June or September). Evaluations are either in written or in oral form. The specific evaluation details and procedures for each course are presented at the start of each study period.

# Mobility and/or Internationalisation outlook

The computer-science related components of the programme adhere to the standard curricula proposed by international standard organisations such as ACM and IEEE. This fosters student mobility to or from the numerous universities offering similar programmes that conform to these norms.

The programme respects the harmonisation rules established by universities of the CFB; the degree obtained upon completion of the programme therefore entitles direct access, without the need for any complementary prerequisites, to the master's programme in Computer Science at any one of those universities.

In the context of the master studies in Computer Science at UCL, the student also has the opportunity to participate in the Erasmus/ Socrates exchange programmes which UCL has subscribed to, together with universities from numerous European and extra-European countries, as well as with the Catholic University of Leuven (Katholieke Universiteit Leuven) in Flanders.

# Possible trainings at the end of the programme

Access to the master's in Computer Science

The bachelor's programme in Computer Science grants direct access to the master's programme in Computer Science.

Access to the master in Management

The master's programme in Management is accessible to students having followed a minor in Management, under certain conditions which are described on the web page dedicated to this minor https://uclouvain.be/prog-Imingest3.html

#### **Contacts**

**Curriculum Management** 

Secrétaire du Jury: <u>Cristel Pelsser</u> (https://uclouvain.be/repertoires/cristel.pelsser)
 Président du Jury: <u>Claude Oestges</u> (https://uclouvain.be/repertoires/claude.oestges)

Useful Contact(s)

Secrétariat: <u>bac-sinf@uclouvain.be</u>

• Conseillère aux études en sciences informatiques: Cécile Lombart (https://uclouvain.be/repertoires/cecile.lombart)