



MA-IREL | 2024-2025

# Master of science in Electrical Engineering

The 2024-2025 programme is subject to change. It is provided for information purposes only.

## Programme mnemonic

MA-IREL

> Focus *electronics and information technologies* : M-IRELE

## Studies level

Master 120 credits

## Learning language

english

## Schedule

office hours

## Studies category / subcategory

Sciences and technics / Sciences and technics

## Campus

Other campus and Solbosch

ated to their field, such as electrotechnics, automatic control, instrumentation, signal processing, microelectronics, telecommunications, real time information technology and mathematics.

## Programme's added value

The aim of the ULB's course in electrical engineering is to maintain as broad a programme as possible over four years and then to offer options enabling students to increase their knowledge of a more specific area.. A 12-week internship can be carried out at the beginning of the second year of the master. Which also has an international dimension through a range of opportunities for students to go on Erasmus exchanges and good contact with the VUB.

## Teaching methods

The pedagogical methods used encourage students to develop cross-cutting skills in project management, for example, the ability to work independently or as part of a team, and strong oral and written communication skills.

## 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->

## Programme objectives

Electrical engineers trained at the ULB are well placed to respond to market needs from technical consultants, companies, administration departments and research centres. They are capable of analysing and setting up complex industrial processes, i.e. measuring physical quantities for electricity and transporting it remotely, drawing up control algorithms, assessing system failure risks and detecting them when they occur, creating human-machine interfaces and measuring the impact of devices they create on other electrical systems and the environment. Their training means that they can contribute to meeting the challenge of supplying constant high-quality electrical energy and of finding the most rational way to use it. Electricity is also an information vector (for data, voice communication and image transfer) in industrial processes and in our daily lives and this information needs to be produced, processed and transported. Electrical engineers possess a solid grounding in areas related to their field, such as electrotechnics, automatic control, instrumentation, signal processing, microelectronics, telecommunications, real time information technology and mathematics.



et-accompagnement/aid-services-and-support-1] for your specific needs.


## International/Openness

Numerous Erasmus possibilities

This Master is part of Bruface (Master of Sc. in Electronics and Information Technology Engineering)

### Contacts

 [polytech@ulb.be](mailto:polytech@ulb.be)

 <https://polytech.ulb.be/fr/les-etudes/masters/electronique-et-telecommunications>

### Jury President

Johan GYSELINCK

### Jury Secretary

Emanuele GARONE



# Master of science in Electrical Engineering

## Focus electronics and information technologies

The Master is defined around 4 axes:

- > Electronics and microelectronics
- > Telecommunication
- > Multimedia
- > Automatic control

### Bloc 1 | M-IRELE | MA-IREL

## Compulsory courses

ELEC-H401	<b>Modulation and coding</b>   Francois HORLIN (Coordinator) ⌚ 5 credits [lecture: 36h, practical work: 24h] 📅 second term 🗨 English
ELEC-H409	<b>Digital architectures and design</b>   Dragomir MILOJEVIC (Coordinator) ⌚ 4 credits [lecture: 12h, practical work: 36h] 📅 first term 🗨 English
ELEC-H415	<b>Communication channels</b>   Philippe DE DONCKER (Coordinator) ⌚ 5 credits [lecture: 24h, tutorial classes: 36h, project: 12h] 📅 second term 🗨 English
ELEC-H417	<b>Communication networks : protocols and architectures</b>   Jean-Michel DRICOT (Coordinator) ⌚ 5 credits [lecture: 36h, practical work: 24h] 📅 first term 🗨 English
ELEC-H473	<b>Microprocessor architecture</b>   Dragomir MILOJEVIC (Coordinator) ⌚ 5 credits [lecture: 24h, practical work: 36h] 📅 second term 🗨 English
ELEC-Y400	<b>Analog electronics</b>   Piet WAMBACQ (Coordinator) ⌚ 5 credits [lecture: 36h, tutorial classes: 24h] 📅 first term 🗨 English
ELEC-Y412	<b>Image processing</b>   Adrian MUNTEANU (Coordinator) ⌚ 5 credits [lecture: 24h, tutorial classes: 18h, practical work: 30h] 📅 second term 🗨 English
ELEC-Y413	<b>Signal theory</b>   Gert VANDERSTEEN (Coordinator) ⌚ 4 credits [lecture: 36h] 📅 first term 🗨 English
ELEC-Y418	<b>Sensors and Microsystem electronics</b>   Maarten Kuijk (Coordinator) ⌚ 5 credits [lecture: 30h, tutorial classes: 30h] 📅 second term 🗨 English
ELEC-Y430	<b>Digital signal processing</b>   Nicolaos DELIGIANNIS (Coordinator) ⌚ 4 credits [lecture: 24h, practical work: 24h] 📅 first term 🗨 English
ELEC-Y503	<b>Measurement and Data Driven Modelling</b>   John LATAIRE (Coordinator) ⌚ 4 credits [lecture: 24h, practical work: 24h] 📅 second term 🗨 English
MATH-H407	<b>Control system design</b>   Emanuele GARONE (Coordinator) ⌚ 5 credits [lecture: 24h, tutorial classes: 12h, practical work: 24h] 📅 first term 🗨 English

### One course chosen from the following

ELEC-Y404 (optional)	<b>Operating systems and security</b>   Bruno Tiago DA SILVA GOMES (Coordinator) ⌚ 4 credits [lecture: 12h, project: 90h] 📅 first and second terms 🗨 English
PROJ-H415 (optional)	<b>Project Electronics and Telecommunication</b>   Francois HORLIN (Coordinator) ⌚ 4 credits [project: 96h] 📅 academic year 🗨 English A choisir parmi : <ul style="list-style-type: none"> <li>&gt; Projet scientifique</li> <li>&gt; Chef d'équipe</li> <li>&gt; CODEPO</li> <li>&gt; ECO Marathon</li> <li>&gt; Plydaire</li> </ul>

# Master of science in Electrical Engineering

## Focus electronics and information technologies

### Bloc 2 | M-IRELE | MA-IREL

## Master Thesis (compulsory)

### Master thesis

MEMO-H503

**Master thesis in Electrical Engineering** | Philippe DE DONCKER (Coordinator), Maarten Kuijk and Roger VOUNCKX

⌚ 24 credits [mfe/tfe: 600h] 📅 academic year 🗨 English

## Options - Block 2

*An alternative chosen from the three following*

### Option nano, opto-electronics and embedded systems

ELEC-H505  
(optional)

**Advanced digital architecture** | Dragomir MILOJEVIC (Coordinator) and Jan Tobias Mühlberg

⌚ 5 credits [lecture: 24h, practical work: 36h] 📅 second term 🗨 English

ELEC-Y411  
(optional)

**High-frequency Electronics and Antenna** | Yves ROLAIN (Coordinator) and Gert VANDERSTEEN

⌚ 5 credits [lecture: 24h, tutorial classes: 18h, project: 36h] 📅 first term 🗨 English

ELEC-Y415  
(optional)

**Software and engineering for embedded systems** | Bruno Tiago DA SILVA GOMES (Coordinator)

⌚ 5 credits [lecture: 20h, tutorial classes: 10h, project: 60h] 📅 second term 🗨 English

ELEC-Y515  
(optional)

**Nano-Electronics Devices & Technologies** | Bertrand Parvais (Coordinator) and Johan STIENS

⌚ 5 credits [lecture: 30h, practical work: 30h] 📅 first term 🗨 English

ELEC-Y548  
(optional)

**Photonics** | Francis BERGHMANS (Coordinator) and Hugo THIENPONT

⌚ 4 credits [lecture: 36h] 📅 first term 🗨 English

*or*

### Option information and communication technology systems

ELEC-H422  
(optional)

**Wireless communication channels** | Philippe DE DONCKER (Coordinator)

⌚ 4 credits [lecture: 24h, practical work: 24h] 📅 second term 🗨 English

ELEC-H423  
(optional)

**Mobile and wireless networks** | Jean-Michel DRICOT (Coordinator)

⌚ 4 credits [lecture: 24h, practical work: 24h] 📅 first term 🗨 English

ELEC-H522  
(optional)

**Digital communications** | Francois HORLIN (Coordinator)

⌚ 4 credits [lecture: 24h, practical work: 24h] 📅 second term 🗨 English

ELEC-Y512  
(optional)

**Computer vision** | David Blinder (Coordinator)

⌚ 4 credits [lecture: 18h, tutorial classes: 12h, project: 36h] 📅 first term 🗨 English

ELEC-Y591  
(optional)

**Machine Learning and Big Data Processing** | Nicolaos DELIGIANNIS (Coordinator) and Adrian MUNTEANU

⌚ 5 credits [lecture: 24h, tutorial classes: 18h, project: 30h] 📅 second term 🗨 English

INFO-Y093  
(optional)

**Image and video technology** | Peter SCHELKENS (Coordinator)

⌚ 3 credits [lecture: 15h, tutorial classes: 30h] 📅 first term 🗨 English

or

## Option measuring, modeling and control

ELEC-H509  
(optional)

**Optimization-based Control Design** | Emanuele GARONE (Coordinator)

⌚ 4 credits [lecture: 24h, practical work: 24h] 📅 first term 🗣 English

ELEC-Y416  
(optional)

**Advanced Measurement and Data Driven Modeling** | John LATAIRE (Coordinator)

⌚ 4 credits [lecture: 24h, tutorial classes: 24h] 📅 first term 🗣 English

ELEC-Y417  
(optional)

**Selected Topics in Nonlinear System Identification** | Yves ROLAIN (Coordinator) and Dries PEUMANS

⌚ 3 credits [lecture: 18h, project: 42h] 📅 first term 🗣 English

ELEC-Y513  
(optional)

**Identification of dynamical systems** | John LATAIRE (Coordinator)

⌚ 5 credits [lecture: 18h, tutorial classes: 30h, project: 30h] 📅 first term 🗣 English

ELEC-Y591  
(optional)

**Machine Learning and Big Data Processing** | Nicolaos DELIGIANNIS (Coordinator) and Adrian MUNTEANU

⌚ 5 credits [lecture: 24h, tutorial classes: 18h, project: 30h] 📅 second term 🗣 English

MATH-H503  
(optional)

**Model-Based and Data-Driven Fault Detection and Isolation** | Michel KINNAERT (Coordinator)

⌚ 3 credits [lecture: 18h, practical work: 18h] 📅 second term 🗣 English

## Electives MA2 including optional internships

*A total of 12 credits chosen from the following*

ELEC-H503  
(optional)

**Artificial organs** | Antoine NONCLERCQ (Coordinator)

⌚ 5 credits [lecture: 24h, practical work: 36h] 📅 second term 🗣 English

ELEC-H504  
(optional)

**Network Security** | Jean-Michel DRICOT (Coordinator)

⌚ 3 credits [lecture: 24h, practical work: 12h] 📅 second term 🗣 English

ELEC-H507  
(optional)

**Photonic communication systems** | Simon-Pierre GORZA (Coordinator)

⌚ 5 credits [lecture: 36h, tutorial classes: 24h] 📅 first term 🗣 English

ELEC-H550  
(optional)

**Embedded System Security** | Jan Tobias Mühlberg (Coordinator)

⌚ 5 credits [lecture: 24h, practical work: 36h] 📅 second term 🗣 English

ELEC-Y516  
(optional)

**Lasers** | Guy VERSCHAFFELT (Coordinator) and Nathalie VERMEULEN

⌚ 4 credits [lecture: 36h, tutorial classes: 12h] 📅 first term 🗣 English

ELEC-Y521  
(optional)

**Laboratories in Photonics Research** | Heidi OTTEVAERE (Coordinator), Nicolas Le Thomas and Wendy Meulebrouck

⌚ 6 credits [lecture: 8h, tutorial classes: 88h] 📅 second term 🗣 English

ELEC-Y531  
(optional)

**Physical Communication** | Dries PEUMANS (Coordinator)

⌚ 6 credits [lecture: 30h, practical work: 60h] 📅 first term 🗣 English

ELEC-Y532  
(optional)

**Telecommunication Networks** | Marnix GOOSSENS (Coordinator)

⌚ 3 credits [lecture: 24h] 📅 first term 🗣 English

ELEC-Y535  
(optional)

**Capita Selecta Telecom** | Gert VANDERSTEEN (Coordinator) and Dries PEUMANS

⌚ 3 credits [lecture: 12h, practical work: 24h] 📅 second term 🗣 English

ELEC-Y540  
(optional)

**Project Computer Engineering** | Bart JANSEN (Coordinator)

⌚ 3 credits [practical work: 36h] 📅 second term 🗣 English

ELEC-Y541  
(optional)

**Multiprocessors and Reconfigurable Architectures** | Abdellah TOUHAFI (Coordinator) and Bruno Tiago DA SILVA GOMES

⌚ 3 credits [lecture: 18h, practical work: 18h] 📅 academic year 🗣 English

ELEC-Y542  
(optional)

**CAE-tools for the Design of Analog Electronic Circuits** | Gert VANDERSTEEN (Coordinator)

⌚ 3 credits [lecture: 12h, practical work: 30h] 📅 first term 🗣 English

ELEC-Y543 (optional)	<b>Industrial Measurement Environments</b>   Yves ROLAIN (Coordinator) ⌚ 4 credits [lecture: 30h, practical work: 12h] 📅 second term 🗨 English
ELEC-Y546 (optional)	<b>Cryptography</b>   Ann DOOMS (Coordinator) ⌚ 3 credits [lecture: 18h, tutorial classes: 24h] 📅 second term 🗨 English
GEST-S421 (optional)	<b>Entrepreneurial ecosystems</b>   Judith BEHRENS (Coordinator) ⌚ 5 credits [lecture: 24h, tutorial classes: 24h] 📅 second term 🗨 English
GEST-Y500 (optional)	<b>Entrepreneurship</b>   Nikolay DENTCHEV (Coordinator) ⌚ 3 credits [lecture: 15h, tutorial classes: 9h, personal assignments: 62h] 📅 first term 🗨 English
INFO-H422 (optional)	<b>Theory of information coding computing and complexity</b>   Nicolas CERF (Coordinator) and Jérémie ROLAND ⌚ 5 credits [lecture: 48h, tutorial classes: 12h] 📅 second term 🗨 English
INFO-H501 (optional)	<b>Pattern recognition and image analysis</b>   Olivier DEBEIR (Coordinator) and Christine DECAESTECKER ⌚ 5 credits [lecture: 36h, practical work: 24h] 📅 second term 🗨 English
INFO-H502 (optional)	<b>Virtual Reality</b>   Gauthier LAFRUIT (Coordinator) ⌚ 5 credits [lecture: 24h, practical work: 24h, project: 12h] 📅 first term 🗨 English
INFO-Y095 (optional)	<b>Voice, image coding, media and systems</b>   Gert VANDERSTEEN (Coordinator) and Leo VAN BIESEN ⌚ 6 credits [lecture: 42h, tutorial classes: 18h] 📅 first term 🗨 English
INFO-Y098 (optional)	<b>Capita selecta multimedia</b>   Colas SCHRETTTER (Coordinator) ⌚ 3 credits [lecture: 24h] 📅 second term 🗨 English
INFO-Y575 (optional)	<b>Cloud Artificial Intelligence Services</b>   Gert VANDERSTEEN (Coordinator) and Lesley De Cruz ⌚ 3 credits [lecture: 8h, tutorial classes: 20h, project: 30h] 📅 first and second terms 🗨 English
INFO-Y576 (optional)	<b>Cloud Machine Learning</b>   Gert VANDERSTEEN (Coordinator) and Lesley De Cruz ⌚ 3 credits [lecture: 8h, tutorial classes: 30h, project: 30h] 📅 first and second terms 🗨 English
MECA-Y502 (optional)	<b>Theory and Practice of Advanced Control</b>   Emanuele GARONE (Coordinator) and Michel KINNAERT ⌚ 4 credits [lecture: 24h, practical work: 24h] 📅 second term 🗨 English
PHYS-Y016 (optional)	<b>Optical materials</b>   Jan DANCKAERT (Coordinator), Kristiaan Neyts and Guy VERSCHAFFELT ⌚ 6 credits [lecture: 30h, tutorial classes: 30h] 📅 first term 🗨 English
STAG-H501 (optional)	<b>Internship (60 days)</b>   Frédéric ROBERT (Coordinator) ⌚ 10 credits [personal assignments: 300h] 📅 first term 🗨 English
STAG-H502 (optional)	<b>Internship (40 days)</b>   Lincy Pyl (Coordinator) ⌚ 6 credits [personal assignments: 180h] 📅 first term 🗨 English

## Modules transversaux

Students have also the opportunity to choose courses among the courses of the 'transversal modules' of the School.

English : LANG-H500

Engineering and society : PROJ-H421 - GEST-H509 - BIME-G5505 - PHYS-F517

Sustainability : GEST-S492 - ENVI-F405 - CHIM-H504 - ENVI-F452 - ENVI-F454 - ELEC-Y514

Finance, accounting, management, marketing, logistics and quality : GEST-S101 - GEST-S318 - GEST-S421 - GEST-Y501 GEST-H501 - GEST-H502

Participation to a summer school : EDUC-H601

*Up to six credits chosen from the following*

BIME-G5505 (optional)	<b>Interfaculty and interdisciplinary program in Healthcare Innovation</b>   Hilde STEVENS (Coordinator) ⌚ 5 credits [lecture: 40h, tutorial classes: 20h] 📅 second term 🗨 English
CHIM-H504 (optional)	<b>Engineering aspects of circular economy</b>   Prakash VENKATESAN (Coordinator) ⌚ 5 credits [lecture: 24h, practical work: 36h] 📅 second term 🗨 English
DROI-C5174 (optional)	<b>Approche interdisciplinaire du droit de la propriété intellectuelle/Interdisciplinary Approach to In</b>   Julien CABAY (Coordinator) ⌚ 5 credits [lecture: 24h] 📅 first term 🗨 English/French

EDUC-H601 (optional)	<b>Summer School</b>   Johan GYSELINCK (Coordinator) ⌚ 5 credits [personal assignments: 5h] 📅 academic year 🗣 English
ELEC-Y514 (optional)	<b>Sustainability : an interdisciplinary Approach</b>   Cathy MACHARIS (Coordinator) and Waldo Galle ⌚ 6 credits [lecture: 36h, practical work: 24h, personal assignments: 100h] 📅 academic year 🗣 English
ENVI-F405 (optional)	<b>Climat: sciences et politiques</b>   Frank PATTYN (Coordinator) and Louise Knops ⌚ 5 credits [lecture: 40h] 📅 second term 🗣 French
ENVI-F452 (optional)	<b>Environmental impact analysis and management</b>   Wouter ACHTEN (Coordinator) ⌚ 5 credits [lecture: 24h, practical work: 12h, project: 24h] 📅 first term 🗣 English/French
ENVI-F454 (optional)	<b>Energie: Société et environnement</b>   Michel HUART (Coordinator) and Nadine MATTIELLI ⌚ 5 credits [lecture: 30h, practical work: 12h, project: 24h] 📅 first term 🗣 French
GEST-H501 (optional)	<b>Logistics Engineering and Management</b>   Alassane Ballé NDIAYE (Coordinator) ⌚ 5 credits [lecture: 12h, tutorial classes: 36h] 📅 first term 🗣 English
GEST-H502 (optional)	<b>Supply Chain Performance Analytics</b>   Alassane Ballé NDIAYE (Coordinator) ⌚ 5 credits [lecture: 12h, tutorial classes: 36h, personal assignments: 12h] 📅 second term 🗣 English
GEST-H509 (optional)	<b>Ethique de l'ingénieur</b> ⌚ 3 credits [lecture: 12h, tutorial classes: 12h, practical work: 12h] 📅 second term 🗣 French
GEST-S101 (optional)	<b>Comptabilité financière</b>   Laurent GHEERAERT (Coordinator) and Gilles GEVERS ⌚ 5 credits [lecture: 36h, tutorial classes: 8h] 📅 second term 🗣 French
GEST-S318 (optional)	<b>Introduction to theoretical finance</b>   Laurent GHEERAERT (Coordinator) ⌚ 5 credits [lecture: 24h, tutorial classes: 24h] 📅 second term 🗣 English
GEST-S421 (optional)	<b>Entrepreneurial ecosystems</b>   Judith BEHRENS (Coordinator) ⌚ 5 credits [lecture: 24h, tutorial classes: 24h] 📅 second term 🗣 English
GEST-S492 (optional)	<b>Energy policy, sustainability &amp; management</b>   Adel EL Gammal (Coordinator), Julien BLONDEAU and Michel HUART ⌚ 5 credits [lecture: 36h, seminars: 24h] 📅 first term 🗣 English
GEST-Y501 (optional)	<b>Business Management and Entrepreneurship</b>   Marc GOLDCHSTEIN (Coordinator) ⌚ 3 credits [lecture: 33h] 📅 first term 🗣 English
LANG-H500 (optional)	<b>English for professional purposes</b>   Alexander CORNFORD (Coordinator) ⌚ 5 credits [tutorial classes: 48h, personal assignments: 12h] 📅 first and second terms 🗣 English
PROJ-H421 (optional)	<b>Projet polydaire: expériences didactiques innovantes pour le secondaire</b>   Simon-Pierre GORZA (Coordinator) ⌚ 5 credits [project: 150h] 📅 academic year 🗣 French