



MA-IRBC | 2023-2024

# Master in Chemistry and Bio-industries Bioengineering

## Programme mnemonic

MA-IRBC

> Focus *Professional* : M-IRBCS

## Studies level

Master 120 credits

## Learning language

french

## Schedule

office hours

## Studies category / subcategory

Sciences and technics / Agronomy and bioengineering

## Campus

Plaine

## Programme's added value

The studies leading to the academic degree of Master in Bioengineering ensure the student of a **versatility** based on the acquisition of general scientific bases associated with the learning of engineering techniques. This versatility favors the development of an integration and interaction capability for a global approach of the problems and coming from a care of the sustainability of the realized solutions.

The Masters in bioengineering deliver, on top of this general versatile training, a more specific training that are translated in 3 major orientations, corresponding to the main domains of bioengineers activity, namely, **chemical and bio-industries**, environment science and technology, and agronomic science.

Bioengineers student at ULB benefits from a unique **interfaculty environment**, in a multidisciplinary university in the **capital of Europe**, close to the European Institutions.

The combination of the teachings from the Science Faculty and from the Brussels Polytechnic School is a major asset to strengthen the multidisciplinary of the training.

The teachings in this Master are based on cutting edge research in the different laboratories of the EIB and some laboratories of the Science Faculty and of the Brussels Polytechnic School. It also relies on some internationally-renowned research institutes as Institute of Interdisciplinary Research in Human and Molecular Biology (IRIBHM) from Faculty of Sciences and Institute of Molecular Biology and Medicine (IBMM) from Faculty of Medicine.

The Master in Chemistry and Bio-industries is a EUR-ACE<sup>®</sup> labelled programme, like all the EIB Masters. Awarded by the European Network for Accreditation of Engineering Education (ENAAE), the **European label EUR-ACE<sup>®</sup>** attests the quality of teaching and management of the establishment. It is awarded to engineering schools that meet the quality criteria of the specific EUR-ACE<sup>®</sup> Framework Standards & Guidelines (EAFSG). It promotes the mobility of students between certified institutions and the professional integration of graduates in Belgium and abroad.

## Teaching methods

The program, divided in mandatory courses, elective courses and internship, offers varied teaching methods: from lecture to exercise and practical in laboratories or personal work in the framework of projects.

## Programme objectives

The training meets the objectives set by the society, evolving and lead by the ever widening range of bioengineering applications. The studies take their roots in the domains of environment management, agro-ecosystems and all the industrial activities based on living beings.

The deeply multidisciplinary training helps the student to develop his creativity and his versatility in order to be functional in the various domains of engineering and biological sciences.

The Master in Chemistry and Bio-industries covers specialized fields such as: biotechnology, processes, genetics, cellular biology, food industry and bioinformatics. The following skills development and improvement are targeted:

- > Design innovative scientific and technological solutions
- > Manage and assume the responsibility of scientific research in the domains of chemistry and bio-industries
- > Measure, analyze and make a diagnosis in the framework of complex engineering problematic in order to implement operational and sustainable solutions.
- > Stimulate the development of the student personality (their ethic commitment) and their preparation to a responsible citizenship, particularly by allowing them to integrate the decision-making processes of the institution and of the school of bioengineering.



During the block 1 of the Master, half the teaching is allocated to exercises, practical, visits, personal work while the other half is dedicated to lectures.

During the block 2 of the Master, emphasis is put on the master thesis (25 ECTS), which is a long duration thorough research work and on a 12 weeks internship. These two works represent together close to 60% of the final year.

## Succeed in your studies

### Choose

The information and guidance counsellors at the InfOR-études [<https://www.ulb.be/en/studies-info-desk-1>] service will help you choose your studies throughout the year.

### Succeed

Take part in preparatory courses [<https://www.ulb.be/en/studies-info-desk-1>] or get help to succeed [<https://www.ulb.be/en/studies-info-desk-1>], before or during your studies.

### Get help

Apply for financial aid, look for accommodation or a student job, get support [<https://www.ulb.be/fr/aides-services-et-accompagnement/aid-services-and-support-1>] for your specific needs.

## International/Openness

EIB students have the opportunity to stay one or two semesters in a foreign university. Most of the time, this stay takes place during the first block of the Master. To enable those stays, EIB has signed exchange agreements with about twenty bioengineering departments of EU universities (Erasmus program)

Available destinations through these agreements are: Austria, France, Italy, Portugal, Spain and the United Kingdom. Moreover, bilateral exchange agreements have been signed by the ULB with non-EU universities, allowing students to go study outside of Europe for a semester or a complete academic year.

The internship organized by the Development Cooperation Committee of the Polytechnic School (Codepo) offers the opportunity to some of EIB students to go for one month in a developing country. This internship is proposed in the list of elective courses of the Master.

On top of that, various laboratories propose master theses on subjects that require a one to three month stay abroad, most of the time in developing countries.

EIB has developed a national and international network of academic and industrial partnership that is materialized by

student exchanges (Erasmus and internship), lectures given by industrial specialists, on site visits and research collaborations.

For the Master in "Chemistry and bio-industries", this is translated, among other things, in practical on industrial pilot plants, lectures from industrial executives from Vivaqua and Total, visits of wastewater treatment plants, of food industries and other Belgian companies. The Development Cooperation may take place during the training.

## Job opportunities

This training leads to a broad range of application domains. Agronomy, environment, territorial planning, biotechnologies,... are all sectors in which a bioengineer will be able to flourish. He might particularly work in industry, administrations (national and international), and consultancy but also in teaching and research.

The studies leading to the academic degree of Master in Bioengineering Sciences are compliant with the law regarding the access to the profession and confers **the professional title of bioengineer**.

Graduated with a Master degree in Chemistry and bioindustries from EIB can get employment in many fields:

- R&D or processing in different industrial sectors: pharmaceuticals, chemistry, food industry, biotechnology, bioinformatics
- as expert, consultant or trainer in technical center, consultancy company or administration (national, international).
- researcher in academic laboratory (with or without doctoral degree).

### Contacts

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 <https://bioing.ulb.be/>

### Jury President

Philippe BOGAERTS

### Jury Secretary

Sigrid FLAHAUT

# Master in Chemistry and Bio-industries Bioengineering

## Focus Professional

The Master is focused on life sciences and biotechnology which have an important role to play in line with trends in society. The Master course programme enables students to control biotechnology and bioinformatic tools suitable for creating and producing in agribusiness, chemistry or pharmaceutical industry. From lab to large-industrial scale, working with single living cell as well as whole populations, students can manage complex issues in various industrial sectors.

The first year of the Master consists in two mains axes : "Science and technology" and "Engineering science". During the second year, the training programme plans professionalisation. Students can acquire work experience through periods spent in academic laboratory or companies (company visits and internship).

The Master diploma in Bioengineering Sciences gives access to undertake doctoral studies.

## Bloc 1 | M-IRBCS | MA-IRBC

### Module Chimie et biologie

BING-F4002	<b>Acquisition et analyse de données</b>   Marius GILBERT (Coordinator), Marc DUFRENE and Simon Dellicour ⌚ 5 credits [lecture: 24h, tutorial classes: 36h] 📅 first term 🗨 French
BING-F4007	<b>Compléments de biochimie et de microbiologie</b>   Sigrid FLAHAUT (Coordinator) and Nausicaa NORET ⌚ 5 credits [lecture: 48h, practical work: 12h] 📅 second term 🗨 French
BIOL-F412	<b>Biotechnologies animales et végétales</b>   Nathalie VERBRUGGEN (Coordinator) and Benoît VANHOLLEBEKE ⌚ 5 credits [lecture: 36h, project: 24h] 📅 second term 🗨 French
BMOL-F5001	<b>Physiologie cellulaire et biologie moléculaire du gène</b>   Véronique KRUYIS (Coordinator), Bruno ANDRE, Cyril GUEYDAN and Maud MARTIN ⌚ 5 credits [lecture: 48h] 📅 first term 🗨 French
CHIM-F4002	<b>Cinétique chimique, catalyse enzymatique et macromolécules biologiques</b>   Geneviève DUPONT (Coordinator), Cédric GOVAERTS and Vincent RAUSSENS ⌚ 5 credits [lecture: 48h, tutorial classes: 12h] 📅 first term 🗨 French

### Module Ingénierie

BING-H4000	<b>Modeling and control of dynamical systems in bioengineering</b>   Philippe BOGAERTS (Coordinator) and Didier GONZE ⌚ 5 credits [lecture: 48h, tutorial classes: 12h] 📅 second term 🗨 English
BING-H4003	<b>Unit operations and processes for the environment and bio-industries</b>   Benoît HAUT (Coordinator), Frédéric DEBASTE and Benoît SCHEID ⌚ 10 credits [lecture: 36h, tutorial classes: 48h, practical work: 36h] 📅 second term 🗨 English
BING-H5000	<b>Introduction à la bioinformatique et à ses applications</b>   Dimitri GILIS (Coordinator) and Fabrizio PUCCI ⌚ 5 credits [lecture: 36h, practical work: 24h] 📅 first term 🗨 French
CHIM-H413	<b>Chemical and biological reactor design</b>   Frédéric DEBASTE (Coordinator) and David CANNELLA ⌚ 5 credits [lecture: 30h, tutorial classes: 18h, practical work: 12h] 📅 first term 🗨 English
MATH-H304	<b>Automatique</b>   Michel KINNAERT (Coordinator) ⌚ 5 credits [lecture: 30h, practical work: 30h] 📅 second term 🗨 French

### Cours à option

A total of five credits chosen from the following

BING-H505  
(optional)

[Fundamentals of biomaterials](#) | Mohammadamin SHAVANDI (Coordinator)

🕒 5 credits [lecture: 36h] 📅 second term 🗨 English

BMOL-F457  
(optional)

[Travaux pratiques de biologie cellulaire](#) | Maud MARTIN (Coordinator), Guillaume OLDENHOVE and David PEREZ-MORGA

🕒 5 credits [practical work: 48h] 📅 second term 🗨 French

# Master in Chemistry and Bio-industries Bioengineering

Focus Professional

## Bloc 2 | M-IRBCS | MA-IRBC

### Cours obligatoires

- MEMO-F514 **Mémoire** | Philippe BOGAERTS (Coordinator)  
⌚ 25 credits [mfe/tfe: 300h] 📅 first and second terms
- STAG-F014 **Stage en entreprise en chimie et bio-industries** | Sigrid FLAHAUT (Coordinator)  
⌚ 15 credits [work placement: 180h] 📅 first term 🗣️ French

### Module à choisir

#### Module Bioinformatique

*A total of 15 credits chosen from the following*

- BINF-F401 (optional) **Computational Methods for Functional Genomics** | Vincent DETOURS (Coordinator)  
⌚ 5 credits [lecture: 36h, practical work: 24h] 📅 second term
- BINF-F405 (optional) **Biophysics and structural bioinformatics II** | Dimitri GILIS (Coordinator), Fabrizio PUCCI and Wim VRANKEN  
⌚ 5 credits [lecture: 36h, practical work: 24h] 📅 second term
- CHIM-F4001 (optional) **Rational drug design and PKPD modeling** | Jean-Christophe LELOUP (Coordinator) and Martine PREVOST  
⌚ 5 credits [lecture: 36h, tutorial classes: 12h, project: 24h] 📅 second term 🗣️ English
- CHIM-F422 (optional) **Modélisation des rythmes du vivant** | Didier GONZE (Coordinator), Geneviève DUPONT and Jean-Christophe LELOUP  
⌚ 5 credits [lecture: 24h, tutorial classes: 24h, project: 30h] 📅 second term 🗣️ French
- CHIM-F443 (optional) **Approches computationnelles des états de la matière** | Nathalie VAECK (Coordinator), Antoine Aerts, Emilie CAUET and Martine PREVOST  
⌚ 5 credits [practical work: 36h, project: 24h] 📅 first term 🗣️ French
- INFO-F438 (optional) **Algorithms in computational biology** | John IACONO (Coordinator)  
⌚ 5 credits [lecture: 24h, tutorial classes: 12h, project: 60h] 📅 second term 🗣️ English
- INFO-H410 (optional) **Techniques of artificial intelligence** | Hugues BERSINI (Coordinator)  
⌚ 5 credits [lecture: 24h, tutorial classes: 12h] 📅 second term 🗣️ English
- PHYS-F512 (optional) **Molecular motors and stochastic processes** | Pierre GASPARD (Coordinator)  
⌚ 5 credits [lecture: 36h, tutorial classes: 24h] 📅 first term 🗣️ English

#### Module biotechnologies moléculaire et cellulaire

*A total of 15 credits chosen from the following*

- BIME-H407 (optional) **Introduction to medical imaging and optical microscopy** | Olivier DEBEIR (Coordinator) and Simon-Pierre GORZA  
⌚ 5 credits [lecture: 48h, tutorial classes: 12h] 📅 first term 🗣️ English
- BING-H5001 (optional) **Biorefinery: from biomass transformation to biobased products** | David CANNELLA (Coordinator)  
⌚ 5 credits [lecture: 36h, practical work: 24h] 📅 first term 🗣️ English

BING-H507 (optional)	<b>Molecular and biomolecular engineering</b>   Gilles BRUYLANTS (Coordinator) ⌚ 5 credits [lecture: 24h, tutorial classes: 12h] 📅 second term 🗣 English
BMOL-F006 (optional)	<b>Microbiologie moléculaire</b>   Carine VAN LINT (Coordinator), Mélanie BOECKSTAENS, Abel GARCIA-PINO, Dukas Jurénas, Anna Maria MARINI and Laurence VAN MELDEREN ⌚ 5 credits [lecture: 40h] 📅 second term 🗣 French
BMOL-F417 (optional)	<b>Communication inter-cellulaire (signalisation/intégration des signaux)</b>   Benoît VANHOLLEBEKE (Coordinator) and Bernard ROBAYE ⌚ 5 credits [lecture: 28h, seminars: 8h] 📅 first term 🗣 French
BMOL-F418 (optional)	<b>Immunologie et biologie du cancer</b>   Etienne MEYLAN (Coordinator), Fabienne ANDRIS and Stanislas GORIELY ⌚ 5 credits [lecture: 40h] 📅 second term 🗣 French
BMOL-F420 (optional)	<b>Relations hôtes-vecteurs-parasites: notions approfondies</b>   Sabrina BOUSBATA (Coordinator) and Luc VANHAMME ⌚ 5 credits [lecture: 36h, practical work: 24h] 📅 second term 🗣 French
CHIM-F422 (optional)	<b>Modélisation des rythmes du vivant</b>   Didier GONZE (Coordinator), Geneviève DUPONT and Jean-Christophe LELOUP ⌚ 5 credits [lecture: 24h, tutorial classes: 24h, project: 30h] 📅 second term 🗣 French
CHIM-H407 (optional)	<b>Molecular structural characterization and analysis</b>   Gilles BRUYLANTS (Coordinator) and Sebastiaan EELTINK ⌚ 5 credits [lecture: 36h, tutorial classes: 12h, practical work: 12h] 📅 first term 🗣 English

## Module biotechnologie agro-alimentaire

*A total of 15 credits chosen from the following*

BING-F5002 (optional)	<b>Contrôle des fabrications alimentaires et législation des entreprises</b>   Sigrid FLAHAUT (Coordinator) and Philippe MAURER ⌚ 5 credits [lecture: 36h, practical work: 24h] 📅 first term 🗣 French
BING-F502 (optional)	<b>Principales filières agroalimentaires et valorisation de molécules d'intérêt d'origine alimentaire</b>   Christophe BLECKER (Coordinator), Sigrid FLAHAUT and Caroline STEVIGNY ⌚ 5 credits [lecture: 36h, practical work: 12h, project: 30h] 📅 first term 🗣 French
BING-F504 (optional)	<b>Nutrition animale et humaine</b>   Joanne RASSCHAERT (Coordinator) and Carine DE VRIESE ⌚ 5 credits [lecture: 48h] 📅 second term 🗣 French
BING-F530 (optional)	<b>Brasserie: contrôle de fabrication des matières premières au produit fini</b>   Laurence VAN NEDERVELDE (Coordinator) ⌚ 5 credits [lecture: 36h, practical work: 24h] 📅 first term 🗣 French
GEST-H501 (optional)	<b>Logistics Engineering and Management</b>   Alassane Ballé NDIAYE (Coordinator) ⌚ 5 credits [lecture: 12h, tutorial classes: 36h] 📅 first term 🗣 English

## Autre UE

Choisir 5 crédits dans les programmes de masters de l'Ecole interfacultaire de Bioingénieurs, de la Faculté des Sciences, de l'Ecole Polytechnique de Bruxelles ou dans le programme des masters bioingénieurs de la Faculté des Bioingénieurs de l'Université Catholique de Louvain (UCL)

*A total of five credits chosen from the following*

TEMP-0000 (optional)	<b>Cours extérieurs au programme</b> ⌚ 5 credits 📅 academic year 🗣 French
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