



**UNIVERSITA' DEGLI STUDI DI MILANO**  
**PROGRAMME DESCRIPTION - ACADEMIC YEAR 2020/21**  
**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, Matteo Chiara, David Horner, (Academic guidance tutors)  
Proff. Veronica Gregis, Concetta Compagno (Erasmus and international mobility tutors)  
Prof. Thomas Vaccari (Study plan tutor)  
Prof. Federico Zambelli (Master's degree admission tutor)

#### **Degree Course website**

<http://mbb.cdl.unimi.it>

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

<http://www.unimi.it/en/education/faculties-and-schools/science-and-technology/industrial-biotechnology>

<http://www.unimi.it/en/education/molecular-biotechnology-and-bioinformatics>

#### **Academic Services Office**

Milan - Via Celoria, 26. Presently by email only. Email: [biotecindamb@unimi.it](mailto:biotecindamb@unimi.it)

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

Milan - Via S. Sofia, 9/1. To contact the office or book an appointment: Email: [international.students@unimi.it](mailto:international.students@unimi.it)

#### **Student administrative office**

Milan - Via Celoria, 18 Tel. 0250325032 <https://www.unimi.it/en/node/360> <https://www.unimi.it/en/node/359>  
<https://www.unimi.it/en/node/359>

### **CHARACTERISTICS OF DEGREE PROGRAMME**

#### **General and specific learning objectives**

The MB&B Master degree aims at providing students with advanced skills in molecular biotechnology and 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 its interest, choosing from courses in plant genetics, nanotechnology, biophysics, molecular microbiology, molecular parasitology, structural biology, patenting and technology transfer. The MB&B Master degree combines lecture-based courses (in the first year and 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 bioinformatics 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)

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 critically.

#### 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

The students will develop their ability to understand, discuss, and transfer the taught subjects in the English language, and their 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 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 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 graduates 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 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.

Entry requirement requires a knowledge of English equal to or higher than level B1 of the Common European Framework of Reference for Languages (QCER).

Level B1 is verified during the admission phase in the following ways:

- linguistic certification obtained no later than 3 years, of B1 or higher level (for the list of linguistic certifications recognized by the University, see the website:

<https://www.unimi.it/en/node/297/>). The certification must be loaded during the admission procedure;

- B1 level of English achieved during a bachelor’s three-year degree course through the SLAM course. Checks made less than four years ago are considered valid. Verification takes place ex officio without any need to attach certificates;

- B1 level of English achieved during a bachelor’s three-year degree course at an Italian University. Checks made less than four years ago are considered valid. The university certification must be loaded during the admission procedure.

## Programme structure

Didactic modality and its articulation

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’s 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 placement testing (see Language test paragraph).

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 incontestable 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.

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 deadline for submitting the study plan will be indicated on the web page: <https://www.unimi.it/en/node/122/>. 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 the student in order to grant admission to the final dissertation.

Lecture timetable

The first Semester starts on October 5th, 2020 and ends on January 22nd, 2021.

The second Semester starts on March 1st, 2021 and ends on June 18th, 2021

Lesson timetables will be available at the URL:

<https://easystaff.divisi.unimi.it/PortaleStudenti/>

or by downloading the official student Class timetable app of the University of Milan “Lezioniunimi”

### Exams

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.

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 occur for exams not managed within the MB&B Master degree.

### Tutoring

Tutors will provide students with academic advice, guidance on their course choices and personal advice. For the academic year 2020/2021 students can contact Prof. Carlo Camilloni, David Horner, Matteo Chiara, Federico Zambelli, and Thomas Vaccari at their standard institutional e-mail addresses (name.surname@unimi.it). Students that need tutoring may also contact the secretary’s e-mail address: biotecindamb@unimi.it.

### Language test / computer literacy test

To obtain the degree, students are required to demonstrate an English language proficiency at level B2 within the Common European Framework of Reference for Languages (CEFR). This level can be assessed in the following ways:

- by submitting the language certificate achieved no more than three years prior to the submission, at level B2 or higher, recognised by the University (the list of recognised language certificates can be found at <https://www.unimi.it/en/node/297/>). The language certificate must be uploaded during the admission process;
- by taking the Placement Test, organised by SLAM exclusively during the first year, from October to January. Students who fail to reach level B2 will have to attend an English course organised by SLAM. The Placement Test is compulsory for all students who do not have a valid language certificate.

Students who do not take the Placement Test within the deadline and students who fail the SLAM end-of-course test within six attempts will have to obtain a language certificate within the year in which the language exam is scheduled.

- Level of English assessed through a computer-based test during the bachelor’s degrees obtained at the University of Milan. English levels B2 achieved no more than four years previously are deemed valid. The verification is automatic with no need to attach any certificate during the application phase.

### Compulsory attendance

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

### 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. 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.

### Degree programme final exam

For the admission to the final exam, the student must have passed all the exams in his/her study plan. The final exam consists of the oral presentation and discussion of the main results of the thesis project 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 30 different 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 MB&B degree program supports the international mobility of the University program: MB&B lecturers (for the academic year 2020/2021, Proff. Veronica Gregis and Concetta Compagno) act as tutors for students interested in the Erasmus + program, in order to guide students in their choice of the most suitable program for their formation. Every January, the Erasmus + program is presented to the MB&B students through a local event organized by the coordinator of the Erasmus + program of the Industrial Biotechnology area (Prof. Veronica Gregis).

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 to Erasmus Studio can be found at the following link: <https://www.unimi.it/en/international/study-abroad/studying-abroad-erasmus>.

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

The students of the University of Milan can participate in mobility programmes, which last 3 to 12 months, through a public selection procedure.

Ad hoc commissions will evaluate:

- 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 generally begins around February each year with the publication of a call for applications specifying the destinations, with the respective programme duration, requirements and online application deadline.

Every year, before the deadline for the call, the University organizes informative meetings to illustrate opportunities and rules for participation to students.

### Erasmus+ scholarship

The European Union grants the winners of the Erasmus+ programme selection a scholarship to contribute to their mobility costs, which is 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.

Learn more at <https://www.unimi.it/en/international/study-abroad/studying-abroad-erasmus>

For assistance, please contact:

International Mobility Office

Via Santa Sofia, 9/1 (second floor)

Tel. 02 503 13501-12589-13495-13502

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

Desk opening hours: Monday to Friday 9 am - 12 noon

## **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: <https://www.unimi.it/en/node/92/>

### 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

- <https://www.unimi.it/en/node/92/>

- <https://www.unimi.it/en/education/molecular-biotechnology-and-bioinformatics>

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

20

<b>1st COURSE YEAR Core/compulsory courses/activities</b>				
<b>Scheduling</b>	<b>Learning activity</b>	<b>Module/teaching unit</b>	<b>Ects</b>	<b>Sector</b>
	English proficiency B2 (3 ECTS)		3	ND
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