UCLouvain

BIRC2M

2019 - 2020

Master [120] in Chemistry and Bioindustries

At Louvain-la-Neuve - 120 credits - 2 years - Day schedule - In french
Dissertation/Graduation Project : **YES** - Internship : **optional**
Activities in English: **YES** - Activities in other languages : **NO**
Activities on other sites : **NO**
Main study domain : **Sciences agronomiques et ingénierie biologique**
Organized by: **Faculté des bioingénieurs (AGRO)**
Programme acronym: **birc2m** - Francophone Certification Framework: 7

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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 acquired in the Bachelor's degree (in the advanced minor).

[2] Refers to the option / module choice in the Master.

[3] Refers to mastering all the laboratory and field techniques used for the characterisation or monitoring of a system.

2. To explore an integrated body of "engineering and management knowledge" which serves as the foundation from which to operate with expertise in the field of environmental sciences.

2.1 To build an advanced knowledge base (e.g.: concepts, laws, technologies) and tools (e.g. modelling, programming) in engineering sciences:

• Chemometrics and Biometrics
• Biochemical and microbial engineering
• Thermodynamics
• Process engineering: unit operations
• Reactor design

2.2 To build and master highly specialised knowledge and tools in one of the following bioengineering specialisations:

• 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

2.3 To master the operational use of specialised tools in engineering sciences (e.g.: systems analysis, statistical analysis, programming, modelling, etc.)[1]]:

• Chemometrics and biometrics

• Thermodynamics

• Specific tools in relation to the choice of specialisation

2.4 To activate and apply their knowledge of engineering with a critical mind and using a quantitative approach 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.

2.5 To locate and understand how companies and organisations operate, including the role of the different players, their financial and social realities and responsibilities and the challenges and constraints which characterise their environment.

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[1] The tools are explained on the basis of the radioscopy of the programme and courses.

3. To design and execute a research project, implementing an analytical scientific and, if applicable, systematic approach, to further understanding of an original research problem in their field of specialisation, incorporating several disciplines.

This skill set will develop throughout the 5 years. Amongst others it requires the use of a set of skills as described below. These skills correspond in fact to the different stages of the scientific approach.

The majority of these skills are developed in the Bachelor and Master programmes, with differentiation predominately on 3 levels:

- the level of detail and complexity applied to the scientific problem/research studied;

- the degree of innovation shown by the student;

- the degree of autonomy demonstrated by the student throughout the process.

3.1 To summarise the state of knowledge on a complex research problem which relates to their choice of specialisation: to research information, to select and validate its reliability based on the nature of the source of the information and comparing several sources.

3.2 To specify and define the research question.

3.3 To examine the research question using conceptual abstraction and formulate hypotheses.

3.4 To develop and implement a rigorous methodology to answer the research question.

3.5 To master and apply statistical data analysis tools in the context of a complex scientific issue.

3.6 To analyse and interpret the results to produce a substantiated critique on a complex scientific question.

3.7 To demonstrate an ability to summarise and formulate conclusions on a complex scientific question.

3.8 In each of the skills mentioned above, to demonstrate rigour, precision and the critical thinking essential for any scientific method.

3.9 To demonstrate innovation in at least one of the skills mentioned above.

4. To formulate and resolve a complex environmental engineering problem related to new situations presenting a degree of uncertainty. The student will be able to design appropriate, sustainable and innovative solutions through a systematic approach integrating processes from the nanoscale (atoms, chemical mechanisms,....) to the microscopic and macroscopic scales (organisms, reactor,...). This problem may relate to the management and use of resources (soil, water, plant) and ecosystems, to land management, to the impact of human activities on the capacity of the environment to provide goods and services to humanity.

This skill set will develop throughout the 5 years. Amongst others it requires the use of a set of skills as described below. These skills correspond in fact to the different stages of the engineering approach.

The majority of these skills are developed in the Bachelor and Master programmes, with differentiation predominately on 3 levels:

- the complexity and scope of the problem addressed;

- the degree of autonomy demonstrated by the student throughout the process;

- the degree of depth in each skill.

4.1 To strategically differentiate the key elements from the less critical elements relating to a complex chemical engineering or bioindustries problem, in order to define and determine the field of action for this problem.

4.2 To identify the knowledge acquired and that to be acquired to resolve the complex chemical engineering or bioindustries problem.

4.3 To analyse a complex chemical engineering or bioindustries problem using a systematic and multidisciplinary approach in order to carry out diagnostics and formulate the specifications.

4.4 To demonstrate an ability for conceptual abstraction and formalisation in analysing and resolving the complex chemical engineering or bioindustries problem.

4.5 To develop scientifically and technologically relevant and innovative solutions, through a multidisciplinary (integration and articulation of knowledge) and quantitative approach, making it possible to develop products, systems, processes or services in the field of applied chemistry and bioindustries.

4.6 To test solutions and evaluate their impact in relation to an economic, environmental, social and cultural context.

4.7 To formulate concrete and responsible recommendations to encourage sustainable development in relation to the efficient operational and sustainable implementation of the solutions proposed.

5. To design and implement a multidisciplinary project, alone and in a team, with the stakeholders concerned while taking the objectives into account and incorporating the scientific, technical, environmental, economic and human factors.

The graduate must be able to manage a project alone and in a team, not only the scientific and technological dimensions but also the financial and, if applicable social aspects and with a degree of complexity representative of typical professional scenarios.

5.1 To know and understand the principles and factors of group dynamics (including the constructive role of conflict).

5.2 To know and understand the project management process (project cycles): formulation and definition of the project, project management, monitoring and evaluation of the project.

5.3 To situate a multidisciplinary project within its environment and identify the issues, constraints and stakeholders and to clearly define its objectives.

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.

7.4 To make decisions and act with respect for humanistic values, cultural openness and solidarity, especially in North–South relations.

7.5 To assume professional responsibilities and act in a managerial capacity vis-à-vis their colleagues.

8. To demonstrate independence and be proactive in acquiring new knowledge and developing new skills in order to adapt to changing or uncertain situations and to grow, to build a professional project within a continuing development approach.

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.

8.1 To manage their work independently: to set priorities, anticipate and plan all the activities in time, including in the face of changing, uncertain or urgent situations.

8.2 To manage stress and frustrations in urgent, changing, inconsistent or uncertain situations.

8.3 To question and know themself: to undergo self-assessment, by analysing their successes and failures, to identify strengths and weaknesses and their personal performance in relation to the context.

8.4 To grow personally and professionally: to build a professional project in line with their own values and aspirations, to manage their motivation and involvement in bringing the project to fruition, to persevere in complex situations.

8.5 To independently identify and absorb new knowledge and skills essential for learning to understand new contexts quickly.

8.6 To commit to the lifelong learning which will allow them to grow socially and professionally.

Programme structure

This programme comprises a series of activities totalling 120 credits spread over two years worth 60 credits each.

The special nature of certain option courses (international programme for the option course in brewing and shared programme for the option course in Information Analysis and Management in Biological Engineering between the three Masters in Bioengineering) requires different approaches for the core subjects programme and the professional focus.

The programme is described according to three special subjects:

1.foundation special subject (applies to option course 1C, 2C, 3C and 4C),

2. Information Analysis and Management in Biological Engineering special subject (applies to option course 10C)

3.Brewing special subject (applies to option 12C).

Certain foundation special subject option courses are organized jointly with one or two of the other Masters in Bioengineering programmes. This is the reason for the special numbering of these option courses. (For example, option course 1C is also in the programme for the Master in Agronomic Science where it is called option course 1A.)

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/cpme.html
- on how the Master in Bioengineering programmes work, please contact the Faculty Office.

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.

> Tronc commun *[en-prog-2019-birc2m-lbirc200t.html]*

> Professional Focus *[en-prog-2019-birc2m-lbirc200s]*

Options courses

> Science, Technology and Food Quality (Option 1C) *[en-prog-2019-birc2m-lbirc201o.html]*
> Biomolecular and Cellular Engineering (Option 2C) *[en-prog-2019-birc2m-lbirc202o.html]*
> Nanobiotechnology, Materiels and Catalysis (Option 3C) *[en-prog-2019-birc2m-lbirc203o.html]*
> Environmental Technology, Water, Earth, Air (Option 4C) *[en-prog-2019-birc2m-lbirc204o.html]*
> Information Analysis and Management in Biological Engineering (Option 10C) *[en-prog-2019-birc2m-lbirc210o.html]*
> Busniness Creation (Option 13C) *[en-prog-2019-birc2m-lbirc213o.html]*

BIRC2M Detailled programme

Programme by subject

CORE COURSES [60.0]

O Mandatory	⊠ Optional
△ Courses not taught during 2019-2020	⊘ Periodic courses not taught during 2019-2020
⊕ Periodic courses taught during 2019-2020	Activity with requisites

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

Students taking the option "Information Analysis and Management in Biological Engineering" will enrol at the specific commun courses called "tronc commun" of that option.

⊠ *Programme for students chosing one of these options 1C, 2C, 3C, 4C and 13C (60 credits)*

Students chosing the option "enterpreneurship"(13C) will realise their master thesis within this specific programme.

						Year 1	Year 2
O LBIRC2200	Master thesis			27 Credits			x
O LBIRC2210	Master thesis' accompanying seminar	Sonia Collin Stephan Declerck (coord.) Christine Dupont Eric Gaigneaux Patrick Gerin Michel Ghislain	30h	3 Credits	1 + 2q		x
O LBIRC2106	Chemometrics	Bernadette Govaerts	22.5h +15h	3 Credits	1q	x	x
O LBIRC2107	Bibliographical team project: chemistry and bio-industries	Stephan Declerck Eric Gaigneaux Patrick Gerin (coord.) Michel Ghislain	45h	4 Credits		x	
O LMAPR2430	Industrial processes for the production of base chemicals	Juray De Wilde	30h +22.5h	5 Credits	1q		x
O LBIRC2201	Industrial project in chemical and biochemical engineering	Iwona Cybulska Patrick Gerin (coord.)	52.5h	5 Credits	1q		x
O LBIRC2109	Process engineering : unit operations	Frédéric Debaste (compensates Damien Debecker) Damien Debecker	60h+15h	6 Credits	2q	x	

O Traineeship or Courses to be chosen for 5 credits:

⊠ LBIR2000	Masters Internship			10 Credits	2q		x
⊠	Free choice of courses for 5 credits.			Credits			x

⊠ *Programme for students taking Option 10C - Information Analysis and Management in Biological Engineering (60 credits)*

O LBIRC2200	Master thesis			27 Credits			x
O LBIRC2210	Master thesis' accompanying seminar	Sonia Collin Stephan Declerck (coord.) Christine Dupont Eric Gaigneaux Patrick Gerin Michel Ghislain	30h	3 Credits	1 + 2q		x

						Year 1	Year 2
O LBIRA2101	Biometry : analysis of the variance	Xavier Draye (coord.) Bernadette Govaerts	30h+15h	4 Credits	1q	x	
O LBIRC2107	Bibliographical team project: chemistry and bio-industries	Stephan Declerck Eric Gaigneaux Patrick Gerin (coord.) Michel Ghislain	45h	4 Credits			x
O LBIRC2109	Process engineering : unit operations	Frédéric Debaste (compensates Damien Debecker) Damien Debecker	60h+15h	6 Credits	2q	x	
O LBIRC2201	Industrial project in chemical and biochemical engineering	Iwona Cybulska Patrick Gerin (coord.)	52.5h	5 Credits	1q		x
O LBRMC2201	Bioinformatics : DNA and protein sequences	Michel Ghislain (coord.) Jacques Mahillon	30h+15h	4 Credits	1q	x	

O Traineeship or Courses to be chosen for 5 credits:

⊠ LBIR2000	Masters Internship			10 Credits	2q		x
⊠	Free choice of courses for 5 credits.			Credits			x

O *Ethics (2 credits)*

The students will opt firstly for the course LTECO2300. Two other choices are also available.

⊠ LTECO2300	Societies, cultures, religions : Ethical questions	Marcela Lobo Bustamante	15h	2 Credits	1q	x	x
⊠ LTECO2100	Sociétés, cultures, religions : Biblical readings	Hans Ausloos	15h	2 Credits	1q	x	x
⊠ LTECO2200	Societies-cultures-religions : Human Questions	Régis Burnet Dominique Martens	15h	2 Credits	1 ou 2q	x	x

PROFESSIONAL FOCUS [30.0]

O Mandatory
⊠ Optional
△ Courses not taught during 2019-2020
⊘ Periodic courses not taught during 2019-2020
⊕ Periodic courses taught during 2019-2020
Activity with requisites

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

O *Contenu:*

						Year 1	Year 2
O LBIRC2101	Biochemical analysis and genetic engineering	François Chaumont Charles Hachez Pierre Morsomme (coord.)	37.5h +45h	7 Credits	1q	x	
O LBIRC2102	Organic analysis II	Iwona Cybulska Marie-France Herent Raphaël Robiette (coord.)	45h+30h	7 Credits	2q	x	
O LBIRC2104	Analytical chemistry II	Christine Dupont Yann Garcia (coord.)	22.5h +30h	5 Credits	1q	x	
O LBIRC2105	Physical chemistry II	Damien Debecker	45h+15h	6 Credits	1q	x	
O LBIRC2108	Biochemical and Microbial Engineering	Iwona Cybulska	30h +22.5h	5 Credits	2q	x	

OPTIONS [30.0]

> Science, Technology and Food Quality (Option 1C) *[en-prog-2019-birc2m-lbirc201o]*
> Biomolecular and Cellular Engineering (Option 2C) *[en-prog-2019-birc2m-lbirc202o]*
> Nanobiotechnology, Materiels and Catalysis (Option 3C) *[en-prog-2019-birc2m-lbirc203o]*
> Environmental Technology, Water, Earth, Air (Option 4C) *[en-prog-2019-birc2m-lbirc204o]*
> Information Analysis and Management in Biological Engineering (Option 10C) *[en-prog-2019-birc2m-lbirc210o]*
> Busniness Creation (Option 13C) *[en-prog-2019-birc2m-lbirc213o]*

SCIENCE, TECHNOLOGY AND FOOD QUALITY (OPTION 1C) [30.0]

O Mandatory	⊠ Optional
△ Courses not taught during 2019-2020	⊘ Periodic courses not taught during 2019-2020
⊕ Periodic courses taught during 2019-2020	Activity with requisites

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

Contenu:

						Year 1	Year 2
O LBRAL2103	Food chemistry	Sonia Collin	30h +22.5h	5 Credits	1q	x	
O LBRAL2104	Food microbiology	Jacques Mahillon	30h +22.5h	5 Credits	2q	x	
O LBRAL2201A	Food technology (partim)	Iwona Cybulska Axel Kather	52.5h	5 Credits	2q		x

Courses to be chosen for 15 credits minimum amongst the following list:

Students doing the traineeship will take only 10 credits instead of 15 credits amongst the suggested list.

⊠ LBRAL2102	Physiological and nutritional biochemistry	Cathy Debier Yvan Larondelle (coord.)	45h	5 Credits	1q	x	x
⊠ LBRAS2302	Chimie du houblon et technologies associées	Sonia Collin	30h+30h	5 Credits	1q	x	x
⊠ LBRAS2303	Hop Chemistry and Technology for wort boilong and dry-hopping	Pablo Alvarez Costales Stephan Declerck (coord.) Marc Maudoux	30h+15h	4 Credits	1q	x	x
⊠ LBRAS2304	Qualités organoleptiques et microbiologiques de la bière et du vin	Sonia Collin (coord.) Marc Maudoux	15h+30h	4 Credits	1q	x	x
⊠ LBRTE2201	Human and environmental toxicology	Cathy Debier (coord.) Philippe Hantson	37.5h +7.5h	5 Credits	1q	x	x

BIOMOLECULAR AND CELLULAR ENGINEERING (OPTION 2C) [30.0]

O Mandatory	⊠ Optional
△ Courses not taught during 2019-2020	⊘ Periodic courses not taught during 2019-2020
⊕ Periodic courses taught during 2019-2020	Activity with requisites

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

Contenu:

						Year 1	Year 2
O LBRMC2101	Genetic engineering	François Chaumont (coord.) Charles Hachez	30h+7.5h	3 Credits	1q	x	
O LBRMC2201	Bioinformatics : DNA and protein sequences	Michel Ghislain (coord.) Jacques Mahillon	30h+15h	4 Credits	1q	x	
O LBRMC2202	Cell culture technology	David Alsteens Charles Hachez (coord.) Pascal Hols	30h	3 Credits	1q	x	

Courses to be chosen for 15 credits minimum amongst the suggested list:

Students doing the traineeship will take 10 credits of courses amongst this list instead of 15 credits.

⊠ LBBMC2101	Biochimie structurale et fonctionnelle	Pierre Morsomme Patrice Soumillion	36h+6h	4 Credits	1q	x	x
⊠ LBBMC2104	Biochimie physiologique animale	Pierre Morsomme Melissa Page	36h+18h	5 Credits	2q	x	x
⊠ LBBMC2105	Ingénierie des protéines et enzymologie	Pierre Morsomme Patrice Soumillion	36h+18h	5 Credits	2q	x	x
⊠ LBBMC2106	Génétique moléculaire et génomique microbiennes	Bernard Hallet Pascal Hols	36h+18h	5 Credits	2q	x	x
⊠ LBBMC2107	Physiologie cellulaire microbienne	Stephan Declerck Michel Ghislain Bernard Hallet Pascal Hols Pierre Morsomme	36h+18h	5 Credits	2q	x	x
⊠ LBBMC2108	Génétique moléculaire et génomique végétale	Henri Batoko François Chaumont Xavier Draye Charles Hachez (compensates François Chaumont)	36h+18h	5 Credits	2q	x	x
⊠ LBBMC2109	Physiologie cellulaire végétale	Henri Batoko François Chaumont Charles Hachez Pierre Morsomme	36h+18h	5 Credits	2q	x	x
⊠ LBBMC2110	Génétique moléculaire et génomique animales et humaines	Françoise Gofflot Bernard Knoops René Rezsohazy	36h+18h	5 Credits	2q	x	x
⊠ LBBMC2111	Physiologie cellulaire animale et humaine	Patrick Dumont Bernard Knoops	36h+18h	5 Credits	2q	x	x
⊠ LBBMC2203	Séminaire de formation à la recherche	David Alsteens Henri Batoko François Chaumont Cathy Debier Isabelle Donnay Yves Dufrêne Patrick Dumont Michel Ghislain Françoise Gofflot Charles Hachez Bernard Hallet Pascal Hols Bernard Knoops Yvan Larondelle Jacques Mahillon Pierre Morsomme Jean-François Rees René Rezsohazy Patrice Soumillion (coord.)	40h+40h	5 Credits		x	x
⊠ LBIO1335	Immunology : basis and applications in biology	Jean-Paul Dehoux	25h+15h	3 Credits	1q	x	x

						Year 1	2
⊠ LBRNA2202	Nano-biotechnologies	Yves Dufrêne	30h	3 Credits	2q	x	x
⊠ LBRTE2201	Human and environmental toxicology	Cathy Debier (coord.) Philippe Hantson	37.5h +7.5h	5 Credits	1q	x	x
⊠ LGBIO2030A	Biomaterials	Sophie Demoustier Christine Dupont	30h+10h	3 Credits	1q	x	x

Courses to be chosen for 5 credits minimum.

NANOBIOTECHNOLOGY, MATERIELS AND CATALYSIS (OPTION 3C) [30.0]

- Mandatory
- Optional
- Courses not taught during 2019-2020
- Periodic courses not taught during 2019-2020
- Periodic courses taught during 2019-2020
- Activity with requisites

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

Contenu:

					Year 1	Year 2
LBBMC2101A	Biochimie structurale et fonctionnelle	Pierre Morsomme Patrice Soumillion	20h	2 Credits	1q		x
LBRNA2102	Material surface characterisation	David Alsteens Christine Dupont (coord.) Eric Gaigneaux	52.5h	5 Credits	2q	x	
LBRNA2103	Chemistry of solids	Eric Gaigneaux	42h	4 Credits	1q	x	
LBRNA2201	Principles in heterogeneous catalysis	Eric Gaigneaux	52.5h	5 Credits	1q		x
LBRNA2202	Nano-biotechnologies	Yves Dufrêne	30h	3 Credits	2q	x	
LGBIO2030A	Biomaterials	Sophie Demoustier Christine Dupont	30h+10h	3 Credits	1q		x
LMAPR2019	Polymer Science and Engineering	Sophie Demoustier Alain Jonas (coord.) Evelyne Van Ruymbeke	45h+15h	5 Credits	1q	x	

Courses to be chosen for 3 credits minimum amongst the following list p.e.:

1. Students doing the traineeship do not take a course for 3 credits amongst the suggested list as well as the course LBBMC2102A (2 credits)from the mandatory courses of this option. 2. Students not doing the traineeship will take only the course of 5 credits (totally free) of the TC to complete their programme.

LBRMC2201	Bioinformatics : DNA and protein sequences	Michel Ghislain (coord.) Jacques Mahillon	30h+15h	4 Credits	1q		x
LGBIO2030B	Biomaterials	Sophie Demoustier Christine Dupont	0h+20h	2 Credits	1q		x
LMAPR2013	Physical Chemistry for Metals and Ceramics	Pascal Jacques	30h+30h	5 Credits	1q		x
LMAPR2016	Project in Polymer Science	Charles-André Fustin Alain Jonas	0h+45h	5 Credits	2q		x
LMAPR2018	Rheometry and Polymer Processing	Christian Bailly Evelyne Van Ruymbeke	30h +22.5h	5 Credits	2q		x

ENVIRONMENTAL TECHNOLOGY, WATER, EARTH, AIR (OPTION 4C) [30.0]

O Mandatory	⊠ Optional
△ Courses not taught during 2019-2020	⊘ Periodic courses not taught during 2019-2020
⊕ Periodic courses taught during 2019-2020	Activity with requisites

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

O Contenu:

						Year 1	Year 2
O LBRES2103	Soil physics applied to Agronomy and Environment	Charles Bielders (coord.) Mathieu Javaux	30h+15h	4 Credits	1q	x	
O LBRTE2101	Aquatic and soil biological and physical chemistry	Pierre Delmelle Patrick Gerin (coord.)	37.5h +15h	5 Credits	1q	x	
O LBRTE2201	Human and environmental toxicology	Cathy Debier (coord.) Philippe Hantson	37.5h +7.5h	5 Credits	1q		x

O Two courses to be chosen for 10 credits minimum:

Students doing the traineeship will take only 5 credits of course amongst this list.

⊠ LBRES2102	Engineering of the water and the pollutants in grounds and groundwaters	Sébastien Lambot (coord.) Marnik Vanclooster	30h +22.5h	5 Credits	2q	x	x
⊠ LGCIV2073	Hydrogeology and Geoenvironment	Pierre-Yves Bolly	30h	5 Credits	1q	x	x
⊠ LMAPR2648	Evaluation of sustainability in chemical and environmental engineering	Damien Debecker Olivier Françoisse Patricia Luis Alconero (coord.) Olivier Noiset	30h+15h	5 Credits	2q	x	x
⊠ LMAPR2647	Sustainable treatment of industrial and domestic waste: Fundamentals	Olivier Françoisse Patricia Luis Alconero Olivier Noiset Benoît Stenuit	30h+15h	5 Credits	1q	x	x

O Free choice of courses for 6 credits.

Students are invited to use part of their 6 credits to chose some activities amongst the above suggested list.

INFORMATION ANALYSIS AND MANAGEMENT IN BIOLOGICAL ENGINEERING (OPTION 10C) [30.0]

- Mandatory
- Optional
- Courses not taught during 2019-2020
- Periodic courses not taught during 2019-2020
- Periodic courses taught during 2019-2020
- Activity with requisites

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

Contenu:

						Year 1	Year 2
LBRTI2102	Process-based modelling in bioscience engineering	Emmanuel Hanert	30h+15h	5 Credits	1q	x	
LBRTI2202	Special questions in information management	Patrick Bogaert (coord.) Emmanuel Hanert	30h	3 Credits	2q		x
LCOMU2600	Scientific popularisation	Philippe Verhaegen	30h	4 Credits	1q	x	
LINFO1225	Conception orientée objet et gestion de données	Kim Mens	30h+30h	5 Credits	2q	x	x
LSTAT2320	Design of experiment.	Patrick Bogaert Bernadette Govaerts	22.5h +7.5h	5 Credits	2q	x	

Courses to be chosen for 8 ECTS minimum amongst the following list:

Students doing a traineeship will take only 3 credits of courses amongst the suggested list instead of the 8 credits.

LBRAI2101	Population and quantitative genetics	Philippe Baret (coord.) Xavier Draye	30h+7.5h	3 Credits	1q		x
LBRAT2102	Spatial modelling of territorial dynamics	Pierre Defourny	15h+15h	3 Credits	2q		x
LECGE1333	Game theory and information in economics	Julio Davila Muro Pierre Dehez	30h+10h	5 Credits	2q		x
LELEC2870	Machine Learning : regression, dimensionality reduction and data visualization	John Lee (compensates Michel Verleysen) Michel Verleysen	30h+30h	5 Credits	1q		x
LELEC2920	Communication networks	Benoît Macq	30h+30h	5 Credits	1q		x
LGEO2130	Fundamentals of geographic and environmental modelling	Eric Deleersnijder Jean-François Remacle (compensates Eric Deleersnijder) Sophie Vanwambeke	30h+30h	5 Credits	2q		x
LINGE1322	Computer science: Analysis and Design of Information Systems	Jean Vanderdonckt	30h+15h	5 Credits	2q		x
LINGI1122	Program conception methods	Charles Pecheur	30h+30h	5 Credits	2q		x
LPHYS2162	Introduction to the physics of the climate system and its modelling	Hugues Goosse Jean-Pascal van Ypersele de Strihou	22.5h +22.5h	5 Credits	1q		x
LPHYS2267	Paleoclimate dynamics and modelling	Qiuzhen Yin	22.5h +7.5h	5 Credits	2q		x
LSINF2275	Data mining & decision making	Marco Saerens	30h+15h	5 Credits	2q		x
LSTAT2020	Statistical softwares and basic statistical programming	Céline Bugli	15h+15h	4 Credits	1q		x
LSTAT2120	Linear models	Christian Hafner	30h+7.5h	5 Credits	1q		x
LSTAT2350	Data Mining	Tim Verdonck	15h+15h	5 Credits	2q		x

BUSNINESS CREATION (OPTION 13C) [30.0]

L'objectif du module CPME 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 Création d'entreprise (CPME) 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 CPME et les cours d'option sur les deux années du master.

O Mandatory	⊠ Optional
△ Courses not taught during 2019-2020	⊘ Periodic courses not taught during 2019-2020
⊕ Periodic courses taught during 2019-2020	Activity with requisites

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 (http://www.uclouvain.be/cpme ou cpme@uclouvain.be). 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.

O Contenu:

						Year 1	Year 2
O LCPME2001	Entrepreneurship Theory (in French)	Blanche Havenne (compensates Frank Janssen) Frank Janssen	30h+20h	5 Credits	1q	x	
O LCPME2002	Managerial, legal and economic aspects of the creation of a company (in French)	Yves De Cordt Marine Falize	30h+15h	5 Credits	1q	x	
O LCPME2003	Business plan of the creation of a company (in French)	Frank Janssen	30h+15h	5 Credits	2q	x	x
O LCPME2004	Advanced seminar on Entrepreneurship (in French)	Frank Janssen	30h+15h	5 Credits	2q	x	

O Courses to be chosen for 10 credits minimum among one of the others options of this master

Students doing the traineeship will take 5 credits of courses instead of the suggested 10 credits.

Course prerequisites

A document entitled en-prerequis-2019-birc2m.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 UCLouvain 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 your UCLouvain account.

BIRC2M - Information

Admission

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

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

SUMMARY

University Bachelors

Diploma	Special Requirements	Access	Remarks
UCLouvain Bachelors			
Bachelor in Bioengineering		Direct Access	
Autre Bachelier du domaine des sciences et technologies		Based on application: accepted, conditional on further training, or refusal	Le ou la futur·e étudiant·e prend contact avec le Conseiller aux études.
Others Bachelors of the French speaking Community of Belgium			
Bachelier en Sciences de l'ingénieur, orientation bioingénieur		Direct Access	
		Based on application: accepted, conditional on further training, or refusal	
Bachelors of the Dutch speaking Community of Belgium			
		Based on application: accepted, conditional on further training, or refusal	Les conditions d'accès seront définies au cas par cas en fonction des prérequis nécessaires.
		Based on application: accepted, conditional on further training, or refusal	
Foreign Bachelors			
		Based on application: accepted, conditional on further training, or refusal	Les conditions d'accès seront définies au cas par cas en fonction des prérequis nécessaires.

Non university Bachelors

> Find out more about links to the university

Diploma	Access	Remarks
BA en agronomie (techniques et gestion agricoles) - EPS - crédits supplémentaires entre 45 et 60 BA en agronomie (toutes orientations) - HE - crédits supplémentaires entre 45 et 60 BA en chimie (biochimie, biotechnologie, chimie appliquée) - EPS - crédits supplémentaires entre 45 et 60	Les enseignements supplémentaires éventuels peuvent être consultés dans le module complémentaire.	Type court

BA en chimie (biochimie, biotechnologie, chimie appliquée, environnement) - HE - crédits supplémentaires entre 45 et 60

Holders of a 2nd cycle University degree

Diploma	Special Requirements	Access	Remarks
"Licenciés"			
Ingénieur chimiste et des bioindustries		Based on application: accepted, conditional on further training, or refusal	
Masters			
		Based on application: accepted, conditional on further training, or refusal	

Holders of a non-University 2nd cycle degree

Adults taking up their university training

> See the website Valorisation des acquis de l'expérience

It is possible to gain admission to all masters courses via the validation of professional experience procedure.

Access on the file

Reminder : all Masters (apart from Advanced Masters) are also accessible on file.

Admission and Enrolment Procedures for general registration

Supplementary classes

To enrol for this Masters, the student must have a good command of certain subjects. If this is not the case, they must add preparatory modules to their Master's programme.

O Mandatory	⊠ Optional
△ Courses not taught during 2019-2020	⊘ Periodic courses not taught during 2019-2020
⊕ Periodic courses taught during 2019-2020	Activity with requisites

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

O *Cours passerelle pour le master en bioingénieur, orientation chimie et bioindustries (45 credits)*

O LBIR1315	Probability and statistics II	Patrick Bogaert	22.5h+22.5h	3 Credits	1q
O LBIR1351	Introduction to systems analysis	Philippe Baret	10h+20h	3 Credits	1q
O LBIR1325A	Transfert de fluides et d'énergie pour les bioingénieurs: partim A	Yann Bartosiewicz Mathieu Javaux Marnik Vanclooster	37.5h+22.5h	5 Credits	1q
O LBIR1349	Chimie analytique I	Christine Dupont (coord.) Yann Garcia	30h+15h	3 Credits	1q
O LBIR1350	General Microbiology	Jacques Mahillon	37.5h+15h	4 Credits	2q
O LANGL2480	English Communication Skills for Bioengineers	Ahmed Adrioueche Maïté Dupont Dominique François Sandrine Meirlaen Mark Theodore Pertuit Charlotte Peters Adrien Pham (coord.) Françoise Stas Anne-Julie Toubeau	30h	2 Credits	2q
O LBIR1360	Firm management and organisation	Pierre De Muelenaere	30h+7.5h	3 Credits	1q
O LBIR1355	Métabolisme microbien et synthèse de biomolécules	Michel Ghislain (coord.) Yvan Larondelle	22.5h+15h	3 Credits	2q
O LBIR1340	Fondements de mécanique quantique et de spectroscopie	Eric Gaigneaux (coord.) Xavier Gonze	22.5h+22.5h	3 Credits	2q
O LBIR1342	Analyse de composés organiques dans des matrices complexes	Sonia Collin	30h+45h	5 Credits	2q
O LBIR1346	Surface and colloid chemistry	Christine Dupont	30h	3 Credits	2q
O LBIR1341	Laboratories, seminars and integrated practice of analytical chemistry	Christine Dupont	30h+45h	5 Credits	1q
O LBIR1352A	Génétique générale - partim A	Philippe Baret	30h+7.5h	3 Credits	2q

O *Specifics courses (10 credits)*

O	Activités au choix libre *The students have a free choice of courses within one of the bachelor programs in Sciences and Technolgy Sector : https://uclouvain.be/fr/etudier/les-facultes.html*			4 Credits	
O LBIR1130	Introduction to Earth sciences	Pierre Delmelle (coord.) Sophie Opfergelt	30h+30h	6 Credits	2q

Teaching method

The overall structure of the programmes for the Bachelor of Science in Engineering (Bioengineering) and the Master in Bioengineering clearly reflect the

concepts of specialization, gradual choice and individualization of the courses.

1st cycle (Bachelor) :

- same programme for SC and AGRO in first year (BIR11BA),
- special programme in second year (BIR12BA) for all the BIR students
- distinct programme with 30 credits for option courses in third year (BIR**C**13BA, BIR**A**13BA, BIR**E**13BA) : three advanced subsidiary subjects available : chemistry (BIRC), agronomy (BIRA), environment (BIRE).

2nd cycle (Master) :

â€¢ choice of three Masters in Bioengineering with a professional focus, together with twelve option courses which partly overlap, optional subjects (either free choice or from the lists) and a final individual dissertation.

This overall structure gives students the opportunity to have a highly individualized programme whilst at the same time retaining both the **comprehensive nature** of the training and the foundation elements of university education : **independence, competence**, **open-mindedness and interest in research**.

The twelve option courses, which partly overlap at the level of the three Masters in Bioengineering, correspond to fields of activity identified on the basis of a wide-ranging survey of graduates of the Faculty working professionally and of contacts with potential employers.

The interdisciplinarity and the integrated approach are key dimensions in the training of **bioengineers in chemistry and bioindustry**. This is reflected by :

- availability of courses organized by other faculties ;
- grouping of training activities : combined exercises, joint project, analysis of real situations, simulations ;
- the perception, analysis, diagnosis and content of the course specifications (management, design of new processes etc) combine different kinds of tools (field observation, laboratory analysis, databases, chimiometrics etc) and various scales in space (from the molecular to plots of land and farms, from an agricultural region to a sub-continent and beyond) and in time ;
- teaching teams with a wide range of expertise ;
- learning how best to work in groups of students to develop a real, independent capacity for intellectual work.

Training for research. through research, which is essential for conceptual and innovative awareness and developing intellectual rigour, is reflected by different types of activities :

- producing a final dissertation and taking part in dissertation seminars ;
- participation in subject seminars providing direct contact with young researchers working in the field of chemistry, applied biology and bioindustry;
- presentation of seminars by students from an outside research group or groups and the production of a dissertation.

The application of skills, knowledge and techniques that students have acquired and how they use them together is taken into account in an integrated project in applied chemistry and biology. This is an important learning activity supplements the dissertation which, in the view of the Faculty, remains the most important part of training for research.

Through the close connection between the teaching and research, the development of new tools and new approaches is the subject of advanced training from the beginning of the 2nd cycle and is therefore central to this Master programme (e.g. biotechnology and nanotechnology). All this enables graduates of this programme to be able to make rapid use of new techniques and approaches in their early professional experience.

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”.

Students are assessed according to the activities in the programme : this can take the form of written and/or oral examinations as well as individual and/or group work.

Further details about how the assessment is done can be found in the course specifications.

Mobility and/or Internationalisation outlook

The programme for the Master in Chemistry and Bio-industries offers a wide range of opportunities to study at other institutions, in Belgium, Europe and elsewhere.

The Faculty would like to highlight the strengths of this programme, particularly the potential for research and the fact that it is very much a part of a complete University. The shape of the option courses available has also been influenced by the different fields of activity in which bioengineers work.

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 Développment 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
Web site	http://www.uclouvain.be/agro

Mandate(s)

- Doyen : Philippe Baret
- Directeur administratif de faculté : Christine Denayer

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

- Charles Bielders
- Quentin Ponette

Useful Contact(s)

- Eric Gaigneaux