



# Master in cybersecurity

## Focus Cryptanalysis and Forensics

MA-SECU | M-SECUC | 2024-2025

### Programme mnemonic

MA-SECU

> Focus *Cryptanalysis and Forensics* : M-SECUC

### Exists also in

> Focus *Erasmus Mundus joint master in Cybersecurity (CYBERUS)* : M-SECUM

### Studies level

Master 120 credits

### Learning language

english

### Schedule

office hours

### Studies category / subcategory

Sciences and technics / Sciences and technics

### Campus

Other campus and Plaine

## Teaching methods

Students attend **interactive theoretical classes** and take part in **projects and challenges** that further add to the expertise and practical know-how required in the IT industry.

These projects will give students (**alone or in groups**) the opportunity to apply the concepts covered during the lectures, and to learn new material by solving proposed challenges.

Along with the practical implementation of these learning activities, students develop their **abilities (soft skills)** to write solid, scientific, and structured reports and documentation. In addition, they look into cybersecurity from the perspective of management and ethics.

The programme is organised around **five specific and complementary key disciplines**: (1) Cryptography, (2) Systems and Networks, (3) Legal, ethical, and human aspects, (3) Security management, and (5) Secure software engineering

**The first year** of the Master is dedicated to a **common set of courses**. Several seminars and elective courses ensure the **curriculum is dynamic and remains up to date**. For instance, 10 credits can be chosen as elective courses, selected from courses already taught in the participating academic institutions.

**In the second year**, half of the programme's credits are for courses in one of **two focuses**: 'system design and analysis', which is dedicated to the design and thorough analysis of secure systems, and 'corporate strategies', which is dedicated to more concrete applications. Both focuses are built on the **students' personal involvement and self-learning, through several projects**. A significant part of the skills involved is acquired during the **mandatory long-term work placement in a professional environment** (typically 12 weeks).

Students take part in **projects and challenges** that further add to the expertise and practical know-how required in the IT industry. They apply the concepts covered in lectures, and learn new material by solving proposed challenges.

At the end of the programme, students prepare a **Master's dissertation** under the supervision of a professor who is an active researcher in the field.

## Programme objectives

The Master in Cybersecurity trains students who will act as **researchers and / or professionals in information security**, security management, and security engineering in the many branches of the IT industry.

We want our graduates to have a **strong sense of ethics** and to be fully autonomous, able to self-teach, dedicated to their role in society, self-evolving throughout their careers, and to have a **high level of qualification in IT security**.

Courses in this Master are offered by **four academic partners** (Université Libre de Bruxelles, Université Catholique de Louvain, Université de Namur, and the Royal Military School) and **two higher education institutions** (Haute École Bruxelles-Brabant and Haute École Libre de Bruxelles), which jointly deliver a **single diploma**; classes are given in a rich and multidisciplinary environment.

## Succeed in your studies

Choose



The information and guidance counsellors at the InfOR-études [<https://www.ulb.be/en/studies-info-desk-1>] service will help you choose your studies throughout the year.

#### Succeed

Take part in preparatory courses [<https://www.ulb.be/en/studies-info-desk-1>] or get help to succeed [<https://www.ulb.be/en/studies-info-desk-1>], before or during your studies.

#### Get help

Apply for financial aid, look for accommodation or a student job, get support [<https://www.ulb.be/fr/aides-services-et-accompagnement/aid-services-and-support-1>] for your specific needs.

## International/Openness

Many opportunities for a work placement or a study programme abroad (Erasmus exchange programme).

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Collaborations with the industry and other European universities is a strong point of this cursus.

## Job opportunities

Our students are active in a wide variety of domains, ranging from telecommunications, software industry, public

administrations, military, law enforcement, and banks, to national and international institutions.

Typical positions for cybersecurity experts are:

- > Chief Security Officer (CSO)
- > Law enforcement officer
- > Computer emergency response team member
- > Security architect
- > Network architect
- > Security analyst, consultant, and auditor
- > Forensics expert
- > Researcher

#### Contacts

 <https://www.masterincybersecurity.eu>

#### Jury President

Jan Tobias Mühlberg

#### Jury Secretary

Jérôme DOSSOGNE



# Master in cybersecurity

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## Bloc 1 | M-SECUC | MA-SECU

### Cours obligatoires

ELEC-H504	<b>Network Security</b>   Jean-Michel DRICOT (Coordinator) ⌚ 5 credits [lecture: 24h, practical work: 12h] 📅 second term 🗨 English
ELEC-H550	<b>Embedded System Security</b>   Jan Tobias Mühlberg (Coordinator) ⌚ 5 credits [lecture: 24h, practical work: 36h] 📅 first term 🗨 English
INFO-F514	<b>Protocols, cryptanalysis and mathematical cryptology</b>   Christophe PETIT (Coordinator) and Liran LERMAN ⌚ 5 credits [lecture: 24h] 📅 second term 🗨 English
INFO-Y023	<b>Cryptography</b>   Olivier PEREIRA ⌚ 5 credits [lecture: 30h, tutorial classes: 15h] 📅 first term 🗨 English
INFO-Y024	<b>Cloud computing</b>   Etienne Rivière ⌚ 5 credits [lecture: 30h, practical work: 15h] 📅 first term 🗨 English
INFO-Y025	<b>Cybersecurity challenge</b>   Jérôme DOSSOGNE ⌚ 5 credits 📅 academic year 🗨 English
INFO-Y111	<b>Computer system security</b>   Ramin SADRE ⌚ 5 credits [lecture: 30h, tutorial classes: 15h] 📅 second term 🗨 English
INFO-Y112	<b>Machine learning and data mining</b> ⌚ 5 credits [lecture: 30h, practical work: 15h] 📅 first term 🗨 English
INFO-Y113	<b>Management of security</b>   Thibault Debatty (Coordinator) and Wim Mees ⌚ 5 credits [lecture: 24h, practical work: 24h] 📅 second term 🗨 English
INFO-Y114	<b>Legal aspects of IT security</b> ⌚ 5 credits [lecture: 30h] 📅 first term 🗨 English
INFO-Y115	<b>Secure software design and web security</b>   Romain Absil (Coordinator) ⌚ 5 credits [lecture: 30h, practical work: 20h] 📅 first term 🗨 English
INFO-Y124	<b>Corporate information security</b>   Charles CUVELLIEZ (Coordinator) ⌚ 5 credits [lecture: 30h, practical work: 30h] 📅 second term 🗨 English

# Master in cybersecurity

## Focus Cryptanalysis and Forensics

### Bloc 2 | M-SECUC | MA-SECU

## Cours obligatoires

### Module 1 - ULB

ELEC-H423	<b>Mobile and wireless networks</b>   Jean-Michel DRICOT (Coordinator) ⌚ 5 credits [lecture: 36h, practical work: 24h] 📅 first term 🗨 English
ELEC-H473	<b>Microprocessor architecture</b>   Dragomir MILOJEVIC (Coordinator) and Jan Tobias Mühlberg ⌚ 5 credits [lecture: 24h, practical work: 36h] 📅 second term 🗨 English
INFO-Y119	<b>Forensics and reverse engineering</b>   Thibault Debatty (Coordinator) ⌚ 5 credits [lecture: 24h, practical work: 24h] 📅 first term 🗨 English
INFO-Y122	<b>Security Analysis: from audits to red teaming</b>   Jérôme DOSSOGNE (Coordinator) ⌚ 5 credits [lecture: 30h, practical work: 30h] 📅 first term 🗨 English
MEMO-F001	<b>Master Thesis</b>   Jean-Michel DRICOT (Coordinator) and Olivier MARKOWITCH ⌚ 20 credits [mfe/tfe: 240h] 📅 academic year 🗨 French
STAG-F009	<b>Security analysis internship</b>   Jean-Michel DRICOT (Coordinator) and Olivier MARKOWITCH ⌚ 10 credits [work placement: 120h] 📅 academic year 🗨 French

*A total of ten credits chosen from the following*

GEST-S482 (optional)	<b>The digital firm</b>   Nicolas VAN ZEEBROECK (Coordinator) and Vincent LION ⌚ 5 credits [lecture: 24h, tutorial classes: 24h] 📅 first term 🗨 English
GEST-S706 (optional)	<b>Entrepreneurship</b>   Olivier WITMEUR (Coordinator) ⌚ 5 credits [lecture: 24h] 📅 second term 🗨 English
INFO-F404 (optional)	<b>Real-Time Operating Systems</b>   Joël GOOSSENS (Coordinator) ⌚ 5 credits [lecture: 24h, tutorial classes: 12h, project: 30h] 📅 first term 🗨 English
INFO-F409 (optional)	<b>Learning dynamics</b>   Tom LENAERTS (Coordinator) ⌚ 5 credits [lecture: 24h, practical work: 12h, project: 60h] 📅 first term 🗨 English
INFO-H415 (optional)	<b>Advanced databases</b>   Esteban ZIMANYI (Coordinator) ⌚ 5 credits [lecture: 24h, tutorial classes: 12h, practical work: 30h] 📅 first term 🗨 English
INFO-H420 (optional)	<b>Management of Data Science and Business Workflows</b>   Dimitrios SACHARIDIS (Coordinator) ⌚ 5 credits [lecture: 24h, tutorial classes: 36h] 📅 first term 🗨 English
INFO-H514 (optional)	<b>Quantum information and computation</b>   Ognyan ORESHKOV (Coordinator) ⌚ 5 credits [lecture: 24h, tutorial classes: 24h] 📅 first term 🗨 English
TEMP-0000 (optional)	<b>Cours extérieurs au programme</b> ⌚ 5 credits 📅 academic year 🗨 French

### Module 2 - UCLouvain

MEMO-Y004	<b>Master thesis</b> ⌚ 20 credits [mfe/tfe: 240h] 📅 academic year 🗨 English
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*A total of 40 credits chosen from the following*

INFO-Y027 (optional)	<b>Privacy enhancing technologies</b>   Olivier PEREIRA and François-Xavier STANDAERT ⌚ 5 credits [lecture: 30h, tutorial classes: 30h] 📅 first term 🗣 English
INFO-Y028 (optional)	<b>Secured Systems Engineering</b>   Axel LEGAY ⌚ 5 credits [lecture: 30h, tutorial classes: 15h] 📅 second term 🗣 English
INFO-Y029 (optional)	<b>Mining patterns in data</b>   Siegfried NIJSSEN ⌚ 5 credits [lecture: 30h, tutorial classes: 15h] 📅 second term 🗣 English
INFO-Y031 (optional)	<b>Algorithms in data science</b>   Vincent BLONDEL, Jean-Charles DELVENNE and Gautier KRINGS ⌚ 5 credits [lecture: 30h, tutorial classes: 22,5h] 📅 first term 🗣 English
INFO-Y032 (optional)	<b>Mobile and embedded computing</b>   Ramin SADRE ⌚ 5 credits [lecture: 30h, tutorial classes: 15h] 📅 second term 🗣 English
INFO-Y034 (optional)	<b>Design of embedded and real time systems</b>   Cristel PELSSER ⌚ 5 credits [lecture: 30h, tutorial classes: 30h] 📅 second term 🗣 English
INFO-Y035 (optional)	<b>Architecture and performance of computer systems</b>   Tom BARBETTE ⌚ 5 credits [lecture: 30h, tutorial classes: 30h] 📅 first term 🗣 English
INFO-Y042 (optional)	<b>Information theory and coding</b>   Jérôme LOUVEAUX, Benoit MACQ and Olivier PEREIRA ⌚ 5 credits [lecture: 30h, tutorial classes: 15h] 📅 second term 🗣 English
INFO-Y043 (optional)	<b>Théorie des nombres</b>   Pierre-Emmanuel CAPRACE and Olivier PEREIRA ⌚ 5 credits [lecture: 30h, tutorial classes: 15h] 📅 first term 🗣 French
INFO-Y044 (optional)	<b>Machine learning : regression, deep networks and dimensionality reduction</b>   John LEE and Michel VERLEYSEN ⌚ 5 credits [lecture: 30h, tutorial classes: 30h] 📅 first term 🗣 English
STAG-Y004 (optional)	<b>Internship</b> ⌚ 10 credits [work placement: 120h] 📅 academic year 🗣 English
TEMP-O000 (optional)	<b>Cours extérieurs au programme</b> ⌚ 5 credits 📅 academic year 🗣 French

## Module 3 - UNamur

INFO-Y054	<b>Ethical aspects of IT and IT security</b>   Marie-des-neiges RUFFO ⌚ 5 credits [lecture: 30h] 📅 second term 🗣 English
INFO-Y056	<b>Data Analysis for cybersecurity</b>   Florentin ROCHET ⌚ 5 credits [lecture: 30h, tutorial classes: 15h] 📅 first term 🗣 English
INFO-Y057	<b>Program Analysis for Cybersecurity</b>   Xavier DEVROEY and Wim Vanhoof ⌚ 5 credits [lecture: 30h, tutorial classes: 15h] 📅 first term 🗣 English
INFO-Y058	<b>Security of Applications</b>   Romain Absil (Coordinator) ⌚ 5 credits [lecture: 30h, tutorial classes: 30h] 📅 second term 🗣 English
INFO-Y059	<b>Software Verification and validation</b>   Xavier DEVROEY and Benoit Vanderose ⌚ 5 credits [lecture: 30h, tutorial classes: 15h] 📅 second term 🗣 English
INFO-Y062	<b>Automated Software Engineering</b> ⌚ 5 credits [lecture: 30h, tutorial classes: 15h] 📅 second term 🗣 English
MEMO-Y006	<b>Master Thesis</b> ⌚ 20 credits [mfe/tfe: 240h] 📅 academic year 🗣 English
STAG-Y005	<b>Internship</b> ⌚ 10 credits [work placement: 120h] 📅 academic year 🗣 English

## Module 4 - HE2B-HELB

INFO-Y063	<b>Organisation of Corporate Security</b>   Gaël Hachez (Coordinator) ⌚ 5 credits [lecture: 30h, practical work: 30h] 📅 second term 🗨 English
INFO-Y119	<b>Forensics and reverse engineering</b>   Thibault Debatty (Coordinator) ⌚ 5 credits [lecture: 24h, practical work: 24h] 📅 first term 🗨 English
INFO-Y122	<b>Security Analysis: from audits to red teaming</b>   Jérôme DOSSOGNE (Coordinator) ⌚ 10 credits [lecture: 60h, practical work: 60h] 📅 first term 🗨 English
INFO-Y123	<b>Human factors in information security</b>   Jérôme DOSSOGNE (Coordinator) ⌚ 10 credits [lecture: 60h, practical work: 60h] 📅 first term 🗨 English
MEMO-Y007	<b>Master Thesis</b> ⌚ 20 credits [mfe/tfe: 240h] 📅 academic year 🗨 English
STAG-Y006	<b>Internship</b>   Yasser El Jasouli (Coordinator) ⌚ 10 credits [work placement: 120h] 📅 academic year 🗨 French