UNIVERSITA' DEGLI STUDI DI MILANO
PROGRAMME DESCRIPTION - ACADEMIC YEAR 2019/20
IN
BIOTECHNOLOGY FOR THE BIOECONOMY - (Classe LM-7)
Immatricolati dall'anno accademico 2018/19

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.ssa Sara Borin

Tutors - Faculty

Academic guidance tutor
Prof. Fabio Forlani (student surname A-L); Prof. Alessio Scarafoni (student surname M-Z)

Erasmus and international mobility tutor
Prof. Alessio Scarafoni

Study plan tutor
Prof. Fabio Forlani

Seminar and workshop tutor
Prof. Fabio Forlani

University and programme transfer tutor
Prof. Sara Borin

Master's degree admission tutor
Prof. Sara Borin

Credit recognition tutor
Prof. Sara Borin

Specific Learning Disabilities (SLD) tutor
Prof. Sara Borin

Degree Course website

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

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CHARACTERISTICS OF DEGREE PROGRAMME

Introduction

This “Manifesto degli Studi” represents the syllabus for the Biotechnology for the Bioeconomy (BforB) Master degree at the University of Milan (Italian: Laurea Magistrale nella classe LM-7 “Biotecnologie Agrarie”). The Department of Food, Environmental and Nutritional Sciences and the associated Department of Agricultural and Environmental Sciences are the academic institutions responsible for the BforB Master degree.

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 technology to sustain a new green and sustainable economy (i.e. bioeconomy), offering solutions for i) an efficient and sustainable production of plant and microbial biomasses; ii) production of bioenergy from (waste) biomasses; environmental protection and safety in terms of bioremediation; iii) green chemistry processes and applications; iv) sustainable agrofood production and processes, v) circular economy.

In this context, the BforB Master degree aims at providing students with advanced molecular and cellular background of microbial and plant systems, which are the basis for the several sectors of the biotechnologies applied to the bioeconomy. 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. In addition, the BforB Master degree will provide theoretical and practical instruments for the set up, analyses and improvement of biotechnological processes for the transformation of renewable raw materials in biotechnological processes exploiting microorganisms, plant systems and enzymes.

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, at 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 learning environment.

Expected learning outcomes

The students of the BforB Master degree will acquire advanced skills and competences in the:

• set-up and optimisation of the production efficiency of biological systems (microorganisms, plants, enzymes) involved in bioprocesses in the agriculture, food and environmental sector, in relation with the consumer needs and the environmental sustainability

• exploitation of the bioinformatic tools and the genomics, proteomics and metabolomics databases

• set up of molecular and chemical analyses methods for basic and applied research activity

• scientific experimental planning and project design and management

• basic knowledges in bioeconomy, business management, life cycle assessment and marketing of biotechnological products

Soft skills enabling team working and the moving into the work market or the scientific research fields will complete the competencies of the BforB Master Degree students

Professional profile and employment opportunities

The BforB graduate is an 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:

• Industrial fermentation for production of metabolites and renewable energy

• 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

• bioremediation of contaminated land and waters, using plants and/or microorganisms

• 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

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 I (Biotecnologia). It can also be accessed by any student with a Laurea Triennale providing a strong background (at least 60 University credits, CFU) in biotechnology-related subjects, i.e. subject identified as “core disciplines” for the L-2 class of Laurea Triennale.

Students with a degree from non-Italian institution: the candidates must possess a bachelor’s degree from an accredited college or University, and strong knowledge in the following areas: molecular biology, genetics, microbiology, plant cell biology, biochemistry, chemistry.

All students must have a good knowledge of spoken and written English as a mandatory prerequisite to enrolment, certified by one of the following:

• Bachelor degree obtained in an international English bachelor course (provide a certification at application for admission)

• B2 level certification (vantage or upper intermediate, as defined by the Common European Framework of reference for Languages: Learning, Teaching, Assessment; recognised certifications: http://www.unimi.it/cataloghi/slam/CertificazioniENG_Apr2018.pdf)

• A B2 result in the placement test given by the University of Milan on September 24th, 2019. Students that will not provide a valid certification at the admission application will be contacted by the course secretariat to sustain the English placement test. Who will not attend the test will not have any other possibility to obtain the English certification by the University of Milan and will mandatorily need to obtain a certification from an external accredited institution within December 2019, 31st.

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 and a final experimental project leading to the final public dissertation.

120 educational credits (CFU, crediti formativi) are required to complete the Master Degree. 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: 25 hours of laboratory and/or training activity

The student will acquire:

61 CFU 9 mandatory courses (see table 1 below)

12 CFU 2 courses chosen from a list of 5 elective courses activated in the 2019-2020 years (see table 2 below)

8 CFU 1 or more courses freely chosen among i) the optional courses specifically activated by the BforB Master Degree (see table 3 below), ii) among elective course (table 2), or iii) among 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 offered by the degree program.

It is possible to exceed the amount of 8 CFU by a fraction of course. Students that already acquired 8 CFU with free choice courses are allowed to follow 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 organised within other Master Degree courses (e.g. REE laboratories) 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.

3 CFU other certified activities (participation to seminars, workshops, courses, etc,). The 3 CFU can also be acquired within the final laboratory internship, by extending the research activities with a small side project. Additional activities will be certified by Prof. Fabio Forlani on behalf of the BforB Study Plan Committee.

36 CFU individual experimental project leading to the final dissertation, to be started in the second year.

Campus

Lecture rooms and laboratories are located in the “Città Studi” campus, mostly in the Food and Agriculture Faculty, Via Celoria 2 (http://www.agraria.unimi.it). In the faculty are located study room and library. A main campus scientific library is located in Via Celoria 26 (Biblioteca Biologica Interdipartimentale).

Tutoring

Tutors will provide students with academic advice, guidance for course choice and personal advice. For the academic year 2019/2020 students can contact Prof. Alessio Scarafoni and Prof. Fabio Forlani at their standard institutional email addresses (name.surname@unimi.it).

Core / compulsory activities

All training activities mentioned in “program structure” are considered mandatory for the Master degree.

Lesson attendance is considered compulsory. Exceptions must be motivated and authorized by 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.

Procedures for exam registration and admittance

Exam sessions are scheduled during recess at the end of each term. For each course, at least 6 tests are scheduled per academic year. Although in principle there is no limit in the number of tests that the student can take per year, some limitations can be specifically given by lecturers.

Study plan definition and submission for approval

The students will submit a “Study plan”, with the indication of elective courses they intend to attend, and how they want to utilize the 11 CFU of freely chosen activities, at the beginning of the second term of the first year (deadlines will be published at www.unimi.it). The Study plan must be discussed with the tutors and then approved by a Study Plan Committee, composed by BforB lecturers. The Study plan can be changed upon request; however, it represents the official record of the degree and the list of courses must correspond to the exams passed by the student in order to grant admission to the final dissertation.

Optional courses specifically organised by BforB Master Degree:

- scheduling (year 1 or 2; semester 1); core compulsory courses: Molecular plant pathology; CFU 4; sector AGR/12; teaching method (LE= lesson; LA= practical lesson): 16 hours LE - 32 hours LA
- scheduling (year 1 or 2; semester 2); core compulsory courses: Soft skills for the academia and industry; CFU 4; sector AGR/16; teaching method (LE= lesson; LA= practical lesson): 24 hours LE - 16 hours LA

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, 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 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.

Lecture timetable

The first term will take place between September 26th 2019 and January 21st 2020.
The second term will take place between February 20th and June 9th 2020.
Lesson timetables and course syllabus will be available at the URL: http://www.agraria.unimi.it

EXPERIENCE OF STUDY ABROAD AS PART OF THE DEGREE PROGRAM

The University of Milan supports the international mobility of its students, offering them the opportunity to spend periods of study and internship abroad, a unique opportunity to enrich their curriculum in an international context. To this purpose, the University of Milan takes part to the European Erasmus + program, which includes over 300 universities in more than 30 countries. Within this program, students can visit one of these universities in order to pursue educational activities as a part of their curriculum, including training activities / internships at companies, training and research centres or other organizations, or even to prepare their dissertation.
The BforB degree program supports the international mobility of the University program: a lecturer acts as a tutor for students interested in the Erasmus + program, in order to guide students in their choice of the most suitable program for their formation.

Study and internships abroad

In the framework of the ERASMUS+ program, the BforB Master course has in place agreements with Universities in, Finland, Germany, Spain, France, Austria, all offering courses in English.
Calls for participation can be found at the following link: http://www.unimi.it/studenti/erasmus/79224.htm. 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 student admitted to the mobility program 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.

How to participate in Erasmus mobility programs

To gain access to mobility programs for study purposes, lasting 3-12 months, the enrolled students of the University of Milan must attend a public selection that starts usually around the month of February each year through the presentation of specific competition announcements, which contain information on available destinations, respective duration of the mobility, requirements and deadlines for submitting the online application. The selection, aimed at evaluating the proposed study abroad program of the candidate, knowledge of a foreign language, especially when this is a preferential requirement, and the motivations behind the request, is performed by specially constituted commissions. Each year, before the expiry of the competition announcements, the University organises information sessions for the specific study course or groups of study courses, in order to illustrate to students the opportunities and participation rules.
To finance stays abroad under the Erasmus + program, the European Union assigns to the selected students a scholarship that - while not covering the full cost of living abroad - is a useful contribution for additional costs as travel costs or greater cost of living in the country of destination. The monthly amount of the communitarian scholarship is established annually at national level; additional contributions may be provided to students with disabilities. In order to enable students in economic disadvantaged conditions to participate in Erasmus+ program, the University of Milan assigns further additional contributions; amount of this contributions and criteria for assigning them are established from year to year.
Student should prove to have a language certification at A2 (or higher) level at the time of the application deadline.
The University of Milan promotes the linguistic preparation of students selected for mobility programs, organising every year intensive courses in the following languages: English, French, German and Spanish.
The University in order to facilitate the organisation of the stay abroad and to guide students in choosing their destination offers a specific support service.
More information in Italian are available on www.unimi.it > Studenti > Studiare all'estero > Erasmus+
For assistance please contact:
- for administrative matters: Ufficio Accordi e relazioni internazionali; via Festa del Perdono 7 (ground floor), Tel. 02 503 13501-12589-13495-13502; Fax 02 503 13503 E-mail: mobility.out@unimi.it (Desk opening hour: Monday-friday 9 – 12):

- for general tutoring, experimental projects and didactic matters: Prof. Alessio Scarafoni, Tel. 02 503 16820 E-mail: alessio.scarafoni@unimi.it.

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

Application and enrolment information and procedures

Students with an Italian University degree: The BforB Master degree can be accessed by graduates of Laurea Triennale belonging to the L-2 class (Biotechnology) and previous class 1 (Biotechnology). It can also be accessed by any student with a Laurea Triennale providing a strong background (at least 60 University credits) in biotechnology-related subjects, i.e., subjects identified as “core disciplines” for the L-2 class of Laurea Triennale.

Students with a degree from a non-Italian institution: the candidates must possess i) a Bachelor’s degree from an accredited college or University, ii) motivation toward this study course stated in a letter of motivation and iii) a strong knowledge in the following areas: genetics, molecular biology, microbiology, cell biology, biochemistry, chemistry.

All students must have a good knowledge of spoken and written English: a bachelor degree obtained in an international English course, or a B2 level certification (vantage or upper intermediate, as defined by the Common European Framework of Reference for Languages: Learning, Teaching, Assessment) or, in alternative, an equivalent result at the Placement test given by the University of Milan, must be obtained prior or upon enrolment, and it is mandatorily required to attend the exam sessions. Knowledge of Italian is not required for attendance.

Practical instructions

The application for admission must be sent online according to the general University rules, following the instructions at http://www.unimi.it, between March 1st and September, 13th 2019 plus one week in October. Enrolment must be performed online after having received the admission. Deadlines for admission application and enrolment will be published at http://www.unimi.it.

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

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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 (Total number of ects:7)	Industrial Bioprocesses Development	4	CHIM/11
		Improvement of bioprocesses in yeast	3	CHIM/11
1 semester	Methods in biotechnology (Total number of ects:10)	Genomics	3	AGR/07, AGR/11, AGR/12
		Functional genomics	4	AGR/07, AGR/11, AGR/12
		Molecular taxonomy	3	AGR/07, AGR/11, AGR/12
1 semester	Structure and functions of biomolecules (Total number of ects:7)	Structure and function of biomolecules	4	CHIM/06, CHIM/10
		Biomolecular spettroscopy	3	CHIM/06, 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
	Internship and final exam		36	NA
1 semester	Bioeconomy: management, assessment and intellectual property (Total number of ects:6)	Intellectual property	3	AGR/01
		Life cycle assessment	2	AGR/01
		Management	1	AGR/01
		Total number of compulsory credits/ects	42	

Elective courses

Elective courses: The student will chose 2 course among the list of elective courses. The elective courses will be activated in the second year of the course except "Experimental planning and biostatistics in biotechnology" that will be activated since the first year.

Chose 2 among the following:

1 semester	Molecular analysis and traceability of biotechnological products		6	BIO/10
1 semester	Natural resource economics and policy		6	SECS-P/01, AGR/01
2 semester	Applied biocatalysis		6	CHIM/11
2 semester	Bio-based innovation in food industry (Total number of ects:6)	Closed-loop food supply chains	1.5	AGR/15
		Innovative Food Processing and Products	1.5	AGR/15
		Bio-based food packaging	1.5	AGR/15

		Sensory and Consumer science	1.5	AGR/15
2 semester	Experimental planning and biostatistics in biotechnology (Total number of ects:6)	Experimental planning	2	AGR/17, BIO/10
		Biostatistics	4	AGR/17, BIO/10
2 semester	Functional foods and nutraceuticals		6	BIO/09

UNDEFINED COURSE YEAR - COMPULSORY COURSES/ACTIVITIES

Scheduling	Learning activity	Module/teaching unit	Ects	Sector
	Other activities (laboratories, seminars)		3	NA
		Total number of compulsory credits/ects	3	

Further elective courses

Free Credits: ECTS 8