UNIVERSITA' DEGLI STUDI DI MILANO
PROGRAMME DESCRIPTION - ACADEMIC YEAR 2022/23
IN
MOLECULAR BIOTECHNOLOGY AND BIOINFORMATICS (Classe LM-8)
Enrolled from 2016/2017 academic year

HEADING

Degree classification - Denomination and code:	LM-8
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, 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

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 Tel. 0250314870 By appointment. Email: molbioinfo@unimi.it

Boards

Prof. Veronica Gregis, Prof. Concetta Compagno (Erasmus); Prof. Marco Nardini, Prof. David Horner (Study mobility); Prof. Marco Nardini, Prof. Thomas Vaccari (Study Plan).

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 https://www.unimi.it/en/node/359

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 MB&B Master 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:
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.

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'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.

In addition to the aforementioned curricular requirements, 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 Bachelor's degree programme through SLAM courses and tests. The test must have been passed within the last four years. It will be assessed administratively, without the applicant having to attach any certificates;
- Placement Test delivered by the University Language Centre (SLAM), which will take place according to the schedule posted to 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 invited to take the test through the admission procedure.
Candidates who do not sit or pass the placement test will have until 31 December 2022 to obtain and submit a recognized certificate to SLAM.
Students who do not meet the requirement by 31 December will not be admitted to the Master's degree programme and may not sit further tests.

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 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 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 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.

-Schedule of teaching activities
The first semester starts on September 26th, 2022, and ends on January 20nd, 2023.
The second semester starts on March 1st, 2023, and ends on June 16th, 2023.

- Class timetable
Lesson timetables are available at the URL:
https://easystaff.divsi.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 assessment of the student.

- Exam sessions and assessment methods
Exam sessions are scheduled during a 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. 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.

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 2022/2023, 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 secretary's e-mail address: biotecindamb@unimi.it

Language test / computer literacy test

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

- Through a language certificate at a B2 level or higher, as submitted during the admission procedure;
- Through the entrance test (B2 level or higher);
- Through a Placement Test, which is delivered by the University Language Centre (SLAM) during year I only, from October to January (B2 or higher).

All students who do not have a B2 level or higher will be required to attend a B2-level English course, which will be delivered by the University Language Centre (SLAM), in the second semester of year I only.

Those who do not attend the course or do not pass the end-of-course test within six attempts must obtain a paid language certificate by graduation.

Compulsory attendance

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

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. The 120 CFU required to take the final test for the achievement of the master's degree are acquired, in compliance with these regulatory 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 2022/2023, 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 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's degree, as well as to carry out the experimental project for the dissertation. Students admitted to the mobility program must submit a study plan detailing the training activities that they plan 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's 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 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
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/92/
See also https://www.unimi.it/en/education/molecular-biotechnology-and-bioinformatics

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's degree. Successful applicants will receive notice of their eligibility and will be allowed to enrol in the Master degree program. The Admission Committee may require an interview with the applicant in order to better assess their eligibility.
The deadline for application for Italians and EU-candidates is August 26, 2022. For extra-EU candidates applying for visas, the deadline for application is May 31, 2022, 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.

Links to enrolment information and procedures

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

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

25

1st COURSE YEAR Core/compulsory courses/activities

Scheduling	Learning activity	Module/teaching unit	Ects	Sector
	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	

Further elective courses

The student must choose at least two of the following courses

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

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.

End of course requirements

	Thesis project and final dissertation		39	ND
		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.