MECA2M
2019 - 2020
Master [120] in Mechanical Engineering

At Louvain-la-Neuve - 120 credits - 2 years - Day schedule - In english
Dissertation/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 acronym: meca2m - Francophone Certification Framework: 7

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Introduction

This program trains students various fields of mechanical engineering: fluid mechanics, analytical and computational applied mechanics, the mechanics of materials and structures, applied dynamics, mechanical production, mechanical engineering design, mechanical manufacturing, and machines (thermal, thermodynamic, and energetic).

Through pedagogical laboratories, case studies, projects and a master’s thesis, you will get hands-on experience, and you will become acquainted with the cutting edge methods used in relevant fields.

You will undertake numerous integrated projects, which will allow you to conceive, model, achieve and validate experimental systems, prototypes and devices.

Your profil

You

• Have solid skills in the field of mechanics due to your undergraduate studies

• Envisage a career in the industrial sector where you will play a role in design and research or in the organization and oversight of production;

• Wish to use your skills in the following fields: aeronautics, the spatial industry, energy, the metallurgical or plastics industry, the automotive industry, biomechanics, etc.;

• Seek a programme that will allow you to master scientific, technological and human problems that are linked to the field of mechanics.

Your futur job

Mechanical engineers are present in all industrial sectors: the chemical industry, pharmaceutical and food industries, electronics and telecommunications industries, metallurgy, aeronautics, construction and engineering, large scale distribution, banking and consulting services, nanotechnologies and medical technologies, etc.

They play a role as researchers and developers, are responsible for production or management and hold jobs in marketing and sales (of advanced technological products).

We find civil engineers in departments of finance, information technology, training or quality control, the public sector, higher education, or in the Ministry of equipment and transportation. (www.fabi.com)

Your programme

This Master’s degree offers you:

• A versatile education in fields related to mechanical engineering;

• A vast choice of majors directly related to the latest research advances in the field;

• Pedagogy that links theory and practice: labs, projects, case studies, etc.;

• Advanced learning of numerical methods and their applications;

• The opportunity to undertake an internship in the industrial sector;

• The opportunity to complete part of our curriculum abroad, in Europe or elsewhere in the world, for exchange or double-degree programmes, with partner institutions such as ISAE SUPAERO or Keio University

• The opportunity to obtain three Master degrees within two years, if you are accepted into the international Master programme “TFM-ASA” (Transfers-Fluids-Materials), specialized in aeronautical and space applications. For more information on this program: https://www.tfmasa.eu
Learning outcomes

This diploma in civil engineering in mechanics aims to meet the challenges of designing and innovating, according to a polytechnical
approach, complex solutions and systems linked to mechanics and its applications. This Master’s degree aims to train experts in the
area of mechanics and its applications and to do so in the context of the rapidly changing circumstances of Europe and the world.
The future civil engineer in mechanics will acquire the skills and knowledge to become
A professional polytechnic engineer capable of integrating several disciplines in the areas of continuum mechanics, thermodynamics and machine design.
An individual capable of putting into practice his/her skills as well as the tools used in research and technology.
A specialist in extremely varied and specialized applied fields such as energetics, aerodynamics, automobiles, rail transport, robotics,
numerical simulation, and scientific information.
A manager who can manage projects alone or in a team.

Polytechnic and multidisciplinary, the education offered by the Louvain School of Engineering privileges the acquisition of skills and
knowledge that combine theory and practice and that deal with analysis, design, manufacturing, production, research and development
and innovation while at the same time taking ethics and sustainable development into consideration.

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

1. Demonstrate a mastery of a solid body of knowledge in basic and engineering sciences, permitting him/her to understand and solve
problems that are raised by mechanics.

1.1 Identify and apply concepts, laws, and practical reasoning to a given problem related to:

• Continuum mechanics
• Energy, thermodynamics and thermics
• Mathematical modelling and numerical simulation
• Project management
• Robotics, automated systems

1.2 Identify and use adequate modelling and calculation tools to solve these problems

1.3 Verify the plausibility and confirm the validity of results (orders of magnitude, units).

2. Organize and carry out an applied engineering procedure for the development of a product (and/or a service) that meets a need or
solves a problem specific to the field of mechanics.

2.1 Analyse the problem or the operational needs that must be met, formulate the product specifications while taking technical and
economic constraints into account.

2.2 Model the problem and design one or more technical solutions while integrating the mechanical aspects corresponding to the
product specifications.

2.3 Evaluate and classify solutions in light of all the criteria included in the product specifications: efficiency, feasibility, quality,
ergonomics, and security.

2.4 Implement and test a solution in the form of a mock up, a prototype and/or a numerical model.

2.5 Formulate recommendations to improve the operational characteristics of a proposed solution.

3. Organize and carry out a research project to understand a physical phenomenon or a new problem related to mechanics.

3.1 Document and summarize the existing knowledge in the field of mechanics.

3.2 Suggest a model and/or experimental device to simulate the performance of a system, thereby testing relevant hypotheses related
to the phenomenon being studied.

3.3 Put together a summary report, which aims to explain the potentialities for theoretical and/or technical innovation resulting from the
research project.

4. Contribute, as a member of a team, to the achievement of a multidisciplinary project while taking into account its objectives, allocated
resources and constraints.

4.1 Create a project framework and explain the project objectives while taking into account the challenges and constraints that
characterize the project’s environment.

4.2 Collectively commit to a work schedule

4.3 Operate in a multidisciplinary environment with individuals who hold different points of view

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

5. Demonstrate effective communication skills (speaking and writing skills in French or in a foreign language) with the goal of
successfully carrying out assigned projects.

5.1 Identify the client’s needs: ask appropriate questions and listen to the entire request (not simply the technical aspects).

5.2 Present convincing arguments by using the language of your interlocutors (colleagues, technicians, clients, superiors).

5.3 Communicate through graphics and schemes (interpret a scheme, present a project, structure information).

5.4 Read, analyse, and use technical documents (standards, outlines, specifications).

5.5 Draft written documents that take contextual requirements and social conventions into account.
5.6 Give convincing oral presentations using appropriate communication techniques. Display rigour, openness, and critical thinking. Be able to adopt the appropriate global point of view to validate the socio-technical relevance of a hypothesis or a solution, all the while drawing upon available technological and scientific innovations.

6.1 Apply standards and assure the robustness of a solution in the fields of mechanics and electricity.

6.2 Put solutions into perspective by including non-technical concerns (for example, in the area of energy and climate, take environmental and social angles into consideration).

6.3 Demonstrate critical thinking vis-à-vis technical solutions.

6.4 Evaluate one’s own work

Programme structure

Besides a core curriculum (36 credits) and a final specialization (30 credits), students complete their technical training by selecting courses (a minimum of 34 credits) among the following:

- Energy
- Aeronautics
- Dynamics, robotic and biomechanics
- Design, manufacturing and mechanics of materials
- Nuclear engineering

and the module of a multidisciplinary class of your choice.

In the spirit of openness, students can complete their program (a maximum of 20 credits) through multidisciplinary coursework. This includes an internship, completing a language programme, a choice of general knowledge classes or classes in human sciences. This is possible thanks to the flexibility that characterises this master’s programme in civil and mechanical engineering. Based on their course choices, students will eventually select one or two majors.

The graduation (or end of studies) project is normally carried out at the end of the programme (second year). Depending on the students’ programme, he/she may take the courses in the first or second-year if the course prerequisites allow it. This may be particularly useful for those students who pursue a portion of their studies outside of UCL as part of an exchange programme. These types of programmes will be submitted for approval by the Programme Commission of the Master’s degree in question.

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's degree in Mechanical Engineering [en-prog-2019-meca2m-lmeca220t.html]

> Professional Focus [en-prog-2019-meca2m-lmeca222o]

Options courses

> Majors for the Master's degree in mechanical engineering [en-prog-2019-meca2m-lmeca223o.html]
  > Major in aeronautics [en-prog-2019-meca2m-lmeca222o.html]
  > Major in dynamics, robotic and biomechanics [en-prog-2019-meca2m-lmeca223o.html]
  > Major in energy [en-prog-2019-meca2m-lmeca224o.html]
  > Major in design, manufacturing and mechanics of materials [en-prog-2019-meca2m-lmeca225o.html]
  > Major in nuclear engineering [en-prog-2019-meca2m-lmeca226o.html]

> Major in small and medium sized business creation [en-prog-2019-meca2m-lmeca227o.html]

> Major in business risks and opportunities [en-prog-2019-meca2m-lmeca230o.html]

> Elective courses for the Master's degree in Mechanical Engineering [en-prog-2019-meca2m-lmeca232o.html]
  > Elective courses available for Master students in mechanical engineering [en-prog-2019-meca2m-lmeca232o.html]
  > Elective courses : transversal skills and contacts with industry [en-prog-2019-meca2m-lmeca952o.html]
### Programme by subject

#### CORE COURSES

- **Mandatory**
- **Optional**
- **Courses not taught during 2019-2020**
- **Periodic courses not taught during 2019-2020**
- **Activity with requisites**

#### Graduation Project/End of Studies Project
- **Course:** LMECA2990
- **Title:** Graduation Project/End of Studies Project
- **Credits:** 28 Credits
- **Period:** Year 1
- **Instructors:** Bruno Dehez, Christophe Everarts (compensates Benoît Raucent), Renaud Ronsse

#### Project in Mechanical Design II
- **Course:** LMECA2840
- **Title:** Project in Mechanical Design II
- **Credits:** 6 Credits
- **Period:** Year 1 + 2q
- **Instructors:** Bruno Dehez, Christophe Everarts (compensates Benoît Raucent), Renaud Ronsse

#### Societies, Cultures, Religions (2 credits)

The students select one course between:

- **LTECO2100** Sociétés, cultures, religions : Biblical readings
  - **Instructor:** Hans Ausloos
  - **Credits:** 2 Credits
  - **Period:** 1q

- **LTECO2300** Sociétés, cultures, religions : Ethical questions
  - **Instructor:** Marcela Lobo Bustamante
  - **Credits:** 2 Credits
  - **Period:** 1q

- **LTECO2200** Sociétés-cultures-religions : Human Questions
  - **Instructor:** Régis Burnet, Dominique Martens
  - **Credits:** 2 Credits
  - **Period:** 1 ou 2q

#### PROFESSIONAL FOCUS [30.0]

- **Mandatory**
- **Optional**
- **Courses not taught during 2019-2020**
- **Periodic courses not taught during 2019-2020**
- **Activity with requisites**

#### Thermal cycles
- **Course:** LMECA2150
- **Title:** Thermal cycles
- **Instructor:** Yann Bartosiewicz
- **Credits:** 5 Credits
- **Period:** 1q

#### Internal combustion engines
- **Course:** LMECA2220
- **Title:** Internal combustion engines
- **Instructor:** Francesco Contino, Hervé Jeannart
- **Credits:** 5 Credits
- **Period:** 2q

#### Fluid mechanics and transfer II
- **Course:** LMECA2322
- **Title:** Fluid mechanics and transfer II
- **Instructor:** Matthieu Duponcheel, Grégoire Winckelmans
- **Credits:** 5 Credits
- **Period:** 1q
<table>
<thead>
<tr>
<th>Code</th>
<th>Course</th>
<th>Year</th>
<th>Credits</th>
<th></th>
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<tbody>
<tr>
<td>LMECA2410</td>
<td>Mechanics of Materials</td>
<td>1</td>
<td>5</td>
<td>x</td>
</tr>
<tr>
<td>LMECA2755</td>
<td>Industrial automation</td>
<td>1</td>
<td>5</td>
<td>x</td>
</tr>
<tr>
<td>LMECA2801</td>
<td>Machine design</td>
<td>1</td>
<td>5</td>
<td>x</td>
</tr>
</tbody>
</table>
**OPTIONS [54.0]**

Students have to complete their programme with major and/or elective courses. They will select:

<table>
<thead>
<tr>
<th>Majors for the Master's degree in mechanical engineering</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt; Major in aeronautics [ en-prog-2019-meca2m-lmeca222o ]</td>
</tr>
<tr>
<td>&gt; Major in dynamics, robotic and biomechanics [ en-prog-2019-meca2m-lmeca223o ]</td>
</tr>
<tr>
<td>&gt; Major in energy [ en-prog-2019-meca2m-lmeca224o ]</td>
</tr>
<tr>
<td>&gt; Major in design, manufacturing and mechanics of materials [ en-prog-2019-meca2m-lmeca226o ]</td>
</tr>
<tr>
<td>&gt; Major in nuclear engineering [ en-prog-2019-meca2m-lmeca231o ]</td>
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<table>
<thead>
<tr>
<th>Major in business creation and management</th>
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<tbody>
<tr>
<td>&gt; Major in small and medium sized business creation [ en-prog-2019-meca2m-lmeca229o ]</td>
</tr>
<tr>
<td>&gt; Major in business risks and opportunities [ en-prog-2019-meca2m-lmeca230o ]</td>
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</table>

<table>
<thead>
<tr>
<th>Elective courses for the Master's degree in Mechanical Engineering</th>
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</thead>
<tbody>
<tr>
<td>&gt; Elective courses available for Master students in mechanical engineering [ en-prog-2019-meca2m-lmeca232o ]</td>
</tr>
<tr>
<td>&gt; Elective courses: transversal skills and contacts with industry [ en-prog-2019-meca2m-lmeca952o ]</td>
</tr>
</tbody>
</table>

**MAJOR IN AERONAUTICS**

Open to all students of civil and mechanical engineering and electromechanical engineering, classes in this major review mechanical applications of aeronautics: aeronautic structures, vibrations, aerodynamics, dynamics of flight, etc. The learning process consists of advanced classes in the mechanics of fluids and solids, with particular attention paid to numerical methods. This major is complemented by majors in Energy, Dynamics, Robotics and Biomechanics as well as Design, Manufacturing and Materials Mechanics (regarding problems of energy in aeronautics, motorisation, dynamics and the importance of materials in the design and maintenance of airplanes).

**De 20 à 30 CREDITS parmi**

<table>
<thead>
<tr>
<th>Year</th>
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<tbody>
<tr>
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**Contenu:**

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<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Instructor(s)</th>
<th>Credits</th>
<th>Year</th>
<th>Weekly Hours</th>
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<tbody>
<tr>
<td>LGCIV2041</td>
<td>Numerical analysis of civil engineering structures</td>
<td>Luca Sgambi</td>
<td>5</td>
<td>2</td>
<td>20h+15h</td>
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<tr>
<td>LMECA2195</td>
<td>Gasdynamics and reacting flows</td>
<td>Miltiadis Papalexandris</td>
<td>5</td>
<td>2</td>
<td>30h+30h</td>
</tr>
<tr>
<td>LMECA2300</td>
<td>Advanced Numerical Methods</td>
<td>Philippe Chatelain</td>
<td>5</td>
<td>2</td>
<td>30h+30h</td>
</tr>
<tr>
<td>LMECA2323</td>
<td>Aerodynamics of external flows</td>
<td>Philippe Chatelain</td>
<td>5</td>
<td>2</td>
<td>30h+30h</td>
</tr>
<tr>
<td>LMECA2520</td>
<td>Calculation of planar structures</td>
<td>Issam Doghri</td>
<td>5</td>
<td>2</td>
<td>30h+30h</td>
</tr>
<tr>
<td>LMECA2550</td>
<td>Aircraft propulsion systems.</td>
<td>Philippe Chatelain</td>
<td>5</td>
<td>1</td>
<td>30h+30h</td>
</tr>
<tr>
<td>LMECA2660</td>
<td>Numerical methods in fluid mechanics</td>
<td>Laurent Bricteux</td>
<td>5</td>
<td>2</td>
<td>30h+30h</td>
</tr>
<tr>
<td>LMECA2830</td>
<td>Aerospace dynamics.</td>
<td>Philippe Chatelain</td>
<td>5</td>
<td>1</td>
<td>30h+30h</td>
</tr>
<tr>
<td>Code</td>
<td>Title</td>
<td>Credits</td>
<td>Year</td>
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<tr>
<td>LMECA2853</td>
<td>Turbulence</td>
<td>5</td>
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</tbody>
</table>
MAJOR IN DYNAMICS, ROBOTIC AND BIOMECHANICS

Open to all students of civil and mechanical engineering and electromechanical engineering, classes in this major review dynamics, robotics as well as biomechanics. Whether it be an analysis of vibrations, adjustment of a robot or the design and production of components or micro-components in bioengineering (for example, artificial Implants, valves and prosthetics), this major allows students to address one or more applications from a mechanics perspective. This major is complemented by the majors in Aeronautics, Energy as well as Design, Manufacturing and Materials Mechanics especially for students interested in problems related to dynamics and robotics in aeronautics and energy. The design and the choice of materials is crucial whether it be for the adjustment of a robot or the selection of bio-materials in rehabilitation projects.

De 20 à 30 CREDITS parmi

<table>
<thead>
<tr>
<th>Number</th>
<th>Course Title</th>
<th>Credits</th>
<th>Hours</th>
<th>Prerequisite</th>
<th>Year</th>
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<tbody>
<tr>
<td>LGBIO2040</td>
<td>Biomechanics</td>
<td>5</td>
<td>Greet Kerckhofs</td>
<td>20h+30h</td>
<td>2q</td>
</tr>
<tr>
<td>LGCIV2042</td>
<td>Dynamics of structures</td>
<td>5</td>
<td>João Saraiva Esteves, Pacheco De Almeida</td>
<td>20h+15h</td>
<td>1q</td>
</tr>
<tr>
<td>LMECA2170</td>
<td>Numerical Geometry</td>
<td>5</td>
<td>Vincent Legat, Jean-François Remacle</td>
<td>30h+30h</td>
<td>1q</td>
</tr>
<tr>
<td>LMECA2215</td>
<td>Vehicle System Dynamics</td>
<td>5</td>
<td>Paul Fisette</td>
<td>30h+30h</td>
<td>1q</td>
</tr>
<tr>
<td>LMECA2355</td>
<td>Mechanical design in biomedical engineering</td>
<td>5</td>
<td>Greet Kerckhofs, Ann Vankruikelsven (compensates Benoît Raucent)</td>
<td>30h+30h</td>
<td>1q</td>
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<tr>
<td>LMECA2732</td>
<td>Introduction to robotics</td>
<td>5</td>
<td>Renaud Ronsse</td>
<td>30h+30h</td>
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<tr>
<td>LMECA2802</td>
<td>Multibody system Dynamics</td>
<td>5</td>
<td>Paul Fisette</td>
<td>30h+30h</td>
<td>2q</td>
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<tr>
<td>LINMA2875</td>
<td>System Identification</td>
<td>5</td>
<td>Julien Hendrickx</td>
<td>30h+30h</td>
<td>2q</td>
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<tr>
<td>LMECA2335</td>
<td>Biorobotics</td>
<td>5</td>
<td>Renaud Ronsse</td>
<td>30h+30h</td>
<td>2q</td>
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</tbody>
</table>

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

Classes in this major review the subject of energy in the real world. This subject is addressed in its entirety first by the study of production techniques and energy conversion (thermal machines, nuclear energy, renewable energy) followed by an analysis of the risks associated with energy production and the means of minimising these risks (major risks, pollution) and finally a study of energy consumption and its consequences. This major is complemented by the major in Aeronautics for those students interested in problems of energy and motorisation in aeronautics. This is also the case for the major in Dynamics, Robotics and Biomechanics as well as the major in Design, Manufacturing and Materials Mechanics for students interested in dynamics, automation, and materials used in the design and maintenance of systems of production and energy conversion.

### Content:

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Instructor(s)</th>
<th>Credits</th>
<th>Period</th>
<th>Year</th>
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<tbody>
<tr>
<td>LENV2007</td>
<td>Renewable energies</td>
<td>Xavier Draye, Patrick Gerin, Hervé Jeanmart, Geoffrey Van Moeseke</td>
<td>4</td>
<td>1q</td>
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<tr>
<td>LMECA2160</td>
<td>Combustion and fuels</td>
<td>Miltiadis Papalexandris</td>
<td>5</td>
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<tr>
<td>LMECA2240</td>
<td>Testing of thermal machinery.</td>
<td>Francesco Contino, Hervé Jeanmart</td>
<td>2</td>
<td>2q</td>
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<tr>
<td>LMECA2325</td>
<td>Biomass conversion</td>
<td>Patrick Gerin, Hervé Jeanmart</td>
<td>5</td>
<td>1q</td>
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<tr>
<td>LMECA2420</td>
<td>Advanced topics in energetics.</td>
<td>Yann Bartosiewicz, Hervé Jeanmart</td>
<td>3</td>
<td>2q</td>
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<tr>
<td>LMECA2600</td>
<td>Introduction to nuclear engineering and reactor technology</td>
<td>Hamid Ali Abderrahim</td>
<td>5</td>
<td>1q</td>
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<tr>
<td>LMECA2711</td>
<td>Quality management and control.</td>
<td>Nicolas Bronchart</td>
<td>5</td>
<td>2q</td>
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<tr>
<td>LMECA2771</td>
<td>Thermodynamics of irreversible phenomena.</td>
<td>Miltiadis Papalexandris</td>
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<td>2q</td>
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<tr>
<td>LMECA2780</td>
<td>Introduction to Turbomachinery</td>
<td>Tony Arts</td>
<td>5</td>
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</tbody>
</table>
MAJOR IN DESIGN, MANUFACTURING AND MECHANICS OF MATERIALS

Open to civil, mechanical and electromechanical engineering students, this major reviews design, manufacturing and the importance of materials in the development of a mechanical system. It also addresses physical and chemical properties and the behaviour of metals, polymers and composites. Next, the main techniques for shaping these materials (moulding by injection or compression, stretching, laminating, forging, extrusion, embossing) are studied from the thermo-mechanical and technological point of view. Finally, numerical modelling of these procedures is tackled with particular attention paid to welding techniques. All phases of the mechanical manufacturing process are studied from the design stage to the setting up of suitable manufacturing techniques to the production schedule and organisation of working groups. This major is rounded out by those in aeronautics and energy as well as dynamics, robotics and biomechanics for students interested in issues pertaining to design, manufacturing and the importance of materials be they in aeronautics, energy, transportation or bio-engineering.

De 20 à 30 CREDITS parmi

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
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<tr>
<td>LMAPR2481</td>
<td>Deformation and fracture of materials</td>
<td>Hosni Idrissi Thomas Pardoen</td>
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<tr>
<td>LMAPR2482</td>
<td>Plasticity and metal forming</td>
<td>Laurent Delannay Thomas Pardoen</td>
<td>5</td>
<td>2</td>
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<tr>
<td>LMECA2141</td>
<td>Rheology</td>
<td>Vincent Legat Evelyne Van Ruymbeke</td>
<td>5</td>
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<tr>
<td>LMECA2453</td>
<td>Advanced manufacturing technologies</td>
<td>Aude Simar</td>
<td>5</td>
<td>1</td>
</tr>
<tr>
<td>LMECA2520</td>
<td>Calculation of planar structures</td>
<td>Issam Doghri</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>LMECA2640</td>
<td>Mechanics of composite materials</td>
<td>Issam Doghri</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>LMECA2860</td>
<td>Welding</td>
<td>Pascal Jacques Aude Simar</td>
<td>5</td>
<td>1</td>
</tr>
</tbody>
</table>

Courses not taught during 2019-2020

Periodic courses not taught during 2019-2020

Periodic courses taught during 2019-2020

Activity with requisites

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

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 conditional 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.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Instructor</th>
<th>Credits</th>
<th>Contact Hours</th>
<th>Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>LMECA2600</td>
<td>Introduction to nuclear engineering and reactor technology</td>
<td>Hamid Aït Abderrahim</td>
<td>5</td>
<td>30h+30h</td>
<td>1q</td>
</tr>
<tr>
<td>LMECA2648</td>
<td>Nuclear thermal-hydraulics (Centre d'étude nucléaire-Mol)</td>
<td>Yann Bartosiewicz</td>
<td>5</td>
<td>40h+7.5h</td>
<td>1q</td>
</tr>
</tbody>
</table>

Elective courses for the nuclear engineering major

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
<th>Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>LBNEN2002</td>
<td>Introduction to Nuclear Physics &amp; Measurements (Centre d'étude nucléaire-Mol)</td>
<td>3</td>
<td>1q</td>
</tr>
<tr>
<td>LBNEN2003</td>
<td>Safety of Nuclear Powerplants (Centre d'étude nucléaire-Mol)</td>
<td>5</td>
<td>2q</td>
</tr>
<tr>
<td>LBNEN2011</td>
<td>Radiation protection (Centre d'étude nucléaire-Mol)</td>
<td>3</td>
<td>1q</td>
</tr>
</tbody>
</table>

Click on the course title to see detailed informations (objectives, methods, evaluation...)
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 familiarize the civil engineering student with the specifics of entrepreneurship and business development in order to develop the necessary abilities, knowledge and tools to create a business. It is a truly interdisciplinary initiative where students from different faculties are brought together in cross-disciplinary teams to create an entrepreneurial project. The Interdisciplinary program in entrepreneurship (CPME) is spread over two years and is integrated into more than 20 Masters (8 faculties). The program includes a collective and interdisciplinary master thesis focused on an entrepreneurial project (start-up or spin-off) and realized in teams of 3 to 4 students from 3 to 4 different faculties. The access is reserved for a small number of students by a selection procedure. Additional information may be found at www.uclouvain.be/cpme This major is not available in English and may not be taken at the same time as the major “Business risks and opportunities”.

De 20 à 25 CREDITS parmi

Required courses for the major in small and medium sized businesses

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Instructor(s)</th>
<th>Credits</th>
<th>Period</th>
</tr>
</thead>
<tbody>
<tr>
<td>LCPME2001</td>
<td>Entrepreneurship Theory (in French)</td>
<td>Blanche Havenne (compensates Frank Janssen)</td>
<td>5</td>
<td>1q</td>
</tr>
<tr>
<td>LCPME2002</td>
<td>Managerial, legal and economic aspects of the creation of a company (in French)</td>
<td>Yves De Cordt, Marine Falize</td>
<td>5</td>
<td>1q</td>
</tr>
<tr>
<td>LCPME2003</td>
<td>Business plan of the creation of a company (in French)</td>
<td>Frank Janssen</td>
<td>5</td>
<td>2q</td>
</tr>
<tr>
<td>LCPME2004</td>
<td>Advanced seminar on Entrepreneurship (in French)</td>
<td>Frank Janssen</td>
<td>5</td>
<td>2q</td>
</tr>
</tbody>
</table>

Prerequisite CPME courses

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

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Instructor(s)</th>
<th>Credits</th>
<th>Period</th>
</tr>
</thead>
<tbody>
<tr>
<td>LCPME2000</td>
<td>Venture creation financement and management I</td>
<td>Yves De Rongé, Olivier Giacomin</td>
<td>5</td>
<td>1q</td>
</tr>
</tbody>
</table>
## MAJOR IN BUSINESS RISKS AND OPPORTUNITIES

Cette option n’est pas accessible en anglais et ne peut être prise simultanément avec l’option « Formation interdisciplinaire en création d’entreprise - CPME ».

- **Mandatory**
- **△ Courses not taught during 2019-2020**
- **Optional**
- **Periodic courses taught during 2019-2020**
- **Activity with requisites**

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

### De 16 à 20 CREDITS parmi

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Instructor(s)</th>
<th>Credits</th>
<th>Period</th>
</tr>
</thead>
<tbody>
<tr>
<td>LFSA1290</td>
<td>Introduction to financial and accounting management</td>
<td>Philippe Grégoire</td>
<td>4</td>
<td>2q</td>
</tr>
<tr>
<td>LFSA2140</td>
<td>Elements of law for industry and research</td>
<td>Vincent Cassiers, Werner Derijcke, Bénédicte Inghels</td>
<td>3</td>
<td>2q</td>
</tr>
<tr>
<td>LFSA2210</td>
<td>Organisation and human resources</td>
<td>John Cultiaux, Eline Jammaers</td>
<td>3</td>
<td>2q</td>
</tr>
<tr>
<td>LFSA2230</td>
<td>Introduction to management and to business economics</td>
<td>Benoît Gailly</td>
<td>4</td>
<td>2q</td>
</tr>
<tr>
<td>LFSA2245</td>
<td>Environment and business</td>
<td>Jean-Pierre Tack</td>
<td>3</td>
<td>1q</td>
</tr>
</tbody>
</table>

### One course between

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
<th>Period</th>
</tr>
</thead>
<tbody>
<tr>
<td>LFSA2202</td>
<td>Ethics and ICT</td>
<td>3</td>
<td>2q</td>
</tr>
<tr>
<td>LLSMS2280</td>
<td>Business Ethics and Compliance Management</td>
<td>5</td>
<td>1q</td>
</tr>
</tbody>
</table>

### 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.
ELECTIVE COURSES AVAILABLE FOR MASTER STUDENTS IN MECHANICAL ENGINEERING

- **Mandatory**
- **Optional**
- **Courses not taught during 2019-2020**
- **Periodic courses taught during 2019-2020**

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

### Year

#### 1

#### 2

### Contenu:

#### Comprehensive courses

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Instructor(s)</th>
<th>Credits</th>
<th>Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>LELEC1530</td>
<td>Basic analog and digital electronic circuits</td>
<td>Denis Flandre Jean-Didier Legal (coord.)</td>
<td>5</td>
<td>1</td>
</tr>
<tr>
<td>LELEC1370</td>
<td>Measurements and electrical circuits</td>
<td>Christophe Craeye Bruno Dehez Claude Oestges (coord.)</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>LINMA1510</td>
<td>Linear Control</td>
<td>Denis Dochain</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>LMECA1451</td>
<td>Mechanical manufacturing.</td>
<td>Laurent Delannay Aude Simar</td>
<td>5</td>
<td>1</td>
</tr>
</tbody>
</table>

### ELECTIVE COURSES : TRANSVERSAL SKILLS AND CONTACTS WITH INDUSTRY

- **Mandatory**
- **Optional**
- **Courses not taught during 2019-2020**
- **Periodic courses not taught during 2019-2020**
- **Periodic courses taught during 2019-2020**

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

The student selects between 3 and 22 credits (max 27 if the student selects the internship) in this list below or in the courses of the major "business risks and opportunities". An alternative is to select the Major in small and medium sized business creation.

### Year

#### 1

#### 2

### Contenu:

#### Transversal skills and contacts with industry

The student selects min 3 credits among the courses of the majors "business risks and opportunities", "small and medium sized business creation" and courses of professional integration activity specific to the program.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Instructor(s)</th>
<th>Credits</th>
<th>Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>LFSA2995</td>
<td>Company Internship</td>
<td>Jean-Pierre Raskin</td>
<td>10</td>
<td>1+2</td>
</tr>
<tr>
<td>LMECA2420</td>
<td>Advanced topics in energetics.</td>
<td>Yann Bartosiewicz Hervé Jeanmart</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>LMECA2711</td>
<td>Quality management and control.</td>
<td>Nicolas Bronchart</td>
<td>5</td>
<td>2</td>
</tr>
</tbody>
</table>

### Communication

Max=8 CREDITS parmi

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Instructor(s)</th>
<th>Credits</th>
<th>Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>LALLE2500</td>
<td>Professional development seminar German</td>
<td>Caroline Klein Ann Rinder (coord.)</td>
<td>3</td>
<td>1+2</td>
</tr>
</tbody>
</table>

### Languages

Students may select from any language course offered at the ILV. Special attention is placed on the following seminars in professional development:

- **Max=8 CREDITS parmi**

---

<table>
<thead>
<tr>
<th>Code</th>
<th>Course Description</th>
<th>Coordinator(s)</th>
<th>Hours</th>
<th>Credits</th>
<th>Year 1</th>
<th>Year 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>LALLE2501</td>
<td>Professional development seminar-German</td>
<td>Caroline Klein Ann Rinder (coord.)</td>
<td>30h</td>
<td>5</td>
<td>1 + 2q</td>
<td>x</td>
</tr>
<tr>
<td>LESPA2600</td>
<td>Vocational Induction Seminar - Spanish (B2.2/C1)</td>
<td>Paula Lorente Fernandez (coord.) Alici Maria Tirado Fernandez (compensates Paula Lorente Fernandez)</td>
<td>30h</td>
<td>3</td>
<td>1q</td>
<td>x</td>
</tr>
<tr>
<td>LESPA2601</td>
<td>Vocational Induction Seminar - Spanish (B2.2/C1)</td>
<td>Paula Lorente Fernandez (coord.) Alici Maria Tirado Fernandez (compensates Paula Lorente Fernandez)</td>
<td>30h</td>
<td>5</td>
<td>1q</td>
<td>x</td>
</tr>
<tr>
<td>LNEER2500</td>
<td>Seminar of Entry to professional life in Dutch - Intermediate level</td>
<td>Isabelle Demeulenaere (coord.) Marie-Laurence Lambrecht</td>
<td>30h</td>
<td>3</td>
<td>1 ou 2q</td>
<td>x</td>
</tr>
<tr>
<td>LNEER2600</td>
<td>Seminar of entry to professional life in Dutch - Upper-intermediate level</td>
<td>Isabelle Demeulenaere (coord.)</td>
<td>30h</td>
<td>3</td>
<td>1 ou 2q</td>
<td>x</td>
</tr>
</tbody>
</table>

**Group dynamics**

<table>
<thead>
<tr>
<th>Code</th>
<th>Course Description</th>
<th>Coordinator(s)</th>
<th>Hours</th>
<th>Credits</th>
<th>Year 1</th>
<th>Year 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>LEPL2351</td>
<td>Dynamique des groupes - Q1</td>
<td>Christine Jacqmot Benoît Raquent Vincent Wertz (coord.)</td>
<td>15h+30h</td>
<td>3</td>
<td>1q</td>
<td>x</td>
</tr>
<tr>
<td>LEPL2352</td>
<td>Dynamique des groupes - Q2</td>
<td>Christine Jacqmot Benoît Raquent Vincent Wertz (coord.)</td>
<td>15h+30h</td>
<td>3</td>
<td>2q</td>
<td>x</td>
</tr>
</tbody>
</table>

**Other non-disciplinary courses**

*The student may further select maximum 8 credits in other disciplines.*
Course prerequisites

A document entitled (nb: not available for this programme meca2m) 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 (https://uclouvain.be/fr/decouvrir/rgee.html).

The programme’s courses and learning outcomes

For each UCLouvain 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?”
Admission

General (https://uclouvain.be/en/study/inscriptions/admission-requirements-master-s-degree.html) and specific admission requirements for this program must be satisfied at the time of enrolling at the university.

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

SUMMARY

- Specific Admission Requirements
- 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
- Access on the file
- Admission and Enrolment Procedures for general registration

Specific Admission Requirements

This programme is taught in English with no prerequisite in French. The student is supposed to have at least a B2 level in the European Framework of Reference. A certificate is required for the holders of a non-Belgian degree, see selection criteria of the personalized access.

University Bachelors

<table>
<thead>
<tr>
<th>Diploma</th>
<th>Special Requirements</th>
<th>Access</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>UCLouvain Bachelors</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bachelor in Engineering</td>
<td></td>
<td>Direct Access</td>
<td>Students who have neither major nor minor in the field of their civil engineering Master's degree may have an adapted master programme.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Diploma</th>
<th>Special Requirements</th>
<th>Access</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Others Bachelors of the French speaking Community of Belgium</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bachelor in Engineering</td>
<td></td>
<td>Direct Access</td>
<td>Students with a Bachelor’s degree in engineering sciences who have not taken the equivalent of a minor in the field of their civil engineering master degree may have an adapted master programme.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Diploma</th>
<th>Special Requirements</th>
<th>Access</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bachelors of the Dutch speaking Community of Belgium</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bachelor in engineering</td>
<td></td>
<td>Access with additional training</td>
<td>Students who have no specialisation in the field of their civil engineering master degree may have an adapted master programme with up to 60 additional credits.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Diploma</th>
<th>Special Requirements</th>
<th>Access</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foreign Bachelors</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bachelor in engineering</td>
<td>Bachelors degree of Cluster Institution</td>
<td>Direct Access</td>
<td>Students with a Bachelor's degree in engineering sciences who have not taken the equivalent of a minor in the field of their civil engineering master degree may have an adapted master programme.</td>
</tr>
</tbody>
</table>
Bachelor in Engineering | For others institutions | Based on application: accepted, conditional on further training, or refusal

Non university Bachelors

> Find out more about links (https://uclouvain.be/fr/etudier/passerelles) to the university

Holders of a 2nd cycle University degree

<table>
<thead>
<tr>
<th>Diploma</th>
<th>Special Requirements</th>
<th>Access</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>&quot;Licenciés&quot;</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Masters

<table>
<thead>
<tr>
<th>Master in Engineering</th>
<th>Direct Access</th>
</tr>
</thead>
</table>

Holders of a non-University 2nd cycle degree

Adults taking up their university training

> See the website Valorisation des acquis de l'expérience (https://uclouvain.be/fr/etudier/vae)

It is possible to gain admission to all masters courses via the validation of professional experience procedure.

Consult the site www.uclouvain.be/vae

Admission to all Master's programmes is based on an assessment of the student's prior experience.

Access on the file

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

The first step of the admission procedure requires to submit an application online: https://uclouvain.be/en/study/inscriptions/futurs-etudiants.html

Selection criteria are summarized here.

Admission and Enrolment Procedures for general registration

Teaching method

Methods that promote multidisciplinary studies

The Master’s degree programme in civil and mechanical engineering is directly linked to the role played by mechanical civil engineers. They are at the centre of today's industries (such as robotics, transportation, energy production, micro medical devices, and space shuttles). Mechanical engineers must design diverse products like instruments, vehicles, and machines or even bigger systems. They must also design manufacturing procedures for these products. Finally, they play a leading role in the organisation, control, upkeep and maintenance of production systems. Versatility is necessary for working in sectors such as aeronautics, energy, metallurgy, petrochemistry, automobiles and biomechanics.

The educational programme for civil and mechanical engineering is thus by nature versatile. On the one hand, the field of mechanics is vast and is linked to the majority of other engineering fields most notably electricity, materials, chemistry, civil engineering, automation and modelling. On the other hand, students gain specialised skills in an engineering field while retaining solid scientific and technical credentials. This is due to the inclusive nature of engineering majors and the flexibility that characterises each student’s course schedule. Furthermore, students have the option of taking courses in non-technical fields.

The research skills of the teaching team are extremely varied and range from advanced numerical simulation to aspects of energy design techniques. Unquestionably UCL provides a wealth of education to its students. The Master’s thesis (graduation project) is often the last multidisciplinary project. It is possible to choose one's advisor from among all the professors of the Louvain School of Engineering or to carry out the project at another institution such as the Von Karman Institute.

Various teaching strategies

The pedagogical approach is the same as that of the Bachelor’s degree programme in engineering sciences: active learning, an equal mix of team work and individual work, and emphasis on the development of non-technical skills. An important characteristic of the programme in mechanics is the immersion of students in their professors' research laboratories, which educate students through the questioning process inherent in research.

The programme prioritises projects, including a large scale project that puts groups of students in semi-professional situations. These projects promote students' critical thinking skills, which in turn allows them to design, model, realise and validate a prototype. Furthermore, in the Small and Medium Sized Business Creation major, students complete group projects as part of multidisciplinary teams throughout the duration of their Master’s degree program.

In the last year of the programme, half of the time is devoted to the graduation project, which offers students the possibility of studying a given subject in-depth and 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). This project is based on a theme related to one or several of the fundamental disciplines in mechanics at the Louvain School of Engineering or the Von Karman Institute. It may also be directly linked to a company. Finally, for students majoring in Small and Medium Sized Business Creation, the graduation project has a multidisciplinary design with the goal allowing groups of three students, ideally from different academic departments, to work on a business creation project.

Diverse learning situations

Students will be confronted with various pedagogical tools adapted to different disciplines: lectures, projects, exercise sessions, problem solving sessions, case studies, experimental laboratories, internships in industry or research, group as well as individual work, and seminars. In certain areas, eLearning permits students to learn at their own pace and to carry out virtual experiments.

These diverse learning situations develop interdisciplinary skills as well as those that are non-technical. Thus, students acquire knowledge in a progressive manner all the while developing their independence, organisational and time management skills as well as their ability to communicate.

Evaluation

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”.

Evaluation methods conform to the rules used to evaluate coursework and exams. Further details about the methods specific to each academic department may be found in their respective evaluation descriptions (“Evaluating students’ knowledge”).

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.

These diverse measures of evaluation allow for a complete assessment of the students’ acquired skills. Written and oral exams are used to evaluate the knowledge acquired in Axis 1. Multiple choice questions (MCQ) may also be used to test knowledge but are less successful in testing students’ ability to adapt to different situations. Thus MCQ are never used alone. Certain written exams begin with a new situation-problem and most of the questions refer to the different steps to solve this situation-problem. Thus the exam isn’t a repetition or even a dissertation but an opportunity for students to use their skills to solve a new situation-problem. Thus students’ skills are tested vis-à-vis the main steps in the engineering process (Axis 2). Axis 3 is mainly evaluated through seminars and the graduation project. Axes 4-6 are evaluated through various measures. For example, regarding Axis 5, written communication may be evaluated through written exams or report writing while oral communication may be evaluated by oral exams, a thesis defence, and oral presentations.

Certificate-based evaluation of learning for Axes 1 and 2 is mainly carried out through exams that take place at the end of the semester. The questions mostly have to do with the application of typical exercises. This testing is consistent with the students’ acquired skills. The objectives of Axes 3-6 are most often obtained through the disciplinary mini-projects carried out in small groups. They are included in the teaching plan. When this is the case, the mini-project report is evaluated and the group mark contributes to 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.
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**

Further Master's degree programmes: Master's degree in nuclear engineering
Further doctoral degree programmes: GRAMECH (GRAduate School in MECHANics)

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**

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**Curriculum Management**

**Entity**

Structure entity: SST/EPL/MECA
Denomination: MECA
Faculty: Louvain School of Engineering (EPL)
Sector: Sciences and Technology (SST)
Acronym: MECA
Postal address: Place du Levant 2 - bte L5.04.03
1348 Louvain-la-Neuve
Tel: +32 (0) 10 47 22 00

Academic supervisor: Miltiadis Papalexandris

**Jury**

- Jean-Didier Legat
- Vincent Legat

**Useful Contact(s)**

- Isabelle Hennau

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