UCLouvain

BIRC2M

2024 - 2025

Master [120] in Chemistry and Bioindustries

BIRC2M - Introduction

Introduction

BIRC2M - Teaching profile

Learning outcomes

Master in Chemistry and Bio-industries students must endeavour to diagnose and solve complex and original issues in bioengineering through a multidisciplinary approach in order to develop and implement innovative and sustainable solutions.

This Master's programme aims to train experts in the field of applied chemistry and bio-industries.

The future bioengineers acquire the knowledge and skills required to become:

• professionals able to tackle and diagnose problems in applied chemistry and bio-industries: production and quality, traceability, new processes, bioengineering with a high level of innovation, etc.;

• scientists able to understand complex processes on different scales, used to multidisciplinary approaches (chemistry, physico-chemistry, microbiology, etc.) and consultation with other specialists;

• innovators able to develop new methods in applied chemistry and biology: biotechnologes, nanotechnologies, catalysis, remediation, etc.

Highly versatile and multidisciplinary in character, the course dispensed by the Faculty of Biological, Agricultural and Environmental Engineering focuses on acquiring skills which combine theory and practice to train "bioengineers" mastering a broad base of scientific and technological knowledge and skills, allowing them to adopt an integrated approach to biological, agricultural and environmental systems.

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

1. To explore a body of knowledge (knowledge, methods and techniques, models and processes) in natural and human sciences which serves as the foundation from which to operate with expertise in the fields of applied chemistry and bioindustries.

1.1 To build an advanced knowledge base in the field of applied chemistry and bioindustries and more specifically in the following disciplines [1]:

• Analytical chemistry
• Organic analysis
• Biochemical analysis
• Physical chemistry and physico-chemical calculations
• Chemistry of colloids and surfaces
• Reactor design

1.2 To build highly specialised scientific knowledge in one of the following bioengineering specialisations [2]:

• Science, technology and food quality
• Biomolecular and cell engineering
• Nanobiotechnologies, materials and catalysis
• Environmental technologies: water, soil, air
• Information analysis and management in biological engineering

1.3 To master procedural skills in conducting experiments: analytical chemistry techniques, organic and biochemical analysis techniques, technical analysis of complex matrices, chemometrics or biometrics, as well as specific techniques in relation to their choice of specialisation[3].

1.4 To apply their knowledge critically to tackle a complex problem in the field of applied chemistry or bioindustries by incorporating processes at different scales ranging from the atomic scale to the organism and matter scale, and up to the process scale.

1.5 To apply multiple strands of knowledge to resolve a multidisciplinary problem in the field of applied chemistry or bioindustries in order to develop relevant and innovative solutions.

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[1] Refers to the choice of the Master (core subjects and professional focus). The knowledge of some of these disciplines will have been partially 5 0.509J 1 0tadidisci0127 Tmof amoniuls.0120obl 0 229.liofessional focus8;1. T"of the follonformation analsional fo" the fo0 268.36300659 Tm [(s

5.4 To plan and develop all the stages of a multidisciplinary project, alone and in a team, and to work together after having allocated the tasks.

5.5 To involve key players at appropriate stages in the process.

5.6 To work within a team and collaborate effectively to achieve common objectives.

5.7 To take and assume the decisions required for the effective project management either alone or in a team in order to achieve the intended objectives.

5.8 To recognise and take into consideration the diversity of opinions and ways of thinking of team members and to manage conflict constructively to work towards a consensual decision.

5.9 To lead a team (demonstrate leadership): to motivate team members, to develop a collaborative climate, to guide them to cooperate in the achievement of a common objective, to manage conflict.

6. To communicate, interact and convince in a professional manner, in French and English at level C1 (Common European Framework of Reference for Languages published by the Council of Europe), both verbally and in writing, adapting to their conversational partners and the context.

6.1 To understand and use scientific articles and advanced technical documents in French and English.

6.2 To communicate information, ideas, solutions and conclusions as well as the knowledge and underlying principles, in a clearly structured, substantiated, concise and comprehensive way (as appropriate) both verbally and in writing according to the standards of communication specific to the context and by adapting their presentation according to the level of expertise of the audience.

6.3 To develop logic diagrams to concisely pose complex global questions.

6.4 To communicate the state of knowledge in a specific field concisely and critically.

6.5 To communicate results and conclusions, and to support a message, in an appropriate manner using scientific tables, graphs and diagrams.

6.6 To communicate effectively and respectfully with various stakeholders, demonstrating listening skills, empathy and assertiveness.

6.7 To argue and convince: to understand the points of view of various stakeholders and present their arguments accordingly.

6.8 To master the IT and technological tools essential for professional communication.

6.9 To learn English to level C1 according to the European Framework.

7. To act critically and responsibly by taking account of sustainable development issues and operating with a humanistic outlook.

The majority of these skills are not developed exclusively through specific activities, but rather as a result of the multiple and diverse situations encountered throughout the course, the educational programmes and the way in which it is run, as well as through the university environment.

7.1 To demonstrate intellectual independence of thought, to examine knowledge and professional practices and trends critically.

7.2 To make decisions and act in society with respect for ethical values and in compliance with laws and conventions.

7.3 To make decisions and act responsibly by factoring in sustainable development values.

Year 1 :

core subjects programme :

1. Foundation special subject: 10 credits
2. Information Analysis and Management special subject: 15 credits
3. Brewing special subject : 11 credits

professional focus programme :

1 Foundation special subject : 30 credits
2. Information Analysis and Management special subject: 30 credits
3. Brewing special subject: 19 credits

choice of one option course from six available :

1. Foundation special subject: 20 credits
2. Information Analysis and Management special subject: 15 credits
3. Brewing special subject: 30 credits

Year 2 :

core subjects programme :

1. Foundation special subject: 50 credits
2. Information Analysis and Management special subject: 45 credits
3. Brewing special subject: 49 credits (dissertation + 19 credits for courses at the University of Lorraine)

professional focus programme :

1. Foundation special subject : 0 credits
2. Information Analysis and Management special subject: 0 credits
3. Brewing special subject: 11 credits (taken at the University of Lorraine)

choice of one option course from six available :

1. Foundation special subject : 10 credits
2. Information Analysis and Management special subject: 15 credits
3. Brewing special subject: 0 credits

Optional subjects :

There are some optional courses within the programme. They may either be chosen from a suggested list or may be chosen freely from all the courses available at UCL or even at another institution. The same applies to all the optional courses in the programme.

All these choices must be made in the timescale laid down by the Faculty Department and agreed by the Academic Secretary. For courses from another faculty or institution, students must gain prior agreement from the lecturer in charge of the course.

Additional training "Business Creation"

Students enrolled on the Master in Bioengineering programme have the possibility of taking a module of interdisciplinary training entitled *"Business Creation".* This additional programme features in the Master programmes of various faculties (Bioengineering, Law, Business Management, Civil Engineering, Psychology). It is designed to provide students, as potential creators, with the tools for analysis and understanding which will help them to appreciate how entrepreneurship works when creating or taking on a business and develop projects of this kind within existing organizations.

In addition, this training enables students to gain familiarity with other disciplines and to learn how to work in multidisciplinary teams.

For further information :

- on the training programme, please refer to : https://uclouvain.be/fr/etudier/ineo
- on how the Master in Bioengineering programmes work, please contact the Faculty Office.

BIRC2M Programme

Detailed programme by subject

CORE COURSES

- 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, ck9et

Year

				Year 1	2
⊠ LGBIO2030A	Biomaterials	Sophie Demoustier Christine Dupont	EN [q1] [30h+10h] [3 Credits] > *French-friendly*	x	
⊠ WSBIM2122	Omics data analysis	Laurent Gatto	EN [q1] [30h+10h] [3 Credits]	x	

⊠ Courses to be chosen for 5 credits minimum (suggestion for option 3C)

⊠ LBBMC2101A	Structural and functional biochemistry	Pierre Morsomme Patrice Soumillion	FR [q1] [20h] [2 Credits]	x	
⊠ LBIR1381	Principles of Biorefining	Damien Debecker (coord.) Benoît Stenuit	EN [q1] [30h] [3 Credits] > *French-friendly*	x	
⊠ LBRMC2201	Bioinformatics : DNA and protein sequence analysis	Michel Ghislain	EN [q1] [30h+15h] [4 Credits] > *French-friendly*	x	
⊠ LCHM2231	Chemistry and functionality of inorganic materials	Yann Garcia	EN [q2] [45h+15h] [6 Credits] > *French-friendly*	x	
⊠ LCHM2261A	Polymer Chemistry and Physical Chemistry (part 1 : Polymer Chemistry)	Charles-André Fustin Jean-François Gohy Alain Jonas	EN [q1] [22.5h+7.5h] [3 Credits] > *French-friendly*	x	
⊠ LMAPR2013	Science and engineering of metals and ceramics	Pascal Jacques	EN [q1] [30h+30h] [5 Credits] > *French-friendly*	x	
⊠ LMAPR2016	Project in Polymer Science	Charles-André Fustin Alain Jonas	EN [q2] [30h+15h] [5 Credits] > *French-friendly*	x	
⊠ LMAPR2018	Rheology	Evelyne Van Ruymbeke	EN [q2] [30h+30h] [5 Credits] > *French-friendly*	x	
⊠ LMAPR2019	Polymer Science and Engineering	Sophie Demoustier Alain Jonas Evelyne Van Ruymbeke	EN [q1] [45h+15h] [5 Credits] > *French-friendly*	x	

⊠ Courses to be chosen for 5 credits minimum (suggestion for option 4C)

⊠ LBIR1381	Principles of Biorefining	Damien Debecker (coord.) Benoît Stenuit	EN [q1] [30h] [3 Credits] > *French-friendly*	x	

			Year 1	Year 2
⊠ LINGE1322	Computer science: Analysis and Design of Information Systems	Jean Vanderdonckt	FR [q2] [30h+15h] [5 Credits] 2	

OPTIONS

From 23 to 25credit(s)

> Option 1C - Food & quality *[en-prog-2024-birc2m-lbirc201o]*
> Option 2C - Biomolecules & cells *[en-prog-2024-birc2m-lbirc202o]*
> Option 3C - Nano(bio)materials and catalysis *[en-prog-2024-birc2m-lbirc203o]*
> Option 4C - Environmental Technology *[en-prog-2024-birc2m-lbirc204o]*
> Option 10C - Data Science *[en-prog-2024-birc2m-lbirc210o]*
> Option 12C - Sustainability engineering *[en-prog-2024-birc2m-lbirc206o]*
> Busniness Creation (Option 13C) *[en-prog-2024-birc2m-lbirc213o]*
> Option 18C : Human health *[en-prog-2024-birc2m-lbirc205o]*

OPTION 1C - FOOD & QUALITY [24.0]

- 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...)

Content:

				Year 1	Year 2
LBRAL2102	Physiological and nutritional biochemistry	Cathy Debier (coord.) Emeline Dierge	EN [q1] [37.5h+0h] [4 Credits] *> French-friendly*		x
LBRAL2103	Food chemistry	Sonia Collin	FR [q1] [30h+30h] [5 Credits]	x	
LBRAL2104	Food microbiology	Annika Gillis	EN [q2] [30h+22.5h] [4 Credits] *> French-friendly*	x	
LBRAL2201	Food technology	Axel Kather Benoît Stenuit (coord.)	EN [q2] [52.5h] [5 Credits] *> French-friendly*	x	

Suggestions d'unités d'enseignement au choix libre pour 6 crédits minimum pour l'option 1C

LBRAL2202	Technological quality control	Vincent Baeten	FR [q1] [30h] [2 Credits]	x	x
LBRAS2302	Chimie du houblon et technologies associées	Sonia Collin	FR [q1] [30h+30h] [5 Credits]	x	x
LBRAS2304	Qualités organoleptiques et microbiologiques de la bière et du vin	Sonia Collin (coord.) Margaux Simon	FR [q1] [15h+30h] [4 Credits]	x	x
LBRTE2201	Human and environmental toxicology	Cathy Debier	EN [q1] [30h+7.5h] [4 Credits] *> French-friendly*	x	x

OPTION 2C - BIOMOLECULES & CELLS [24.0]

- 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, ...)

OPTION 3C - NANO(BIO)MATERIALS AND CATALYSIS [24.0]

- 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, ...)

OPTION 10C - DATA SCIENCE [25.0]

- 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...)

Content:

				Year 1	Year 2
LBRAI2219	Systems Biology Modelling	Valentin Couvreur (compensates Mathieu Javaux) Xavier Draye (coord.) Guillaume Lobet	[FR] [q2] [30h] [3 Credits] > *English-friendly*		x
LBRTI2101B	Data Science in bioscience engineering	Patrick Bogaert Emmanuel Hanert			

BUSNINESS CREATION (OPTION 13C) [24.0]

L'objectif du module INEO est de fournir aux étudiants, créateurs potentiels d'entreprise, les outils d'analyse et de réflexion qui les aideront à comprendre les processus entrepreneuriaux afin de créer ou reprendre une entreprise et de développer des projets de cette nature au sein d'organisations existantes. En outre, cette formation permet aux étudiants de se familiariser avec d'autres disciplines et d'apprendre à travailler en équipes multidisciplinaires. Les étudiants qui souhaitent suivre le module interdisciplinaire en entrepreneuriat (INEO) doivent s'y inscrire en même temps qu'à l'option dès la première année de master. En effet, le programme de ce module devra s'articuler avec celui de l'option sur les deux années de master. Attention: l'inscription à ce module fait l'objet d'une sélection. Ce n'est qu'après avoir reçu l'accord de participation à ce programme que les étudiants pourront prendre contact avec le vice-doyen pour aménager leur programme de cours personnel et répartir les cours INEO et les cours d'option sur les deux années du master.

- 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...)

Access to this option is limited via a selection process at the beginning of the master programme (https://uclouvain.be/fr/etudier/ineo). Students enrolled for this option do not take the course LBIRC2210 (master thesis' accompanying seminar) and are required to take another course for 3 credits.

Year

OPTION 18C : HUMAN HEALTH [24.0]

- 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...) Not open to incoming exchange students

Year

LBIR1325A	Transfer of fluids and energy for Bio-engineer	Yann Bartosiewicz Quentin Goor (compensates Mathieu Javaux) Marnik Vanclooster	FR [q1] [37.5h+22.5h] [5 Credits]
LBIR1340	Basis of quantum mechanics and spectroscopy	Eric Gaigneaux (coord.) Xavier Gonze	FR [q2] [22.5h+22.5h] [3 Credits] *> English-friendly*
LBIR1341	Laboratories, seminars and integrated practice of analytical chemistry	Arnaud Detaille (compensates Christine Dupont) Christine Dupont (coord.) Thibaut Huybrechts (compensates Christine Dupont)	FR [q1] [30h+45h] [5 Credits]
LBIR1342	Analyse de composés organiques dans des matrices complexes	Sonia Collin	FR [q2] [30h+45h] [5 Credits]
LBIR1346	Surface and colloid chemistry	Christine Dupont Aurélien vander Straeten (compensates Christine Dupont)	FR [q2] [30h] [3 Credits]
LBIR1349	Analytical Chemistry I	Christine Dupont (coord.) Yann Garcia Yann Garcia (compensates Christine Dupont)	FR [q1] [30h+15h] [3 Credits]
LBIR1350	General Microbiology	Annika Gillis	FR [q2] [37.5h+15h] [4 Credits]
LBIR1351	Introduction to systems analysis	Philippe Baret	FR [q1] [10h+20h] [3 Credits]
LBIR1352P	General genetics *Le cours magistral étant commun, les partims M et P du cours LBIR1352 ne peuvent être cumulés.*	Philippe Baret Annika Gillis	

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.

BIRC2M - Information

There are two kinds of international mobility : students who have already gained their Bachelor degree can move abroad to study for their Master at another institution ; it is also possible to take some course modules in another institution. The mobility rate for AGRO students on exchange schemes such as Erasmus is around 30-40% and the number of our students who go abroad is similar to the number of foreign students who come to study here.

This mobility should increase given the harmonization of education at the European level and the conclusion of new partnership agreements outside ERASMUS as well as membership of thematic networks. The AGRO Faculty is also a member of the ATHENS network.

In particular, the programme of the Master in Chemistry and Bio-industries offers an option course on brewing, organized in cooperation with the University of Lorraine (France). The precise terms for the exchange of course and students between the two institutions are still being negotiated and will be announced as soon as possible.

Possible trainings at the end of the programme

The Master in Bioengineering programme follows on directly from the Bachelor in Engineering Science (Bioengineering) with an option course in Chemistry.

Successful completion of this programme enables direct entry to other training programmes in the second and third cycles.

- **Advanced Masters** : The Advanced Masters in the field authorized by regulations in addition to those established by the University Development Commission (Commission Universitaire au Développement â€“ CUD) in the same field.
- **Doctoral programmes** : doctorates in Agronomic Sciences and Biological Engineering.

Contacts

Curriculum Management

Faculty

Structure entity	SST/AGRO
Denomination	Faculty of bioscience engineering (AGRO)
Sector	Sciences and Technology (SST)
Acronym	AGRO
Postal address	Croix du Sud 2 - bte L7.05.01 1348 Louvain-la-Neuve Tel: +32 (0) 10 47 37 19 - Fax: +32 (0) 10 47 47 45
Website	http://www.uclouvain.be/agro

Mandate(s)

- Dean : Christine Dupont
- Administrative director : Carole Dekelver

Commission(s) of programme

- Commission de programme - Master Bioingénieur-Sciences agronomiques (BIRA)
- Commission de programme - Master Bioingénieur-Chimie et bioindustries (BIRC)
- Commission de programme - Master Bioingénieur-Sciences & technologies de l'environnement (BIRE)
- Commission de programme - Bachelier en sciences de l'ingénieur, orientation bioingénieur (CBIR)
- Commission de programme interfacultaire en Sciences et gestion de l'environnement (ENVI)
- Fermes universitaires de Louvain (FERM)

Academic supervisor: Eric Gaigneaux

Jury

- Président: president-jury-agro@uclouvain.be
- Secrétaire du Jury de la 2ième année de master: Sophie Opfergelt

Useful Contact(s)

- - Informations pour les étudiants: conseiller-agro@uclouvain.be