

ELME2M

2015 - 2016

Master [120] in Electro-mechanical Engineering

At Louvain-la-Neuve - 120 credits - 2 years - Day schedule - In englishDissertation/Graduation Project : **YES** - Internship : **optional**Activities in other languages : **YES**Activities on other sites : **optional**Main study domain : **Sciences de l'ingénieur et technologie**Organized by: **Ecole Polytechnique de Louvain (EPL)**Programme code: **elme2m** - Francophone Certification Framework: 7**Table of contents**

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ELME2M - Introduction

Introduction

Introduction

The Master's degree programme in electro-mechanical engineering draws equally from two fields (mechanics and electricity) and prioritises basic knowledge with the goal of deepening or reorienting students' knowledge mid-career.

By the end of the programme, students will be able to keep up with technical developments and adapt themselves to the needs of the job market.

Your profile

You

- Have solid knowledge of electricity and mechanics;
- Want to improve your understanding of current technological and scientific issues;
- Want to design, model, realise and validate experimental devices and systems;
- Want to specialise in mechatronics or in energy and foresee a career in robotics and "flexible production", energy transformation and management, vehicles and transportation systems and/or aeronautics.

Your programme

This Master's degree offers:

- General knowledge of electro-mechanics based on research;
- The mastery of mathematical and physical methods used in electricity and mechanics;
- An interdisciplinary approach to problem solving with particular emphasis placed on interface problems;
- Pedagogy centred on project-based learning;
- The possibility of testing your knowledge in the job market thanks to internships in the industrial sector

Majors: Mechatronics; Energy

ELME2M - Teaching profile

Learning outcomes

Integrating the fields of mechanics and electricity is one of the major challenges of the civil engineering student in electro-mechanics.

The Master's degree in Electro-mechanical engineering from UCL favours multidisciplinary training and the ability to solve interface problems raised by the integration of several fields. It integrates the fields of electricity and mechanics into a coherent whole and prioritises basic knowledge with the aim of deepening or reorienting students' knowledge mid-career.

Students will acquire the knowledge and skills necessary to become:

- Specialists in mechatronics (electronics, mechanical production, automation and robotics) or specialists in energy (smart grids/ energy networks, thermodynamics and energy).
- Individuals with field experience capable of putting into practice their knowledge of research and technology.
- Managers who can manage team projects

The Master's degree programme in electro-mechanical engineering prepares its students to be aware of technical progress and adapt to the needs of the job market and changes in business.

Polytechnic and multidisciplinary, the training provided by the Louvain School of Engineering privileges the acquisition of knowledge that combines theory and practice and that is open to analysis, design, manufacturing, production, research and development and innovation all the while paying attention to ethics and sustainable development.

On successful completion of this programme, each student is able to :

1. Demonstrate mastery of a solid body of knowledge in basic science and engineering science allowing the student to learn and solve problems pertaining to electro-mechanics. (Axis 1)

1. Identify and use concepts, laws and appropriate reasoning from a variety of fields in mechanics and electricity to solve a given problem:

- Electricity (in the broad sense)
- Electrical energy (transport, quality, management)
- Electro-technics (conversion, controls, activation)
- Electronics (digital electronics, instrumentation)
- Automation
- Computer sciences (real time)
- Mechanics (modeling, design)
- Thermodynamics and thermics
- Fluid dynamics
- Robotics and automation.

2. Identify and use modelling and calculation tools to solve problems associated with the aforementioned fields.

3. Verify problem solving results especially with regard to orders of magnitude and/or units (in which the results are expressed).

2. Organize and carry out an applied engineering process to develop a product and/or service responding to a particular need or problem in the field of electro-mechanics. (Axis 2)

1. Analyse a problem, take stock of features and constraints, and formulate specifications in a field where the technical and economic limits are taken into account.

2. Model a problem and design one or more technical solutions (drawing on the fields of mechanics, electrics, electronics or information technology) and respond to problem specifications.

3. Evaluate and classify solutions with regards to all the specification criteria: efficiency, feasibility, ergonomic quality and environmental security (for example: too expensive, too complex, too dangerous, too difficult to manipulate).

4. Test a solution using a mock up, a prototype or a numerical model.

5. Formulate recommendations to improve a technical solution.

3. Organise and carry out a research project to learn about a physical phenomenon or a new problem relating to the field of electro-mechanics. (Axis 3)

1. Document and summarise the existing body of knowledge in the field of mechanics and electricity.
2. Suggest an experimental model or device (for example in the area of thermal regulation) by first constructing a mathematical model, then by using laboratories to create a device simulates system behaviour and tests relevant hypotheses.
3. Synthesize conclusions in a report that shows the key parameters and their influence on the behaviour of the phenomenon under study (choice of forms and materials, physio-chemical environment, conditions for use).

4. Contribute, through teamwork, to a multidisciplinary project and carry out the project while taking into account its objectives, resources, and constraints. (Axis 4)

1. Frame and explain the project's objectives taking into account the issues and constraints that characterise the project's environment.
2. Collaborate with peers on a multidisciplinary topic (mechanics and electricity) to create a work schedule (and resolve any resulting conflicts).
3. Make team decisions to successfully complete the project whether they be about technical solutions or the division of labour.

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

1. Identify the clients' needs: question, listen and ensure the understanding of all the dimensions of the request and not just the technical aspects.
2. Present your arguments and convince your interlocutors (technicians, colleagues, clients, superiors) by adopting their language.
3. Communicate through graphics and diagrams: interpret a diagram, present work results, structure information.
4. Read and analyse different technical documents related to the profession (standards, drawings, specifications).
5. Draft written documents that take into account contextual requirements and social conventions.
6. Use modern communication techniques to give convincing oral presentations.

6. Display rigour, openness, and critical thinking; validate the socio-technical relevance of a hypothesis or a solution, all the while drawing upon available technological and scientific innovations. (Axis 6)

1. Apply standards and assure the robustness of a solution in the fields of mechanics and electricity.
2. Put solutions into perspective by including non-technical concerns (for example, in the area of energy and climate, take environmental and social factors into consideration).
3. Demonstrate critical thinking vis-à-vis technical solutions.
4. Evaluate one's own work.

Programme structure

The student's programme includes:

- A common core curriculum (30 credits)
- A final specialisation (30 credits)
- One or more of the major courses or elective courses listed below.

The graduation project is normally completed in the second year. However, students may, depending on the nature of their project, choose to take their classes in the first or second year so long as their course prerequisites allow it. This is particularly the case for students completing part of their program 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 requested 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.

For a programme-type, and regardless of the focus, options/or elective courses selected, this master will carry a minimum of 120 credits divided over two annual units, corresponding to 60 credits each.

[> Core courses for the Master in Electro-mechanical Engineering](#) [en-prog-2015-elme2m-lelme220t.html]

Focuses

- > Professional focus:Mecatronics [en-prog-2015-elme2m-lelme220s]
- > Professional focus:Energy [en-prog-2015-elme2m-lelme221s]

Options courses

- > Options [en-prog-2015-elme2m-lelme913r.html]
 - > Major in circuits and electronic systems [en-prog-2015-elme2m-lelme227o.html]
 - > Major in MEMS & NEMS [en-prog-2015-elme2m-lelme229o.html]
 - > Major in automation and dynamic systems [en-prog-2015-elme2m-lelme230o.html]
 - > Major in dynamic s, robotics and biomechanics [en-prog-2015-elme2m-lelme223o.html]
 - > Major in nuclear engineering [en-prog-2015-elme2m-lelme237o.html]
 - > Major in aeronautics [en-prog-2015-elme2m-lelme240o.html]
 - > Major in design, manufacturing and mechanics of materials [en-prog-2015-elme2m-lelme241o.html]
 - > Major in business risks and opportunities [en-prog-2015-elme2m-lelme235o.html]
 - > Major in small and medium sized business creation [en-prog-2015-elme2m-lelme236o.html]
- > Elective courses [en-prog-2015-elme2m-lelme2010o.html]

ELME2M Detailed programme

Programme by subject

CORE COURSES [54.0]

- Mandatory
- △ Courses not taught during 2015-2016
- ⊕ Periodic courses taught during 2015-2016
- ⊗ Optional
- ⊖ Periodic courses not taught during 2015-2016
- Activity with requisites

Click on the course title to see detailed informations (objectives, methods, evaluation...)

							Year	
							1	2
○	LELME2990	Graduation project/End of studies project	N.		28 Credits		x	
○ Electricity and electronics courses								
○	LELEC2311	Physics of Electromechanical Converters	Bruno Dehez	30h+15h	4 Credits	2q	x	
○	LELEC2660	Power electronics	Marc Bekemans	30h+15h	4 Credits	1q	x	
○	LELEC2811	Instrumentation and sensors	David Bol, Laurent Francis	30h+30h	5 Credits	1q	x	
○ Mechanical courses								
○	LMECA2755	Industrial automation	Bruno Dehez, Paul Fisette, Renaud Ronsse	30h+30h	5 Credits	1q	x	
○ Religion courses for students in natural sciences								
Select 2 credits from among The student shall select								
⊗	LTECO2100	Questions of religious sciences: Biblical readings	Hans Ausloos	15h	2 Credits	1q	x	x
⊗	LTECO2200	Questions of religious sciences: reflections about Christian faith	Dominique Martens	15h	2 Credits	2q	x	x

						Year	
						1	2
⌘ LTECO2300	Questions of religious sciences: questions about ethics	Marcela Lobo Bustamante	15h	2 Credits	1q	x	x

o Project (6 credits)

⌘ LELME2002	Project in mechatronics	Bruno Dehez, Renaud Ronsse	30h+30h	6 Credits	1 + 2q	x	
⌘ LELME2003	Project in energy	Yann Bartosiewicz, Emmanuel De Jaeger, Hervé Jeanmart	30h+30h	6 Credits	1 + 2q	x	

LIST OF FOCUSES

> Professional focus:Mecatronics [en-prog-2015-elme2m-lelme220s]

> Professional focus:Energy [en-prog-2015-elme2m-lelme221s]

PROFESSIONAL FOCUS:MECATRONICS [30.0]

● Mandatory

△ Courses not taught during 2015-2016

⊕ Periodic courses taught during 2015-2016

⊗ Optional

⊖ Periodic courses not taught during 2015-2016

■ Activity with requisites

Click on the course title to see detailed informations (objectives, methods, evaluation...)

						Year	
						1	2
● LELEC2103	Project in Electricity 3 : Electronic systems	Jean-Didier Legat, Jérôme Louveaux, Luc Vandendorpe	75h	5 Credits	1 + 2q	x	x
● LELEC2313	Dynamic modelling and control of electromechanical converters	Emmanuel De Jaeger, Bruno Dehez	30h+30h	5 Credits	1q	x	x
● LELEC2531	Design and Architecture of digital electronic systems	Jean-Didier Legat	30h+30h	5 Credits	1q	x	x
● LMECA2732	Introduction to robotics	Renaud Ronsse	30h+30h	5 Credits	2q	x	x
● LMECA2801	Machine design	Benoît Raucent, Aude Simar	30h+30h	5 Credits	1q	x	x
● LINGI2315	Design of Embedded and real-time systems	Jean-Didier Legat	30h+30h	5 Credits	2q	x	x

PROFESSIONAL FOCUS:ENERGY [30.0]

● Mandatory

△ Courses not taught during 2015-2016

⊕ Periodic courses taught during 2015-2016

⊗ Optional

⊖ Periodic courses not taught during 2015-2016

■ Activity with requisites

Click on the course title to see detailed informations (objectives, methods, evaluation...)

						Year	
						1	2
● LMECA2150	Thermal cycles	Yann Bartosiewicz	30h+30h	5 Credits	1q	x	x
● LMECA2160	Combustion and fuels	Miltiadis Papalexandris	30h+30h	5 Credits	1q	x	x
● LMECA2220	Internal combustion engines	Hervé Jeanmart	30h+30h	5 Credits	2q	x	x
● LMECA2322	Fluid mechanics and transfer II	Jean-François Remacle, Grégoire Winckelmans	30h+30h	5 Credits	1q	x	x
● LELEC2520	Electric Power Systems	Emmanuel De Jaeger	30h+30h	5 Credits	1q	x	x
● LELEC2595	Power quality	Emmanuel De Jaeger	30h+30h	5 Credits	2q	x	x

OPTIONS

Students complete their programme through a combination of major course work and elective classes for a minimum total of 120 credits.

Options

- > Major in circuits and electronic systems [en-prog-2015-elme2m-lelme227o]
- > Major in MEMS & NEMS [en-prog-2015-elme2m-lelme229o]
- > Major in automation and dynamic systems [en-prog-2015-elme2m-lelme230o]
- > Major in dynamic s, robotics and biomechanics [en-prog-2015-elme2m-lelme223o]
- > Major in nuclear engineering [en-prog-2015-elme2m-lelme237o]
- > Major in aeronautics [en-prog-2015-elme2m-lelme240o]
- > Major in design, manufacturing and mechanics of materials [en-prog-2015-elme2m-lelme241o]
- > Major in business risks and opportunities [en-prog-2015-elme2m-lelme235o]
- > Major in small and medium sized business creation [en-prog-2015-elme2m-lelme236o]
- > Elective courses [en-prog-2015-elme2m-lelme2010o]

OPTIONS

Students may select one of the majors suggested by the Master's degree programme in electrical or mechanical engineering provided that the courses in question are not already part of their course schedule. The following majors are highly recommended.

MAJOR IN CIRCUITS AND ELECTRONIC SYSTEMS

The goal of this major (which it shares with Master's degree programs in electricity and electro-mechanics) is to introduce students to system design techniques, computer aided simulation, manufacturing and experimental characterisation of components and circuits (both analogue and numerical) as well as mixed systems. Emphasis is placed on practical applications and the completion of projects.

○ Mandatory

△ Courses not taught during 2015-2016

⊕ Periodic courses taught during 2015-2016

⊗ Optional

⊖ Periodic courses not taught during 2015-2016

■ Activity with requisites

Click on the course title to see detailed informations (objectives, methods, evaluation...)

The student may select 15 to 30 credits from the following courses:

De 15 à 29 credits parmi

Year

1 2

○ Compulsory course in circuits and electronics systems

Course Code	Course Title	Instructor	Hours	Credits	Period	Year 1	Year 2
LELEC2532	Design and Architecture of analog electronic systems	David Bol, Denis Flandre	30h+30h	5 Credits	2q	X	X

⊗ Elective courses for circuits and electronic systems

LELEC2570	Synthesis of digital integrated circuits	David Bol	30h+30h	5 Credits	1q	X	X
LELEC2590	Seminars in electronics and communications	Denis Flandre, Isabelle Huynen, Jérôme Louveaux	30h	3 Credits	2q	X	X
LELEC2620	Modeling and implementation of analog and mixed analog/digital circuits and systems on chip	David Bol	30h+30h	5 Credits	2q	X	X
LELEC2650	Synthesis of analog integrated circuits	Denis Flandre	30h+30h	5 Credits	1q	X	X
LELEC2660	Power electronics	Marc Bekemans	30h+15h	4 Credits	1q	X	X
LELEC2760	Secure electronic circuits and systems	François-Xavier Standaert	30h+30h	5 Credits	2q	X	X

MAJOR IN MEMS & NEMS

As with other Master's degree programmes in electrical or mechanical engineering, the major in micro and nanosystems seeks to introduce students to micro and nano manufacturing and design techniques, multi-physical simulation and the characterisation of micro and nano receptors and actuators in integrated technology. Given the applications of MEMS and NEMS in numerous sectors (automobile, telecommunications, electronics, households, medicine), the analysis of micro and nanostructures and the study of their behaviour is based on a multidisciplinary approach.

● Mandatory

△ Courses not taught during 2015-2016

⊕ Periodic courses taught during 2015-2016

⊗ Optional

⊖ Periodic courses not taught during 2015-2016

■ Activity with requisites

Click on the course title to see detailed informations (objectives, methods, evaluation...)

The student may select 15 to 28 credits from the following courses:

De 15 à 28 crédits parmi

Year

1 2

o Compulsory courses in MEMS & NEMS

● LELEC2560	Micro and Nanofabrication Techniques	Laurent Francis, Benoît Hackens, Jean-Pierre Raskin	30h+30h	5 Credits	2q	x	x
● LELEC2895	Design of micro and nanosystems	Denis Flandre, Laurent Francis (coord.), Thomas Pardoën, Jean-Pierre Raskin	30h+30h	5 Credits	1q	x	x

⊗ Elective courses in MEMS & NEMS

⊗ LELEC2590	Seminars in electronics and communications	Denis Flandre, Isabelle Huynen, Jérôme Louveaux	30h	3 Credits	2q	x	x
⊗ LMAPR2015	Physics of Nanostructures	Jean- Christophe Charlier, Xavier Gonze, Luc Piraux	37.5h +22.5h	5 Credits	1q	x	x
⊗ LMAPR2020	Materials Selection	Christian Bailly, Thomas Pardoën	30h +22.5h	5 Credits	2q	x	x
⊗ LPHY2246	Basses pressions et physique du vide	Benoît Hackens, Sorin Melinte	30h	5 Credits	1q	x	x
⊗ LELEC2811	Instrumentation and sensors	David Bol, Laurent Francis	30h+30h	5 Credits	1q	x	x

MAJOR IN AUTOMATION AND DYNAMIC SYSTEMS

● Mandatory

△ Courses not taught during 2015-2016

⊕ Periodic courses taught during 2015-2016

⊗ Optional

⊖ Periodic courses not taught during 2015-2016

■ Activity with requisites

Click on the course title to see detailed informations (objectives, methods, evaluation...)

The student may select:
De 15 à 30 credits parmi

Year

1 2

⊗ Recommended courses in automatics and dynamic systems

Students may select a minimum of 10 credits from among the following:

⊗ LINMA2120	Applied mathematics research seminar	Pierre-Antoine Absil, Vincent Blondel, Philippe Chevalier, Jean-Charles Delvenne (coord.), François Glineur, Julien Hendrickx, Raphaël Jungers, Philippe Lefèvre, Yurii Nesterov, Paul Van Dooren, Mathieu Van Vyve	30h	3 Credits	2q	x	x
⊗ LINMA2360	Project in mathematical engineering	Pierre-Antoine Absil, François Glineur (coord.), Yurii Nesterov, Paul Van Dooren	30h +22.5h	5 Credits	2q	x	x
⊗ LINMA2361	Nonlinear dynamical systems	Pierre-Antoine Absil	30h +22.5h	5 Credits	1q	x	x
⊗ LINMA2671	Automatic : Theory and implementation	Julien Hendrickx	30h+30h	5 Credits	1q	x	x
⊗ LINMA2875	System Identification	Julien Hendrickx	30h+30h	5 Credits	2q	x	x

⊗ Courses of interest in automatics and dynamic systems

⊗ LELEC2870	Machine Learning : regression, dimensionality reduction and data visualization	John Lee (compensates Michel Verleysen), Michel Verleysen	30h+30h	5 Credits	1q	x	x
⊗ LGBIO2060	Modelling of biological systems	Philippe Lefèvre	30h+30h	5 Credits	1q	x	x
⊗ LINGI2262	Machine Learning :classification and evaluation	Pierre Dupont	30h+30h	5 Credits	2q	x	x
⊗ LMAPR2510	Mathematical ecology	Eric Deleersnijder, Emmanuel Hanert, Thierry Van Effelterre	30h +22.5h	5 Credits	2q	x	x
⊗ LMECA2732	Introduction to robotics	Renaud Ronsse	30h+30h	5 Credits	2q	x	x

MAJOR IN DYNAMIC S, ROBOTICS AND BIOMECHANICS

The goal of this major (which it shares with Master's degree programs in electricity and electro-mechanics) is to give students a complete education in this field. All phases of the mechanical manufacturing process are studied from the design stage to putting manufacturing techniques into place to production planning and the organisation of workshops.

In addition, students will learn about important technological techniques (machine parts) as well as solid mechanics (elasticity and plasticity) in order to master the processing, behaviour and use of common materials. Finally, attention is paid to methods used in the fields of automation and robotics.

● Mandatory

△ Courses not taught during 2015-2016

⊕ Periodic courses taught during 2015-2016

⊗ Optional

⊖ Periodic courses not taught during 2015-2016

■ Activity with requisites

Click on the course title to see detailed informations (objectives, methods, evaluation...)

The class MECA 2732 may not be taken as part of this major by ELME students. Students majoring in this field may select:

De 20 à 30 credits parmi

						Year	
						1	2
⊗ LAUCE2185	Dynamics of structures	Jean-Pierre Coyette	30h+30h	5 Credits	1q	x	x
⊗ LMECA2170	Numerical Geometry	Vincent Legat, Jean-François Remacle	30h+30h	5 Credits	1q	x	x
⊗ LMECA2355	Mechanical design in biomedical engineering	Olivier Cartiaux, Olivier Cartiaux (compensates Emilie Marchandise), Benoît Herman (compensates Benoît Raucent), Emilie Marchandise, Benoît Raucent	30h+30h	5 Credits	1q	x	x
⊗ LMECA2215	Vehicle System Dynamics	Paul Fisette	30h+30h	5 Credits	1q	x	x
⊗ LGBIO2040	Biomechanics	François Henrotte (compensates Emilie Marchandise), Emilie Marchandise	30h+30h	5 Credits	2q	x	x
⊗ LINMA2875	System Identification	Julien Hendrickx	30h+30h	5 Credits	2q	x	x
⊗ LMECA2802	Multibody system Dynamics	Paul Fisette	30h+30h	5 Credits	2q	x	x
⊗ LMECA2732	Introduction to robotics	Renaud Ronsse	30h+30h	5 Credits	2q	x	x

MAJOR IN NUCLEAR ENGINEERING

As with the Master's in civil electromechanical engineering with a specialization in energy as well as the Master's in civil and mechanical engineering, the goal of this major is to offer an in-depth education in the principal aspects of nuclear engineering. Entry into this programme, which is primarily overseen by the Mol Centre of Nuclear Energy, is contingent on an evaluation of candidates' skills based on the rules used for ERASMUS-SOCRATES exchange students.

Further information about this major may be found on Mol's website SCK-CEN.

- Mandatory
- △ Courses not taught during 2015-2016
- ⊕ Periodic courses taught during 2015-2016
- ⊗ Optional
- ⊖ Periodic courses not taught during 2015-2016
- Activity with requisites

Click on the course title to see detailed informations (objectives, methods, evaluation...)

Visit <http://www.scken.be/BEN> for further information about course locations, hours and language. The student may select

De 17 à 23 credits parmi

Year

1 2

o Compulsory courses for the nuclear engineering major (11 credits)

● LMECA2600	Introduction to nuclear engineering and reactor technology	Hamid Aït Abderrahim	30h+30h	5 Credits	1q	x	
● LMECA2648	Nuclear thermal-hydraulics.	Yann Bartosiewicz	40h+7.5h	6 Credits	2q		x

o Elective courses for the nuclear engineering major

De 6 à 12 credits parmi

⊗ LBEN2002	Introduction to Nuclear Physics & Measurements (Centre d'étude nucléaire-Mol)	N.		6 Credits	1q		x
⊗ LBEN2003	Safety of Nuclear Powerplants (Centre d'étude nucléaire-Mol)	N.		3 Credits	2q		x

MAJOR IN AERONAUTICS

● Mandatory

△ Courses not taught during 2015-2016

⊕ Periodic courses taught during 2015-2016

⊗ Optional

⊖ Periodic courses not taught during 2015-2016

■ Activity with requisites

Click on the course title to see detailed informations (objectives, methods, evaluation...)

The student shall select
De 15 à 30 credits parmi

						Year	
						1	2
⊗ LMECA2853	Turbulence.	Eric Deleersnijder, Grégoire Winckelmans	30h+30h	5 Credits	1q	x	x
⊗ LMECA2550	Aircraft propulsion systems.	Philippe Chatelain	30h+30h	5 Credits	1q	x	x
⊗ LMECA2520	Calculation of planar structures	Issam Doghri	30h+30h	5 Credits	2q	x	x
⊗ LMECA2830	Aerospace dynamics.	Philippe Chatelain	30h+30h	5 Credits	1q	x	x
⊗ LMECA2323	Aerodynamics of external flows	Philippe Chatelain, Grégoire Winckelmans	30h+30h	5 Credits	2q	x	x
⊗ LMECA2195	Gasdynamics and reacting flows	Miltiadis Papalexandris	30h+30h	5 Credits	2q	x	x
⊗ LMECA2660	Numerical methods in fluid mechanics	Grégoire Winckelmans	30h+30h	5 Credits	2q	x	x
⊗ LMECA2300	Advanced Numerical Methods	Philippe Chatelain, Christophe Craeye, Vincent Legat, Jean-François Remacle	30h+30h	5 Credits	2q	x	x

MAJOR IN DESIGN, MANUFACTURING AND MECHANICS OF MATERIALS

● Mandatory

△ Courses not taught during 2015-2016

⊕ Periodic courses taught during 2015-2016

⊗ Optional

⊖ Periodic courses not taught during 2015-2016

■ Activity with requisites

Click on the course title to see detailed informations (objectives, methods, evaluation...)

*The student shall select:**De 15 à 30 credits parmi*

						Year	
						1	2
⊗ LMECA2860	Welding.	Pascal Jacques, Aude Simar	30h+30h	5 Credits	1q	x	x
⊗ LMAPR2481	Deformation and fracture of materials	Thomas Pardoën	30h+30h	5 Credits	1q	x	x
⊗ LMECA2453	Advanced manufacturing technologies	Aude Simar	30h+30h	5 Credits	1q	x	x
⊗ LMECA2141	Rheology	Vincent Legat, Evelyne Van Ruymbeke	30h+30h	5 Credits	1q	x	x
⊗ LMECA2640	Mechanics of composite materials	Issam Doghri, Frédéric Lani	30h+30h	5 Credits	2q	x	x
⊗ LMECA2330	Machine components	Laurent Delannay, Benoît Raucent, Renaud Ronsse, Thomas Servais (compensates Benoît Raucent)	30h+30h	5 Credits	2q	x	x
⊗ LMECA2131	Introduction to nonlinear solid mechanics.	Issam Doghri	30h+30h	5 Credits	2q	x	x
⊗ LMAPR2482	Plasticity and metal forming	Laurent Delannay, Thomas Pardoën	30h +22.5h	5 Credits	2q	x	x

MAJOR IN BUSINESS RISKS AND OPPORTUNITIES

● Mandatory

△ Courses not taught during 2015-2016

⊕ Periodic courses taught during 2015-2016

⊗ Optional

⊖ Periodic courses not taught during 2015-2016

■ Activity with requisites

Click on the course title to see detailed informations (objectives, methods, evaluation...)

This major may not be taken as the same time as the major in small and medium size business creation. The student may

De 16 à 20 credits parmi

Year

1 2

⊗ LFSA2140	Elements of law for industry and research	Fernand De Visscher, Werner Derijcke, Bénédicté Inghels	30h	3 Credits	1q	x	x
⊗ LFSA2230	Introduction to management and to business economics	Benoît Gailly	30h+15h	4 Credits	2q	x	x
⊗ LFSA1290	Introduction to financial and accounting management	André Nsabimana (compensates Gerrit Sarens), Gerrit Sarens	30h+15h	4 Credits	2q	x	x
⊗ LFSA2202	Ethics and ICT	Axel Gosseries, Olivier Pereira	30h	3 Credits	2q	x	x
⊗ LFSA2245	Environment and business	Thierry Bréchet	30h	3 Credits	1q	x	x
⊗ LFSA2210	Organisation and human resources	John Cultiaux	30h	3 Credits	2q	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 SMALL AND MEDIUM SIZED BUSINESS CREATION

In keeping with most of the Masters' degrees in civil engineering, the goal of this major is to familiarise the civil engineering student with the specifics of small and medium sized businesses, entrepreneurship, and business development in order to develop the necessary abilities, knowledge and tools to create a business. This major is reserved for a small number of students, selection of whom is based on a written application and individual interview. The written application must be submitted before the start of the academic year for Master's 1.

Applications may be sent to:

Secrétariat CPME-Place des Doyens, 1
1348 Louvain-la-Neuve (tel. 010/47 84 59)

Selected students will replace their Master's thesis in the common core curriculum with a thesis related to business creation (the number of credits remaining the same).

● Mandatory

△ Courses not taught during 2015-2016

⊕ Periodic courses taught during 2015-2016

⊗ Optional

⊖ Periodic courses not taught during 2015-2016

■ Activity with requisites

Click on the course title to see detailed informations (objectives, methods, evaluation...)

Further information about this major may be found at <http://www.uclouvain.be/cpme>. This major may not be taken at the same time as a major in management. Students in this major may choose

De 20 à 25 credits parmi

Year

1 2

○ Required courses for the major in small and medium sized businesses

○ LCPME2001	Entrepreneurship Theory (in French)	Frank Janssen	30h+20h	5 Credits	1q	x	
○ LCPME2003	Business plan of the creation of a company (in French)	Frank Janssen	30h+15h	5 Credits	2q		x

						Year	
						1	2
● LCPME2002	Managerial, legal and economic aspects of the creation of a company (in French)	Régis Coeurderoy, Yves De Cordt, Marine Falize (compensates RÉgis Coeurderoy)	30h+15h	5 Credits	1q	x	x
● LCPME2004	Advanced seminar on Entrepreneurship (in French)	Roxane De Hoe (compensates Frank Janssen), Frank Janssen	30h+15h	5 Credits	2q	x	x

⌘ Prerequisite CPME courses

Students who have not taken management courses during their previous studies must enroll in LCPME2000.

● LCPME2000	Venture creation financement and management I	Olivier Giacomini, Paul Vanzeveren	30h+15h	5 Credits	1 + 2q	x	
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ELECTIVE COURSES

Among the elective courses, students' attention is drawn to classes in automation, electric engineering and/ or mechanical engineering. Students may also choose from classes in management, law, economics and languages. Elective classes not selected from the list below must be approved by the Diploma Commission.

Students may also complete an internship. However, before enrolling in the Company Internship course, students must contact one of the advisors in the ELME Diploma Commission to make sure that the internship is feasible in a company that the student has contacted themselves or via a member of the Diploma Commission.

- Mandatory
 △ Courses not taught during 2015-2016
 ⊕ Periodic courses taught during 2015-2016
- ✘ Optional
 ⊖ Periodic courses not taught during 2015-2016
 ■ Activity with requisites

Click on the course title to see detailed informations (objectives, methods, evaluation...)

Students may complete their major course programme with courses from the list below without special permission.

						Year	
						1	2
✘ LINMA2370	Modelling and analysis of dynamical systems	Jean-Charles Delvenne, Denis Dochain (coord.)	30h +22.5h	5 Credits	1q	x	x
✘ LELEC1930	Intoduction to telecommunication	Jérôme Louveaux	30h+15h	4 Credits	2q	x	x
✘ LELEC2753	Electrical Power Systems: in-depth questions	Emmanuel De Jaeger	30h+15h	5 Credits	2q	x	x
✘ LELEC2920	Communication networks	Benoît Macq	30h+30h	5 Credits	1q	x	x
✘ LMECA1451	Mechanical manufacturing.	Laurent Delannay, Aude Simar	30h+30h	5 Credits	1q	x	x
✘ LMECA2240	Testing of thermal machinery.	Hervé Jeanmart	15h+15h	2 Credits	2q	x	x
✘ LMECA2325	Biomass conversion	Patrick Gerin, Hervé Jeanmart	30h+30h	5 Credits	1q	x	x
✘ LMECA2410	Dynamics of elastic systems	Jean-Pierre Coyette, Laurent Delannay	30h+30h	5 Credits	2q	x	x
✘ LMECA2420	Advanced topics in energetics.	Yann Bartosiewicz, Hervé Jeanmart	30h	3 Credits	2q	x	x
✘ LMECA2645	Major technological hazards in industrial activity.	Denis Dochain, Alexis Dutrieux	30h	3 Credits	2q	x	x
✘ LMECA2771	Thermodynamics of irreversible phenomena.	Miltiadis Papalexandris	30h+30h	4 Credits	2q	x	x
✘ LMECA2780	Fluid compressors	Tony Arts	30h+30h	5 Credits	2q	x	x
✘ LMECA2801	Machine design	Benoît Raucent, Aude Simar	30h+30h	5 Credits	1q	x	x
✘ LFSA2351A	Group dynamics	Piotr Sobieski (coord.)	15h+30h	3 Credits	1q	x	x
✘ LFSA2351B	Group dynamics	Piotr Sobieski (coord.)	15h+30h	3 Credits	2q	x	x
✘ LENVI2007	Renewable energies	Xavier Draye, Patrick Gerin (coord.), Hervé Jeanmart, Geoffrey Van Moeseke	30h	4 Credits	1q	x	x

✘ Company internships (10 credits)

Students enrolling in a 5 credit internship coupled with the graduation project (LFSA 2996) must round out their programme with a 5 credit course approved by the programme commission.

Students may include in their curriculum a company training period worth 10 credits. However, if this activity is related to their final thesis, they shall choose the 5-credit FSA 2996 course.

✘ LFSA2995	Company Internship	Claude Oestges, Jean-Pierre Raskin	30h	10 Credits	1 + 2q	x	x
✘ LFSA2996	Company Internship	N.		5 Credits	1 + 2q	x	x

✘ Languages

Students may select from any language course offered at the ILV for a maximum of 3 credits out of the 120 core credits needed for their Master's degree. Special attention is placed on the following seminars in professional development:

Students may include in their electives any language course of the Institute of Modern Languages (ILV) for a maximum of 3 credits within the 120 basic credits of their Master's. Their attention is drawn to the following professional insertion seminars:

						Year	
						1	2
⌘ LNEER2500	Professional development seminar: Dutch - intermediate level	Isabelle Demeulenaere (coord.), Mariken Smit	30h	3 Credits	1 ou 2q	x	x
⌘ LNEER2600	Professional development seminar: Dutch - upper-intermediate level	Isabelle Demeulenaere (coord.), Marie-Laurence Lambrecht	30h	3 Credits	1 ou 2q	x	x
⌘ LALLE2500	Professional development seminar German	Caroline Klein, Ann Rinder	30h	3 Credits	1 + 2q	x	x
⌘ LALLE2501	Professional development seminar-German	Caroline Klein, Ann Rinder	30h	5 Credits	1 + 2q	x	x
⌘ LESPA2600	Professional development seminar- Spanish	Carmen Vallejo Villamor	30h	3 Credits	1 ou 2q	x	x
⌘ LESPA2601	Professional development seminar- Spanish	Begona Garcia Migura, Paula Lorente Fernandez (coord.)	30h	5 Credits	1q	x	x

Course prerequisites

A document entitled [en-prerequis-2015-elme2m.pdf](#) specifies the activities (course units - CU) with one or more pre-requisite(s) within the study programme, that is the CU whose learning outcomes must have been certified and for which the credits must have been granted by the jury before the student is authorised to sign up for that activity.

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

As the prerequisites are a requirement of enrolment, there are none within a year of a course.

The prerequisites are defined for the CUs for different years and therefore influence the order in which the student can enrol in the programme's CUs.

In addition, when the panel validates a student's individual programme at the beginning of the year, it ensures the consistency of the individual programme:

- It can change a prerequisite into a corequisite within a single year (to allow studies to be continued with an adequate annual load);
- It can require the student to combine enrolment in two separate CUs it considers necessary for educational purposes.

For more information, please consult [regulation of studies and exams](#).

The programme's courses and learning outcomes

For each UCL training programme, a [reference framework of learning outcomes](#) specifies the competences expected of every graduate on completion of the programme. You can see the contribution of each teaching unit to the programme's reference framework of learning outcomes in the document "In which teaching units are the competences and learning outcomes in the programme's reference framework developed and mastered by the student?"

The document is available by clicking [this link](#) after being authenticated with UCL account.

ELME2M - Information

Admission

Decree of March 31st 2004 defining higher education, favoring its integration in the European framework of higher education and refinancing universities.

The admission requirements have to be met at the time of enrolment at the university.

All information can be obtained from the [University's Enrolment Office \(Service des inscriptions – SIC\)](#).

[General conditions](#)

[Special conditions](#)

[Language examination: knowledge of the French language \(Pedagogical Master's degree\)](#)

General conditions

Students with one of the following qualifications have access to studies leading to the award of a Master's degree:

- an undergraduate (first-cycle) degree in the same field of study;
- the same Master's (second-cycle) degree, but with a different specialization;
- a university degree, in accordance with a decision by the academic authorities and subject to the additional conditions that they lay down;
- a "long-type" degree that gives access to Master's studies, in accordance with a decision by the Government and subject to the additional conditions that it lays down;
- a degree comparable to those mentioned above, issued under the same conditions by the Flemish Community of Belgium, the German Community of Belgium or the Royal Military Academy;
- a degree obtained abroad and deemed equivalent to those mentioned above.

By way of derogation, Master's programmes are also open to students who, in order to obtain their undergraduate degree in the same field of study, still have to gain no more than 12 credits and are registered for those courses. However, students admitted on these terms cannot be passed by the Master's Examination Board until they have met the admission requirements in full and have obtained the necessary undergraduate degree.

-
- Access to the 2nd cycle on the basis of a "short-cut":

- Access to the 2nd cycle of university for those students who have a [short-type non-university higher education degree](#)
- Access to the 2nd cycle of university for those students who have a [long-type non-university higher education degree](#)

- Access to the 2nd cycle on the basis of the enhancement of the knowledge and competence acquired by personal and professional experience:

With the aim of acceding 2nd-cycle studies, the jury of these studies can enhance the [knowledge and competence acquired by their personal and professional experience](#).

This useful experience must correspond to at least 5 years of activities, without taking into account the years of higher-education study that were not passed successfully. At the end of an evaluation procedure organized by the academic authorities, the jury will decide whether the skills and knowledge of the student are sufficient to be able to follow these studies successfully (*).

- For those students who have an academic grade from a Belgian university or a foreign title or grade (which does not give access to studies in this particular year on the basis of the general conditions mentioned above), access to the 2nd basic cycle on the basis of an enhancement of 180 ECTS credits by the admissions jury (personalized admission on the basis of a file). (*)

(*) At the end of the admissions procedure organized by the competent jury and subject to the conditions fixed by the academic authorities, the student may follow complementary studies that make up a maximum of 60 supplementary credits. In case the supplementary workload of this student exceeds 15 credits, this training is considered to be a preparatory year. It does not lead to a degree and is considered to be the last year of a 1st cycle that gives access to the studies aimed at.

No student can be admitted to any one year of a Pedagogical Master's degree if they have not passed an [examination attesting to a sufficient knowledge of the French language](#).

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

- [University Bachelors](#)

- Non university Bachelors
- Holders of a 2nd cycle University degree
- Holders of a non-University 2nd cycle degree
- Adults taking up their university training
- Personalized access

University Bachelors

Diploma	Special Requirements	Access	Remarks
UCL Bachelors			
Bachelor in engineering	Major in mechanics with minor in electricity OR Major in electricity with minor in mechanics	Direct access	
Bachelor in engineering		Access with additional training	Students who have neither majored nor minored in the field of their civil engineering Master's degree, must submit a written application in which they list their detailed course curriculum (list of course work and marks year by year) to the programme commission. The commission will then suggest a programme in keeping with the student's previous course of study with the possible addition of a maximum of 15 supplemental credits.
		Direct access	
Others Bachelors of the French speaking Community of Belgium			
Bachelor in engineering	With specific options in former institution related to electricity and mechanics	Direct access	
Bachelor in engineering		Access with additional training	Students with a Bachelor's degree in engineering sciences (with a focus on electricity or mechanics engineering) who have not taken the equivalent of a minor in electricity or mechanics must submit a written application to the electricity or mechanics programme commission in which they list their detailed course curriculum (list of course work and marks year by year). The jury will suggest a programme in keeping with the student's previous course of study with the possible addition of a maximum of 15 supplemental credits.
Bachelors of the Dutch speaking Community of Belgium			
Bachelor in engineering	With specific options in former institution related to electricity and mechanics	Direct access	
Bachelor in engineering		Access with additional training	Students who have no specialisation in electricity or mechanics must submit a written application to the programme commission in electricity or mechanics engineering in which they list their detailed course curriculum (list of course work and marks year by year). The jury will

			suggest a programme in keeping with the student's previous course of study with the possible addition of a maximum of 15 supplemental credits.
Foreign Bachelors			
Bachelor in engineering	Bachelors from the Cluster network	Direct access	Conditions imposed on UCL Engineering Bachelor
Bachelor in engineering	Other institutions	Access with additional training	Students will submit a written application for admission to EPL in which they list their detailed course curriculum (list of course work and marks year by year). The jury will determine whether the candidate may be admitted according to the regulations. Where necessary the jury may suggest a programme in keeping with the student's previous course of study with the possible addition of a maximum of 15 supplemental credits.

— Non university Bachelors

Diploma	Access	Remarks
> Find out more about links to the university		
> BA en sciences industrielles - type long	Accès au master moyennant ajout de maximum 60 crédits d'enseignements supplémentaires obligatoires au programme. Voir 'Module complémentaire'	Type long

— Holders of a 2nd cycle University degree

Diploma	Special Requirements	Access	Remarks
"Licenciés"			
Engineers considered equivalent to corresponding bachelors		Direct access	
Masters			

Masters in engineering		Direct access	
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— Holders of a non-University 2nd cycle degree

Diploma	Access	Remarks
> Find out more about links to the university		
> MA en sciences de l'ingénieur industriel (toutes finalités) > MA en sciences industrielles (toutes finalités)	Accès direct au master moyennant ajout éventuel de 15 crédits max	Type long

— Adults taking up their university training

> See the website www.uclouvain.be/en-vae

Tous les masters peuvent être accessibles selon la procédure de valorisation des acquis de l'expérience.

Personalized access

Reminder : all Masters (apart from Advanced Masters) are also accessible on file.

Students may submit an application for admission to the Louvain School of Engineering in which they list their detailed course curriculum (list of course work and marks year by year). The School in collaboration with the relevant programme commission will determine whether the student may be admitted and their decision will respect the programme rules. When necessary, they may suggest an individualised programme consisting of a part of the elective courses in the relevant Master's degree programme in civil engineering with the possible addition of a maximum of 15 supplemental credits.

The School in collaboration with the relevant programme commission will determine whether the student may be admitted and their decision will respect the programme rules. When necessary, the jury may suggest a programme in keeping with the student's previous course of study with the possible addition of a maximum of 15 supplemental credits.

Admission and Enrolment Procedures for general registration

Supplementary classes

To enrol for this Masters, the student must have a good command of certain subjects. If this is not the case, they must add preparatory modules to their Master's programme.

● Mandatory

△ Courses not taught during 2015-2016

⊕ Periodic courses taught during 2015-2016

⊗ Optional

⊖ Periodic courses not taught during 2015-2016

■ Activity with requisites

Click on the course title to see detailed informations (objectives, methods, evaluation...)

○	Supplementary classes	N.		Credits	
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Teaching method

The majority of classes consist of lectures and tutorials. The tutors are upper-class students who have specialised tutor training (the class LFS2351). This class provides its participants with practical tutoring techniques to help fellow students.

Methods that promote multidisciplinary studies

UCL's Master's degree programme in electro-mechanics is by nature multidisciplinary because it combines classes in electricity, mechanics, automation and computer sciences. It also includes non-engineering elective classes such as economics, management and languages.

Various teaching strategies

Through a pedagogy that prioritises projects that integrate several subjects, students gain critical thinking skills, which in turn allows them to design, model, and create electro-mechanic prototypes and systems.

In the last year of the programme, half of the time is devoted to the graduation project, which offers students the possibility of working as part of a research team or collaborating with the industrial sector to study a given subject in-depth. It provides an introduction to the actual working life of an engineer or researcher (thanks to the size of the project and the context within which it is carried out).

Diverse learning situations

Various pedagogical approaches are used: lectures, projects, exercise sessions, problem solving sessions, case studies, experimental laboratories, computer simulations, educational software, internships in industry or research, factory visits, seminars and group as well as individual work. In certain subjects, eLearning allows students to learn at their own pace and carry out virtual experiments.

These diverse learning situations permit students to build their knowledge in an iterative and progressive manner all the while developing their independence, organisational and time management skills as well as their ability to communicate. Students have access to the newest information technology (materials, software, networks) during their studies.

Evaluation

The evaluation methods comply with the [regulations concerning studies and exams](#). More detailed explanation of the modalities specific to each learning unit are available on their description sheets under the heading "Learning outcomes evaluation method".

Student work is 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.

ELME Evaluation Methods

	Axis 1 et 2	Axis 3	Axis 3, 4, 5 et 6
Certificate-based evaluation	-End of the semester exam based on course exercises -Tests in some introductory classes	-Report on mini project in field of study -Progress report on multidisciplinary project	-Progress report on multidisciplinary project -Report, public presentation, and yearly work for graduation project
Formative evaluation	Tutor feedback in exercises-based classes and APP	-Tutor feedback in exercises-based classes and APP -Self-evaluation grid available	-Tutor feedback in exercises-based classes and APP -Work on oral communication portion of graduation project

The certificate-based evaluation for Axes 1 and 2 is mainly achieved through exams at the end of the semester. Exam questions primarily have to do with class exercises. This is in keeping with the description of skills and knowledge to be acquired by the end of the programme (see above).

For certain introductory classes given during the Bachelor's degree programme (BAC 12 and 13), a certificate-based test is given mid-semester. This test allows student assess their educational progress. This is notably the case for LMECA 1901 (continuum mechanics) or LELEC1370 (circuits and electrical measures).

The objectives of Axis 3 are achieved through disciplinary mini-projects carried out in small groups. Where applicable, the mini-project is evaluated and the mark is included in the student's final mark.

In certain instances, teaching is done through the Learning by Problem Solving method (Apprentissage par problèmes or APP); for example in the required course MECA2821. In this case the APP group reports contribute to the student's final mark.

The interdisciplinary projects LELME2002 or LELME2003 target the learning objectives in Axes 2-6. Their evaluation includes the continuous evaluation of the following skills: writing specifications, carrying out a mock up or preliminary project, writing a report, group work, planning group work, thesis defence before a jury, carrying out a project and choosing appropriate technical solutions.

The evaluation of the graduation project (TFE) is aligned with the learning outcomes in Axes 2-6.

In order to improve students' communication skills (Axis 5), practice presentations are organised about two months before the graduation project presentations.

The formative evaluation of Axis 6 is achieved in part during the projects required for LELME2002 or LELME 2003 via tutor feedback and above all during the graduation project. Given the nature of the graduation project, the topics outlined in Axes 6.2 and 6.3 are more or less accounted for.

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

Since its creation, the Louvain School of Engineering (EPL) has participated in diverse [exchange programs](#) that were put into place at the European level and beyond.

Possible trainings at the end of the programme

Specialised Master's Degrees

- [Specialised Master's Degree in Nanotechnology](#)
- [Specialised Master's Degree in Nuclear Engineering](#)
- Specialised Master's Degree in Biotechnology and Applied Biology

Doctoral Programmes

Most doctoral students study at the Institute of Information and Communication Technologies, Electronics and Applied Mathematics as well as the Institute of Mechanics, Materials and Civil Engineering. The faculty of these Institutes participate in numerous doctoral programmes. A comprehensive list is available from the President of the Third Cycle Commission.

UCL Master's degrees (about 60) are accessible to UCL Master's degree holders

For example:

- The [Master's degree \(120\) in sciences and environmental management](#) and the [Master's degree \(60\) in sciences and environmental management](#) (automatic admission with possible complementary coursework)
- Different [Master's degree programmes in management](#) (automatic admission based on written application): see this list
- The [Master's degree \(60\) in information and communication](#) at Louvain-la-Neuve or the [Master's degree \(60\) in information and communication](#) at Mons

Contacts

Curriculum Management

Entite de la structure ELME

Acronyme	ELME
Dénomination	Commission de programme - Ingénieur civil électromécanicien
Adresse	Place du Levant 3 bte L5.03.02 1348 Louvain-la-Neuve
Secteur	Secteur des sciences et technologies (SST)
Faculté	Ecole Polytechnique de Louvain (EPL)
Commission de programme	Commission de programme - Ingénieur civil électromécanicien (ELME)

Academic Supervisor : [Hervé JEANMART](#)

Jury:

Président du Jury : [Jean-Didier LEGAT](#)

Secrétaire du Jury - Energie : [Hervé JEANMART](#)

Secrétaire du Jury - Mécatronique : [Hervé JEANMART](#)

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