



UNIVERSITA' DEGLI STUDI DI MILANO
PROGRAMME DESCRIPTION - ACADEMIC YEAR 2018/19
MASTER DEGREE IN
MOLECULAR BIOTECHNOLOGY AND BIOINFORMATICS (Classe
LM-8)
Enrolled from 2016/2017 academic year

HEADING

Degree classification - Denomination and code:	LM-8 Industrial biotechnologies
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:	F1B

PERSONS/ROLES

Head of Study Programme

Prof. Marco Nardini

Tutors - Faculty

Proff. Carlo Camilloni, David Horner (tutor for Erasmus+ programme), Martin Kater, Giulio Pavesi, Thomas Vaccari

Degree Course website

<http://www.ccdbiotec.unimi.it>

Email: biotecindamb@unimi.it

Student administrative office

Via Celoria, 20 Tel. (0039) 199188128 Opening times: Mon-Wed-Fri 9-12; Tue-Thu 13.30-15.30

<http://www.unimi.it/studenti/segreteria/773.htm>

Student information office

Via Celoria, 26 Opening times: from Monday to Friday, 10-11:45 <http://www.ccdbiotec.unimi.it> Email: molbioinfo@unimi.it

CHARACTERISTICS OF DEGREE PROGRAMME

Introduction

This "Manifesto degli Studi" represents the syllabus for the Molecular biotechnology and bioinformatics (MB&B) Master degree at the University of Milan (Italian: Laurea magistrale nella classe LM-8 "Biotecnologie industriali"). The Department of Biosciences is the academic institution responsible for the MB&B Master degree.

General and specific learning objectives

The MB&B Master degree aims at providing students with advanced skills in molecular biotechnology and in computational biology and bioinformatics, with a strong focus on the most advanced tools and approaches for the analysis of genomes, proteomes and metabolomes. The main goal of the MB&B Master degree is to give the students a broad theoretical and practical background needed to apply their knowledge to any biological/biotechnology problems.

Specific goal of MB&B is to provide a deep and up-to-date knowledge in the following core subjects:

- bioinformatics
- molecular biology and biotechnology
- functional genomics and "-omics" technologies
- protein expression systems
- metabolic engineering and industrial processes
- structural biochemistry
- molecular enzymology
- data analysis

In addition, the student will have the opportunity to develop further specific disciplines of their interest, choosing from courses in plant genetics, nanotechnology, biophysics, molecular microbiology, molecular parasitology, structural biology and economics. The MB&B Master degree combines lecture-based courses (in the first year and in the first term of the second year) and an experimental laboratory project leading to a dissertation (second year), to be chosen by the students among many projects offered by the University of Milan and other research institutes, including private companies.

Expected learning outcomes

1. Knowledge and understanding

Graduates in MB&B must possess deep general knowledge in the main biotechnological disciplines, so to allow them to apply a multidisciplinary approach to solving complex problems. Thus, in the first year of the course, MB&B offers advanced courses in biotechnology-related disciplines, such as biology and chemistry. The bioinformatic tools learned in the degree program will allow students to apply these skills to the management, analysis and interpretation of biological data.

2. Applying knowledge and understanding

A main objective of the MB&B Master Degree is to form graduates fully capable of applying the knowledge acquired. This will be achieved both through the teaching classes, in which a lot of time will be devoted to problem solving and applied knowledge, and through the dissertation work in the second year of the course. The experimental project carried out as part of the dissertation work will be instrumental to increase the students' ability to apply their acquired knowledge.

3. Autonomy / judgment (Making judgments)

In order to foster the acquisition of autonomous judgment by the students, teaching classes will discuss recent issues and "hot topics" in their subject, and will include a problem solving approach. Through reading and discussing teaching material and research papers, students will be stimulated to evaluate notions and information in a critical manner.

4. Communication skills

The students will improve their communication skills in teaching classes, which will include activities such as journal clubs, seminars, etc., as well as in their experimental project leading to their dissertation, which will include oral presentation and discussion of their results and writing their dissertation work in English.

5. Learning skills

Development of the ability to understand, discuss, and transfer the taught subjects in the English language. Ability to access and organize databases and other information on the net. The quality of the teaching classes and the time devoted to the experimental project leading to the dissertation will allow the students to learn through a "hands on" approach and through the constant interaction both with their peers and the instructors.

Professional profile and employment opportunities

The MB&B Master degree provides employment opportunities in the following areas:

management of production facilities in the biotechnological industry, including diagnostics, chemicals, and agro-food industry; promotion of scientific development and technological innovation in Research & Development in different industrial settings; service management in areas related to industrial biotechnology, as well as in Quality Control laboratories; research laboratories in both private and public institutions. Graduates will be able to operate, in their own fields of specialization, at a high level of responsibility, managing the ethical, technical and legal aspects of their work. In addition, thanks to its strong commitment to teaching a broad range of biotechnological disciplines, the MB&B Master degree is ideal to provide the background knowledge required for Ph.D. and other higher education courses.

The specific business contexts that the MB&B Graduate can enter are, among others: the pharmaceutical industry, chemical industry, food industry, industry and services for environmental biotechnology, biotechnology service centers applying information technology, genomics and proteomics research laboratories of both public and private institutions.

The MB&B graduates will possess full and updated knowledge in:

- the production of intermediates and products for fine chemicals and for the food industry
- industrial fermentation processes for the production of metabolites and for obtaining energy from renewable sources
- control of biotechnological processes
- development of innovative diagnostic techniques
- analysis of nucleotide and protein sequences
- development of new biologically active molecules through the study of molecular interactions between proteins and nucleic acids, and the identification of new molecular targets
- design and development of bioinformatics platforms and new methods for biological data analysis

Pre-requisites for admission

Students with an Italian University degree:

The MB&B 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 a Bachelor's degree from an accredited college or University, and a strong knowledge in most (or all) of the following areas: genetics, molecular biology, microbiology, cell biology, biochemistry, chemistry.

All students must have a good knowledge of spoken and written English: they must hold a B1 level certification prior to enrollment. 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 offered by the University of Milan is required to attend the final dissertation. Knowledge of Italian is not required for attendance.

Programme structure

The MB&B Master degree is a 2-year course; each year is divided in two terms. The programme includes different activities, such as frontal lectures, practical classes, and experimental project leading to the final dissertation.

120 educational credits (CFU, Crediti Formativi Universitari) are required to complete the Master degree. A CFU corresponds to a standard student workload of 25 hours, and it is calculated as follows:

- for frontal lectures, 1 CFU= 8 hours of lectures and 17 hours of personal elaboration;
- for practical classes, 1 CFU= 16 hours of laboratory activities and 9 hours of personal elaboration;
- for experimental projects, 1 CFU= 25 hours of laboratory and/or training activities.

The student will acquire 56 CFU from 8 mandatory courses, all scheduled in the first year, and at least 12 CFU from elective courses (see Table below) to be taken either in the first or in the second year. Finally, the student must acquire a minimum of 10 CFU freely chosen by the student. At least 6 CFU out of these 10 CFU must be acquired through attendance of a course (and passing the exam): the course can be chosen either from the list of the MB&B elective courses or from any course offered by the University of Milan, as long as considered consistent with the aims of the MB&B degree and it is not a repetition of course already offered in the degree program. Students can also choose classes taught in Italian as freely chosen CFU. 4 CFU can be acquired by additional laboratory activity, (namely, an extension of the thesis period) upon submission of a written request that must be approved by the MB&B Study Plan Committee.

39 CFU are assigned to the individual experimental project leading to the final dissertation, to be started in the second year. Finally, 3 CFU will be assigned for knowledge of the English language, upon submission of a valid B2 level certificate or equivalent (see Prerequisites for admission).

Conscientious objection policy

In the MB&B Master degree the use of animals for teaching purposes is not allowed as stated by the law: art. 5f of the Legislative Decree 26/2014. Such procedures are allowed during the traineeships for thesis preparation. However, they must be carried out exclusively by authorized staff, since, in this case, the Legislative Decree 26/2014 does not apply. According to Italian law n. 413, October 12 1993, "Norme sull'obiezione di coscienza alla sperimentazione animale", students have the uncontested right to conscientiously object to participation in any experimental activity using animals. In this case, the Teaching Board will suggest alternative traineeships, that are consistent with the educational goals of the MB&B course, to ensure the correct acquisition of the study credits necessary for degree completion.

Campus

Lecture rooms and laboratories are located in the "Città Studi" campus, mostly in the University buildings of Via Celoria, 26 (Edifici Biologici); Via Celoria, 20 (Settore Didattico); Via Golgi, 19 (Edificio Golgi). The Department of Biosciences is the reference structure for all teaching activities related to the MB&B course.

Libraries

The main campus library is the Biblioteca Biologica Interdipartimentale (Via Celoria, 26).

Tutoring

Tutors will provide students with academic advice, guidance on their course choices and personal advice. For the academic year 2018/2019 students can contact Prof. Carlo Camilloni, David Horner (tutor for Erasmus + programme), Martin Kater, Giulio Pavesi and Thomas Vaccari at their standard institutional e-mail addresses (name.surname@unimi.it).

Core / compulsory activities

All training activities mentioned in "Program structure" are considered mandatory for the Master Degree.

Language test / computer literacy test

Knowledge of English is a requirement for access to the final dissertation, and accounts for 3 CFU. Students must obtain 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 offered by the University of Milan. The University of Milan offers English courses through its language service. Knowledge of Italian is not required for attendance.

Compulsory attendance

Course attendance is considered compulsory. Exceptions must be motivated and authorized by the lecturer.

Testing and assessment procedures

Each course is followed by an exam, usually a written or an oral test (or a combination). Course exams must be passed, with grades calculated on a 30-point scale, to obtain course credits, with 18/30 being the minimum pass grade. Credits for a course are only granted upon passing the corresponding exam. Courses can be taught by more than one instructor: 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, 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 occur for exams not managed within the MB&B Master degree (for example, the English Placement test offered by the University of Milan can only be taken 3 times within a single academic year).

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 10 CFU of freely chosen activities, within a month after the beginning of the second term of the first year (i.e., end of March). The Study plan must be approved by a Study Plan Committee, composed of MB&B 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 student in order to grant admission to the final dissertation.

Internship criteria

The students will carry out an experimental project leading to writing a dissertation in English, whose 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 39 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 MB&B 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 1 October 2018 and 18 January 2019.

The second term will take place between 4 March 2019 and 14 June 2019.

Lesson timetables will be available at the URL: <http://www.ccdbiotec.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 centers or other organizations, or even to prepare their dissertation.

The MB&B degree program supports the international mobility of the University program: a lecturer (for the academic year 2018/2019, Prof. D. Horner) 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 frame work of the Erasmus+ program, the MB&B Master course has in place agreements with Universities in Denmark, Germany, Spain, France, Norway, and The Netherlands, 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 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 MB&B 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 attended (with a passed exam) by the student are registered in his/her career, preferably 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 MB&B lecturers) and the study plan must be approved by the MB&B 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 organizes 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.

The University of Milan promotes the linguistic preparation of students selected for mobility programs, organizing every year intensive courses in the following languages: English, French, German and Spanish.

The University in order to facilitate the organization 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:

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

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

Application and enrolment information and procedures

The application must be sent online according to the general University rules, following the instructions at this URL: <http://www.unimi.it/studenti/matricole/77648.htm>

Requirements for admission

Students with an Italian University degree

The MB&B 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.

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The candidates must possess a Bachelor's degree from an accredited college or University, and a strong knowledge in some (or all) of the following areas: genetics, molecular biology, microbiology, cell biology, biochemistry, chemistry.

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Eligibility assessment

The personal curriculum of the applicants will be evaluated by an Admission Committee composed of the coordinator and at least two lecturers of the Master degree. The applicants will receive communication of their eligibility and will be allowed to enroll in the Master degree program. The Admission Committee might require an interview with the applicant in order to better assess their eligibility.

Links to enrolment information and procedures

<http://www.unimi.it/studenti/matricole/77648.htm>

Practical instructions

Applicants considered eligible by the Admission Committee can enroll in the MB&B Master degree under the terms and conditions indicated at <http://www.unimi.it>

The students of the Università degli Studi di Milano can apply for admission to MB&B prior to the conclusion of their Laurea Triennale (i.e., expecting to graduate from a Laurea Triennale between October 2018 and December 2018).

Students coming from other Universities upon graduation (between October 2018 and December 2018) must present degree certification at the Segreteria Studenti.

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

30

1st COURSE YEAR Core/compulsory courses/activities				
Scheduling	Learning activity	Module/teaching unit	Ects	Sector
1	Biotechnological products and processes		6	(6) CHIM/11, (6) CHIM/06
1	Functional genomics and bioinformatics		10	(10) BIO/11, (10) BIO/18
1	Methods in bioinformatics		6	INF/01
1	Molecular and cellular microbiology		6	(6) BIO/19, (6) BIO/18
1	Rational design and structural characterization of bioactive molecules		6	(6) CHIM/02, (6) CHIM/06
2	Advanced molecular and cellular biotechnology		10	(10) BIO/11, (10) BIO/06
2	Advanced plant cell biotechnology		6	(6) BIO/18, (6) BIO/04
2	Language proficiency (english)		3	L-LIN/12
2	Protein engineering and molecular enzymology		6	BIO/10
			Total number of compulsory credits/ects	59
Further elective courses				
The student must choose at least two of the following courses				
1	Bioimaging		6	(6) FIS/07, (6) FIS/03
1	Biotechnological and molecular strategies in the control of parasites and vector-borne diseases		6	VET/06
1	Nanotechnology for biomedical applications and biosensors <i>Not active in the academic year 2018/2019</i>		6	(6) CHIM/01, (6) CHIM/06
1	Patenting and technology transfer		6	(6) IUS/01, (6) AGR/01, (6) IUS/04
1	Structural bioinformatics		6	(6) BIO/11, (6) BIO/10, (6) INF/01
2	Advanced bioinformatics for biotechnology		6	(6) BIO/11, (6) INF/01
2	Macromolecular structural biology		6	BIO/10
2	Molecular breeding and plant genetics		6	(6) AGR/07, (6) BIO/18
<p>The student must acquire 10 additional credits (CFU) choosing from any course offered by the University of Milan, provided that they are coherent to the topics of the MB&B and the contents not overlapping with those of mandatory and guided through courses in the study plan.</p> <p>Four credits can be acquired by extending the thesis project, upon presenting a motivated written request that must be approved by the MB&B Study Plan Committee.</p>				
End of course requirements				
	Thesis project and final dissertation		39	ND
			Total number of compulsory credits/ects	39