GBIO2M

Master [120] in Biomedical 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 code: gbio2m - Francophone Certification Framework: 7

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GBIO2M - Introduction

Introduction

This Master's degree programme educates engineers capable of using a large set of skills (analytical, modelling, design and inventiveness) in order to face future technological challenges in the scientific and technical fields linked to biomedical engineering and this in ever evolving European and global contexts.

Upon completion of this Master’s degree programme, you will have fundamental knowledge in all areas of biomedical engineering (bioinstrumentation, biomaterials, imaging and medical physics, mathematical modelling, artificial organs and rehabilitation, bioinformatics and biomechanics) as well as cutting edge knowledge of one or more major fields of study.

Your profile

You:

• Have developed a marked interest in the biomedical field and its technological outputs (as a result of your undergraduate studies);
• Seek targeted information about current scientific or technological issues as well as the national and international job market;
• Want to play a role in development, production or management in the healthcare field.

Your programme

This Master’s degree offers:

• Knowledge of the main scientific and industrial issues in the fields of applied biomedical engineering;
• Classes that emphasize theories and practice to develop advanced professional knowledge;
• The choice of one of more major fields of study in biomedical engineering;
• The chance to complete an internship in a hospital, in industry or in a research centre;
• The possibility of completing part of your master’s degree abroad (in Europe or elsewhere) and in certain cases the granting of a dual master’s degree (diploma granted jointly by UCL and the institution where you studied abroad).
GBIO2M - Teaching profile

Learning outcomes

Nowadays, more and more engineers are bringing their ingenuity and analytical skills to the healthcare field. The objective of the Master’s degree programme in biomedical engineering is to graduate engineers being capable of meeting the scientific and technological challenges of biomedical engineering in an ever-changing global and European context. Inherently multidisciplinary, this programme builds upon a strong collaboration between the sector of Sciences and Technologies, and the sector of Health Sciences. Building up on students’ existing knowledge in basic sciences (physics, chemistry, mathematics) and life science (biology, anatomy, biochemistry and physiology), this Master’s degree programme offers the opportunity to develop multidisciplinary skills in a wide range of topics. Graduated students will be able to understand and model living systems and ultimately be able to design analytical or therapeutic tools (for example, developing new biomedical technologies).

Graduated students will have fundamental knowledge of the main fields of biomedical engineering: bioinstrumentation, biomaterials, imaging and medical physics, mathematical modelling, artificial organs and rehabilitation, bioinformatics and biomechanics. They will further acquire advanced training in one or more of these fields of expertise.

By choosing among several elective courses, students can opt either for polyvalent profile or one being more specialised. Fields of particular interest include (1) software development and algorithms for biomedical data; (2) biomaterials (implants, etc.); (3) biomechanics and medical robotics; (4) medical imaging and medical physics; (5) clinical engineering (i.e. engineering jobs in the hospital).

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

1. Demonstrate mastery of a solid body of knowledge and skills in basic science and engineering science allowing them to understand and solve biomedical engineering problems (Axis 1).

   1.1 Identify and use biomedical engineering concepts, laws and reasoning to solve problems in a variety of areas:
   - Develop algorithms and software particularly for dealing with biomedical data; analyse biological data and medical images
   - Biomaterials (interfaces, biocompatibility, etc.)
   - Biomechanics, motor control and medical robotics (for surgery and rehabilitation)
   - Clinical engineering
   1.2 Identify and use the modelling and calculation tools necessary to solve problems raised by the fields mentioned above
   1.3 Validate problem solving results, notably those expressed in orders of magnitude:
   - in particular validate models by comparing them to theoretical or experimental results

2. Organise and carry out a procedure in applied engineering related to the development of a product and/or a service that meets a need or solves a particular problem in the field of biomedical engineering (Axis 2).

   2.1 Analyse a problem, take stock of its functionalities and constraints; create a specifications note that takes into account technical and economic limits.
   2.2 Model a problem and design one or more technical solutions using mechanical, electric, electronic and computerised approaches with the specifications note in mind.
   2.3 Evaluate and classify solutions with regard to all the criteria in the specifications note: efficiency, feasibility, quality, ergonomics, security, biocompatibility, etc.
   2.4 Test a solution though a mock up, a prototype and/or a numerical model.
   2.5 Formulate recommendations to improve a technical solution either to reject it or to explain necessary improvements to make the product operational.

3. Organise and carry out a research project to understand a physical phenomenon or new problem related to biomedical engineering (Axis 3).

   3.1 Document and summarize the existing body of knowledge.
   3.2 Suggest a model and/or an experimental device allowing for the simulation and testing of hypotheses related to the phenomenon being studied.
   3.3. Write a summary report explaining the potentialities of the theoretical and/or technical innovation resulting from the research project.

4. Contribute as part of a team to the planning and completion of a project while taking into account its objectives, allocated resources, and constraints (Axis 4).

   4.1 Frame and explain the project’s objectives (in terms of performance indicators) while taking into account its issues and constraints (resources, budget, deadlines). Understand the principal mechanisms that govern the healthcare economy as well as the financing of social security.
   4.2 Collaborate on a work schedule, deadlines and roles, for example the division of labour among students.
   4.3 Work in a multidisciplinary environment with peers holding different points of view; manage any resulting disagreement or conflicts.
4.4 Make team decisions and assume the consequences of these decisions (whether they are about technical solutions or the division of labour to complete a project).

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

5.1 Identify the needs of the client or the user: question, listen and understand all aspects of their request and not just the technical aspects.

5.2 Present your arguments and convince your interlocutors (doctors, therapists, technicians, colleagues, clients, superiors) of your technological choices by adopting their language.

5.3 Communicate through graphics and diagrams: interpret a diagram, present results, structure information.

5.4 Read and analyse different technical documents (rules, plans, specification notes).

5.5 Draft documents that take into account contextual requirements and social conventions as well as the vocabulary specific to biomedical disciplines.

5.6 Make a convincing oral presentation (in French or English) using modern communication techniques.

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

6.1 Rigorously apply the standards of biomedical engineering (terms, units of measure, quality standards and security).

6.2 Find solutions that go beyond strictly technical issues by considering sustainable development and the socio-economic ethics of a project, particularly concerning the consequences of a medical or therapeutic practice;

6.3 Demonstrate critical awareness of a technical solution in order to verify its robustness and minimize the risks that may occur during implementation.

6.4 Evaluate oneself and independently develop necessary skills for "lifelong learning" in the field.

Programme structure

The Master’s degree programme includes:

- a core curriculum (35 credits) including a Master thesis and an additional industrial project;
- a set of courses in the Professional focus (30 credits);
- one or more major courses;
- elective courses to round out the programme

A project with an industrial focus (5 credits) is completed at the beginning of the programme (1st year) while the Master thesis is normally completed at the end of the programme (2nd year). It is recommended that students take courses from the Professional focus (30 credits) at the beginning of their Master’s programme (1st year). However, students may take these courses in the 1st or 2nd year as long as they have completed the course prerequisites. This is particularly the case for students who completed part of their education abroad.

If during the student’s former education, he or she already followed a course being part of the programme (either mandatory or elective) or followed an equivalent activity (pending approval by the programme jury), he or she may replace this activity by elective courses (pending the fulfillment of the programme rules). The student will also verify that he/she has obtained the minimum number of credits required for the approval of the diploma as well as for the approval of their major (in order to include their academic distinctions in the diploma appendix).

These types of programmes will be submitted for approval by the relevant Master’s degree programme jury.

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.
GBIO2M Detailed programme

Programme by subject

CORE COURSES [35.0]

For students who did their bachelor at UCL
The student shall select

<table>
<thead>
<tr>
<th>Code</th>
<th>Course</th>
<th>Credits</th>
<th>1</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td>LGBIO2990</td>
<td>Master Thesis</td>
<td>28</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LGBIO2220</td>
<td>Industrial project in biomedical engineering</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LTECO2100</td>
<td>Questions of religious sciences: Biblical readings</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LTECO2200</td>
<td>Questions of religious sciences: reflections about Christian faith</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LTECO2300</td>
<td>Questions of religious sciences: questions about ethics</td>
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</tr>
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</table>

Religion courses for students in natural sciences (2 credits)

<table>
<thead>
<tr>
<th>Code</th>
<th>Course</th>
<th>Credits</th>
<th>1</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td>LTECO2100</td>
<td>Questions of religious sciences: Biblical readings</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LTECO2200</td>
<td>Questions of religious sciences: reflections about Christian faith</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LTECO2300</td>
<td>Questions of religious sciences: questions about ethics</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Transversal skills and professional contacts

If the student takes the internship LFSA2995 the maximum authorized credits are 26
De 3 à 21 credits parmi
The "professional focus" block of the Master in biomedical engineering offers a series of courses describing the main field of biomedical engineering, from bioinformatics to biomechanics and imaging. It thus consolidates the "general" profile of the program. Students can expect to acquire a deep level of knowledge in each of the disciplines, owing to the large volume of credits devoted to this block.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Teachers</th>
<th>Credits</th>
<th>ECTS</th>
<th>1st Year</th>
<th>2nd Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>LGBIO2010</td>
<td>Bioinformatics</td>
<td>Pierre Dupont, Michel Ghislain</td>
<td>30+30h</td>
<td>5</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>LGBIO2020</td>
<td>Bioinstrumentation</td>
<td>André Moraux, Michel Verleysen</td>
<td>30+30h</td>
<td>5</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>LGBIO2030</td>
<td>Biomaterials</td>
<td>Sophie Demoustier, Christine Dupont</td>
<td>30+30h</td>
<td>5</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>LGBIO2040</td>
<td>Biomechanics</td>
<td>Greet Kerckhofs</td>
<td>30+30h</td>
<td>5</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>LGBIO2050</td>
<td>Medical Imaging</td>
<td>Anne Bol, John Lee, Benoît Macq, Frank Peeters</td>
<td>30+30h</td>
<td>5</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>LGBIO2060</td>
<td>Modelling of biological systems</td>
<td>Philippe Lefèvre</td>
<td>30+30h</td>
<td>5</td>
<td>x</td>
<td>x</td>
</tr>
</tbody>
</table>
OPTIONS

Students MUST choose at least one major from the 5 biomedical engineering majors. They MAY further choose one or more other majors from those in biomedical engineering, or management and business creation.

Majors in biomedical engineering

- Major in Clinical Engineering
- Major in acquisition and processing of biomedical data
- Major in Biomaterials
- Major in Biomechanics and medical robotics
- Major in Medical physics and medical imaging

Majors in business creation and management

- Business risks and opportunities
- Major in small and medium sized business creation

Elective courses

- Elective courses in Genetic engineering
- Elective courses in biochemical engineering
- Elective courses in pharmaceutical engineering
- Elective courses in statistics
- Elective courses

MAJORS IN BIOMEDICAL ENGINEERING

MAJOR IN CLINICAL ENGINEERING

The objective of this major is to provide students with the necessary body of knowledge to work as an engineer in a hospital or in a biomedical products company. It covers areas related to the management of medical technologies, quality control, etc.

Required courses (8 credits)

- LGBIO2110: Introduction to Clinical Engineering
- LMECA2711: Quality management and control.

Elective courses

- LBIRA2101: Biometry : analysis of the variance
- LINGI1341: Computer networks

LSTAT2330 and WESP2123 are mutually exclusive, so as WFSP2218 and LBIRA2101

Students selecting this major may choose De 20 à 30 credits parmi De 12 à 22 credits parmi
<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Instructor(s)</th>
<th>Credit</th>
<th>ECTS</th>
<th>Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>LING2172</td>
<td>Databases</td>
<td>Siegfried Nijssen</td>
<td>30h+30h</td>
<td>6</td>
<td>2q</td>
</tr>
<tr>
<td>LSTAT2110</td>
<td>Data Analysis</td>
<td>Johan Segers</td>
<td>22.5h+7.5h</td>
<td>5</td>
<td>1q</td>
</tr>
<tr>
<td>LSTAT2310</td>
<td>Statistical quality control.</td>
<td>Bernadette Govaerts</td>
<td>15h+5h</td>
<td>4</td>
<td>1q</td>
</tr>
<tr>
<td>LSTAT2330</td>
<td>Statistics in clinical trials.</td>
<td>Catherine Legrand, Annie Robert</td>
<td>22.5h+7.5h</td>
<td>5</td>
<td>2q</td>
</tr>
<tr>
<td>LSTAT2360</td>
<td>Seminar in data management: basic</td>
<td>Catherine Legrand</td>
<td>7.5h+10h</td>
<td>5</td>
<td>1q</td>
</tr>
<tr>
<td>WESP2123</td>
<td>Principes des essais cliniques</td>
<td>Laurence Habimana, Annie Robert, Françoise Smets</td>
<td>20h+10h</td>
<td>4</td>
<td>1q</td>
</tr>
<tr>
<td>WESP2234</td>
<td>Strategy of the medical decision</td>
<td>Laurence Habimana, Annie Robert (coord.)</td>
<td>30h</td>
<td>3</td>
<td>1q</td>
</tr>
<tr>
<td>WFSP2218</td>
<td>Analyse longitudinale : régression linéaire, logistique et de Poisson</td>
<td>Annie Robert</td>
<td>20h+20h</td>
<td>4</td>
<td>1q</td>
</tr>
<tr>
<td>WFSP2260</td>
<td>Management humain et comportement organisationnel</td>
<td>Pierre Meurens, Sophie Thunus (coord.)</td>
<td>40h+30h</td>
<td>5</td>
<td>2q</td>
</tr>
</tbody>
</table>
MAJOR IN ACQUISITION AND PROCESSING OF BIOMEDICAL DATA

The objective of this major is to provide students with the necessary body of knowledge to acquire and analyze biomedical data, i.e. either raw signal data or large bases of pre-processed data. This major is especially well-suited for students holding a bachelor in computer science, electricity or applied mathematic.

**Students selecting this major may choose**

De 20 à 30 credits parmi

### Required courses (10 credits)

<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>LELEC2531</td>
<td>Design and Architecture of digital electronic systems</td>
<td>Jean-Didier Legat</td>
<td>5</td>
<td>1q</td>
</tr>
<tr>
<td>LELEC2900</td>
<td>Signal processing</td>
<td>Benoît Macq and Luc Vandendorpe</td>
<td>2</td>
<td>2q</td>
</tr>
</tbody>
</table>

### Elective courses

The classes LSTAT2320 and LBIRC2106 are mutually exclusive as are the classes LSTAT 2120 and LBIRA2101.

De 10 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>LELEC2532</td>
<td>Design and Architecture of analog electronic systems</td>
<td>David Bol and Denis Flandre</td>
<td>5</td>
<td>2q</td>
</tr>
<tr>
<td>LELEC2811</td>
<td>Instrumentation and sensors</td>
<td>David Bol and Laurent Francis</td>
<td>5</td>
<td>1q</td>
</tr>
<tr>
<td>LELEC2870</td>
<td>Machine Learning : regression, dimensionality reduction and data visualization</td>
<td>John Lee (compensates Michel Verleysen) and Michel Verleysen</td>
<td>5</td>
<td>1q</td>
</tr>
<tr>
<td>LINGI2251</td>
<td>Software Quality Assurance</td>
<td>Charles Pecheur</td>
<td>5</td>
<td>2q</td>
</tr>
<tr>
<td>LINGI2261</td>
<td>Artificial intelligence: representation and reasoning</td>
<td>Yves Deville</td>
<td>6</td>
<td>1q</td>
</tr>
<tr>
<td>LINGI2262</td>
<td>Machine Learning : classification and evaluation</td>
<td>Pierre Dupont</td>
<td>5</td>
<td>2q</td>
</tr>
<tr>
<td>LINMA2361</td>
<td>Nonlinear dynamical systems</td>
<td>Pierre-Antoine Absil</td>
<td>5</td>
<td>1q</td>
</tr>
<tr>
<td>LINMA2370</td>
<td>Modelling and analysis of dynamical systems</td>
<td>Jean-Charles Delvenne (coord.) and Denis Dochain</td>
<td>5</td>
<td>1q</td>
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<tr>
<td>LINMA2471</td>
<td>Optimization models and methods</td>
<td>François Glineur</td>
<td>5</td>
<td>1q</td>
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<tr>
<td>LINMA2875</td>
<td>System identification</td>
<td>Julien Hendrick</td>
<td>5</td>
<td>2q</td>
</tr>
<tr>
<td>LSTAT2320</td>
<td>Design of experiment</td>
<td>Patrick Bogaert and Bernadette Govaerts</td>
<td>5</td>
<td>2q</td>
</tr>
<tr>
<td>LSTAT2110</td>
<td>Data Analysis</td>
<td>Johan Segers</td>
<td>5</td>
<td>1q</td>
</tr>
<tr>
<td>LBIRC2106</td>
<td>Chemometrics</td>
<td>Bernadette Govaerts</td>
<td>3</td>
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<tr>
<td>LSTAT2120</td>
<td>Linear models</td>
<td>Christian Hather</td>
<td>5</td>
<td>1q</td>
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<tr>
<td>LBIRA2101</td>
<td>Biometry : analysis of the variance</td>
<td>Xavier Draye (coord.) and Anouar El Ghouch and Bernadette Govaerts (compensates Anouar El Ghouch)</td>
<td>4</td>
<td>1q</td>
</tr>
</tbody>
</table>

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

MAJOR IN BIOMATERIALS

The goal of this major is to provide students with the necessary body of knowledge to understand and develop technologies related to biomaterials (implants, biocompatibility, etc.). This major is particularly well-suited for students holding a bachelor in applied chemistry and physics AND biomedical engineering.

Students selecting this major may choose
De 20 à 30 credits parmi

Required courses KIMA students

KIMA students must enrol in LGBIO2030 and LBIR1220A except if they took these courses during their undergraduate programme. De 5 à 10 credits parmi

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
<th>Year</th>
<th>Hours</th>
<th>Lecturers</th>
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<tbody>
<tr>
<td>LBIR1250A</td>
<td>Biochimie I (partim EPL)</td>
<td>5 Credits</td>
<td>2q</td>
<td>30+15h</td>
<td>Sophie Demoustier, Christine Dupont</td>
</tr>
<tr>
<td>LGBIO2030</td>
<td>Biomaterials</td>
<td>5 Credits</td>
<td>1q</td>
<td>30+30h</td>
<td>Sophie Demoustier, Christine Dupont</td>
</tr>
</tbody>
</table>

Required courses GBIO students

GBIO students must enrol in LMAPR2481 and LMAPR1805 unless they took these courses during their undergraduate (BAC) programme. De 5 à 10 credits parmi

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
<th>Year</th>
<th>Hours</th>
<th>Lecturers</th>
</tr>
</thead>
<tbody>
<tr>
<td>LMAPR2481</td>
<td>Deformation and fracture of materials</td>
<td>5 Credits</td>
<td>1q</td>
<td>30+30h</td>
<td>Thomas Pardoen</td>
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<tr>
<td>LMAPR1805</td>
<td>Introduction to materials science</td>
<td>5 Credits</td>
<td>2q</td>
<td>45+15h</td>
<td>Jean-Christophe Charlier, Pascal Jacques, Aurélien Lherbier (compensates Jean-Christophe Charlier), Bernard Nysten, Thomas Pardoen (coord.)</td>
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</table>

Recommended courses

De 10 à 21 credits parmi

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
<th>Year</th>
<th>Hours</th>
<th>Lecturers</th>
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</thead>
<tbody>
<tr>
<td>LBIR1321</td>
<td>Biochemistry II : metabolic pathways and their regulation</td>
<td>3 Credits</td>
<td>1q</td>
<td>30+15h</td>
<td>Michel Ghislain (coord.), Yvan Larondele</td>
</tr>
<tr>
<td>LBIO1335</td>
<td>Immunology</td>
<td>3 Credits</td>
<td>1q</td>
<td>25+15h</td>
<td>Jean-Paul Dehoux</td>
</tr>
<tr>
<td>LELEC2580</td>
<td>Micro and Nanofabrication Techniques</td>
<td>5 Credits</td>
<td>2q</td>
<td>30+30h</td>
<td>Laurent Francis, Benoît Hackens, Jean-Pierre Raskin</td>
</tr>
<tr>
<td>LMAPR2012</td>
<td>Macromolecular Nanotechnology</td>
<td>5 Credits</td>
<td>2q</td>
<td>45+15h</td>
<td>Sophie Demoustier, Karine Glinel, Karine Glinel (compensates Bernard Nysten), Jean-François Goy, Bernard Nysten (coord.)</td>
</tr>
<tr>
<td>LMAPR2019</td>
<td>Polymer Science and Engineering</td>
<td>5 Credits</td>
<td>1q</td>
<td>45+15h</td>
<td>Sophie Demoustier, Alain Jonas, Evelyne Van Ruymbeke</td>
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</table>

Elective courses

max=15 credits parmi

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
<th>Year</th>
<th>Hours</th>
<th>Lecturers</th>
</tr>
</thead>
<tbody>
<tr>
<td>LBIRC2101A</td>
<td>Analyse biochimique et notions de génie génétique: analyse biochimique</td>
<td>4 Credits</td>
<td>1q</td>
<td>18.5+22.5h</td>
<td>François Chaumont, Charles Hachez, Pierre Morsonne (coord.)</td>
</tr>
<tr>
<td>Course Code</td>
<td>Course Title</td>
<td>Instructor(s)</td>
<td>Credits</td>
<td>Year</td>
<td></td>
</tr>
<tr>
<td>-------------</td>
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</tr>
<tr>
<td>LBIRC2108</td>
<td>Biochemical and Microbial Engineering</td>
<td>Iwona Cybulski</td>
<td>5</td>
<td>2q</td>
<td></td>
</tr>
<tr>
<td>LGBIO2020</td>
<td>Bioinstrumentation</td>
<td>André Mouraux</td>
<td>5</td>
<td>1q</td>
<td></td>
</tr>
<tr>
<td>LMAPR2010</td>
<td>Polymer Materials</td>
<td>Christian Bailly Bernard Nysten Evelyne Van Ruymbeke (compensates Bernard Nysten)</td>
<td>5</td>
<td>1q</td>
<td></td>
</tr>
<tr>
<td>LMAPR2013</td>
<td>Physical Chemistry for Metals and Ceramics</td>
<td>Pascal Jacques</td>
<td>5</td>
<td>1q</td>
<td></td>
</tr>
<tr>
<td>LMAPR2014</td>
<td>Physics of Functional Materials</td>
<td>Xavier Gonze Luc Piraux Gian-Marco Rignanese</td>
<td>5</td>
<td>1q</td>
<td></td>
</tr>
<tr>
<td>LMAPR2018</td>
<td>Rheometry and Polymer Processing</td>
<td>Christian Bailly Evelyne Van Ruymbeke</td>
<td>5</td>
<td>2q</td>
<td></td>
</tr>
<tr>
<td>LMAPR2631</td>
<td>Surface Analysis</td>
<td>Arnaud Delcorte Bernard Nysten</td>
<td>5</td>
<td>2q</td>
<td></td>
</tr>
</tbody>
</table>
### MAJOR IN BIOMECHANICS AND MEDICAL ROBOTICS

The goal of this major is to provide students with the necessary body of knowledge to understand and develop technologies related to biomechanics (fluids and solids) and medical robotics (surgical assistance and rehabilitation). This major is particularly well-suited for students holding a bachelor in mechanics.

<table>
<thead>
<tr>
<th>Mandatory</th>
<th>Optional</th>
</tr>
</thead>
<tbody>
<tr>
<td>Courses not taught during 2017-2018</td>
<td>Periodic courses not taught 2017-2018</td>
</tr>
<tr>
<td>Periodic courses taught during 2017-2018</td>
<td>Activity with requisites</td>
</tr>
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</table>

Students selecting this major may choose

De 20 à 30 credits parmi

### Required courses (10 credits)

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Instructor(s)</th>
<th>Credits</th>
<th>Periods</th>
</tr>
</thead>
<tbody>
<tr>
<td>LMECA2170</td>
<td>Numerical Geometry</td>
<td>Vincent Legat, Jean-François Remacle</td>
<td>5</td>
<td>1q x x</td>
</tr>
<tr>
<td>LMECA2355</td>
<td>Mechanical design in biomedical engineering</td>
<td>Greet Kerckhofs, Benoît Raucent, Ann Vankrunkelsven (compensates Benoît Raucent)</td>
<td>5</td>
<td>1q x x</td>
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### Elective courses

De 10 à 20 credits parmi

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Instructor(s)</th>
<th>Credits</th>
<th>Periods</th>
</tr>
</thead>
<tbody>
<tr>
<td>LINMA2671</td>
<td>Advanced control and applications</td>
<td>Julien Hendrickx</td>
<td>5</td>
<td>1q x x</td>
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<tr>
<td>LINMA2875</td>
<td>System Identification</td>
<td>Julien Hendrickx</td>
<td>5</td>
<td>2q x x</td>
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<tr>
<td>LMECA2300</td>
<td>Advanced Numerical Methods</td>
<td>Philippe Chatelain, Christophe Craeye, Vincent Legat, Jean-François Remacle</td>
<td>5</td>
<td>2q x x</td>
</tr>
<tr>
<td>LMECA2330</td>
<td>Machine components</td>
<td>Laurent Delannay, Benoît Raucent, Renaud Ronsse, Thomas Servais (compensates Benoît Raucent)</td>
<td>5</td>
<td>2q x x</td>
</tr>
<tr>
<td>LMECA2660</td>
<td>Numerical methods in fluid mechanics</td>
<td>Grégoire Winckelmans</td>
<td>5</td>
<td>2q x x</td>
</tr>
<tr>
<td>LMECA2732</td>
<td>Introduction to robotics</td>
<td>Renaud Ronsse</td>
<td>5</td>
<td>2q x x</td>
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<tr>
<td>LMECA2755</td>
<td>Industrial automation</td>
<td>Bruno Dehez, Paul Fisette, Renaud Ronsse</td>
<td>5</td>
<td>1q x x</td>
</tr>
<tr>
<td>LMECA2802</td>
<td>Multibody system Dynamics</td>
<td>Paul Fisette</td>
<td>5</td>
<td>2q x x</td>
</tr>
<tr>
<td>LMECA2840</td>
<td>Project in Mechanical Design II</td>
<td>Bruno Dehez, Christophe Everarts (compensates Benoît Raucent), Benoît Raucent, Renaud Ronsse</td>
<td>6</td>
<td>1+2q x x</td>
</tr>
</tbody>
</table>
### MAJOR IN MEDICAL PHYSICS AND MEDICAL IMAGING

The goal of this major is to provide students with the necessary body of knowledge to understand and develop technologies related to medical physics and medical imaging. This major is particularly well-suited for students holding a bachelor in electricity or applied chemistry and physics.

- **Mandatory**
- **Optional**
- **Courses not taught during 2017-2018**
- **Periodic courses not taught during 2017-2018**
- **Activity with requisites**

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

**Students selecting this major may choose**
**De 20 à 30 credits**

<table>
<thead>
<tr>
<th>Year</th>
<th>1</th>
<th>2</th>
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### Required courses (10 credits)

<table>
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<tr>
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<th>Course title</th>
<th>Instructor(s)</th>
<th>Credits</th>
<th>Hours</th>
<th>Period</th>
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</thead>
<tbody>
<tr>
<td>LELEC2885</td>
<td>Image processing and computer vision</td>
<td>Christophe De Vleeschouwer (coord.), Laurent Jacques</td>
<td>5</td>
<td>30h+30h</td>
<td>1q x x</td>
</tr>
<tr>
<td>LGBIO2070</td>
<td>Engineering challenges in protontherapy</td>
<td>Guillaume Janssens, John Lee, Edmond Sterpin</td>
<td>5</td>
<td>30h+30h</td>
<td>2q x x</td>
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</tbody>
</table>

### Elective courses

**De 10 à 20 credits**

<table>
<thead>
<tr>
<th>Course code</th>
<th>Course title</th>
<th>Instructor(s)</th>
<th>Credits</th>
<th>Hours</th>
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</thead>
<tbody>
<tr>
<td>LMECA2645</td>
<td>Major technological hazards in industrial activity.</td>
<td>Denis Dochain, Alexis Dutileux</td>
<td>3</td>
<td>30h</td>
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<tr>
<td>LPHY2236</td>
<td>Ionizing radiation measurement: detectors and Nuclear electronics.</td>
<td>Eduardo Cortina Gil</td>
<td>5</td>
<td>37.5h+55h</td>
</tr>
<tr>
<td>LPHY2340</td>
<td>Use, management and control of radio elements</td>
<td>Pascal Froment</td>
<td>3</td>
<td>22.5h</td>
</tr>
<tr>
<td>LPHY2360</td>
<td>Physique atomique, nucléaire et des radiations</td>
<td>Krzysztof Piotrzkowski</td>
<td>2</td>
<td>22.5h</td>
</tr>
<tr>
<td>WMNJC2100</td>
<td>Master and complementary master</td>
<td>Véronique Roelants, Thierry Vander Borght (coord.)</td>
<td>2</td>
<td>15h</td>
</tr>
<tr>
<td>WRDTH3120</td>
<td>Dosimétrie en radiothérapie et contrôle de qualité</td>
<td>Edmond Sterpin</td>
<td>3</td>
<td>30h</td>
</tr>
<tr>
<td>WRDTH3131</td>
<td>Radiobiologie</td>
<td>Vincent Grégoire, Pierre Scalliet (coord.)</td>
<td>2</td>
<td>22.5h</td>
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<tr>
<td>WRDTH3160</td>
<td>Dosimétrie informatisée en radiothérapie</td>
<td>Vincent Grégoire, Pierre Scalliet, Edmond Sterpin (coord.)</td>
<td>5</td>
<td>30h+60h</td>
</tr>
<tr>
<td>WRPR2001</td>
<td>Notions de base de radioprotection</td>
<td>Michaël Dupont, Vincent Grégoire (coord.)</td>
<td>2</td>
<td>10h+5h</td>
</tr>
<tr>
<td>WRPR2330</td>
<td>Utilisation des radioisotopes et des molécules marquées en biologie</td>
<td>Bernard Galiez (coord.) Thierry Vander Borght</td>
<td>3</td>
<td>15h+15h</td>
</tr>
</tbody>
</table>
MAJORS IN BUSINESS CREATION AND MANAGEMENT

These two majors are exclusive. Students may choose only one.

BUSINESS RISKS AND OPPORTUNITIES

☐ Mandatory
△ Courses not taught during 2017-2018
☐ Periodic courses taught during 2017-2018
☐ Optional
☐ Periodic courses not taught during 2017-2018
☐ Activity with requisites

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

This major may not be taken if the major in small and medium sized business creation is taken. Students selecting this major may choose

De 16 à 20 credits parmi

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Teacher</th>
<th>Credits</th>
<th>Duration</th>
<th>Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>LFSA1290</td>
<td>Introduction to financial and accounting management</td>
<td>Genit Sarens</td>
<td>4</td>
<td>30h+15h</td>
<td>2q</td>
</tr>
<tr>
<td>LFSA2140</td>
<td>Elements of law for industry and research</td>
<td>Werner Derijcke</td>
<td>3</td>
<td>30h</td>
<td>1q</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Bénédicte Inghels</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>Christophe Lazaro</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>LFSA2210</td>
<td>Organisation and human resources</td>
<td>John Cultiaux</td>
<td>3</td>
<td>30h</td>
<td>1q</td>
</tr>
<tr>
<td>LFSA2230</td>
<td>Introduction to management and to business economics</td>
<td>Benoît Gailly</td>
<td>4</td>
<td>30h+15h</td>
<td>1q</td>
</tr>
<tr>
<td>LFSA2245</td>
<td>Environment and business</td>
<td>Thierry Bréchet</td>
<td>3</td>
<td>30h</td>
<td>1q</td>
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</table>

One course between

De 3 à 5 credits parmi

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Teacher</th>
<th>Credits</th>
<th>Duration</th>
<th>Year</th>
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</thead>
<tbody>
<tr>
<td>LFSA2202</td>
<td>Ethics and ICT</td>
<td>Axel Gossengers</td>
<td>3</td>
<td>30h</td>
<td>1q</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Olivier Pereira</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>LLSMS2280</td>
<td>Business Ethics and Compliance Management</td>
<td>Carlos Desmet</td>
<td>5</td>
<td>30h</td>
<td>1q</td>
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</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.
MAJOR IN SMALL AND MEDIUM SIZED BUSINESS CREATION

Accessible from most of the Masters’ degrees in engineering, the goal of this major is to familiarize engineering students 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 their own business. This major is accessible only to a small number of students whose selection is based on a written application and individual interview. The written application must be submitted before the beginning of the first academic year of the Master.

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 core curriculum with a thesis related to business creation (the number of credits remaining the same).

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 20-25 credits from the following courses:

De 20 à 25 credits parmi

<table>
<thead>
<tr>
<th>Year</th>
<th>Required courses for the major in small and medium sized businesses</th>
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</thead>
<tbody>
<tr>
<td></td>
<td><strong>Mandatory</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Courses not taught during 2017-2018</strong></td>
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<tr>
<td></td>
<td><strong>Periodic courses taught during 2017-2018</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Optional</strong></td>
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<tr>
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<td><strong>Periodic courses not taught during 2017-2018</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Activity with requisites</strong></td>
</tr>
<tr>
<td></td>
<td>Click on the course title to see detailed informations (objectives, methods, evaluation...)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Instructor(s)</th>
<th>Credits</th>
<th>Period</th>
<th>Hours</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>LCPME2001</td>
<td>Entrepreneurship Theory (in French)</td>
<td>Frank Janssen</td>
<td>5</td>
<td>1q</td>
<td>30h+20h</td>
<td>X</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>
<td>30h+15h</td>
<td>X</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>
<td>30h+15h</td>
<td>X</td>
</tr>
<tr>
<td>LCPME2004</td>
<td>Advanced seminar on Entrepreneurship (in French)</td>
<td>Roxane De Hoe (compensates Frank Janssen) Frank Janssen</td>
<td>5</td>
<td>2q</td>
<td>30h+15h</td>
<td>X</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Instructor(s)</th>
<th>Credits</th>
<th>Period</th>
<th>Hours</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>LCPME2000</td>
<td>Venture creation financement and management I</td>
<td>Yves De Rongé Olivier Glacomin</td>
<td>5</td>
<td>1q</td>
<td>30h+15h</td>
<td>X</td>
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</table>

Prerequisite CPME courses

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

### ELECTIVE COURSES IN GENETIC ENGINEERING

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Instructors</th>
<th>Credits</th>
<th>Periods</th>
<th>Requisites</th>
</tr>
</thead>
<tbody>
<tr>
<td>LBIR1322</td>
<td>General genetics</td>
<td>Philippe Baret; Jacques Mahillon</td>
<td>45h+15h</td>
<td>4</td>
<td>2q x x</td>
</tr>
<tr>
<td>LBIRC2101B</td>
<td>Analyse biochimique et notions de génie génétique: Notions de génie génétique</td>
<td>François Chaumont; Charles Hachez; Pierre Morsonne (coord.)</td>
<td>18.5h+22.5h</td>
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### ELECTIVE COURSES IN BIOCHEMICAL ENGINEERING

<table>
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<tr>
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<th>Course Title</th>
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<th>Credits</th>
<th>Periods</th>
<th>Requisites</th>
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<tbody>
<tr>
<td>LBRAL2102</td>
<td>Physiological and nutritional biochemistry</td>
<td>Cathy Debier; Yvan Larondele (coord.)</td>
<td>52.5h</td>
<td>5</td>
<td>1q x x</td>
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<tr>
<td>LBRAL2104</td>
<td>Food microbiology</td>
<td>Jacques Mahillon</td>
<td>30h+22.5h</td>
<td>5</td>
<td>2q x x</td>
</tr>
<tr>
<td>LBRMC2202</td>
<td>Cell culture technology</td>
<td>David Alsteens; Charles Hachez (coord.); Pascal Hols</td>
<td>30h</td>
<td>3</td>
<td>1q x x</td>
</tr>
<tr>
<td>LBRNA2202</td>
<td>Nano-biotechnologies</td>
<td>Yves Dufrêne</td>
<td>30h</td>
<td>3</td>
<td>2q x x</td>
</tr>
<tr>
<td>LBRTE2201</td>
<td>Human and environmental toxicology</td>
<td>Cathy Debier (coord.); Philippe Hantson</td>
<td>45h+7.5h</td>
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### ELECTIVE COURSES IN PHARMACEUTICAL ENGINEERING

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<th>Instructors</th>
<th>Credits</th>
<th>Periods</th>
<th>Requisites</th>
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</thead>
<tbody>
<tr>
<td>LINMA2300</td>
<td>Analysis and control of distributed parameter systems</td>
<td>Denis Dochain</td>
<td>30h+30h</td>
<td>5</td>
<td>1q x x</td>
</tr>
<tr>
<td>LMAPR2118</td>
<td>Fluid-fluid separations</td>
<td>Patricia Luis Alconero; Denis Mignon</td>
<td>30h+22.5h</td>
<td>5</td>
<td>2q x x</td>
</tr>
<tr>
<td>Course Code</td>
<td>Course Title</td>
<td>Instructor(s)</td>
<td>Credits</td>
<td>Semester</td>
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<tr>
<td>LMAPR2230</td>
<td>Reactor Design</td>
<td>Juray De Wilde</td>
<td>5</td>
<td>2</td>
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<tr>
<td>LMAPR2280</td>
<td>Solid-fluid separation</td>
<td>Tom Leyssens Patricia Luis Alconero</td>
<td>5</td>
<td>1</td>
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<tr>
<td>LMAPR2340</td>
<td>Industrial processes for the production of base chemicals</td>
<td>Juray De Wilde</td>
<td>5</td>
<td>1</td>
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<tr>
<td>WFARM1008</td>
<td>Design of the drug</td>
<td>Giulio Muccioli Véronique Préat (coord.)</td>
<td>2</td>
<td>2</td>
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<tr>
<td>WFARM1232</td>
<td>General Pharmacology</td>
<td>Emmanuel Hermans</td>
<td>2</td>
<td>1</td>
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<tr>
<td>WFARM1307</td>
<td>Physical pharmacy</td>
<td>Tom Leyssens</td>
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### ELECTIVE COURSES IN STATISTICS

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<th>Instructor(s)</th>
<th>Credits</th>
<th>Year</th>
<th>Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>LSTAT2020</td>
<td>Statistical computing</td>
<td>Céline Bugli (compensates Bernadette Govaerts) Bernadette Govaerts</td>
<td>6</td>
<td>1</td>
<td>1</td>
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<tr>
<td>LSTAT2040</td>
<td>Statistical analysis</td>
<td>Benjamin Colling (compensates Anouar El Ghouch) Benjamn Colling (compensates Anouar El Ghouch) Anouar El Ghouch</td>
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<td>2</td>
<td>2</td>
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<tr>
<td>LSTAT2130</td>
<td>Introduction to Bayesian statistics</td>
<td>Philippe Lambert</td>
<td>4</td>
<td>2</td>
<td>2</td>
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<tr>
<td>LSTAT2170</td>
<td>Times series</td>
<td>Rainer von Sachs</td>
<td>5</td>
<td>1</td>
<td>1</td>
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<tr>
<td>LSTAT2210</td>
<td>Advanced linear models</td>
<td>Catherine Legrand</td>
<td>4</td>
<td>2</td>
<td>2</td>
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<tr>
<td>LSTAT2220</td>
<td>Analysis of survival and duration data</td>
<td>Ingrid Van Keilegom</td>
<td>4</td>
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</tr>
</tbody>
</table>

**Activity with requisites**

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

This module in statistics offers courses being useful for data processing (analysis laboratory, clinical research, quality management, etc.). Students taking at least 45 credits in this module and among courses in statistics from the majors of the Master (labels LBIRA, LBIRC, LSTAT, WESP, WFSP) will later get a direct access to the second year of the Master in Statistics: Biostatistics [120 credits]. More information about this program bridge via info-stat-actu@uclouvain.be

### ELECTIVE COURSES

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Instructor(s)</th>
<th>Credits</th>
<th>Year</th>
<th>Semester</th>
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<tbody>
<tr>
<td>LFSA2995</td>
<td>Company Internship</td>
<td>Jean-Pierre Raskin</td>
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<tr>
<td>LFSA2996</td>
<td>Company Internship</td>
<td></td>
<td>5</td>
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**Compétences transversales et contact avec l’entreprise**

L’étudiant choisit minimum 3 crédits parmi un stage, un ou plusieurs cours de l’option "Enjeux de l’entreprise", l’option "CPME", une UE d’activité professionnelle liée à la discipline

**De 3 à 21 credits parmi**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Instructor(s)</th>
<th>Credits</th>
<th>Year</th>
<th>Semester</th>
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</thead>
<tbody>
<tr>
<td>LGBIO2220</td>
<td>Industrial project in biomedical engineering</td>
<td>Sophie Demoustier Philippe Lefèvre Renaud Ronsse</td>
<td>5</td>
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<td>1</td>
</tr>
</tbody>
</table>

**Activity with requisites**

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

- **Mandatory**: mandatory courses
- **Optional**: optional courses
- **Courses not taught during 2017-2018**: courses not taught during the academic year 2017-2018
- **Periodic courses taught during 2017-2018**: periodic courses taught during the academic year 2017-2018
- **Activity with requisites**: courses with specific requisites
### Communication

L'étudiant choisit maximum 8 crédits visant le développement de ses compétences de communication

max=8 credits parmi

### Languages

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

<table>
<thead>
<tr>
<th>Code</th>
<th>Course Description</th>
<th>Instructor(s)</th>
<th>Credits</th>
<th>Period</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>LALLE2500</td>
<td>Professional development seminar German</td>
<td>Caroline Klein, Ann Rinder (coord.)</td>
<td>30h</td>
<td>3</td>
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<tr>
<td>LALLE2501</td>
<td>Professional development seminar-German</td>
<td>Caroline Klein, Ann Rinder (coord.)</td>
<td>30h</td>
<td>5</td>
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</tr>
<tr>
<td>LESPA2600</td>
<td>Vocational Induction Seminar - Spanish (B2.2/C1)</td>
<td>Paula Lorente Fernandez (coord.)</td>
<td>30h</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>LESPA2601</td>
<td>Vocational Induction Seminar - Spanish (B2.2/C1)</td>
<td>Paula Lorente Fernandez (coord.)</td>
<td>30h</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>LNEER2500</td>
<td>Seminar of Entry to professional life in Dutch - Intermediate level</td>
<td>Isabelle Demeulenaere (coord.), Mariken Smit</td>
<td>30h</td>
<td>3</td>
<td></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>
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</tr>
</tbody>
</table>

### Group dynamics

<table>
<thead>
<tr>
<th>Code</th>
<th>Course Description</th>
<th>Instructor(s)</th>
<th>Credits</th>
<th>Period</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>LFSA2351A</td>
<td>Group dynamics</td>
<td>Piotr Sobieski, Vincent Wertz (coord.)</td>
<td>15h+30h</td>
<td>3</td>
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</tr>
<tr>
<td>LFSA2351B</td>
<td>Group dynamics</td>
<td>Piotr Sobieski, Vincent Wertz (coord.)</td>
<td>15h+30h</td>
<td>3</td>
<td></td>
</tr>
</tbody>
</table>

### Autre UE non disciplinaires

L'étudiant peut proposer maximum 8 crédits d'ouverture vers d'autres disciplines (maximum un cours BEST ou des UE hors EPL).

max=8 credits parmi
Course prerequisites

A document entitled en-prerequis-2017-gbio2m.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.
Admission

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

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.

- 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

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University Bachelors

<table>
<thead>
<tr>
<th>Diploma</th>
<th>Special Requirements</th>
<th>Access</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>UCL 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>

Others Bachelors of the French speaking Community of Belgium

<table>
<thead>
<tr>
<th>Diploma</th>
<th>Special Requirements</th>
<th>Access</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<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>

Bachelors of the Dutch speaking Community of Belgium

<table>
<thead>
<tr>
<th>Diploma</th>
<th>Special Requirements</th>
<th>Access</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bachelor in engineering</td>
<td></td>
<td>Direct access</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>

Foreign Bachelors

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Non university Bachelors

<table>
<thead>
<tr>
<th>Diploma</th>
<th>Access</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt; Find out more about links to the university</td>
<td></td>
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Holders of a 2nd cycle University degree

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

<table>
<thead>
<tr>
<th>Master in engineering</th>
<th>Direct access</th>
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---

**Holders of a non-University 2nd cycle degree**

<table>
<thead>
<tr>
<th>Diploma</th>
<th>Access</th>
<th>Remarks</th>
</tr>
</thead>
</table>

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**Adults taking up their university training**

> See the website [Valorisation des acquis de l'expérience](https://uclouvain.be/en-prog-2017-gbio2m.html)  
It is possible to gain admission to all masters courses via the validation of professional experience procedure.

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**Personalized access**

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](https://uclouvain.be/en/study/inscriptions/futurs-etudiants.html)  
Selection criteria are summarized here.

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**Admission and Enrolment Procedures for general registration**
Teaching method

Methods that promote multidisciplinarity

The Master’s degree programme in biomedical engineering is by nature interdisciplinary since it lies at the interface between engineering and biomedical sciences. It is grounded on a solid course programme that provides students with knowledge of the main areas in biomedical engineering as well as various majors in related disciplines.

Various teaching strategies

The teaching methods used in the Master’s degree programme in biomedical engineering are consistent with that of the Bachelor’s degree programme in engineering sciences: active learning, an equal mix of group work and individual work, and emphasis on the development of non-technical skills.

A major characteristic of the programme is the immersion of students in research laboratories (for class laboratories, case studies, projects, theses) exposing them to advanced methods and allowing them to learn by questioning. This process is very central for a research perspective.

Half of the student workload in the last year consists in the Master thesis fulfillment and offers students the possibility to deeply investigate. Given its size and context it provides a true initiation into the working life of an engineer or researcher.

Diverse learning situations

Learning is achieved by various pedagogical methods such as internships, case studies, classes, projects, exposure to cutting edge research and meetings with key industrial players in the field.

This variety of teaching techniques allows students to learn in an iterative and progressive way.

The business creation major is based on an interactive teaching method and is oriented toward problem-based learning. Throughout the program, students work in multidisciplinary teams to participate in group projects. The Master’s thesis is multidisciplinary in nature so that groups of three students, ideally from different academic departments, can work on a business creation project.

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. Professors provide details about evaluation methods used in their courses at the beginning of each semester.

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

Accessible complementary Master's degrees: currently under examination.

Accessible PhD curricula: by virtue of its training towards and via research, the Master in biomedical engineering gives its students an excellent preparation towards PhD studies. Instructors involved in the Master are members of various doctoral schools, which are there to welcome students who wish to further their studies via a PhD.

Contacts

Curriculum Management
### Entity

<table>
<thead>
<tr>
<th>Structure entity</th>
<th>SST/EPL/GBIO</th>
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</thead>
<tbody>
<tr>
<td>Denomination</td>
<td>(GBIO)</td>
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<tr>
<td>Faculty</td>
<td>Louvain School of Engineering (EPL)</td>
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<tr>
<td>Sector</td>
<td>Sciences and Technology (SST)</td>
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<tr>
<td></td>
<td>1348 Louvain-la-Neuve</td>
</tr>
<tr>
<td></td>
<td>Tel: +32 (0)10 47 25 - Fax: +32 (0)10 47 25</td>
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### Academic Supervisor
- Renaud RONSSE

### Jury
- Président du Jury: Jean-Didier LEGAT
- Secrétaire du Jury: Renaud RONSSE

### Useful Contacts
- Secrétariat: Isabelle DARGENT