



UNIVERSITA' DEGLI STUDI DI MILANO
PROGRAMME DESCRIPTION - ACADEMIC YEAR 2024/25
MASTER DEGREE
Biology Applied to Research in Biomedicine (Classe LM-6)
Enrolled from 2011/2012 academic year

HEADING

Degree classification - Denomination and code:	LM-6 Biology
Degree title:	Dottore Magistrale
Length of course:	2 years
Credits required for admission:	180
Total number of credits required to complete programme:	120
Years of course currently available:	1st , 2nd
Access procedures:	Open, subject to entry requirements
Course code:	F92

PERSONS/ROLES

Head of Study Programme

Prof.ssa Isabella Dalle Donne

Degree Course Coordinator

Prof.ssa Graziella Cappelletti (Email:graziella.cappelletti@unimi.it)

Tutors - Faculty

Tutor per l'orientamento: Prof.ssa Marta Valenza (orientamento in entrata), Prof.ssa Federica Marini e Prof. Paolo Gandellini (orientamento in uscita)

Tutor per la mobilità internazionale e l'Erasmus: Prof.ssa Cristina Bonza e Prof.ssa Federica Marini

Tutor per i piani di studi: Prof.ssa Graziella Cappelletti e Prof.ssa Alida Amadeo

Tutor per stage, tirocini, laboratori e tesi di laurea: Prof.ssa Annalisa Bucchi, Prof.ssa Giuseppina Caretti

Tutor per trasferimenti: Prof.ssa Graziella Cappelletti

Tutor per ammissioni lauree magistrali: Prof.ssa Graziella Cappelletti, Prof.ssa Elisabetta Tanzi, Prof.ssa Alida Amadeo, Prof.ssa Marta Valenza, Prof.ssa Cristina Tringali, Prof. Alessandro Rufini, Prof.ssa Giuseppina Caretti

Tutor per riconoscimenti crediti: Prof.ssa Graziella Cappelletti

Degree Course website

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

Admission information contact email

Email: Orientamento.Barb@unimi.it

Admissions and enrolment

<https://www.unimi.it/it/studiare/frequentare-un-corso-di-laurea/iscriversi/iscriversi-un-corso-magistrale>

Disability and SLD academic tutor (appointed by the Academic Board):

Prof.ssa Diletta Dolfini Email: diletta.dolfini@unimi.it

New student information center

via Celoria, 26 - 2° piano, torre A. <https://informastudenti.unimi.it/saw/ess?AUTH=SAML>

Student registrar

Via Celoria, 18 Phone 0250325032 <https://www.unimi.it/it/node/360> <https://www.unimi.it/it/node/359>

Study programme head and course management

via Celoria, 26 - 2° piano, torre A. <https://informastudenti.unimi.it/saw/ess?AUTH=SAML>

CHARACTERISTICS OF DEGREE PROGRAMME

General and specific learning objectives

The Master of Science (M.Sc.) programme in BIOLOGY APPLIED to BIOMEDICAL RESEARCH (BARB, Class LM-6 Biology) aims to provide students with the theoretical and practical knowledge necessary to manage individually or in collaboration with other professional figures their research in both basic and applied aspects of the biomedical field.

The M.Sc. in BARB proposes the basic flexible scheme applied previously and introduces some substantial new features that allow a better characterization of the biomedical aspects of the M.Sc. programme and a better identification of the professional figure of the biomedical scientist and its role in all aspects of basic/applied research activities.

Specific educational aims are:

- 1) to provide students with the basic notions of biological processes underlying the physiology of organs and systems, their pathological dysfunctions and their modulation by pharmacological and other interventions, specifically in man.
- 2) to teach students how to apply theoretical notions to applications of biomedical interest for humans and in relation to the interaction with the environment;
- 3) to provide tools for understanding and practicing theoretical knowledge in the lab;
- 4) to foster the most updated knowledge in the biomedical field by use of specific teaching modules whose content will be continuously refreshed.

Expected learning outcomes

In accordance with the principles of European harmonization, the expected learning outcomes developed by graduates in the M.Sc. meet the specific requirements identified according to the Dublin Descriptors system:

- Knowledge and ability to understand, in terms of acquiring: cultural competence with reference to the specific field of applied biology in biomedical research and related application areas and to the areas of general and human physiology, human anatomy, general and human pathology, pharmacology, clinical molecular biology, epidemiological and prevention sciences.

- In-depth multidisciplinary application skills for biological analysis, methodological, technological and instrumental, with reference to the mastery of instrumental methodology, use of analytical tools of biomedical investigation, techniques of data acquisition, processing and interpretation, supporting mathematical and computer tools, with the application of a scientific method of investigation specifically dedicated to biomedical research.

- Acquisition of conscious autonomy of judgment with reference to responsibility and management of projects, facilities, and personnel; identification of new perspectives and innovative development strategies; evaluation, interpretation, and reprocessing of literature data; professional ethics.

- Acquisition of appropriate skills and tools for communication and information management with reference to abilities to communicate fluently in a foreign EU language using disciplinary vocabulary, develop and present research projects, organize and lead research groups, illustrate research results.

- Acquisition of appropriate skills for continuous development and deepening of competencies, with reference to consultation of specialized databases, learning innovative technologies, advanced cognitive tools for continuous updating of knowledge.

The M.Sc. BARB aims to train master's degree graduates capable of working in the creative, organizational and operational stages of research in the biomedical and bio-health field in public and private, European and non-European laboratories, present in universities, hospitals, research centers, local and state agencies, pharmaceutical research and development companies and others; participating in the theoretical and practical development of new technologies in the biological field applied to biomedicine in industries in the field; managing with responsible tasks the organization of work in public and private analytical laboratories.

This master's degree is also an optimal cultural basis for eventual continuation of advanced training with a PhD.

Professional profile and employment opportunities

Master's graduates in Biology Applied to Research in Biomedicine will be able to hold high-profile positions in the field of biological research applied to human beings, with particular regard to the biological processes underlying the physiology of organs and systems, their pathological dysfunctions and the modulation of biological processes by pharmacological interventions.

Pursuant to Presidential Decree 328/01, graduates may sit for the State exam to qualify for the profession of biologist and be included in the National Council of Biologists - Ordine Nazionale dei Biologi (section A). They may also apply for PhD programmes, postgraduate schools and second-level vocational master programmes.

The programme aims to train future biologists, biochemists, biophysicists, biotechnologists, researchers and graduate technicians in biological sciences. Professional skills provided by the Master's degree in BARB are coherent with the national guidelines defined by the Board of Biologists of Italian Universities (Collegio dei Biologi delle Università Italiane - CBUI) during its periodic meetings, which also involved representatives from the National Council of Biologists, trade unions for biologists and other institutions and companies in the field.

Master's graduates in Biology Applied to Research in Biomedicine will possess specific and updated expertise in the field of theoretical and experimental biomedical research and have a deep knowledge of the biological principles that govern

mechanisms and vital processes in human beings.

Their theoretical know-how is complemented by a specific knowledge of the most advanced biomedical technologies used in basic research, as well as in healthcare and industrial applications, enabling graduates to be autonomous in their work and contribute to the advancement of knowledge and applications in the biomedical field. The overall structure and learning outcomes of this degree programme have been designed based on emerging employability areas for biologists at a regional, national and European level. The degree programme is specifically designed to provide students with the skills needed to practise as biologists. Moreover, graduates with specific expertise and cultural skills may find job opportunities beyond Italy's borders, for example in the European market.

Graduates will be able to:

1. Work in laboratories of public and private entities conducting biomedical research, e.g. universities, hospitals, scientific institutes for research, hospitalisation and healthcare (IRCCS), research centres, local government offices and pharmaceutical companies, in Europe and beyond;
2. Support the development of new biomedical and biohealth technologies at manufacturing companies in this field;
3. Organise work activities within public and private laboratories, also taking on managerial tasks;
4. Work for agencies specialising in scientific communication and dissemination, or academic publishers specialising in the biomedical sector;
5. Work as freelance professionals to provide biomedical consulting services.

Initial knowledge required

Applicants to the programme must hold minimum curricular requirements and prove adequate knowledge (Ministerial Decree 270/04).

ADMISSION REQUIREMENTS

Graduates in Biological Sciences (Class L-13) fully meeting curricular requirements can access the Master's Degree Programme in BIOLOGY APPLIED TO RESEARCH IN BIOMEDICINE, provided that their course of studies is consistent with the CBUI Italian National Board's guidelines, as duly certified. These guidelines, provided in the CBUI model table, specify the required academic fields and the respective recommended credits (CFU): 66-96 CFU in basic biological disciplines (BIO/01, BIO/02, BIO/04, BIO/05, BIO/06, BIO/07, BIO/09, BIO/10, BIO/11, BIO/18, BIO/19); 12-15 CFU in basic non-biological chemical disciplines (CHIM/01, CHIM/02, CHIM/03, CHIM/06); 15-18 CFU in basic non-biological mathematical, physical and computer science disciplines (MAT/01-09, FIS/01-08 and INF/01).

The programme can also be accessed by graduates of the same class (L-13), who have not followed a course of studies in line with the CBUI's guidelines, or of class L-12 - Biological Sciences pursuant to Ministerial Decree 509/99, or of other classes, as long as they meet certain curricular requirements. More specifically, they must have earned an adequate number of CFU (normally not less than 90 CFU) in groups of academic fields equivalent or similar to those listed in the table for class L-13 - Biological Sciences across non-biological and basic biological disciplines, according to a quantitative logic similar to that of the above mentioned CBUI criteria.

The consistency of the study plans of other degree classes with these criteria will be assessed by a special board.

Students from degree programmes outside class L-13 should send their curriculum for assessment to orientation services (barb@unimi.it) or the academic office (cl.biol@unimi.it) well in advance, ideally during their Bachelor's programme. Based on your curriculum, you may be required to take any additional exams or earn more credits before applying for enrolment.

ADMISSION ASSESSMENT

The educational background required for admission to the Master's degree programme includes adequate basic training in biology, allowing the candidate to pursue advanced-level studies. The admission assessment will include:

1. the assessment of the candidate's previous curriculum;
2. the candidate's knowledge and skills.

The candidate's knowledge and aptitude will be key for admission. A board made up of at least three faculty members will assess the candidate through a written exam and an individual interview. The board will award up to 20/100 for the degree mark, up to 10/100 for the curriculum of studies (type of degree, any elective courses attended/passed, other diplomas, etc.), and up to 70/100 for the interview and written exam. Candidates who have achieved an overall score of at least 60/100 will be admitted. Candidates who fail the admission assessment may not enrol on the programme for the current year.

The written exam will consist of 40 closed-ended multiple-choice questions on different areas of biology. The interview will assess the student's knowledge, motivation and potential for completing this advanced-level programme.

The written exam and interview will take place only once, in September, for all applicants, both graduates and upcoming graduates, subjected to assessment of curricular requirements. Candidates must show up before the examining board with an ID.

For 2024/2025 academic year, admission interviews will take place as follows:

- written exam at 2.00 pm on 3 September 2024, room G14, via Golgi 19
- oral interview between 9 and 12 September 2024, according to a timetable to be announced at the beginning of September.

For non-EU, non-resident students with foreign qualifications, applications will be assessed based on the qualifications, and

possibly an online interview.

Non-EU citizens residing in Italy and EU citizens access university education on equal terms with Italian citizens and therefore must go through the same assessment process as Italian candidates.

Compulsory attendance

Attendance is strongly recommended for all courses.

Internship criteria

THESIS

Thesis work and the final exam may award a total of 39 credits. Upcoming graduates are required to undertake an internship at a laboratory of the University or another public or private institution. The thesis must be an original work of biomedical interest, intended to solve a scientific problem and documenting the candidate's ability to correctly use the experimental method. Descriptive theses will not be accepted.

Upcoming graduates are required to work on their thesis for about one year at a scientific laboratory under an academic supervisor. Laboratory attendance for thesis work will be ascertained by thesis supervisors as appropriate. You will have both a thesis supervisor and a co-supervisor, and you can work on your thesis on or off campus, i.e. in any of the departments where faculty members for your DP teach, or in other departments of the University of Milan or in laboratories or non-university institutes as pre-selected based on their proven scientific reputation. Upcoming graduates may earn a portion of 39 CFU through internships or other experiences in work environments that provide specific theoretical and technical skills. The thesis can be written in Italian or English.

THESIS SUPERVISOR

All professors and researchers who are part of the Academic Board of the Department of Biological Sciences, as well as the professors and researchers of the Department of Biosciences, can be thesis supervisors.

THESIS APPLICATION AND INTERNSHIP

Upcoming graduates may submit their proposed thesis subjects in accordance with the timeline set by the Departmental Academic Board. To help students choose their topic, the following initiatives will be launched:

- 1) Web page listing thesis subjects proposed by faculty members (http://www.campagnenaturalistiche.unimi.it/offerte_tesi/);
- 2) Thesis orientation meetings for the specific academic year, with reference to the number of places available for on- and off-campus theses by area.

The thesis application outcome will be discussed with the student or notified shortly after submission. The internship activity (thesis topic, supervisor, internship start and end dates) must in any case be formalized with the course administration office and the programme coordinator.

The coordinator, or his/her deputy, will advise students to work on their thesis off campus if there are no on-campus thesis opportunities. They will direct students to an official professor of the degree programme who will act as supervisor for off-campus theses. The latter will check internship reports and ensure that the internship takes place in compliance with programme rules. The supervisor will critically assess the candidate's work and decide whether their thesis meets the requirements for a Master's Degree in Biology. The name of the research facility where experimental work was conducted must appear on the first page of the thesis.

Degree programme final exams

The final exam consists in defending a written paper on internship research in a public session before a board of 5 faculty members. The board will assess the student's skills in terms of methodology, analytical tools, data analysis and processing, as well as their ability to use the experimental method and interpret the findings of their original biomedical research work.

The degree mark will be awarded on a scale of 110, based on the weighted average of exam grades, plus up to 9 points for the final paper and up to 1 point for the career (at least 3 exams passed abroad or internship carried out abroad), graded as follows: 1-2 points sufficient, 3-4 satisfactory; 5-6 fair; 7 good; 8 very good; 9 outstanding, according to the quality of the thesis and the ability to answer questions/requests for clarification asked to the candidate during the thesis defense. For more information go to the programme website.

Graduates will be awarded the title of "Dottore Magistrale" in Biology, majoring in Biology Applied to Research in Biomedicine.

Admission requirements

To be admitted to the final exam, the student must:

- 1) have passed the exams for compulsory and elective courses, and earned the corresponding credits, including 3 credits for English language proficiency;
- 2) have completed their internship, as duly certified.

Campus

Classrooms are located in the University buildings in: Via Celoria, 26 (Biology buildings); Via Celoria, 20 (Teaching Sector); Via Golgi, 19.

The Academic Services Office is located in the Department of Biosciences, Via Celoria, 26 – Milano (Tower A, II Floor).

Laboratories

The CLM is characterized by an intense laboratory activity that is mainly carried out in the internship activity for the thesis.

Notes

In order to obtain their degree, students must be proficient in English at a B2 level under the Common European Framework of Reference for Languages (CEFR). This proficiency level may be certified as follows:

- By submitting a language certificate attesting B2 or higher level in English and issued no more than three years before the date of submission. You will find the list of language certificates recognized by the University at: <https://www.unimi.it/en/node/39322>). The certificate must be uploaded during the enrolment procedure, or subsequently to the portal <http://studente.unimi.it/uploadCertificazioniLingue>;

- By taking a placement test offered by the University Language Centre (SLAM) between October and January of the first year. Students who fail the test will be required to take a SLAM course.

The placement test is mandatory for all those who do not hold a valid certificate attesting to B2 or higher level.

Those who have not taken the placement test by the end of January or fail the end-of-course exam six times must obtain the necessary certification privately before graduating.

EXPERIENCE OF STUDY ABROAD AS PART OF THE TRAINING 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

BARB students are given the opportunity to spend part of their curriculum abroad, at a University within the European Union (EU) in the frame of the Erasmus+ program of the European Commission. BARB students can attend courses and take exams that can be included in the core curriculum and/or perform the experimental thesis work in several European Universities localized in Netherland, Norway, Ireland, Germany - where courses taught in English are active – Belgium, France, Spain and Portugal (see <http://www.dbs.unimi.it/ecm/home/erasmus/studenti-in-uscita/scienze-biologiche>; <https://bioscienzebio.unimi.it/mobilita/outgoing-students>). The admitted student will present a study plan including all the activities he/she intends to perform abroad, detailing the corresponding CFU: the number of proposed CFU should roughly correspond to those the student would achieve in the same time lapse remaining in his/her university. The study plan proposed by the student within the Erasmus+ program should be coherent with the BARB Master course and must be evaluated and approved by the Teaching Board. The Teaching Board, if necessary, will require the student to integrate the program of exams taken abroad. At the end of the Erasmus + program, according to the rules established by the Academic Senate, the approved exams will be recorded, possibly with the original denomination, as part of the student's curriculum upon conversion of the European Credit Transfer and Accumulation System (ECTS) into CFU. If the student performs the experimental thesis work abroad, he/she must follow the rules outlined below (see Caratteristiche tirocinio). The Biological Erasmus and international mobility tutor is Dr. Cristina Bonza (cristina.bonza@unimi.it)

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

1st COURSE YEAR Core/compulsory courses/activities common		
Learning activity	Ects	Sector
English proficiency B2 (3 ECTS)	3	ND
EPIDEMIOLOGIC AND PREVENTIVE SCIENCES	6	MED/42
HUMAN ANATOMY AND EXPERIMENTAL MODELS IN BIOMEDICINE	6	BIO/06
MOLECULAR BIOLOGY APPLIED TO THE BIOMEDICAL RESEARCH	6	BIO/11
PATHOLOGY	6	MED/04
PRINCIPLES OF PHYSIOLOGY	6	BIO/09
SYSTEM PHARMACOLOGY	6	BIO/14
	Total compulsory credits	39
Further elective courses		
The student must choose 3 of the following elective courses (12 CFU)		
CELLULAR MICROBIOLOGY AND IMMUNOLOGY	6	BIO/19
DIFFERENTIATION BIOLOGY AND CELL THERAPIES	6	BIO/17
HUMAN AND MOLECULAR GENETICS	6	(3) MED/03, (3) BIO/18
MEMBRANE BIOPHYSICS AND SIGNAL TRANSDUCTION	6	FIS/07
METHODS IN MATHEMATICS AND STATISTICS	6	(4) MAT/06, (2) MAT/07
The student must choose 3 of the following elective courses (18 CFU)		
CELLULAR AND MOLECULAR PATHOLOGY	6	MED/04
CELLULAR AND MOLECULAR PHARMACOLOGY	6	BIO/14
CELLULAR AND MOLECULAR PHYSIOLOGY	6	BIO/09
CELLULAR, MOLECULAR AND FUNCTIONAL APPROACHES TO GENETIC DISEASE	6	BIO/14
CLINICAL BIOCHEMISTRY AND MOLECULAR BIOLOGY	6	BIO/12
CLINICAL MICROBIOLOGY AND HYGIENE	6	(3) MED/07, (3) MED/42
ECOTOXICOLOGY	6	BIO/14
HUMAN AND EXPERIMENTAL NEUROANATOMY	6	BIO/16
NEUROPHYSIOLOGY	6	BIO/09
PHYSIOLOGY AND PHARMACOLOGY OF THE ENDOCRINE SYSTEM	6	(3) BIO/09, (3) BIO/14
TECHNIQUES FOR ADVANCED BIOMEDICAL RESEARCH	6	BIO/09
The student must acquire 12 CFU by selecting any of the courses offered by the University of Milan, provided that they are coherent with their educational plan and that the course content does not overlap with those present in mandatory and guided-choice courses in the study plan. The student can pick the remaining principal and guided-choice courses that he/she had not inserted in the study plan.		
End of course requirements		
FINAL EXAM	39	NA
	Total compulsory credits	39