



**UNIVERSITA' DEGLI STUDI DI MILANO**  
**PROGRAMME DESCRIPTION - ACADEMIC YEAR 2024/25**  
**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. Carlo Camilloni

#### **Tutors - Faculty**

Proff. Carlo Camilloni, Matteo Chiara (Academic guidance tutors)

Proff. Veronica Gregis, Concetta Compagno, David Horner (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>

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

#### **Academic Services Office**

Milan - Via Celoria, 26 Tel. 0250314870 By appointment. <https://informastudenti.unimi.it/saw/ess?AUTH=SAML>

#### **Boards**

Prof. Veronica Gregis, Prof. Concetta Compagno (Erasmus); Prof. Carlo Camilloni, Prof. David Horner (Study mobility); Prof. Carlo Camilloni, Prof. Thomas Vaccari (Study Plan); Prof. Carlo Camilloni, Prof. Federico Zambelli (Admission).

#### **Disability manager**

Prof. Matteo Chiara

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

Milan - Via S. Sofia, 9/1 <https://www.unimi.it/en/international/coming-abroad/international-students-office-welcome-desk>

#### **Student administrative office**

Milan - Via Celoria, 18 Tel. 0250325032 The front offices receive in the days and times indicated on the following webpage:  
<https://www.unimi.it/en/study/student-services/welcome-desk-informastudenti/student-desks-locations-and-opening-hours>

### **CHARACTERISTICS OF DEGREE PROGRAMME**

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

The MB&B Master's degree aims to provide students with advanced skills in molecular biotechnology, 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's degree is to give the students the broad theoretical and practical background needed to apply their knowledge to various biological/biotechnology problems.

A specific goal of MB&B includes providing 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, students will have the opportunity to develop skills in further specific disciplines of their interest, choosing from courses in plant genetics, nanotechnology, biophysics, molecular microbiology, molecular parasitology, structural biology, patenting and technology transfer (the latter, included in the University project for the development of soft skills). The MB&B Master's degree combines lecture-based courses (in the first year and the first term of the second year) with 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, 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**

The main objective of the MB&B Master Degree is to form graduates fully capable of applying the knowledge they have acquired. This will be achieved both through the teaching classes, in which a lot of time will be devoted to problem-solving and applied studies, 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 increasing the students' ability to apply their knowledge.

#### **3. Autonomy/judgment (Making judgments)**

To foster the development of capacity for 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 concepts and information critically.

#### **4. Communication skills**

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 an oral presentation and discussion of their results, as well as writing their dissertation in English.

#### **5. Learning skills**

Students will develop their ability to understand, discuss, and transfer the subjects taught in the English language, and their ability to access and organize databases and other information on the internet. 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 with both their peers and the instructors.

### **Professional profile and employment opportunities**

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

research laboratories in both private and public institutions, management of production facilities in the biotechnological industry, including diagnostics, chemicals, and the agro-food industry; promotion of scientific development and technological innovation in Research & Development in various 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's 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, with reference to the professions here listed: biologist and similar professions, biochemist, biophysicist, biotechnologist.

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 and structures

- 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's 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 at the time of the admission request from an accredited college or university, and strong knowledge in most (or all) of the following areas: genetics, molecular biology, microbiology, cell biology, biochemistry. A dedicated commission, designated by the Academic Board, is responsible for collegially analyzing the curriculum studiorum of the applicants in order to verify that the minimum requirements for the registration are satisfied. If deemed necessary, the commission may integrate this documentary assessment with an interview with the candidates. The Laurea Magistrale does not foresee a programmed number of students, with a maximum of 25 places set aside for non-EU students residing outside Italy.

In addition to the aforementioned curricular requirements, a knowledge of English equal to or higher than level B1 of the Common European Framework of Reference for Languages (QCER) is required.

Proficiency in English at a B1 level or higher under the Common European Framework of Reference for Languages (CEFR) is required for admission.

The B1-level requirement will be ascertained by the University Language Centre (SLAM) upon admission as follows:

- Language certificate at or above B1, obtained no more than three years earlier. For the list of language certificates recognized by the University please review: <https://www.unimi.it/en/node/39267>). The certificate must be uploaded when submitting the online application;
- English level achieved during a University of Milan degree programme and certified by the University Language Centre (SLAM) no more than four years before the date of admission application. In this case the process is automatic, the applicant does not have to attach any certificates to the application;
- Placement test administrated by the University Language Centre (SLAM) according to the calendar published on the website: <https://www.unimi.it/en/node/39267>

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

Applicants who do not take or pass the placement test will be required to obtain a language proficiency certificate recognized by the University (see: <https://www.unimi.it/en/node/39322>) and deliver it to the SLAM via the InformaStudenti service by the deadline fixed for the master's programme (<https://www.unimi.it/en/node/39267>).

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

### **Eligibility assessment**

The curriculum studiorum of the applicants will be evaluated by an Admission Committee composed of the coordinator and at least two lecturers of the Master's degree. Successful applicants will receive notice of their eligibility and will be allowed to enroll in the Master's degree program.

For details of application procedures see: <https://www.unimi.it/en/study/bachelor-and-master-study/degree-programme-enrolment/enrolment-masters-programme/open-admission-master-programmes>

The Admission Committee may require an interview with the applicant in order to better assess their eligibility. For extra-EU candidates applying for visas, the deadline for application will be on 30 April 2024, in consideration of the particular timing related to the issuance of the visa and the need to select a limited number of places, as required by current regulations.

### **Programme structure**

- Teaching organization and delivery mode

The MB&B Master's degree is a 2-year course; each year is divided into two terms. The programme includes various activities, including frontal lectures, practical classes, and the 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 the second year. Finally, candidates 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).

#### - Courses

Compulsory courses:

Advanced molecular and cellular biotechnology  
Advanced plant cell biotechnology  
Biotechnological products and processes  
Functional genomics and bioinformatics  
Language proficiency (English)  
Methods in bioinformatics  
Molecular and cellular microbiology  
Protein engineering and molecular enzymology  
Rational design and structural characterization of bioactive molecules

Elective courses:

Advanced bioinformatics for biotechnology  
Bioimaging  
Biotechnological and molecular strategies in the control of parasites and vector-borne diseases  
Macromolecular structural biology  
Molecular breeding and plant genetics  
Nanotechnology for biomedical applications and biosensors  
Patenting and technology transfer  
Structural bioinformatics

#### - Conscientious objection policy

In the MB&B Master's degree, the use of animals for teaching purposes is not allowed as stated by the 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, which 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 submission

The students will submit the Study plan, with the indication of elective courses they intend to attend, and how they wish to utilize the 10 CFU of freely chosen activities, at the first year. Information about dates and procedures for submitting the official study plan: <https://www.unimi.it/en/study/bachelor-and-master-study/following-your-programme-study/plan-study>.

The Study plan must be approved by a Study Plan Committee, composed of MB&B faculty. 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.

In addition, students are invited to consider the activities included in the University project for the development of soft skills: <https://www.unimi.it/en/study/bachelor-and-master-study/following-your-programme-study/soft-skills>

If interested, the soft skills courses must be included in the study plan, they are of compulsory attendance, they have a defined number of places and they can only be selected by the students if they have been subscribed by the Master's degree program to which students belong. <https://mbb.cdl.unimi.it/en/courses>

#### - Schedule of teaching activities

The first semester starts on September 23rd, 2024, and ends on January 17th, 2025.

The second semester starts on March 3rd, 2025, and ends on June 20th, 2025.

#### - Class timetable

Lesson timetables are 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). 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 registration of the score.

- Exam sessions and assessment methods

Exam sessions are scheduled during a recess at the end of each term. For each course, at least 6 exam sessions 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's degree. 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.

Exam registration is compulsory and must be carried out through the UNIMIA - exams registration online service (available at <https://mbb.cdl.unimi.it/en/study/exams>) in order to allow CFUs to be automatically accredited to the student's personal record.

### **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.

### **Laboratories**

The MB&B course is characterized by an intense laboratory activity that is mainly carried out in the internship activity for the thesis.

### **Libraries**

The main campus library is the "Biblioteca di biologia, informatica, chimica e fisica" (Via Celoria 18). See: <http://www.sba.unimi.it/en/libraries/13453.html>

### **Tutoring**

Tutors will provide students with academic advice, guidance on their course choices, and personal advice. For the academic year 2024/2025, students can contact prof. Carlo Camilloni, prof. David Horner, prof. Matteo Chiara, prof. Federico Zambelli, and prof. Thomas Vaccari at their standard institutional e-mail addresses (name.surname@unimi.it). Students that need tutoring may also contact the secretariat's e-mail address: [biotecindamb@unimi.it](mailto:biotecindamb@unimi.it)

### **Language test / computer literacy test**

In order to obtain their degree, students must be proficient in English at a B2 level, certified as follows:

- by submitting a B2 or higher level language certificate issued no more than three years prior to the date of application. You will find the list of language certificates recognized by the University at: <https://www.unimi.it/en/node/39322>). If not submitted during the application process, the certificate must be uploaded when enrolling, or subsequently at: <http://studente.unimi.it/uploadCertificazioniLingue>;
- B2 or higher level achieved earlier and validated during the application process;
- B2 or higher level achieved during the admission test;
- by taking a placement test administered by the University Language Centre (SLAM) between October and January of year 1.

All those who do not achieve B2 or higher level will be required to attend a B2-level English course administered by the University Language Centre (SLAM) during the second semester of year 1.

Those who do not attend the course or do not pass the end-of-course exam after six attempts must obtain the necessary certification privately before graduating.

### **Compulsory attendance**

Attendance to frontal lessons is strongly recommended. The experimental project leading to the final dissertation is mandatory for the obtainment of the Master's 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 the University of Milan or in another research laboratory, upon previous authorization of the Coordinator of the Master's degree. The experimental project accounts for 39 CFU, and thus it represents a major activity within the Master's degree program. Furthermore, 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. The dissertation will describe original research carried out by the student under the supervision of a researcher approved by the MB&B Master's degree program, and its subject must be consistent with the goals and the disciplines taught in the Master's degree.

### **Degree programme final exam**

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 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. Each Laude in the exam score provides an additional 0.5 points. The final score 110/110 cum Laude may be acquired with the unanimous approval of the thesis committee if the candidate achieves at least 112 total points. Students who have carried out thesis internship abroad or who have obtained a weighted average of at least 28/30 in the exams they passed in the Erasmus+ program are awarded 1 additional point (within the 10 available points) in the discussion of the final exam, as an incentive and recognition.

The 120 CFU required to take the final test for the obtainment of the master's degree are acquired, in compliance with the above rules.

## **EXPERIENCE OF STUDY ABROAD AS PART OF THE DEGREE PROGRAM**

The University of Milan supports international mobility by providing its students with the opportunity to spend study and internship periods abroad. It is a unique chance to enrich your educational path in a new exciting environment.

The agreements entered into by the University with over 300 universities from the 27 EU member countries under the European Erasmus+ programme allow regularly enrolled students to carry out part of their studies at one of the partner universities or to undertake internships at companies, training and research centres and other organizations.

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

### **Study and internships abroad**

The MB&B degree program supports the international mobility of the University program: MB&B lecturers (for the academic year 2024/2025, Prof. Veronica Gregis, and Prof. 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 training. 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 framework of the Erasmus+ program, the MB&B Master course has in place agreements with Universities in Germany, Spain, France, Norway, Denmark, and The Netherlands, all offering courses in English. Calls for participation to Erasmus + study program 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's degree and carrying out the dissertation's experimental project. Students admitted to the mobility program must submit a study plan detailing the training activities that they intend 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 period at the home University. The proposed activities must be consistent with the goals and the contents of the Master's degree. The MB&B Student Mobility Committee must approve the study plan, and/or 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 recorded in his/her career record, 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, through a public selection procedure.

Ad hoc commissions will evaluate:

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

Call for applications and informative meetings

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

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

Erasmus+ scholarship

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

Language courses

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

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

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

For assistance, please contact:

International Mobility Office

Via Santa Sofia 9 (second floor)

Tel. 02 503 13501-12589-13495-13502

Contacts: InformaStudenti; [mobility.out@unimi.it](mailto:mobility.out@unimi.it)

Student Desk booking through InformaStudenti

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

### Application and enrolment information and procedures

The application must be submitted online according to the general University rules, following the instructions at this URL:

<https://www.unimi.it/en/node/183/>

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

### Links to enrolment information and procedures

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

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

25

<b>1st COURSE YEAR Core/compulsory courses/activities</b>				
Scheduling	Learning activity	Module/teaching unit	Ects	Sector
	English proficiency B2 (3 ECTS)		3	NN
1 semester	Biotechnological products and processes		6	(3) CHIM/11, (3) CHIM/06
1 semester	Functional genomics and bioinformatics		10	(4) BIO/11, (6) BIO/18
1 semester	Methods in bioinformatics		6	INF/01
1 semester	Molecular and cellular microbiology		6	(5) BIO/19, (1) BIO/18
1 semester	Rational design and structural characterization of bioactive molecules		6	(3) CHIM/02, (3) CHIM/06
2 semester	Advanced molecular and cellular biotechnology		10	(5) BIO/11, (5) BIO/06
2 semester	Advanced plant cell biotechnology		6	(3) BIO/18, (3) BIO/04
2 semester	Protein engineering and molecular enzymology		6	BIO/10
Total number of compulsory credits/ects			59	
<b>Further elective courses</b>				
The student must choose at least two of the following courses				
1 semester	Bioimaging		6	(4) FIS/07, (2) 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	(3) CHIM/01, (3) CHIM/06
1 semester	Patenting and technology transfer		6	(1) IUS/01, (1) AGR/01, (4) IUS/04
1 semester	Structural bioinformatics		6	(1) BIO/11, (1) BIO/10, (3) FIS/07, (1) INF/01
2 semester	Advanced bioinformatics for biotechnology		6	(4) BIO/11, (2) INF/01
2 semester	Macromolecular structural biology		6	BIO/10
2 semester	Molecular breeding and plant genetics		6	(5) AGR/07, (1) BIO/18
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.				
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.				
<b>End of course requirements</b>				
	Thesis project and final dissertation		39	NN
Total number of compulsory credits/ects			39	

## COURSE PROGRESSION REQUIREMENTS

There are no propaedeutic courses that limit progression from the first to the second year.