

GBIO2M - Introduction

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.

A series of video portraits of young engineers in biomedical engineering wants to be discovered [on the "job description" page of the faculty](#).

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 UCLouvain 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.

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 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.

GBIO2M Programme

Detailed programme by subject

CORE COURSES [32.0]

- 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
- △ ⊕ Not offered in 2024-2025 or the following year
- Activity with requisites
- ⊗ Open to incoming exchange students
- ⊗ Not open to incoming exchange students
- [FR] Teaching language (FR, EN, ES, NL, DE, ...)

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

PROFESSIONAL FOCUS [30.0]

- 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
- △ ⊕ Not offered in 2024-2025 or the following year
- Activity with requisites
- 🌐 Open to incoming exchange students
- 🚫 Not open to incoming exchange students
- [FR] Teaching language (FR, EN, ES, NL, DE, ...)





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

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.

Year

1 2

> [Cours au choix en connaissances socio-économiques](#) [en-prog-2024-gbio2m-igbio200o]




				Year	
				1	2
⊗ WESP2234	Clinical decision making	Andrea Penaloza-Baeza Annie Robert (coord.) Kiswendsida Clovis Sawadogo	FR [q1] [30h] [3 Credits] 	x	x
⊗ WFSP2218	Longitudinal analysis: linear, logistic and Poisson regression	Annie Robert	FR [q1] [20h+20h] [4 Credits] 	x	x
⊗ WFSP2260	Human management and organisational behaviour	Pierre Meurens Laurianne Terlinden Sophie Thunus (coord.)	FR [q1] [40h+30h] [5 Credits] 	x	x
⊗ LMECA2711	Quality management and control.	Alexandre Debatty Laurence Guiot (coord.)	FR [q2] [30h+30h] [5 Credits]  > French-friendly	x	x

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

- Mandatory



				Year	
				1	2
⊗ LGBIO2020	Bioinstrumentation <i>For GBIO2M students - LGBIO2020 cannot be taken in this option, it must be validated in the finality.</i>	André Mouraux Dounia Mulders (compensates Michel Verleysen)	EN [q2] [30h+30h] [5 Credits]  > French-friendly	x	x
⊗ LMAPR2013	Science and engineering of metals and ceramics	Pascal Jacques	EN [q1] [30h+30h] [5 Credits]  > French-friendly	x	x
⊗ LMAPR2014	Physics of Functional Materials	Xavier Gonze Luc Piraux Samuel Poncé Gian-Marco Rignanese	EN [q1] [37.5h+22.5h] [5 Credits]  > French-friendly	x	

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.

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.

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From 20 to 30credit(s)

Year

1 2

o Content:

o Required courses (10 credits)

● LELEC2885 [Image processing and computer vision](#)

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COURS AU CHOIX EN CONNAISSANCES SOCIO-ÉCONOMIQUES

● Mandatory



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 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.

GBIO2M - Information

Access Requirements

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

> Find out more about [links](#) to the university

Holders of a 2nd cycle University degree

Diploma	Special Requirements	Access	Remarks
"Licenciés"			

Masters

Master in Engineering	Direct access
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Holders of a non-University 2nd cycle degree

> Find out more about [links](#) to the university

Access based on validation of professional experience

> It is possible, under certain conditions, to use one's personal and professional experience to enter a university course without having the required qualifications. However, validation of prior experience does not automatically apply to all courses. Find out more about [Validation of priori experience](#).

Access based on application

Access based on application : access may be granted either directly or on the condition of completing additional courses of a maximum of 60 ECTS credits, or refused.

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 \(epl-admission@uclouvain.be\)](mailto:epl-admission@uclouvain.be).

Admission and Enrolment Procedures for general registration

