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.

ELEC2M - Teaching profile

Learning outcomes

An essential challenge in the training of electrical engineers is the wide variety of elements that must be mastered, which range from

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 or component data sheets, communication protocols, electrical standards.
5.5 Draft a document that takes into account contextual requirements and the target audience: the specifications for an industrial project, the minutes for a project meeting, internship reports, graduation projects (TFE), etc.
5.6 Use modern communication techniques to give scientific and/or technical oral presentations in French and in English and respond to diverse questions (general or specific) generated by your presentation.

6.Demonstrate rigor, openness and critical and ethical awareness in your work: validate the socio-technical relevance of a hypothesis or a solution. (Axis 6)

6.1 Rigorously apply the field's standards (terms, units of measure, quality standards and security).

6.2 Find solutions that go beyond strictly technical issues by considering sustainable development and the socio-economic ethics of a project (for example, in the fields of photovoltaic cells or biomedical applications)

6.3 Demonstrate critical awareness of a technical solution in order to verify its robustness and minimize the risks that may occur during implementation. For example, the development of a solution that impacts work conditions or users' life in the biomedical field

6.4 Evaluate the knowledge necessary to carry out a project and independently include knowledge that has not been addressed explicitly in the course programme.

Programme structure

The Master's degree program is comprised of:

- a core curriculum (32 credits)
- a final specialisation (30 credits)
- one or more major or elective courses listed below

The graduation project is normally completed during the second year. However, students opt to complete the project in either the first or second year so long as they have fulfilled the necessary prerequisites. This is particularly the case for students who have completed part of their education abroad.

If during the student's previous studies, he or she has already taken a course that is part of the programme (either required or elective) or they have participated in an academic activity that is approved by the programme commission, the student may count this activity toward their graduation requirements (but only if they respect programme rules). The student will also verify that he/she has obtained

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

PROFESSIONAL FOCUS [30.0]

- 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, ...)

				Year 1	2
⊠ LELME2311	Physics of Electromechanical Converters	Bruno Dehez	EN [q2] [30h+30h] [5 Credits] *> French-friendly*	x	x
⊠ LELEC2595	Electrical power systems dynamics and quality of supply				

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.

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- Activity with requisites
- 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:

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.

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- Activity with requisites
- Open to incoming exchange students
- Not open to incoming exchange students

[FR]

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
- △ ⊕

DISCIPLINARY ELECTIVES COURSES

- 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

				Year 1	Year 2
Cours en marketing					
MGEST1108	Marketing	Nadia Sinigaglia	FR [q2] [45h+20h] [6 Credits]	x	x
	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 course Q q Bcoursei coy3rsei coy3rdadyile pseiCoi coy3rdadyile pseiCoi coy3rdadyile pseiCoi coy

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 ».

- Mandatory
- Optional
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- Activity with requisites
- Open to incoming exchange students
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Click on the course title to see detailed informations (objectives, methods, evaluation...)

Content:

				Year 1	Year 2
Required courses					
LINEO2001	Théorie de l'entrepreneuriat	Frank Janssen	FR [q1] [30h+20h] [5 Credits]	x	
LINEO2002	Aspects juridiques, économiques et managériaux de la création d'entreprise	Yves De Cordt Marine Falize	FR [q1] [30h+15h] [5 Credits]	x	
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
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.					
LINEO2021	Financer son projet	Philippe Grégoire Olivier Vercruysse	FR [q2] [30h+15h] [5 Credits]	x	

COURS AU CHOIX EN CONNAISSANCES SOCIO-ÉCONOMIQUES

- Mandatory
- Optional
- Not offered in 2024-2025
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Year
1 2

Content:

				Year 1	2
⊠ LESPA2600	Vocational Induction Seminar - Spanish (B2.2/C1)	Paula Lorente Fernandez (coord.)	ES [q1] [30h] [3 Credits]	x	x
⊠ LESPA2601	Vocational Induction Seminar - Spanish (B2.2/C1)				

Course prerequisites

The **table** below lists the activities (course units, or CUs) for which there are one or more prerequisites within the programme, i.e. the programme CU for which the learning outcomes must be certified and the corresponding credits awarded by the jury before registering for that CU.

These activities are also identified **in the detailed programme**: their title is followed by a yellow square.

Prerequisites and student's annual programme

As the prerequisite is for CU registration puposes only, there are no prerequisites within a programme year. Prerequisites are defined between CUs of different years and therefore influence the order in which the student will be able to register for the programme's CUs.

In addition, when the jury validates a student's individual programme at the beginning of the year, it ensures its coherence, meaning that it may:

- require the student to combine registration in two separate CUs which it considers necessary from a pedagogical point of view.
- transform a prerequisite into a corequisite if the student is in the final year of a degree course.

For more information, please consult the Academic Regulations and Procedures.

 # Prerequisities list

LELEC2570 "Synthesis of digital integrated circuits" has prerequisite(s) LELEC2531

- LELEC2531 - Digital electronic systems

LELEC2650 "Synthesis of analog integrated circuits" has prerequisite(s) LELEC2532

- LELEC2532 - Analog electronic systems

The programme's courses and learning outcomes

For each UCLouvain training programme, a reference framework of learning outcomes specifies the the skills expected of every graduate on completion of the programme. Course unit descriptions specify targeted learning outcomes, as well as the unit's contribution to reference framework of learning outcomes.

ELEC2M - Information

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.

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	

> Holders 12.8000019 283.70401001 Tm [(> Access based on validation of professional experience)] TJ 0 g /F5 8 Tf 1 0 0 -1 8.39

			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

Diploma	Special Requirements	Access	Remarks
"Licenciés"			
Masters			
Master in Engineering		Direct access	

Holders of a non-University 2nd cycle degree

> 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
-