



**UNIVERSITA' DEGLI STUDI DI MILANO**  
**PROGRAMME DESCRIPTION - ACADEMIC YEAR 2019/20**  
**IN**  
**MOLECULAR BIOTECHNOLOGY AND BIOINFORMATICS (Classe**  
**LM-8)**  
**Enrolled from 2016/2017 academic year**

### **HEADING**

<b>Degree classification - Denomination and code:</b>	LM-8
<b>Degree title:</b>	Dottore Magistrale
<b>Length of course:</b>	2 years
<b>Credits required for admission:</b>	180
<b>Total number of credits required to complete programme:</b>	120
<b>Course years currently available:</b>	1st , 2nd
<b>Access procedures:</b>	open, subject to entry requirements
<b>Course code:</b>	F1B

### **PERSONS/ROLES**

#### **Head of Study Programme**

Prof. Marco Nardini

#### **Tutors - Faculty**

Proff. Carlo Camilloni, David Horner, Thomas Vaccari, Federico Zambelli, Matteo Chiara (disability support).

#### **Degree Course website**

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

Email: [biotecindamb@unimi.it](mailto:biotecindamb@unimi.it)

Email: [molbioinfo@unimi.it](mailto:molbioinfo@unimi.it)

#### **International Students - Welcome Desk**

Email: [international.students@unimi.it](mailto:international.students@unimi.it)

#### **Student administrative office**

Via Celoria, 22 Tel. (0039) 199188128 / From abroad 0039 056676357. Students Information Service:

<http://www.unimi.it/ENG/student/52904.htm> E-mail: [www.unimi.infostudente.it](http://www.unimi.infostudente.it)

#### **Student information office**

Via Celoria, 26 Opening times: from Monday to Friday, 10-11:45 <http://www.ccdbiotec.unimi.it> Email: [molbioinfo@unimi.it](mailto: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 2019/2020 students can contact Prof. Carlo Camilloni, David Horner (tutor for Erasmus plus programme), Martin Kater 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 to earn 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.

In order to get their degree, students are required to certify their knowledge of the English language at the B2 level. This level can be certified in one of the following ways:

- by submitting their language certificate, taken no more than 3 years before its submittal and attesting a B2 or higher level (for the list of the language certificates which are accepted by the University of Milan, please refer to the website: <http://www.unimi.it/studenti/100312.htm>). Students can submit their language certificate during the immatriculation procedure or send it to the Language Centre of the University of Milan (SLAM) via the Infostudente service.
- by sitting the placement test run by SLAM, during the first year exclusively, from September to February. Should they not pass the Placement Test, students will have to attend the English language course organized by SLAM.

All students who do not have a valid language certificate must sit the Placement Test. Those students who do not sit the

Placement test by February or do not pass the end of course test in one of the 6 attempts granted will have to get a language certificate outside the University of Milan within their degree.

### **Compulsory attendance**

Attendance to frontal lessons is strongly recommended. The experimental project leading to the final dissertation is considered mandatory for the Master Degree.

### **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 Semester starts on October 1st 2019 and ends on January 20th 2020.

The second Semester starts on March 2nd 2020 and ends on June 19th 2020

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 2019/2020, Prof. D. Horner, Prof. C. Compagno, Prof. L. Popolo) 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](http://www.unimi.it) > Studenti > Studiare all'estero > Erasmus+

For assistance please contact:

International Mobility Office

Via Festa del Perdono, 7 (first floor)

Phone: (+39) 02.503 13501-13502-13495-12589

e-mail: [mobility.out@unimi.it](mailto:mobility.out@unimi.it)

[international.education@unimi.it](mailto:international.education@unimi.it)

## **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.

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 some (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.

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**

### 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>

Students can apply for admission from March 1st 2019 to September 13th 2019. 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 by December 31st 2019). Students coming from other Universities upon graduation (by December 31st 2019) must present degree certification at the Segreteria Studenti.

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

20

<b>1st COURSE YEAR Core/compulsory courses/activities</b>				
Scheduling	Learning activity	Module/teaching unit	Ects	Sector
	English proficiency B2 (3 ECTS)		3	L-LIN/12
1 semester	Biotechnological products and processes		6	CHIM/11, CHIM/06
1 semester	Functional genomics and bioinformatics		10	BIO/11, BIO/18
1 semester	Methods in bioinformatics		6	INF/01
1 semester	Molecular and cellular microbiology		6	BIO/19, BIO/18
1 semester	Rational design and structural characterization of bioactive molecules		6	CHIM/02, CHIM/06
2 semester	Advanced molecular and cellular biotechnology		10	BIO/11, BIO/06
2 semester	Advanced plant cell biotechnology		6	BIO/18, BIO/04
2 semester	Protein engineering and molecular enzymology		6	BIO/10
			Total number of compulsory credits/ects	59
<b>Further elective courses</b>				
<b>The student must choose at least two of the following courses</b>				
1 semester	Bioimaging		6	FIS/07, FIS/03
1 semester	Biotechnological and molecular strategies in the control of parasites and vector-borne diseases		6	VET/06
1 semester	Nanotechnology for biomedical applications and biosensors		6	CHIM/01, CHIM/06
1 semester	Patenting and technology transfer		6	IUS/01, AGR/01, IUS/04
1 semester	Structural bioinformatics		6	BIO/11, BIO/10, FIS/07, INF/01
2 semester	Advanced bioinformatics for biotechnology		6	BIO/11, INF/01
2 semester	Macromolecular structural biology		6	BIO/10
2 semester	Molecular breeding and plant genetics		6	AGR/07, BIO/18
<b>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&amp;B and the contents not overlapping with those of mandatory and guided through courses in the study plan.</b>				
<b>Four credits can be acquired by extending the thesis project, upon presenting a motivated written request that must be approved by the MB&amp;B Study Plan Committee.</b>				
<b>End of course requirements</b>				
	Thesis project and final dissertation		39	ND
			Total number of compulsory credits/ects	39