ELEC2M - Introduction

Introduction

Introduction

This Master's degree offers you:

- Diverse professional opportunities in the industrial sector and in the multiple applications of electricity and its related fields;

- Learning how to approach a project;

- Immersion in research laboratories and high technology;

- A large choice of majors;

- The possibility to complete a part of your coursework or internship abroad (in Europe and elsewhere in the world).

Your profile

You:

- have solid skills in the field of electrical sciences and are capable of seeing a job through to the end;

- Wish to develop the skills that will allow you to meet future technological challenges in the scientific and technical fields linked to electricity and its applications;

- Want to design, model, carry out and validate projects by way of experiments, devices, equipment and complex systems;

- Envisage a career in research or industry.

Your programme

This Master's degree offers you:

- Mastery of mathematical and physical methods related to electricity (circuits and measures, electromagnetics, physical electronics);

- Advanced education in electronics, electromagnetics, communication, information technology, mathematics and system design;

- Specialisations in electronic systems, telecommunication, microwaves, information and signal processing, biomedicine, cryptography, electronics, MEMS receptors, nanotechnology and photovoltaic techniques.

2.2 Model a problem and design one or several original technical solutions corresponding to the assignment specifications (i.e. analysis of existing case studies) and projects (based on new specifications).

2.3 Evaluate and classify solutions in light of the criteria found in the specifications, principally in the context of interdisciplinary projects and specific courses (for example MEMS design or micro-nano-manufacturing technologies).

2.4 Implement and test a solution in the form of a mock-up, a prototype or a numerical model in the context of achieving experimental interdisciplinary projects and for certain classes (for example, micro-nano-manufacturing technologies) as well as for numerical modeling (such as MEMS design).

2.5 Formulate recommendations to improve the operation of the solution under review.

3.Organize and carry out research projects in order to learn about a physical phenomenon or a new problem relating to electricity. (Axis 3)

3.1 When confronted with a new problem, explore the field in question by gathering necessary information through the various available resources (library, scientific articles, Internet, research assistants, industry).

3.2 Suggest a representative mathematical model of an underlying phenomenon and then by working either in a laboratory or via a software platform, create a device or programme that allows the experimental or virtual simulation of the system's behaviour (all the while taking influential parameters into account).

3.3 Write a summary report about the technical aspects of a study in a concise scientific manner; provide an overview of experimental lab results in written reports and suggest possible interpretations of the results.

4.As part of a team, carry out a multidisciplinary project keeping in mind its objectives, allocated resources and relevant constraints. (Axis 4)

4.1 Frame and explain project objectives taking into account the issues and constraints (emergencies, quality, resources, budget) that characterise the project.

4.2 Work collectively to create a project schedule and to determine team member roles in order to successfully carry out the project. This may include the organisation and planning of individual work and that of the team as well as determining the intermediate steps, division of labour, necessary documents, work schedule, and how to integrate your own investigative work into that of the group.

4.3 Work in a multidisciplinary environment in collaboration with other individuals who may hold different points of view or with experts possessing different specialisations all the while being able to put things in perspective in order to overcome any difficulties or conflicts in the team.

4.4 Make team decisions when necessary whether they be about technical solutions or about the division of labour to complete the project.

5.Communicate effectively (speaking or writing in French or a foreign language) with the goal of carrying out assigned projects. (Axis 5)

5.1 Identify the clients' needs: take up a sizable problem regarding an electronic component or system or communicate the functionalities of an algorithm or software program.

5.2 Present your arguments and convince your interlocutors (technicians, colleagues, clients, superiors) by adopting their language; from the laboratory technician to the research engineer or doctoral researcher, notably in the context of graduation projects (TFE) and experiments or APE with access to technical infrastructures or even industry internships.

5.3 Communicate through graphics and diagrams: interpret a diagram, present work results, structure information.

5.4 Read and analyse different technical documents related to the profession (standards, drawings, specifications); for example, circuit

the minimum number of credits required for the approval of their diploma as well as for the approval of their major (in order to include their academic distinctions in the diploma supplement).

These types of programmes will be submitted for approval by the relevant Master's degree programme commission.

ELEC2M Programme

Detailed programme by subject

CORE COURSES [32.0]

○ Mandatory
⊗ Optional
△ Not offered in 2024-2025
⊘ Not offered in 2024-2025 but offered the following year
⊕ Offered in 2024-2025 but not the following year
△ ⊕ Not offered in 2024-2025 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 (objectives, methods, evaluation...)

Year

		1	2

○ LELEC2990	Graduation project/End of studies project
	The graduation project can be written and presented in French or English, in consultation with the supervisor. It may be accessible to exchange students by prior agreement between the supervisors and/or

PROFESSIONAL FOCUS [30.0]

○ Mandatory
❁ Optional
△ Not offered in 2024-2025
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△ ⊕ Not offered in 2024-2025 or the following year
🟨 Activity with requisites
🌐 Open to incoming exchange students
🌐 Not open to incoming exchange students

PROFESSIONAL FOCUS [30.0]

Year

MAJOR IN COMMUNICATION SYSTEMS

The objectives of the telecommunications major are: Present the general organisation of communication networks and systems (wired or wireless) Present communications from the framework of information theory covering data compression (source-coding) and replication (channel coding) Present the different elements of modern modems, as well as systematic design methods for detection blocks and required estimates Offer a range of design tools for modems and systems Through this major, students will master important concepts about IP networks, GSM, UMTS and DSL access networks as well as new communications methods.

- Mandatory
- Optional
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- ⊘ Not offered in 2024-2025 but offered the following year
- ⊕ Offered in 2024-2025 but not the following year
- △ ⊕ Not offered in 2024-2025 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 (objectives, methods, evaluation...)

Year

| 1 | 2 |

● Content:

● Compulsory courses in communication systems
The student shall select at least 15 credits among:

				Year 1	Year 2
✿ LELEC2880	Estimation and communication theory	Jérôme Louveaux (coord.) Luc Vandendorpe	[EN] [q2] [30h+30h] [5 Credits] 🌐 > *French-friendly*	x	x
✿ LELEC2796	Wireless communications	Claude Oestges (coord.) Luc Vandendorpe	[EN] [q1] [30h+30h] [5 Credits] 🌐 > *French-friendly*	x	x
✿ LELEC2350	Electromagnetic waves	Christophe Craeye	[EN] [q2] [30h+30h] [5 Credits] 🌐 > *French-friendly*	x	x
✿ LINFO2147	Communication networks	Cristel Pelsser		x	x
✿ LELEC2348	Information theory and coding				

MAJOR IN INFORMATION AND SIGNAL PROCESSING

The objective of this major is to provide students with new tools used to understand graphs, discrete mathematics, matrices, and optimisation. For example, students may use these tools when solving communication problems, analysing and recognising data and signals, cryptography and system identification.

O Mandatory
⚹ Optional
△ Not offered in 2024-2025
⊘ Not offered in 2024-2025 but offered the following year
⊕ Offered in 2024-2025 but not the following year
△ ⊕ Not offered in 2024-2025 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 (objectives, methods, evaluation...)

				Year	
				1	2

O **Content:**

O **Compulsory courses in information and signal processing**

				Year 1	Year 2
O LELEC2870	Machine learning : regression, deep networks and dimensionality reduction	John Lee John Lee (compensates Michel Verleysen)	[EN] [q1] [30h+30h] [5 Credits] 🌐 > *French-friendly*	x	x
O LELEC2885	Image processing and computer vision	Christophe De Vleeschouwer (coord.) Laurent Jacques	[EN] [q1] [30h+30h] [5 Credits] 🌐 > *French-friendly*	x	x
O LELEC2348	Information theory and coding	Jérôme Louveaux Benoît Macq Olivier Pereira	[EN] [q2] [30h+15h] [5 Credits] 🌐 > *French-friendly*	x	x
O LINMA1510	Linear Control	Gianluca Bianchin	[EN] [q1] [30h+30h] [5 Credits] 🌐 > *French-friendly*	x	x

⚹ **Elective courses in information and signal processing**

				Year 1	Year 2
⚹ LELEC2880	Estimation and communication theory	Jérôme Louveaux (coord.) Luc Vandendorpe	[EN] [q2] [30h+30h] [5 Credits] 🌐 > *French-friendly*	x	x
⚹ LGBIO2050	Medical Imaging	Greet Kerckhofs John Lee Benoît Macq	[EN] [q1] [30h+30h] [5 Credits] 🌐 > *French-friendly*	x	x
⚹ LINFO2262	Machine Learning :classification and evaluation	Pierre Dupont	[EN] [q2] [30h+30h] [5 Credits] 🌐 > *French-friendly*	x	x
⚹ LINMA1691	Discrete mathematics - Graph theory and algorithms	Jean-Charles Delvenne Jean-Charles Delvenne (compensates Vincent Blondel)	[FR] [q1] [30h+22.5h] [5 Credits] 🌐	x	x
⚹ LINMA1702	Optimization models and methods I	François Glineur	[FR] [q2] [30h+22.5h] [5 Credits] 🌐	x	x
⚹ LINMA2111	Discrete mathematics II : Algorithms and complexity	Jean-Charles Delvenne Jean-Charles Delvenne (compensates Vincent Blondel)	[EN] [q1] [30h+22.5h] [5 Credits] 🌐 > *French-friendly*	x	x
⚹ LINMA2380	Matrix computations	Raphaël Jungers	[EN] [q1] [30h+22.5h] [5 Credits] 🌐 > *French-friendly*	x	x
⚹ LINMA2875	System Identification	Gianluca Bianchin	[EN] [q2] [30h+30h] [5 Credits] 🌐 > *French-friendly*	x	x
⚹ LMAT2450	Cryptography	Olivier Pereira	[EN] [q1] [30h+15h] [5 Credits] 🌐 > *French-friendly*	x	x

MAJOR IN CRYPTOGRAPHY AND INFORMATION SECURITY

As with most of the other Master's degree programmes in electrical engineering, computer science and applied mathematics, this major provides students with the knowledge to answer questions about information security with algorithms and mathematics as well as design and solve problems in the context of electronic circuits and information systems.

⚪ Mandatory
✖ Optional
△ Not offered in 2024-2025
⊘ Not offered in 2024-2025 but offered the following year
⊕ Offered in 2024-2025 but not the following year
△ ⊕ Not offered in 2024-2025 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 (objectives, methods, evaluation...)

Year
1 2

⚪ *Content:*

✖ **Elective courses**
In order to validate this option INFO and MAP students have to take at least 20 credits and the ELEC, DATE and DATI students have to take at least 15 credits among:

✖ LELEC2760	Secure electronic circuits and systems		

MAJOR IN ADVANCED ELECTRONIC MATERIALS AND DEVICES

O Mandatory
⊗ Optional
△ Not offered in 2024-2025
⊘ Not offered in 2024-2025 but offered the following year
⊕ Offered in 2024-2025 but not the following year
△ ⊕ Not offered in 2024-2025 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 (objectives, methods, evaluation...)

Year
🟨

DISCIPLINARY ELECTIVES COURSES

O Mandatory
⊗ Optional
△ Not offered in 2024-2025
⊘ Not offered in 2024-2025 but offered the following year
⊕ Offered in 2024-2025 but not the following year
△ ⊕ Not offered in 2024-2025 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 (objectives, methods, evaluation...)

				Year 1	2

O *Content:*

				1	2
O LELEC2520	Electrical power systems	Emmanuel De Jaeger	EN [q1] [30h+30h] [5 Credits] 🌐 > *French-friendly*	x	x
O LELEC2910	Antennas and propagation	Christophe Craeye (coord.) Claude Oestges	EN [q1] [30h+30h] [5 Credits] 🌐 > *French-friendly*	x	x
O LELEC2330	Opto-electronic and power devices	Denis Flandre Laurent Francis (coord.)	EN [q1] [30h+30h] [5 Credits] 🌐 > *French-friendly*	x	x

OPTIONS ET COURS AU CHOIX EN CONNAISSANCES SOCIO-ÉCONOMIQUES

BUSINESS RISKS AND OPPORTUNITIES

This major is not available in English and may not be taken at the same time as the major « Interdisciplinary program in entrepreneurship – CPME ».

O Mandatory
⊗ Optional
△ Not offered in 2024-2025
⊘ Not offered in 2024-2025 but offered the following year
⊕ Offered in 2024-2025 but not the following year
△ ⊕ Not offered in 2024-2025 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 (objectives, methods, evaluation...)

				Year 1	2

O *Content:*

				1	2
O LEPL2211	Business issues introduction	Benoît Gailly	EN [q2] [30h] [3 Credits] 🌐 > *French-friendly*	x	x
O LEPL2212	Financial performance indicators	Anne-Catherine Provost	EN [q2] [30h+5h] [4 Credits] 🌐 > *French-friendly*	x	x
O LEPL2214	Law, Regulation and Legal Context	Vincent Cassiers Werner Derycke	FR [q1] [30h+5h] [4 Credits] 🌐	x	x

O One course between
From 3 to 5credit(s)

				1	2
⊗ LEPL2210	Ethics and ICT	Axel Gosseries Olivier Pereira	EN [q2] [30h] [3 Credits] 🌐 > *French-friendly*		

Year
1 2

✿ Cours en marketing

✿ MGEST1108	Marketing	Nadia Sinigaglia	FR [q2] [45h+20h] [6 Credits] ⊕	x	x
✿ MLSMM2136	Trends in Digital Marketing	Ingrid Poncin	FR [q2] [30h] [5 Credits] ⊕		x
✿ MLSMM2134	e-Consumer Behavior	Karine Charry	FR [q2] [30h] [5 Credits] ⊕		x

✿ Cours en Sourcing and Procurement

✿ LLSMS2036	Supply Chain Procurement	Per Joakim Agrell Antony Paulraj	EN [q1] [30h] [5 Credits] ⊕	x	x
✿ LLSMS2038	Procurement Organisation and Scope	Constantin Blome Canan Kocabasoglu Hillmer (compensates Constantin Blome)	EN [q1] [30h] [5 Credits] ⊕	x	x
✿ LLSMS2037	Sourcing Strategy	Constantin Blome Michael Henke	EN [q1] [30h] [5 Credits] ⊕	x	x

✿ Alternative to the major in business risks and opportunities for computer science students

Computer science students who have already taken courses in this field while pursuing their Bachelor's degree may choose between 16-20 credits from the courses offered in the management minor for computer sciences.

MAJOR IN INTERDISCIPLINARY PROGRAM IN ENTREPRENEURSHIP - INEO

Commune à la plupart des masters de l'EPL, cette option a pour objectif de familiariser l'étudiant·e avec les spécificités de l'entreprenariat et de la création d'entreprise afin de développer chez lui les aptitudes, connaissances et outils nécessaires à la création d'entreprise.

Cette option rassemble des étudiants de différentes facultés en équipes interdisciplinaires afin de créer un projet entrepreneurial. La formation interdisciplinaire en entrepeneuriat (INEO) est une option qui s'étend sur 2 ans et s'intègre dans plus de 30 Masters de 9 facultés/écoles de l'UCLouvain. Le choix de l'option INEO implique la réalisation d'un mémoire interfacultaire (en équipe) portant sur un projet de création d'entreprise. L'accès à cette option, ainsi qu'à chacun des cours, est limité aux étudiant·es sélectionnés sur dossier. Toutes les informations sur https://uclouvain.be/fr/etudier/ineo.

L'étudiant.e qui choisit de valider cette option doit sélectionner au minimum 20 crédits et au maximum 25 crédits. Cette option n'est pas accessible en anglais et ne peut être prise simultanément avec l'option « Enjeux de l'entreprise ».

O Mandatory
⊗ Optional
△ Not offered in 2024-2025
⊘ Not offered in 2024-2025 but offered the following year
⊕ Offered in 2024-2025 but not the following year
△ ⊕ Not offered in 2024-2025 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 (objectives, methods, evaluation...)

				Year	
				1	2

o Content:

o Required courses

					1	2
O LINEO2001	Théorie de l'entrepreneuriat	Frank Janssen	[FR] [q1] [30h+20h] [5 Credits] 🌐		x	
O LINEO2002	Aspects juridiques, économiques et managériaux de la création d'entreprise	Yves De Cordt Marine Falize	[FR] [q1] [30h+15h] [5 Credits] 🌐		x	
O LINEO2003	Plan d'affaires et étapes-clefs de la création d'entreprise *Les séances du cours LINEO2003 sont réparties sur les deux blocs annuels du master. L'étudiant doit les suivre dès le bloc annuel 1, mais ne pourra inscrire le cours que dans son programme de bloc annuel 2.*	Frank Janssen	[FR] [q2] [30h+15h] [5 Credits] 🌐			x
O LINEO2004	Séminaire d'approfondissement en entrepreneuriat	Frank Janssen	[FR] [q2] [30h+15h] [5 Credits] 🌐		x	

⊗ Prerequisite courses

Student who have not taken management courses during their previous studies must enroll in LINEO2021.

					1	2
O LINEO2021	Financer son projet	Philippe Grégoire Olivier Vercruysse	[FR] [q2] [30h+15h] [5 Credits] 🌐		x	

COURS AU CHOIX EN CONNAISSANCES SOCIO-ÉCONOMIQUES

 Mandatory
 Optional
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 Activity with requisites
 Open to incoming exchange students
 Not open to incoming exchange students
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Click on the course title to see detailed informations (objectives, methods, evaluation...)

Year

1 2

 Content:

				Year 1	2
LFSA2995	Company Internship	Dimitri Lederer Jean-Pierre Raskin	FR [q1+q2] [30h] [10 Credits]	x	x
LELEC2590	Seminars in electronics and communications	Denis Flandre Isabelle Huynen Jérôme Louveaux	EN [q2] [30h] [3 Credits] > *French-friendly*	x	x
LEPL2021	Innovation classes for transition and sustainable development	Benoît Macq Xavier Marichal (compensates Benoît Raucent)	EN [q1] [30h+15h] [5 Credits]	x	x

OTHER ELECTIVE COURSES

OTHER ELECTIVE COURSES

 Mandatory
 Optional
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⊕ Offered in 2024-2025 but not the following year
△ ⊕ Not offered in 2024-2025 or the following year
 Activity with requisites
 Open to incoming exchange students
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Year

1 2

 Content:

Year

1 2

| ⊗ LESPA2600 | Vocational Induction Seminar - Spanish (B2.2/C1) | Paula Lorente Fernandez (coord.) | [q1] [30h] [3 Credits] | x | x |

| ⊗ LESPA2601 | Vocational Induction Seminar - Spanish (B2.2/C1) | | | | |

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ELEC2M - Information

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Access Requirements

Master course admission requirements are defined by the French Community of Belgium Decree of 7 November 2013 defining the higher education landscape and the academic organisation of courses.

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

Unless explicitly mentioned, the bachelor's, master's and licentiate degrees listed in this table or on this page are to be understood as those issued by an institution of the French, Flemish or German-speaking Community, or by the Royal Military Academy.

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

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SUMMARY

Specific access requirements

This programme is taught in English with no prerequisite in French. A certificat is required for the holders of a non-Belgian degree, see selection criteria of the Accès on the file.

University Bachelors

Diploma	Special Requirements	Access	Remarks
UCLouvain Bachelors			

			degree may have an adapted master programme.
Bachelor in Engineering	For others institutions	Access based on application	See personalized access

Non university Bachelors

> Find out more about links to the university

Holders of a 2nd cycle University degree

Non university Bachelors

> Find out more about links to the university

Teaching method

Methods that promote multidisciplinary studies

The Master's degree programme in electrical engineering provides students with considerable technical and professional knowledge. It offers in-depth knowledge of the different subjects covered in the Bachelor's degree programme on electricity and expected of electrical engineers (electronics, electromagnetics, communication, system design). It is open to other fields such as

- Computer science, applied mathematics and automation (the latter having been studied in the Bachelor's degree programme for students enrolled in the electricity major); achieved through 32 credits of required common courses
- Electrotechnology, photovoltaic technologies, nanotechnologies, MEMS and NEMS, computer science and communication, biomedical engineering, cryptography and information security via specialised majors.

Regarding elective courses, the programme commission encourages students to broaden their training by choosing classes organised by other programme commissions. Thus the majority of suggested majors are MAPR, INGI, INMA or MATH.

Also of note are the dozen ELEC classes that are open to students enrolled in other Master's degree programmes on the condition that they have taken introductory classes on electric circuits and electronics or complementary classes in electricity.

To encourage interdisciplinary coursework, there are interdisciplinary projects regrouping a series of subjects from the common core curriculum.

Diverse learning situations

The diverse learning situations include lectures, practical work and projects based on the following approach: modelling-simulation-realisation -experimental validation. Depending on the case, students are encouraged to work either in groups or individually. Of note is the interdisciplinary project that requires students to design, model, carry out and test a system. This project draws upon the entirety of their knowledge in the field of their final specialisation as well completes the work begun during their undergraduate studies (ELEC Bachelor's degree programme).

Furthermore, in certain subjects, e-Learning permits students to educate themselves at their own pace and carry out virtual experiments.

This variety of learning situations help students to learn in an iterative and progressive manner, all the while developing their autonomy, organisational abilities, as well as time management and communication skills. Modern information technologies (materials, software, networks) are made available to students.

For example, the major in business creation is based on an interactive approach that emphasizes problem-based learning. Throughout the programme, students enrolled in this major must carry out group work as part of multidisciplinary teams. Their interdisciplinary thesis or graduation project permits groups of three students, ideally from different academic departments, to collaborate on a business creation proposal.

The graduation project aims for the most part to integrate students into research teams at the Institute.

Thus, teaching activities are supplemented by research activities and serve as a starting point for the recruitment of researchers (often a