



UNIVERSITA' DEGLI STUDI DI MILANO
PROGRAMME DESCRIPTION - ACADEMIC YEAR 2023/24
IN
BIOTECHNOLOGY FOR THE BIOECONOMY - (Classe LM-7)
Enrolled from 2022/23 academic year

HEADING

Degree classification - Denomination and code:	LM-7
Degree title:	Dottore Magistrale
Length of course:	2 years
Credits required for admission:	180
Total number of credits required to complete programme:	120
Course years currently available:	1st , 2nd
Access procedures:	open, subject to entry requirements
Course code:	G64

PERSONS/ROLES

Head of Study Programme

Prof. Alessio Scarafoni

Tutors - Faculty

Academic guidance tutor

Prof. Fabio Forlani (student surname A-L); Prof.ssa Eleonora Rolli (student surname M-Z)

Erasmus and international mobility tutor

Prof. Fabio Forlani

Study plan tutor

Prof. Fabio Forlani

Seminar and workshop tutor

Prof. Fabio Forlani

University and programme transfer tutor

Prof. Alessio Scarafoni

Master's degree admission tutor

Prof. Alessio Scarafoni

Credit recognition tutor

Prof. Alessio Scarafoni

Specific Learning Disabilities (SLD) tutor

Prof. Sara Borin

Degree Course website

<https://biotechnologybioeconomy.cdl.unimi.it/en>

Didactic Secretariat of the Faculty of Agricultural and Food Sciences

via Celoria 2 - Milano Città Studi Tel. 0250316511-0250316512 Monday, wednesday and friday from 10.30 am to 12.30 am; tuesday and thursday from 2 pm to 4 pm. <https://informastudenti.unimi.it/saw/ess?AUTH=SAML>

Head of study programme

Tel. 0250316820 Email: presidenza-BforB@unimi.it

Students administrative office

via Celoria 18 - Milano Città Studi Tel. 0250325032 <https://www.unimi.it/en/node/360> <https://www.unimi.it/en/node/359>

CHARACTERISTICS OF DEGREE PROGRAMME

General and specific learning objectives

Bioeconomy responds to the environmental challenges the world is facing, oriented to reduce the dependence on natural resources, transform manufacturing, promote sustainable production of renewable plant, microbial and animal resources and their conversion into food, feed, materials, bio-based products and bio-energy, while growing new jobs and industries.

Biotechnology is one of the key enabling technologies to sustain a new green and sustainable economy (i.e. bioeconomy), offering solutions for an efficient and sustainable production of plant and microbial biomasses; the production of bioenergy from (waste) biomasses; environmental protection and safety in terms of bioremediation; green chemistry processes and applications; sustainable agri-food production and processes, circular economy.

In this context, the Biotechnology for the Bioeconomy (BforB) Master degree aims at providing students with advanced molecular and cellular background of microbe and plant systems, which are the basis for the several sectors of the biotechnologies applied to the bio-economy. The BforB Master degree will equip students with a solid and broad expertise about the structure and function of biological macromolecules of interest for the bioeconomy sector, and complete knowledge about the analyses of informational molecules and the expression of characters with a special focus on multidisciplinary and integrated approaches. The BforB Master degree will provide theoretical and practical instruments for the set-up, analyses and improvement of biotechnological processes for i) the transformation of renewable raw materials in biotechnological processes exploiting microorganisms, plants and enzymes, ii) plant and microbial-based bioremediation strategies, iii) bio-based approaches in food and agriculture sustainable development

The BforB Master degree will be taught entirely in English, providing the students with knowledge and competences that can be spent at European and extra European level, to which the bioeconomy sector is faced. Moreover, the English language will allow the participation of students from out of Italy, making the Master degree a stimulant international learning environment.

Expected learning outcomes

The students of the BforB Master degree will acquire advanced skills and competences in i) set-up and optimization of the production efficiency of biological systems (microorganisms, plants, enzymes) involved in bioprocesses in the agriculture, food and environmental sectors, in relation with the consumer needs and the environmental sustainability; ii) exploitation of the bioinformatics tools and genomics, proteomics and metabolomics databases; iii) set up of molecular and chemical analyses methods for basic and applied research activity; iv) scientific experimental planning and project design and management.

The BforB Master Degree offers courses specifically focused on biotechnology, both general and applied to the agriculture, environmental, food sectors. These will be integrated with courses on the chemical and biochemical sectors, necessary for the comprehension of bioeconomy applications e.g. bioprocesses with cells and enzymes, recover and application of biomolecules from biomasses and agri-food waste. Knowledge on life-cycle assessment, intellectual property, technological transfer and project management will provide basic tools for biotechnology application to the bioeconomy sector. The students will have, moreover, the possibility to personalize their study plan by choosing additional courses on specific bioeconomy sectors like functional foods, molecular traceability, bio-based food industry, biocatalyses, and to acquire horizontal skills like biostatistics and design of experiments, and soft skills enabling team working and the moving into the work market or the scientific research field. Students will have the possibility to further develop the acquired knowledge by the participation to seminars and workshops lead by experts in the different sectors.

The acquired knowledge will be applied during the lessons, in work-group and discussion-based activities, laboratory activities and technical visits to companies involved in the bioeconomy market. A fundamental part of the Master Degree is dedicated to laboratory training, with the possibility to choose short laboratory internship experiences and by the mandatory final thesis internship during which the student will perform an original research project under the guidance of an academic tutor, completed by a final public dissertation.

The knowledge and the learning capacity acquisition will be verified with exams, oral and/or written, and also on the basis of laboratory practical activities, group-works and literature presentations (e.g. journal clubs), discussion-based activities.

Professional profile and employment opportunities

The BforB graduate is a biotechnologist, expert in coordination, management and set up of research and development laboratories in public entities and in private companies in the chemical, agro-environmental and biotechnological sectors. The function will primarily be the development, implementation and coordination of laboratory activity within basic and applied research projects, the set-up of bioprocesses, the quality control. More in detail, the BforB graduate is an expert in planning, development, analyses and control of processes for: i) industrial fermentation for production of metabolites and renewable energy; ii) plant and microbial cell as biofactories for molecules of interest in the fine chemical and polymer industry, agro-food and pharmaceutical industry with particular application to the green chemistry and bio-based industry; iii) bioremediation of contaminated land and waters, using plants and/or microorganisms; iv) innovative diagnosis tools, applied in particular to the traceability in agro-food chain.

The employment opportunities for the BforB graduate are in research bodies (both public and private) and bio-based chemical, pharmaceutical, agro-food, and biotechnological enterprises.

Pre-requisites for admission

Requirements for admission

Students with an Italian University degree: The BforB Master degree can be accessed by graduates of Laurea Triennale

belonging to the L-2 class (Biotecnologia) and previous class 1 (Biotecnologia). It can also be accessed by any student with a Laurea Triennale providing a strong background in biotechnology-related subjects, specifically at least 35 university credits (CFU) in basic disciplines (mathematics, physics, chemistry, biology) among the following SSD: MAT/01-02-03-04-05-06-07-08-09, FIS/01-02-03-04-05-06-07-08, SECS-S/01-02, AGR/07-16, BIO/04-10-11-12-13-18-19, CHIM/01-02-03-06 and at least 25 CFU in "core disciplines" for the L-2 class of Laurea Triennale, among the following SSD: AGR/01-02-03-04-11-12-13-15-17-18, BIO/01-02-03-07-09-15, CHIM/04-05-08-10-11-12, MED/03-07-42, VET/03-04.

Students with a degree from a non-Italian institution: They must possess a Bachelor degree from an accredited college or University comprising exams in all the following areas: molecular biology, genetics, microbiology, plant cell biology, biochemistry, chemistry.

Proficiency in English at a B2 level or higher per the Common European Framework of Reference for Languages (CEFR) is required for admission.

The B2-level requirement will be ascertained by the University Language Centre (SLAM) upon admission as follows:

- Language certificate of B2 or higher level issued no more than three years before the date of admission application. You will find the list of language certificates recognized by the University at: <https://www.unimi.it/en/node/297/>). The certificate must be uploaded when submitting the online application;

- English level achieved during a University of Milan degree programme and certified by the University Language Centre (SLAM) no more than four years before the date of admission application. In this case the process is automatic, the applicant does not have to attach any certificates to the application;

- Placement test administrated by the University Language Centre (SLAM) according to the calendar published on the website: <https://www.unimi.it/en/node/39267/>

All those who fail to submit a valid certificate or do not meet the required proficiency level will be instructed during the admission procedure to take the placement test.

Applicants who do not take or pass the placement test will be required to obtain a language proficiency certificate recognized by the University (see: <https://www.unimi.it/en/node/297/>) and deliver it to the SLAM via the InformaStudenti service by the deadline fixed for the master's programme (<https://www.unimi.it/en/node/39267/>).

Applicants who do not meet the requirement by said deadline will not be admitted to the master's degree programme and may not sit any further tests.

Eligibility assessment

The personal curriculum of the applicants and the certifications will be evaluated by an Admission Committee composed of the coordinator and at least two lecturers of the Master degree. No interview is foreseen. The applicants will receive communication of their eligibility and will be allowed to enroll in the Master degree program. An online self-evaluation test will be provided, allowing the admitted students to identify specific weakness in their knowledge that need to be fulfilled by autonomous study. The teachers are available to give personal advices and bibliographic material.

Practical instructions

Applicants considered eligible by the Admission Committee can enroll in the BforB Master degree under the terms and conditions indicated at <https://www.unimi.it/en/education/biotechnology-bioeconomy>.

Students who have applied for admission to BforB prior to the conclusion of their bachelor degree (Laurea Triennale), if possessing the other admission requirements and a valid English proficiency certificate, will be granted the possibility to attend the first term classes (pre-enrollment). In this case students must present to Segreteria Studenti the bachelor degree up to December 31st 2023 to receive formal admission to the course. Only after admission students are allowed to enroll and only after enrolment they are allowed to give exams.

Programme structure

The BforB Master degree is a 2-year course, and each year is divided in two terms. The program includes different activities: frontal lessons, practical classes, field visits and a final experimental project leading to the final public dissertation.

The Master Degree encompasses the acquisition of 120 educational credits (CFU, crediti formativi). One CFU corresponds to a standard student workload of 25 hours and is calculated as follows:

- Frontal lectures: 8 hours of lecture and 17 hours of personal elaboration
- Practical classes: 16 hours of laboratory activity and 9 hour of personal elaboration
- Experimental project and laboratory internships: 25 hours of laboratory and/or training activity

To complete the study program the student must acquire a total of 120 CFU as follows:

- a) 61 CFU in 9 mandatory courses
- b) 12 CFU in 2 courses chosen from a list of 6 elective courses (see table 1 below)
- c) 8 CFU in 1 or more courses freely chosen among i) the optional courses specifically activated by the BforB Master Degree (see table 2 below), ii) additional elective courses (see table 1 below), or iii) all courses activated by the University of Milan for Master Degrees as long as consistent with the aims of the BforB degree and not a repetition of a course already inserted in the study plan.

* It is possible to exceed the amount of 8 CFU, nevertheless students that already acquired 8 CFU with free choice courses

are allowed to follow more additional courses but these will not be computed in the final degree score.

** A maximum amount of 4 CFU can be acquired by interdisciplinary laboratory activities organized within other Master Degree courses or specifically agreed with one of the Master Degree teachers. Laboratory activities will be certified by Prof. Fabio Forlani on behalf of the BforB Study Plan Committee.

*** Elective and optional courses can be followed during the first or the second year of the Master Degree program, as a student choice. The suggestion is to follow during the second semester of the first year most of the courses, in order to leave the second semester of the second year free for the experimental thesis or stage abroad.

d) 3 CFU with other certified activities (participation to seminars, workshops, external courses), which will be evaluated and certified by Prof. Fabio Forlani on behalf of the BforB Study Plan Committee. The 3 CFU can also be acquired:

i) within the final laboratory internship, by extending the research activities with a small side project,

ii) by participating to a REE laboratory,

iii) by attendance to a language course (language different from English and not mother-tongue). For international students, Italian courses "Additional Language skills: Italian" organized by the SLAM proving after the final exam an Italian language proficiency at level A2 within the Common European Framework of Reference for Languages (CEFR) must be chosen (see table 3 below).

** Guidelines for free and other activities are annexed in <https://biotechnologybioeconomy.cdl.unimi.it/en/study/study-plan-submission>

e) 36 CFU will be acquired by an individual experimental project thesis leading to the final dissertation, to be started in the second year. The experimental project comprises a minimum period of at least six months full time work in a R&D laboratory following the indications of a supervisor i) in the laboratory of a BforB teacher, ii) in the laboratory of a University of Milan or other Universities teacher, iii) in a private or public R&D laboratory in Italy or abroad. Options ii) and iii) must preliminarily have the approval of an academic tutor.

* Guidelines for the degree internship and dissertation are annexed in <https://biotechnologybioeconomy.cdl.unimi.it/en/study/stage-and-internship>

Core/compulsory activities

All training activities mentioned in "program structure" are considered mandatory for the Master degree. Lesson attendance is strongly suggested, exceptions must be motivated to the lecturer. All students must start lesson attendance in the fall semester of the first year: this Master Degree does not have a spring edition.

Testing and assessment procedures

Each course is followed by an exam, usually a written or an oral test (or a combination); students are graded on a maximum score of 30, with 18/30 being the minimum pass grade. Credits for a course are only granted upon passing the corresponding exam. More than one instructor can teach courses: in this case, only one lecturer will be responsible for the final assessment of the student.

Lessons and exams

Exam sessions are scheduled during recess at the end of each term and during the one-week lesson break in the middle of each term. For each course, at least 6 tests are scheduled per academic year. Exams calendar: <https://biotechnologybioeconomy.cdl.unimi.it/en/study/exams>.

Lectures timetable

The first term will take place between 25 September 2023 and 19 January 2024; the second term will take place between 26 February 2024 and 14 June 2024.

Lesson timetables and course syllabus will be available at the URL: <https://biotechnologybioeconomy.cdl.unimi.it/en>

Study plan definition and submission for approval

In the first year of the Master Degree, between February 1st to February 29th 2024, students will have to submit the study plan, following the indications reported in this web page: <https://www.unimi.it/en/study/bachelor-and-master-study/following-your-programme-study/plan-study>.

In the study plan students will define which elective courses they planned to attend and how they want to obtain the 11 CFU of freely chosen activities (8 CFU of free activities and 3 CFU of other free activities). In the subsequent year(s) there will be the possibility to submit a revised study plan.

The University also offers educational activities as part of its project for the development of soft skills. To access educational activities on soft skills, students have to include them in their study plan. These activities have a limited number of places available, and attendance is compulsory. Moreover, students may only choose the activities designated by the bodies of their degree programme. For further details please visit <https://www.unimi.it/en/study/bachelor-and-master-study/following-your-programme-study/soft-skills>.

Lecture rooms and laboratories are located in the “Città Studi” campus, mostly in the Agricultural and Food Sciences Faculty, Via Celoria 2 (<https://www.unimi.it/en/education/faculties-and-schools/agricultural-and-food-sciences>).

Libraries

In the faculty are located study room and library. A main campus scientific library is located in via Celoria 18 (Biblioteca di biologia, informatica, chimica e fisica).

Tutoring

Tutors will provide students with academic advice, guidance for course choice and personal advice. Students can contact the tutors at their standard institutional email addresses (name.surname@unimi.it).

Internship criteria

The students will carry out an experimental project leading to writing a dissertation in English, whose public discussion will constitute the final exam. The experimental project involves the attendance of a research laboratory either at University of Milan or in other research laboratory, in Italy or abroad, upon previous authorization of the Coordinator of the Master degree. The experimental project accounts for 36 CFU, and thus it represents a main activity within the Master degree program. The dissertation will describe an original research carried out by the student under the supervision of a lecturer within the BforB Master degree, and its subject must be consistent with the goals and the disciplines taught in the Master degree.

Degree programme final exam

The final exam consists of the oral presentation and discussion of the thesis main results in front of a dissertation committee and it contributes with a maximum of 10 points to the final grade. The final grade will be thus assigned as the weighted average of the grades in the lecture courses, calculated on a scale of 110, to which the points of the final dissertation will be added.

EXPERIENCE OF STUDY ABROAD AS PART OF THE DEGREE PROGRAM

The University of Milan supports international mobility by providing its students with the opportunity to spend study and internship periods abroad. It is a unique chance to enrich your educational path in a new exciting environment. The agreements entered into by the University with over 300 universities from the 27 EU member countries under the European Erasmus+ programme allow regularly enrolled students to carry out part of their studies at one of the partner universities or to undertake internships at companies, training and research centres and other organizations.

Similar international mobility opportunities are provided outside Europe, through agreements with a number of prestigious institutions.

Study and internships abroad

The complete and updated bouquet of opportunities for participation in international programs can be found at <https://www.unimi.it/en/international/study-abroad>. It is possible to participate to each of them following selections on a competitive basis. The offer includes:

1) Thesis abroad (Tesi all'estero) program: the University of Milan calls twice every year for applications for a study-abroad scholarship to be used to prepare all or a portion of the student's Master's Degree thesis while in residence at an international academic or research institution. Students can choose any destination and institution in the world, without any geographical restrictions. Specific information and deadlines: <https://www.unimi.it/en/international/study-abroad/thesis-abroad>.

2) ERASMUS Student Traineeship program: students can undertake a traineeship with a company, research or training center, university or other organization, in the member states of the European Union, and Iceland, Liechtenstein, Norway, Republic of Macedonia, Serbia. Specific information and deadlines: <https://www.unimi.it/en/node/2109/>.

3) ERASMUS+ Study program: the time spent abroad can be used to attend courses and pass the relative exams, thus collecting credits towards the Master degree, as well as to carry out the experimental project for the dissertation. The BforB Master course has in place agreements with Universities in Finland, Germany, Spain, France, Austria, Belgium, all offering courses in English. Calls for participation will be open usually in February and details can be found at the following link: <https://www.unimi.it/en/international/study-abroad/studying-abroad-erasmus>.

The student admitted to any of the mobility programs must submit a study plan detailing the training activities that he/she plans to carry out, with the corresponding credits. The number of credits should correspond as much as possible to the number of credits that the student should acquire in a similar span of time at the home University. The proposed activities must be consistent with the goals and the contents of the Master degree. The study plan must be approved by the BforB Student Mobility Committee, which can request changes or integrations. At the end of the mobility program, according to the guidelines provided by the University of Milan, the courses (with a passed exam) and laboratory trainings attended by the student are registered in his/her career, with its original name and with an indication of the ECTS (European Credit Transfer and Accumulation System) and their conversion in CFU (usually 1 ECTS= 1 CFU). The students willing to carry out their dissertation work as part of a mobility program abroad must have an internal supervisor (chosen among the BforB lecturers) and the study plan must be approved by the BforB board.

For carrying out any experimental activity abroad, a letter of acceptance from the hosting supervisor is required. If the experimental activities are intended to be part or all the dissertation work (thesis), a similar letter should be drawn up by the internal supervisor. These letters must be sent to the ERASMUS Coordinator before the departure to the foreign destination.

As a general rule, if the period of stay at the foreign laboratory is less than six months long, the student should complete the thesis work at the laboratory of the internal supervisor, or other laboratory indicated by the supervisor, in order to complete the training program.

How to participate in Erasmus mobility programs

The students of the University of Milan can participate in mobility programmes, through a public selection procedure.

Ad hoc commissions will evaluate:

- Academic career
- the candidate's proposed study programme abroad
- his/her foreign language proficiency
- the reasons behind his/her application

Call for applications and informative meetings

The public selection for Erasmus+ mobility for study generally begins around February each year with the publication of a call for applications specifying destinations and requirements. Regarding the Erasmus+ Mobility for Traineeship, the University of Milan usually publishes two calls a year enabling students to choose a destination defined by an inter-institutional agreement or to find a traineeship position on their own.

The University organizes informative meetings to illustrate mobility opportunities and rules for participation.

Erasmus+ scholarship

The European Union grants the winners of the Erasmus+ programme selection a scholarship to contribute to their mobility costs, which may be supplemented by the University funding for disadvantaged students.

Language courses

Students who pass the selections for mobility programmes can benefit from intensive foreign language courses offered each year by the University Language Centre (SLAM).

<https://www.unimi.it/en/node/8/>

Learn more at <https://www.unimi.it/en/node/274/>

For assistance, please contact:

International Mobility Office

Via Santa Sofia 9 (second floor)

Tel. 02 503 13501-12589-13495-13502

Contacts: InformaStudenti; mobility.out@unimi.it

Student Desk booking through InformaStudenti

ADMISSION CRITERIA: 1ST YEAR OPEN, SUBJECT TO ENTRY REQUIREMENTS

Application and enrolment information and procedures

Deadlines to apply for admission are from March 6th up to August 25th, 2023. Detailed information can be found at <https://www.unimi.it/en/study/bachelor-and-master-study/degree-programme-enrolment>

N° of places reserved to non-EU students resident abroad

15

1st COURSE YEAR Core/compulsory courses/activities				
Scheduling	Learning activity	Module/teaching unit	Ects	Sector
1 semester	Biomass and waste recycling promoting the circular economy		7	AGR/13
1 semester	Fermentation biotechnology		7	CHIM/11
1 semester	Methods in biotechnology		9	AGR/07, AGR/12
1 semester	Structure and functions of biomolecules		8	CHIM/10
2 semester	Environmental microbial biotechnology		6	AGR/16
2 semester	Environmental plant biotechnology		6	AGR/13
2 semester	Plants as biofactories		6	AGR/07
2 semester	Protein engineering and proteomics		6	BIO/10
Total number of compulsory credits/ects			55	
2nd COURSE YEAR Core/compulsory courses/activities				
Scheduling	Learning activity	Module/teaching unit	Ects	Sector
1 semester	Bioeconomy: management, assessment and intellectual property		6	AGR/01
Total number of compulsory credits/ects			6	
Further elective courses				
Table 1 - Elective courses: the student will choose 2 course among the list of elective courses. Choose 2 among the following:				
1 semester	Bio-based innovation in food industry		6	AGR/15
1 semester	Biostatistics and design of experiments in biotechnology		6	AGR/17

1 semester	Developing soft skills in science: case-studies from microbial biotechnology		6	AGR/16
1 semester	Molecular analysis and traceability of biotechnological products		6	BIO/10
2 semester	Applied biocatalysis		6	CHIM/11
2 semester	Functional foods and nutraceuticals		6	MED/49

Table 2 - Optional courses

To complete the study program the student must acquire 8 CFU in 1 or more courses freely chosen among:

i) the optional courses specifically activated by the BforB Master Degree (see table 2)

ii) additional elective courses (see table 1)

iii) all courses activated by the University of Milan for Master Degrees as long as consistent with the aims of the BforB degree and not a repetition of a course already inserted in the study plan.

Optional courses specifically activated by the BforB Master Degree:

1 semester	Molecular biobased approaches for plant protection		4	AGR/12
2 semester	Biomolecular experiment planning		2	BIO/10
2 semester	Plant microbiome-based strategies for agri-environmental biotechnologies		4	AGR/16

Table 3 - Other activities:

Further 3 CFUs have to be acquired by International Students mandatorily as “Additional Language Skills: Italian”.

To obtain the degree, those who do not hold an Italian high school diploma or bachelor's degree must demonstrate proficiency in Italian at the A2 or higher level per the Common European Framework of Reference for Languages (CEFR). This level must be demonstrated prior to completing the course programme in one of the following ways:

- by submitting a certificate of A2 or higher level issued no more than three years prior to the date of submission. You will find the list of language certificates recognized by the University at: <https://www.unimi.it/en/node/349/>). The language certificate must be submitted to the University Language Centre (SLAM) via the Language Test category of the InformaStudenti service: [https://informastudenti.unimi.it/saw/ess?AUTH=SAML](https://informastudenti.unimi.it/saw/ess?AUTH=SAML;);

- via a entry-level test administrated by SLAM that can only be taken only once.

Those who fail to reach A2 level will have to attend a 60-hour Italian course geared to their level.

Those who do not take the entry-level test or fail to pass the end-of-course test after six attempts will have to obtain language certification privately in order to earn the 3 credits of Additional language skills: Italian.

Further 3 CFUs have to be acquired by Italian Students by choosing one of the following activities:

- Other activities (laboratories, seminars)
- Ree Crispres - A workshop on genome editing technologies

	Additional Language Skills: Italian (3 ECTS) <i>Compulsory for foreign students, it replaces "Other activities"</i>		3	ND
	Other activities (laboratories, seminars)		3	NA
2 semester	Ree Crispres - A workshop on genome editing technologies		3	AGR/07, BIO/01, AGR/12, AGR/03

End of course requirements

	Internship and final exam		36	NA
		Total number of compulsory credits/ects	36	