

**At Louvain-la-Neuve - 120 credits - 2 years - Day schedule - In English**Dissertation/Graduation Project : **YES** - Internship : **optional**Activities in English: **YES** - Activities in other languages : **optional**Activities on other sites : **optional**Main study domain : **Sciences de l'ingénieur et technologie**Organized by: **Louvain School of Engineering (EPL)**Programme acronym: **ELEC2M** - Francophone Certification Framework: 7**Table of contents**

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## ELEC2M - Introduction

### Introduction

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#### 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

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 2023-2024
- ⊙ Not offered in 2023-2024 but offered the following year
- ⊕ Offered in 2023-2024 but not the following year
- △ ⊕ 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 (objectives, methods, evaluation...)

				Year	
				1	2
● LELEC2990	<a href="#">Graduation project/End of studies project</a> <i>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 the two universities.</i>		EN [q1+q2] [] [25 Credits] 🌐		x
● LELEC2102	<a href="#">Project in Electrical Engineering: Integration of wireless embedded sensing systems</a> <i>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 the two universities.</i>	David Bol (coord.) Laurent Jacques Jérôme Louveaux François-Xavier Standaert	EN [q1] [22.5h+22.5h] [5 Credits] 🌐 > French-friendly	x	x
● LEPL2020	<a href="#">Professional integration work</a> <i>Les modules du cours LEPL2020 sont organisés sur les deux blocs annuels du master. Il est fortement recommandé à l'étudiant.e de les suivre dès le bloc annuel 1, mais il.elle ne pourra inscrire le cours qu'au plus tôt l'année où il.elle présente son travail de fin d'études.</i>	Myriam Banaï Francesco Contino (coord.) Delphine Ducarme Jean-Pierre Raskin	EN [q1+q2] [30h+15h] [2 Credits] 🌐 > French-friendly	x	x

## PROFESSIONAL FOCUS [30.0]

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- Mandatory
  - ✘ Optional
  - △ Not offered in 2023-2024
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  - ⊕ Offered in 2023-2024 but not the following year
  - △ ⊕ Not offered in 2023-2024 or the following year
  - Activity with requisites
  - 🌐 Open to incoming exchange students
  - 🌐 Not open to incoming exchange students
- 
- [FR]ents

## OPTIONS

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L'étudiant-e complète son programme avec des options et/ou des cours au choix.

Dans la rubrique "Options et cours au choix en ingénieur civil électricien", l'étudiant-e doit sélectionner obligatoirement minimum 30 crédits parmi les cours repris dans les options et/ou les cours au choix.

Dans la rubrique "Options et cours au choix en connaissances socioéconomiques", l'étudiant-e valide une des deux options ou choisit obligatoirement au minimum 3 crédits parmi les cours au choix ou les cours de l'option en enjeux de l'entreprise.

### Majors in electrical engineering

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- > [Major in electrotechnics and electrical energy](#) [ en-prog-2023-elec2m-lelec221o ]
- > [Major in communication systems](#) [ en-prog-2023-elec2m-lelec222o ]
- > [Major in information and signal processing](#) [ en-prog-2023-elec2m-lelec224o ]
- > [Major in electronic circuits and systems](#) [ en-prog-2023-elec2m-lelec227o ]
- > [Major in cryptography and information security](#) [ en-prog-2023-elec2m-lelec235o ]
- > [Major in advanced electronic materials and devices](#) [ en-prog-2023-elec2m-lelec236o ]
- > [Disciplinary electives courses](#) [ en-prog-2023-elec2m-lelec237o ]

### Options et cours au choix en connaissances socio-économiques

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- > [Business risks and opportunities](#) [ en-prog-2023-elec2m-lelec230o ]
- > [Major in Interdisciplinary Program in Entrepreneurship - INEO](#) [ en-prog-2023-elec2m-lelec231o ]
- > [Cours au choix en connaissances socio-économiques](#) [ en-prog-2023-elec2m-lelec200o ]

### Other elective courses

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- > [Other elective courses](#) [ en-prog-2023-elec2m-lelec952o ]

## MAJORS IN ELECTRICAL ENGINEERING

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### MAJOR IN ELECTROTECHNICS AND ELECTRICAL ENERGY

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The objective of this major is to provide students with knowledge in electromechanics and control. At the end of this major, the students will have acquired a basic training in power electronics and electrical energy networks. They will master the main aspects related to the use of electricity as an energy vector.

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- 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:

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				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	Emmanuel De Jaeger	EN [q2] [30h+30h] [5 Credits]  > French-friendly	x	x
⊗ LELEC2753	Electrical power systems: advanced topics and smart grids	Emmanuel De Jaeger	EN [q2] [30h+15h] [5 Credits]  > French-friendly	x	x
⊗ LENVI2007	Renewable energy sources	Emmanuel De Jaeger Patrick Gerin (coord.) Hervé Jeanmart			



## ***MAJOR IN COMMUNICATION SYSTEMS***

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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.

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## MAJOR IN ELECTRONIC CIRCUITS AND SYSTEMS

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The objective of the major in circuits and electronics systems (which it shares with other Master's degree programmes in electrical engineering) is to introduce students to techniques of system design, computer simulation, manufacturing and experimental classification of electronic circuit components both numerical and analogue as well as the mixed systems associated with these components. Emphasis is placed on the practical applications necessary to carry out projects.

○ Mandatory

⊗ Optional

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⊖ Not offered in 2023-2024 but offered the following year

⊕ Offered in 2023-2024 but not the following year

△ ⊕ Not offered in 2023-2024 or the following year

■ Activity with requisites

🌐 Open to incoming exchange students

🚫 Not open to incoming exchange students

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## 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'entrepreneuriat 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 entrepreneuriat (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> (<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
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- △ Not offered in 2023-2024
- ⊖ Not offered in 2023-2024 but offered the following year
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Click on the course title to see detailed informations (objectives, methods, evaluation...)

Year

1 2

### Content:

#### Required courses

○ LINEO2001	<a href="#">Théorie de l'entrepreneuriat</a>	<a href="#">Frank Janssen</a>	FR [q1] [30h+20h] [5 Credits] 🌐	x
○ LINEO2002	<a href="#">Aspects juridiques, économiques et managériaux de la création d'entreprise</a>	<a href="#">Yves De Cordt</a> <a href="#">Marine Falize</a>	FR [q1] [30h+15h] [5 Credits] 🌐	x
○ LINEO2003	<a href="#">Plan d'affaires et étapes-clefs de la création d'entreprise</a> <i>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.</i>	<a href="#">Frank Janssen</a>	FR [q2] [30h+15h] [5 Credits] 🌐	x
○ LINEO2004	<a href="#">Séminaire d'approfondissement en entrepreneuriat</a>	<a href="#">Frank Janssen</a>	FR [q2] [30h+15h] [5 Credits] 🌐	







## Course prerequisites

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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 purposes 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](https://uclouvain.be/fr/decouvrir/rgee.html) (<https://uclouvain.be/fr/decouvrir/rgee.html>).

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### # Prerequisites list

- LELEC2570** "Synthesis of digital integrated circuits" has prerequisite(s) LELEC2531
- LELEC2531 - [Electronic digital systems](#)
- LELEC2650** "Synthesis of analog integrated circuits" has prerequisite(s) LELEC2532
- LELEC2532 - [Electronic analog systems](#)
- MLSMM2134** "E-comportement du consommateur" has prerequisite(s) MGEST1108
- MGEST1108 - [Marketing](#)
- MLSMM2136** "Tendances en Digital Marketing" has prerequisite(s) MGEST1108
- MGEST1108 - [Marketing](#)

## The programme's courses and learning outcomes

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For each UCLouvain training programme, a [reference framework of learning outcomes](#) specifies 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.





## Teaching method

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### 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 graduation project is the starting point for a doctorate, publication or paper presentation).

Depending on the situation, students are encouraged to work either individually or in groups.

### Concrete learning: infrastructure

In ELEC courses, "concrete" learning is characterised by student access to high quality technical infrastructures:

The Marconi and Faraday pedagogical laboratories are equipped with the latest in work stations (oscilloscopes, sources, computers) and are accessible to students as part of their laboratory classes and Bachelor's and Master's degree projects. In the case of projects including the creation of a prototype by groups of students, access to prototypes of electronic cards (PCB, components, welding) is available.

R&D platforms in the areas of electronic components and communication systems (Welcome) and micro and nano-technologies (Winfab) are accessible to Master's degree students as part of certain classes and graduation projects.

Computers and work stations equipped with the most recent professional CAO software are accessible to students in the Maxwell building but also remotely from the Engineering School's computer labs. This software is largely used in classes, APE and projects: design sequences for electronic circuits and microwaves, simulation of manufacturing processes, electronic devices, etc.

## Evaluation

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***The evaluation methods comply with the regulations concerning studies and exams (<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".***

Teaching activities are evaluated according to University rules (see the rules for evaluating coursework and exams) namely written and oral exams, laboratory exams, individual or group work, public presentations of projects and theses defences.

In most Master's degree classes, students are primarily evaluated on the basis of their written work, which assesses their mastery of theoretical concepts as well as their ability to solve exercises (of the same level of difficulty as in class).

Group projects are primarily used to evaluate students' ability to solve complex equations and master software. These projects generally result in a report (in the form of a scientific article or a conference paper) or an oral presentation before a jury or lecture hall about the project's results and/or progress. In either case, particular attention is paid to the project's technical qualities as well as the quality of the report's structure, the use of supporting materials, and the students' presentation skills.

For more information on evaluation methods, students may consult the relevant evaluation descriptions.

To obtain a passing grade, the marks received for the teaching units are offset by their respective credits.

## Mobility and/or Internationalisation outlook

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Since its creation, the Louvain School of Engineering (EPL) has participated in diverse [exchange programs](https://uclouvain.be/en/faculties/epl/mobilite-internationale.html) (<https://uclouvain.be/en/faculties/epl/mobilite-internationale.html>) that were put into place at the European level and beyond.

## Possible trainings at the end of the programme

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### Accessible complementary Masters degrees:

- [Advanced Master in Nuclear Engineering](#)
- [Advanced Master in Nanotechnologies](#)

### Accessible Ph. D. curricula

The department of electrical engineering is one of those with the largest number of doctoral students. Members of the department are involved in many thematic Ph. D. schools, some of these having been active for many years, others currently being set up. A list of these thematic Ph. D. schools can be obtained from the chairperson of the Ph. D. committee relating to "Engineering sciences and the Art of building and town planning" of the Académie Universitaire Louvain or on the [FNRS Website](#)

## Contacts

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### Curriculum Management

Entity	
Structure entity	SST/EPL/ELEC
Denomination	<a href="#">(ELEC)</a>
Faculty	Louvain School of Engineering <a href="#">(EPL)</a>
Sector	Sciences and Technology <a href="#">(SST)</a>
Acronym	ELEC
Postal address	Place du Levant 3 - bte L5.03.02 1348 Louvain-la-Neuve Tel: <a href="tel:+32210472586">+32 (0) 10 47 25 86</a> - Fax: <a href="tel:+32210478667">+32 (0) 10 47 86 67</a>

Academic supervisor: [Jérôme Louveaux](https://uclouvain.be/repertoires/jerome.louveaux) (<https://uclouvain.be/repertoires/jerome.louveaux>)

Jury

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