UCLouvain

MECA2M

2024 - 2025

Master [120] in Mechanical Engineering

MECA2M - Introduction

Introduction

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 profile

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 future 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 engnieers 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 possibility of completing a portion of your coursework abroad (in Europe or elsewhere in the world)

MECA2M - Teaching profile

Learning outcomes

				Year 1	2
LMECA2840	Project in Mechanical Design II	Bruno Dehez Christophe Everarts (compensates Benoît Raucent) Renaud Ronsse	LFSA [q1+q2] [30h+30h] [6 Credits] *> French-friendly*	x	
LEPL2020	Professional integration work *The modules of LEPL2020 course are organized over the two annual blocks of the master's degree. It is strongly recommended that students take them from year 1, but they will only be able to register for the course at the earliest the year in which they present their final gradrofessional integrall only be abe*				

Grégoire Winckelmans

PROFESSIONAL FOCUS [30.0]

Hervé Jeanmart

- Mandatory
- Optional
- Not offered in 2024-2025
- Not offered in 2024-2025 but offered the following year
- Offered in 2024-2025 but not the following year
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- Activity with requisites
- Open to incoming exchange students
- Not open to incoming exchange students
- [FR] Teaching language (FR, EN, ES, NL, DE, ...)

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

Content:

			Year 1	Year 2
LMECA2220	Internal combustion engines	Hervé Jeanmart Maxime Pochet (compensates Francesco Contino)		
LMECA2322	Fluid mechanics II	Philippe Chatelain Eric Deleersnijder Grégoire Winckelmans		

MAJORS FOR THE MASTER'S DEGREE IN MECHANICAL ENGINEERING

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

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.

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From 20 to 30credit(s)

Year
1 2

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.

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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.

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Year

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.

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From 20 to 30credit(s)

Content:

				Year 1	Year 2
LMAPR2483	Durability of materials	Laurent Delannay Thomas Pardoen	EN [q2] [30h+22.5h] [5 Credits] *> French-friendly*	x	x
LMECA2453	Advanced manufacturing technologies	Aude Simar	EN [q1] [30h+30h] [5 Credits] *> French-friendly*	x	x
LMECA2520	Calculation of planar structures	Issam Doghri	EN [q2] [30h+30h] [5 Credits] *> French-friendly*	x	x
LMECA2640	Mechanics of composite materials	Issam Doghri	EN [q2] [30h+30h] [5 Credits] *> French-friendly*	x	x
LMECA2860	Welding Science and Technology	Pascal Jacques Aude Simar	EN [q1] [30h+30h] [5 Credits] *> French-friendly*	x	x
LMECA2711	Quality management and control.	Alexandre Debatty Laurence Guiot (coord.)	EN [q2] [30h+30h] [5 Credits] *> French-friendly*	x	x
LMAPR2020	Materials Selection	Pierre Bollen Bernard Nysten	EN [q2] [30h+22.5h] [5 Credits] *> French-friendly*	x	x
LMAPR2018	Rheology	Evelyne Van Ruymbeke	EN [q2] [30h+30h] [5 Credits] *> French-friendly*	x	x

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Content:

Comprehensive courses

				Year 1	Year 2
LELEC1530	Basic analog and digital electronic circuits	Martin Andraud Denis Flandre	FR [q1] [30h+30h] [5 Credits]	x	x
LELEC1370	Measurements and electrical circuits	Christophe Craeye Bruno Dehez Claude Oestges (coord.)	FR [q2] [30h+30h] [5 Credits]	x	x
LINMA1510	Linear Control	Gianluca Bianchin	EN [q1] [30h+30h] [5 Credits] *> French-friendly*	x	x
LMECA1451	Mechanical manufacturing.	Laurent Delannay Aude Simar	FR [q2] [30h+30h] [5 Credits]	x	x
LMECA2645	Major technological hazards in industrial activity.	Aude Simar	FR [q2] [30h] [3 Credits]	x	x

OPTIONS ET COURS AU CHOIX EN CONNAISSANCES SOCIO-ÉCONOMIQUES [3.0]

BUSINESS RISKS AND OPPORTUNITIES

- Mandatory
- Optional
- Not offered in 2024-2025
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Click on the course title to see detailed informations (objectives, methods, evaluation...)

MAJOR IN INTERDISCIPLINARY PROGRAM IN ENTREPRENEURSHIP - INEO

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

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

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

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

Content:

				Year 1	Year 2
Required courses					
LINEO2001	Théorie de l'entrepreneuriat	Frank Janssen	FR [q1] [30h+20h] [5 Credits]	x	
LINEO2002	Aspects juridiques, économiques et managériaux de la création d'entreprise	Yves De Cordt Marine Falize	FR [q1] [30h+15h] [5 Credits]	x	
LINEO2003	Plan d'affaires et étapes-clefs de la création d'entreprise *Les séances du cours LINEO2003 sont réparties sur les deux blocs annuels du master. L'étudiant doit les suivre dès le bloc annuel 1, mais ne pourra inscrire le cours que dans son programme de bloc annuel 2.*	Frank Janssen	FR [q2] [30h+15h] [5 Credits]		x
LINEO2004	Séminaire d'approfondissement en entrepreneuriat	Frank Janssen	FR [q2] [30h+15h] [5 Credits]	x	
Prerequisite courses					
Student who have not taken management courses during their previous studies must enroll in LINEO2021.					
LINEO2021	Financer son projet	Philippe Grégoire Olivier Vercruysse	FR [q2] [30h+15h] [5 Credits]	x	

COURS AU CHOIX EN CONNAISSANCES SOCIO-ÉCONOMIQUES

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Content:

				Year 1	Year 2
LFSA2995	Company Internship	Dimitri Lederer Jean-Pierre Raskin	FR [q1+q2] [30h] [10 Credits]	x	x
LMECA2711	Quality management and control.	Alexandre Debatty Laurence Guiot (coord.)	EN [q2] [30h+30h] [5 Credits] *> French-friendly*	x	x
LMECA2645	Major technological hazards in industrial activity.	Aude Simar			

ES [q1] [30h] [3 Credits]

				Year 1	Year 2
⊠ LESPA2600	Vocational Induction Seminar - Spanish (B2.2/C1)	Paula Lorente Fernandez (coord.)	ES [q1] [30h] [3 Credits]	x	x
⊠ LESPA2601	Vocational Induction Seminar - Spanish (B2.2/C1)	Paula Lorente Fernandez (coord.)	ES [q1] [45h] [5 Credits]	x	x
⊠ LNEER2500					

Course prerequisites

There are no prerequisites between course units (CUs) for this programme, i.e. the programme activity (course unit, CU) whose learning outcomes are to be certified and the corresponding credits awarded by the jury before registration in another CU.

The programme's courses and learning outcomes

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

MECA2M - Information

Access Requirements

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

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

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

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

SUMMARY

Specific access requirements

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

University Bachelors

Diploma	Special Requirements	Access	Remarks
UCLouvain Bachelors			
Bachelor in Engineering		Direct access	Students who have neither major nor minor in the field of their civil engineering Master's degree may have an adapted master programme.
Others Bachelors of the French speaking Community of Belgium			
Bachelor in Engineering		Direct access	Students with a Bachelor’s degree in engineering sciences who have not taken the equivalent of a minor in the field of their civil enginering master degree may have an adapted master programme.
Bachelors of the Dutch speaking Community of Belgium			
Bachelor in engineering		Access with additional training	Students who have no specialisation in the field of their civil enginering master degree may have an adapted master programme with up to 60 additional credits.
Foreign Bachelors			
Bachelor in engineering	Bachelors degree of Cluster Institution	Direct access	Students with a Bachelor’s degree in engineering sciences who have not taken the equivalent of a minor in the field of their civil enginering master

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

Non university Bachelors

> Find out more about links to the university

Holders of a 2nd cycle University degree

Diploma	Special Requirements	Access	Remarks
"Licenciés"			

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 to 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

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".

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 though 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 to 2223Eval216 507he immerstudi,in stojects carrt writin imted accordi6he Baco Tmaval06q2 ol06nl6ynal situations.

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

Over the years, EPL has developed over a hundred partnerships with partners in more than 36 countries (EU and non-EU) to offer exchange programmes to its students. We also offer the possibility of obtaining Double degrees, Joint Degrees or Dual Masters in several fields. The EPL is currently participating in two Erasmus Mundus programmes: FAME and STRAINS.

In addition to exchange programmes under the Erasmus+ programme, numerous agreements have been established with a wide range of universities through various partner networks such as:

- TIME network (Top Industrial Managers in Europe).

- CLUSTER network

- Magalhães network

- Circle U. network through several networks and European University Alliance

So, there's no shortage of opportunities to gain an additional qualification and/or spend part of the year abroad during your two-year Master's degree! It's the perfect opportunity to discover or improve your knowledge of a foreign language, tackle subjects from a new angle and gain unique experience in Europe or the rest of the world.

If you would like more information, please visit the dedicated pages of the EPL International Office to discover all the destinations, testimonials from former students and all the procedures to follow to make these opportunities a success.

Louvain School of Engineering takes part in the TFM-ASA Master Program. The TFM-ASA Master Program is a two-year Master of Science Program taught in English by 3 Universities in 3 different countries (Catholic University of Louvain (Belgium) , Brandenburg University of Technology (Germany) and University of Bordeaux (France)).
The students will benefit from top quality training in Mechanical and Aerospace Engineering. They will spend an entire semester in each university. Many industrial partners are directly involved through internships for students, conferences and even courses.

Louvain School of Engineering takes part in The Erasmus Mundus Joint Master Degree STRAINS. STRAINS is a 2-year master programme of excellence in English for students wishing to develop their knowledge and skills in the field of solid mechanics for the modeling of materials and structures.

It was built by a consortium of six acknowledged European Universities and associated partners. The disciplinary opening is given by the student mobility. The programme leads to the award of a recognized joint diploma. The master is aimed to give thorough theoretical, experimental and numerical tools for solving advanced engineering problems, especially emphasizing the dialogue between these three aspects.

The educational aim of the programme is to qualify students to a level of excellence in one of the **4 specialised fields of Mechanics**:

- Computational Mechanics
- Mechanics of Structures
- Mechanics of Materials
- Material Design & Properties

This **2-year study program of excellence, leading to 120 credit** Master's diplomas was designed to meet the renewed international demand for qualified graduates with dedicated training and experience in fundamental and advanced mechanics.

The programme offers **mobility across 5 European sites** with the objective for the student to do at least 2 or 3 mobilities within its course.

Possible trainings at the end of the programme

Further Master's degree programmes: Advanced Master in Nuclear Engineering

Further doctoral degree programmes: GRAMECH (GRAduate School in MECHanics)

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

For example:

- Different Master's degree programmes in management (automatic admission based on written application)
- The Master [60] in Information and Communication at Louvain-la-Neuve or the Master [60] in Information and Communication at Mons