



## BIRE2M - Introduction

### Introduction

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

- Measurement techniques
- Environmental statistical data analysis
- 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 environmental field by incorporating processes at different scales ranging from the mineral and living organism scale, to landscape and biosphere.

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 radiology 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. This problem may be related 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.

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

4.3 To analyse a complex environmental 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 environmental 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 environmental sciences and technologies.

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.

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.



## CORE COURSES [47.0]

- 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

x

○ LBIRE2200

Master thesis

BM [q1+q2] [] [27 Credits] 🌐



Year



LECSO2330

Economie sociale et transition écologique et sociale

Anaïs Perilleux

PR [q2] [30h] [3 Credits]

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x





## OPTIONS

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Students in this programme have a choice of 5 options followed by a complement to the chosen option in the second year of the programme.

Students who wish to take the INEO module have to enrol in their first year of the master programme. It will be considered however as a complement to the option chosen in the first year.

Students have also the opportunity to take optionnal courses either from a suggested list or from another programme at UCL. In this case, the choice has to be validated by the Study Counsellor. Prior to that, the student must obtain an authorization from the lecturer of the course.




Year

1 2

● LB RTE2201

Human and environmental toxicology

Cathy Debier

EN [q1] [30h+7.5h] [4 Credits] 

## COMPLEMENT TO THE OPTION 4E : POLLUTION MANAGEMENT [20.0]

- 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, ...)

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

Year

1 2

### o Content:

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## OPTION'S COMPLEMENT 5E - LAND USE PLANNING [20.0]

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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, ...)

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

Year



1 2

### o Content:

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● LBIRF2106



				Year	
				1	2
○ LBIRE2233	Integrated project in water and soil resources management	Charles Bielders (coord.) Mathieu Javaux (coord.) Marnik Vanclooster	FR [q1] [40h+8h] [6 Credits] 		x
○ LBRES2206	Advanced Hydrology for Engineers	Mathieu Javaux	EN [q1] [22.5h+15h] [3 Credits]  > <i>French-friendly</i>		x



**OPTION 10E - DATA SCIENCE [23.0]**

- 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:**

● LBRAI2219	<a href="#">Systems Biology Modelling</a>	Valentin Couvreur (compensates Mathieu Javaux) Xavier Draye (coord.) Guillaume Lobet	FR [q2] [30h] [3 Credits] 🌐 > English-friendly	X
● LBRAT2102	<a href="#">Spatial modelling of land dynamics</a>	Pierre Defourny	FR [q2] [15h+15h] [3 Credits] 🌐 > French-friendly	X
● LBRTI2101B	<a href="#">Data Science in bioscience engineering</a>	Patrick Bogaert Emmanuel Hanert	FR [q1] [30h] [2 Credits] 🌐 > English-friendly	X
● LINFO1104	<a href="#">Programming language concepts</a>	Peter Van Roy	FR [q2] [30h+30h] [5 Credits] 🌐	X
● LSTAT2110A	<a href="#">Analyse des données</a>	Benjamin Colling	FR [q1] [15h+7.5h] [3 Credits] 🌐	X

**o Courses to be chosen for 7 credits minimum (7 credits)**

⊗ LBIRA2110B	<a href="#">Statistical analysis of multivariate data - Applied Econometrics</a>	
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## OPTION'S COMPLEMENT - DATA SCIENCE [20.0]

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

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  - ⊕ 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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o Unité d'enseignement obligatoire pour l'étudiant-e qui ne l'aurait pas créditée en Bachelier (2 credits)

LBIR1325B	Transfer of fluids and energy for Bio-engineer	Yann Bartosiewicz Quentin Goor (compensates Mathieu Javaux) Marnik Vanclooster	FR
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## **OPTION'S COMPLEMENT - SUSTAINABILITY ENGINEERING [20.0]**

- 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
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				Year	
				1	2
○ LINEO2003	Plan d'affaires et étapes-clefs de la création d'entreprise	Frank Janssen	PS [q2] [30h+15h] [5 Credits] 		x
○ LINEO2004	Séminaire d'approfondissement en entrepreneuriat	Frank Janssen	PS [q2] [30h+15h] [5 Credits] 	x	

○ LBIR1351	Introduction to systems analysis	Philippe Baret	EN [q1] [10h+20h] [3 Credits] 
○ LBIR1354	Biologie des interactions	Anne-Laure Jacquemart (coord.) Anne Legrève	EN [q2] [22.5h+15h] [3 Credits] 
○ LBIR1360	Firm management and organisation	Pierre De Muelenaere	EN [q1] [30h+7.5h] [3 Credits]  > <i>French-friendly</i>
○ LBIR1362	Environmental Economics	Frédéric Gaspart	EN [q2] [30h+7.5h] [3 Credits] 

## 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 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.

## BIRE2M - Information

### Access Requirements

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## Teaching method

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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) :

- programme designed for the BIR students starting from Year 1
- special programme in second year for all the BIR students
- distinct programme with 30 credits for option courses in third year : three advanced subsidiary subjects available : chemistry , agronomy , environment.

### 2nd cycle (Master) :

- choice of four Masters in Bioengineering with a professional focus, together with a number of options 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 options, which partly overlap at the level of the four Masters in Bioengineering, correspond to fields of activity identified on the basis



