





## BIRA2M - Teaching profile

### Learning outcomes

Master in Agricultural Sciences Engineering 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 sustainable animal and plant production, respectful of the environment and conscious of food security.

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

- professionals able to tackle and diagnose agronomic problems: production and quality, production systems and industries, protection and development of resources, socio-economic impacts;
- scientists able to understand complex processes on different scales, used to multidisciplinary approaches and consultation with other specialists;
- innovators able to design new kinds of production and management methods, new processes, etc. in response to many major challenges: feeding the world, bringing together food and health, reconciling agriculture, environment and sustainable development.

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 :

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 five 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 three 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.

1. To explore an integrated body of knowledge (knowledge, methods and techniques, models and processes) which serves as the foundation from which to operate with expertise in the field of agricultural science and technology.

1.1 To build an advanced knowledge base in the field of agricultural science and more specifically in the following disciplines:

- Plant and animal sciences
- The agrarian system
- Agricultural and rural policies
- Biotechnology

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

- Science, technology and food quality
- Integrated agronomy
- Integrated plant protection
- Water and land resources
- Information analysis and management in agricultural engineering
- Agricultural development and production in the tropical zones

1.3 To master procedural skills in conducting experiments: molecular biology techniques, experimental design, biometrics and data analysis as well as specific techniques in relation to their choice of specialisation.

1.4 To apply their knowledge critically to tackle a complex agricultural issue ranging from the molecular level to an agro-ecosystem.

1.5 To apply multiple strands of knowledge to resolve a multidisciplinary agricultural problem in order to develop relevant and innovative solutions.

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 agricultural science and technology.

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

- Applied biotechnology
- Biometrics
- Animal and plant production
- Management and analysis of production systems and processing
- Agricultural management and decision-making support
- Process engineering

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

- Technology and food quality
- Integrated agronomy
- Integrated plant protection
- Water and land resources
- Agricultural economics and natural resources
- Information analysis and management in agricultural engineering
- Agricultural development and production in the tropical zones

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

- Planning experiments
- Carrying out surveys
- 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 agricultural problem ranging from the molecular level to an agro-ecosystem.

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.

4. To formulate and resolve a complex agricultural 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 incorporating scientific, economic and sociological aspects. This problem may be related to agricultural production and the quality of products, agricultural production systems and sectors, and to the transformation of agricultural products.

4.1 To strategically differentiate the key elements from the less critical elements relating to a complex agricultural engineering 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 agricultural engineering problem.

4.3 To analyse a complex agricultural engineering 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 agricultural engineering 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 agricultural sciences.

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.

*As the graduate must be able to manage a project alone and in a team, the skills listed below are described in the context of the master, through projects not only considered in their 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.



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 and Psychology). It is designed to provide students, as potential creators, with the tools for analysis and understanding which will help them 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.

## BIRA2M Programme

### Detailed programme by subject

#### CORE COURSES [60.0]

Au sein de ce programme, des cours sont proposés au choix. Ils sont à choisir au sein d'une liste ou peuvent faire l'objet d'un choix totalement libre dans le portefeuille de cours de l'UCL, voire d'une autre institution. Tous ces choix doivent être validés par le vice-doyen et/ou avoir reçu l'accord préalable du titulaire du cours, si le cours est emprunté dans une autre faculté ou institution.

- 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...)

				Year	
				1	2
● LBIRA2200	<a href="#">Master thesis</a>		FR [q1+q2] [ ] [27 Credits] 🌐		x
● LBIRA2210	<a href="#">Master thesis' accompanying seminar</a>	Philippe Baret Cathy Debier Frédéric Gaspard Anne Legrève (coord.)	EN [q1+q2] [30h] [3 Credits] 🌐 > French-friendly		x

#### o Projet disciplinaire (10 credits)

● LBIRA2130	<a href="#">Disciplinary project in Agronomy</a>	Philippe Baret Claude Bragard Cathy Debier Xavier Draye Annika Gillis Richard Lambert Anne Legrève Guillaume Lobet Goedele Van den Broeck (coord.)	FR [q2] [100h+0h] [10 Credits] 🌐		x
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#### o Projet intégré (10 credits)

✘ **Projet intégré pour les options 1A, 7A, 8A, 9A, 10A, 11A, 13A et 18A (10 credits)**











Year

1 2

⊗ LBRPP2211	Biological control and plant health	Claude Bragard Stephan Declerck Anne Legrève (coord.)	EN [q2] [37.5h+0h] [4 Credits]  > English-friendly		X
⊗ LBRT2201	Human and environmental toxicology	Cathy Debier	EN [q1] [30h+7.5h] [4 Credits]  > French-friendly		X
⊗ LBRTI2101A	Data Science in bioscience engineering	Patrick Bogaert Emmanuel Hanert	EN [q1] [22.5h+15h] [3 Credits]  > English-friendly		X
⊗ LSTAT2340	Statistical Analyses of omics Data	Laura Symul	EN [q2] [15h+5h] [4 Credits] 		X

**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...)

Year

1 2

**o Content:**

○ LBIRA2105	<a href="#">Agricultural and rural policies</a>	Goedele Van den Broeck	EN [q1] [30h] [3 Credits] 🌐 > French-friendly	X	
○ LBIRA2107	<a href="#">Animal production 1</a>	Eric Froidmont	FR [q2] [37.5h+7.5h] [3 Credits] 🌐 > English-friendly	X	
○ LBIRA2108A	<a href="#">Crop productions : principles</a>	Yannick Agnan Stephan Declerck Xavier Draye Guillaume Lobet	FR [q1] [22.5h+15h] [3 Credits] 🌐 > English-friendly	X	
○ LBIRA2109	<a href="#">Agrarian systems and farm</a>	Guillaume Lobet			

## OPTIONS

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Les étudiants ont le choix entre 7 options en première année de master et 11 modules d'approfondissement en deuxième année de master. La plupart des combinaisons sont possibles. Cependant, les étudiants sont invités à réfléchir dès la première année à l'articulation des options et des modules, certains modules suivant de manière préférentielle certaines options.

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 qui a lieu au moment de la rentrée académique. Une fois sélectionnés, les étudiants prendront 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.

La participation au programme Erasmus Mundus interuniversitaire AFEPA (Agricultural, Food and Environmental Policy Analysis) fait également l'objet d'une sélection dont les modalités sont décrites à la page suivante: [www.uclouvain.be/afepa](http://www.uclouvain.be/afepa)

- > [Option 1A - Food nutrition and health](#) [ en-prog-2024-bira2m-lbira201o ]
- > [Option 7A- Water and Earth Resources](#) [ en-prog-2024-bira2m-lbira207o ]
- > [Option 8A](#) [ en-prog-2024-bira2m-lbira208o ]
- > [Option 9A - Plant health](#) [ en-prog-2024-bira2m-lbira209o ]
- > [Option 10A - Data science](#) [ en-prog-2024-bira2m-lbira210o ]
- > [Option 11A - Agricultural and Resource Economics](#) [ en-prog-2024-bira2m-lbira211o ]
- > [Option 12A : Sustainability engineering](#) [ en-prog-2024-bira2m-lbira012o ]
- > [Option 13A - Business Creation](#) [ en-prog-2024-bira2m-lbira232o ]
- > [Option 18A - Human health](#) [ en-prog-2024-bira2m-lbira218o ]

### OPTION 1A - FOOD NUTRITION AND HEALTH [30.0]

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- 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...)

Year

**OPTION 7A- WATER AND EARTH RESOURCES [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...)

Year

1 2

**o Content:**

● LBIRA2108B	<a href="#">Plant production</a>	Yannick Agnan Stephan Declerck Xavier Draye Guillaume Lobet	EN [q1] [22.5h+0h] [2 Credits] 🌐 > English-friendly	X	
● LBRAI2106	<a href="#">Crop science</a>	Nicolas Desoignies (compensates Guillaume Lobet) Guillaume Lobet	EN [q2] [50h+10h] [6 Credits] 🌐 > English-friendly	X	
● LBRES2101B	<a href="#">Smart technologies for environmental engineering</a>	Sébastien Lambot	EN [q1] [22.5h+15h] [3 Credits] 🌐 > French-friendly	X	
● LBRES2103	<a href="#">Soil physics applied to Agronomy and Environment</a>	Charles Bielders (coord.) Mathieu Javaux Mathieu Javaux (compensates Charles Bielders)	EN [q1] [30h+15h] [4 Credits] 🌐	X	
● LBRES2203	<a href="#">Soil management in tropical and subtropical regions</a>	Charles Bielders (coord.)			



## **OPTION 9A - PLANT HEALTH [30.0]**

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- 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
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## **OPTION 10A - DATA SCIENCE [30.0]**

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- 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
  - △ ⊕
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**OPTION 11A - AGRICULTURAL AND RESOURCE ECONOMICS [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...)

Year

1 2

**o Content:**

● LBRAI2208	Firms and Markets : Strategic Analysis	Frédéric Gaspard	EN [q1] [30h] [4 Credits] 🌐 > French-friendly	X	
● LBRAI2210	Microeconomics of Development	Frédéric Gaspard	EN [q1] [30h] [3 Credits] 🌐 > French-friendly	X	
● LBRAI2212	Economics of Rural Development	Goedele Van den Broeck	EN [q1] [30h] [3 Credits] 🌐 > French-friendly	X	
● LBRAI2213	Impact evaluation in agriculture	Goedele Van den Broeck	EN [q2] [30h+8h] [4 Credits] 🌐 > French-friendly	X	
● LECON2033	Applied econometrics: Microeconometrics	Bertrand Verheyden (compensates Muriel Dejemeppe)	FR [q1] [30h+12h] [5 Credits] 🌐		



												X	
EN	[2.5h+7.5h] [3 Credits]											X	
> French-friendly													
EN	[q2] [30h+8h] [4 Credits]											X	
> French-friendly													
EN	[q1] [30h+15h] [5 Credits]											X	
> French-friendly													
EN	[q1] [30h] [3 Credits]											X	
> French-friendly													

Éditée en Bachelier (2 credits)

Year

1 2

⌘ LBRES2101	Smart technologies for environmental engineering	Sébastien Lambot	EN
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## OPTION 13A - BUSINESS CREATION

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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 qui a lieu au moment de la rentrée académique. Une fois sélectionnés, les étudiants prendront 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]

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## OPTION 18A - HUMAN HEALTH [30.0]

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- 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
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## Supplementary classes

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**To access this Master, students must have a good command of certain subjects. If this is not the case, in the first annual block of their Masters programme, students must take supplementary classes chosen by the faculty to satisfy course prerequisites.**

- 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
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○ LBIR1360	Firm management and organisation	Pierre De Muelenaere	EN [q1] [30h+7.5h] [3 Credits]  > French-friendly
○ LBIR1362	Environmental Economics		

## Course prerequisites

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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

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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.

## BIRA2M - Information

### Access Requirements

*Master course admission requirements are defined by the French Community of Belgium Decree of 7 November 2013 defining the higher education landscape and the academic organisation of courses.*

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

*Unless explicitly mentioned, the bachelor's, master's and licentiate degrees listed in this table or on this page are to be understood as those issued by an institution of the French, Flemish or German-speaking Community, or by the Royal Military Academy.*

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

#### SUMMARY

- > [General access requirements](#)
- > [Specific access requirements](#)
- > [University Bachelors](#)
- > [Non university Bachelors](#)
- > [Holders of a 2nd cycle](#) [Tm \[\(> Uni7erL6299hr587997oach2 0 g /F5 8 Tf 1 0 0 -1 244.97599792 Tm \[\(•\) TJ 0.0863 0.5176 0.9176 rg /F1 8 Tf 1 0 0](#)







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 Faculttnership

