



UNIVERSITA' DEGLI STUDI DI MILANO
PROGRAMME DESCRIPTION - ACADEMIC YEAR 2026/27
IN
QUANTITATIVE BIOLOGY (Classe LM-8 R)
Enrolled in the 2026/2027 academic year

HEADING

Degree classification - Denomination and code:	LM-8 R
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
Access procedures:	open, subject to entry requirements
Course code:	FBT

PERSONS/ROLES

Head of Study Programme

Prof. Carlo Camilloni

Degree Course Coordinator

Prof.ssa Anna Moroni

Tutors - Faculty

Academic guidance advisors - Thomas Vaccari and Marco Buscaglia

Erasmus and International Mobility advisor - Veronica Gregis

Erasmus Traineeship advisor - Federica Marini

Study plan advisor - Matteo Brilli

Internship advisor and Thesis advisor - Anna Moroni

Master's Degree admission advisor - Anna Moroni, Matteo Brilli, Giovanni Nava

Educational Credit (CFU) recognition - Anna Moroni

Degree Course website

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

Academic Services Office

Milan - Via Celoria, 26 Desk by appointment, either online or in person. Please book your appointment via email:

biotecindamb@unimi.it <https://informastudenti.unimi.it/> Email: biotecindamb@unimi.it

Boards

Anna Moroni, Matteo Brilli, Giovanni Nava (Master's degree admission); Marco Buscaglia (Student Mobility); Matteo Brilli (Study Plan).

Disability manager

Prof. Matteo Chiara

Industrial Biotechnology Academic Board

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

International Students Office

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 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 Master's degree course in Quantitative biology (QB) prepares graduates in biological and biotechnological disciplines to operate at the intersection between biology and physics. The quantitative approach requires a physical understanding of biological phenomena and the development of mathematical and computational tools for the analysis, understanding, and redesign of biological systems. The aim is to train a new generation of experts with integrated skills in biology, chemistry, physics, mathematics and computer science, able to perform accurate experimental measurements and apply predictive theoretical models, to explain biological complexity. Quantitative biology uses emerging technological and computational capabilities to model biological processes for biotechnological applications such as protein and metabolic engineering, drug discovery and synthetic biology. It is therefore proposed a path that includes training activities aimed at acquiring in-depth knowledge of:

- Molecular, cellular, and structural biological area: provides in-depth knowledge of basic biological processes, both cellular and molecular, and identifies macromolecular complexes and regulatory networks that require quantitative analysis.
- Biophysics-chemistry area: provides thermodynamic and statistical knowledge of the behavior of individual molecules and covers the most innovative investigation and data analysis techniques in this area (such as, for example, atomic force microscopy, super resolution microscopy, single particle electron cryo microscopy).
- Mathematics-informatics-logic area: provides the tools for formulating predictive and descriptive mathematical models of the behavior of cellular and molecular systems and teaches programming languages for data analysis. It also introduces the concepts and methods of artificial intelligence used to represent and solve logical and computational problems, in particular machine learning.

Expected learning outcomes

Knowledge and understanding

Master's graduates in Quantitative Biology combine a solid preparation in the biomolecular-cellular field with the knowledge of mathematical, chemical and physical tools and of the logical bases of scientific reasoning. This knowledge will enable them to understand and apply an interdisciplinary experimental approach to the study of complex systems, such as dynamic biological systems. Students are guided in the generation of predictive models, simulations and their experimental analysis and verification.

Ability to apply knowledge and understanding

The main goal of the Master's degree in Quantitative Biology is to apply experimentally the theoretical knowledge acquired. Teaching includes hands on laboratory practice and the mandatory experimental thesis includes 33 CFU of lab work. Teaching will further include problem solving aspects to help students choosing appropriate methodological tools to achieve an objective.

Making judgements

The autonomy of judgement will be encouraged reading and discussing research articles in the class, to stimulate students to evaluate experimental results critically. Autonomy of judgement will also be fostered by the problem-based learning teaching method. This approach involves small groups of students tackling the subject of study by discussing it among themselves in the presence of a tutor who intervenes only if required.

Communication skills

The problem-based learning mentioned above helps to develop communication skills, including the confidence in expressing oneself in English, and the ability to relate to other students, including international students. Presentation and discussion of experimental data, in journal clubs and seminars, are among the activities of the compulsory and student-led courses that foster the acquisition of communication skills.

Learning skills

Development of appropriate skills for the acquisition of new knowledge, including through research and reading of scientific articles in English, bibliographic consultations, consultation of databases and other information on the web. The use of alternative and complementary teaching/learning methodologies complementary to the lecture alone, such as problem-based learning, group work, presentations by students, exercises on real case studies, will be encouraged. The didactic means of verification are oral and/or written examinations, practical tests for the presentation of scientific articles and presentation of research projects carried out individually or in small groups.

Professional profile and employment opportunities

The Master's degree in Quantitative Biology provides employment opportunities in research institutes and industry in the areas of bio-nano-technologies, bio-pharmaceutical research, and in the development of high-tech research instrumentation.

Job profiles

Product scientist, Bio-nanotechnologist

- Applies laboratory procedures relating to cellular and molecular processes by identifying and resolving any critical issues.
- Uses non-standard, high-tech scientific instrumentation.
- Manages the IT aspects of the use of machines for generating experimental data.
- Analyses raw experimental data and converts them into various formats.
- Writes codes to analyze biological data using a programming language.
- Interacts effectively with both experimental laboratory staff and developers of high-tech instrumentation and facilitates

their communication.

Employment

In bio-nanotechnology startups, pharmaceutical and biotechnology industry, public and private research institutes with the following assignments:

Junior research scientist - biotechnology/biophysics research laboratory

- Knows the biological system under study, understands the experimental question and helps to identify the appropriate experimental measure to provide adequate answers.
- Designs and carries out experiments independently using high-tech instrumentation.
- Carries out data analysis using specific software.
- Confidently presents scientific data and methods to internal and external partners.

Employment

Public and private scientific institutes, research and development in pharmaceutical, biotechnological and startups industries or companies developing scientific instrumentation with high technological content and innovation.

Pre-requisites for admission

Basic knowledge in mathematics, chemistry, physics and biology is required.

Students willing to enroll in the Master Course in Quantitative Biology must possess the following requirements:

Bachelor or University Degree obtained with a three-year course, or equivalent title obtained abroad.

Minimum English level, assessed by interview

Adequate basic knowledge, assessed by interview

Bachelor's Degree

Eligible for admission to the master's degree program in Quantitative Biology are graduates in the classes:

L-02 Biotechnology

L-05 Philosophy

L-07 Civil and Environmental Engineering

L-08 Information Engineering

L-13 Biological Sciences

L-27 Chemical sciences and technology

L-29 Pharmaceutical sciences and technologies

L-30 Physical sciences and technology

L-31 Computer science and technology

L-32 Science and technology for the environment and nature

L-33 Economic sciences and statistics

L-35 Mathematical Sciences

L-41 Statistics

who have attained sufficient knowledge (at least 12 CFU) in basic disciplines of biological area relevant for QB (SSD BIO/06, BIO/09, BIO/10, BIO/11, BIO/18, BIO/19).

Language Requirement

Knowledge of English (B2 level) is a requirement for the access to the QB master's degree. Students should have acquired beforehand a B2 level certification (vantage or upper intermediate, as defined by the Common European Framework of Reference for Languages: Learning, Teaching, Assessment). Students without a B2 level certification may be accepted on condition that their level of English proficiency, assessed during the entry interview, is evidently good.

Adequate basic knowledge:

The adequate personal background of the candidates and their ability to communicate in English are decisive elements for the acceptance to QB and they are going to be verified and tested during the entry interview. Knowledge of Italian is not required. Particular attention will be given to the knowledge in biological subjects of candidates with non-biological backgrounds. In this case, the entry interview will identify gaps requiring extra study to be levelled off by the student with the support of tutors before enrollment.

Programme structure

The QB Master degree is a 2-year course, each year is divided in two terms (semesters).

The educational pathway includes lectures, classroom exercises, lab practicals and a thesis internship for a total of 120 educational credits (CFU, Crediti Formativi Universitari).

A CFU corresponds to a standard student workload of 25 hours, and it is calculated as follows:

- for lectures, 1 CFU= 8 hours of lectures and 17 hours of personal elaboration;
- for classroom exercises and lab practicals, 1 CFU= 16 hours of laboratory activities and 9 hours of personal elaboration;
- for thesis internship, 1 CFU= 25 hours of laboratory and/or training activities.

- Courses (84 CFU), subdivided into:

Compulsory courses (66 CFU):

Mathematical modeling for Biology

Programming in Python
Cell Biophysics
Measurement of nanoscale interactions in biological systems and data analysis
Principles of spectroscopy and applications to quantitative biology
Advanced molecular biology
Integrated structural biology
Molecular biophysics
Imaging in living cells
Artificial intelligence in Quantitative Biology

Elective courses (6 CFU):

Non linear dynamics in quantitative biology
Structural bioinformatics
Cell population dynamics
Introduction to Logic
Synthetic biology

Free choice courses (12 CFU):

Single Courses freely selected by the student from all the courses offered by the University, consistent with QB educational plan.

Other activities (3 CFU)

Italian language skills for foreigner students, seminars, short lab internships, and other orientation activities to the job market.

Experimental thesis (33 CFU)

The Thesis Internship must be carried out in research laboratories of the University of Milan or, upon approval, in other public or private institutions, national or foreigner. The experimental thesis internship lasts at least 9 months and requires the writing of a final dissertation, reporting the results of an original research project.

- Conscientious objection policy

In the QB 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 QB course, to ensure the correct acquisition of the study credits necessary for degree completion.

- Study plan submission

Students will present a "Study plan", indicating the choice of elective and free courses, at the end of the first semester (first year), within the deadline set by the Student Administrative Office and published on the web page: <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 QB lecturers. After the approval of the study plan, the student can take further exams in addition to his/her academic path. 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. 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. For further details, please visit: <https://www.unimi.it/en/study/bachelor-and-masterstudy/following-your-programme-study/soft-skills>

- Schedule of teaching activities

The first Semester starts on October 1st, 2026 and ends on January 15th, 2027.

The second Semester starts on March 1st, 2027 and ends on June 11th, 2027.

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 "Lezioniumi"

- 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 at the end of each term. For each course, at least 6 exam sessions, three for each term break, are scheduled. Exams are graded on a scale that goes from zero to thirty points. The minimum score to pass an exam is 18, and the maximum is 30 cum laude (with distinction). If failed, the exam can be repeated an unlimited number of times. Also, the exam can be repeated to improve the grade.

Pre-enrollment for the exam is mandatory and occurs through the UNIMIA - online service (available at <https://qbio.cdl.unimi.it/en/study/exams>)

Campus

Lecture rooms and laboratories are located in the campus "Città Studi", in the University buildings of Via Celoria, 26 (Edifici Biologici); Via Celoria, 20 (Settore Didattico); Via Golgi, 19 (Edificio Golgi). The course of Logic (Department of Philosophy) is held in the University headquarters, via Festa del Perdono 7 and Via Santa Sofia. The Department of Biosciences is the reference structure for all teaching activities related to the QB course.

Libraries

The main scientific library is "Biblioteca di biologia, informatica, chimica e fisica" (campus "Città Studi", 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. They will be available for one-to-one meetings with the students. For the academic year 2026/2027 students can contact Professors Anna Moroni, Matteo Brilli, Thomas Vaccari and Marco Buscaglia 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

Among the electives, those who do not hold an Italian high school diploma or degree can obtain 3 credits in Additional language skills: Italian by demonstrating A2 level in Italian per the Common European Framework of Reference for Languages (CEFR). This level can be assessed in one of the following ways:

- by submitting a certificate of A2 or higher level issued no more than three years prior to the date of submission. You will find the list of language certificates recognized by the University at: <https://www.unimi.it/en/node/349/>). The language certificate must be uploaded through <http://studente.unimi.it/uploadCertificazioniLingue> ;

- by an entry-level test administrated by SLAM that can be taken only once and is compulsory for all students who do not have a valid language certificate. Those who fail to reach A2 level will have to attend one or more than one 60-hour Italian course(s) geared to their level. Those who do not take the entry-level test or fail to pass the end-of-course test after six attempts will have to obtain language certification privately in order to earn the 3 credits of Additional language skills: Italian. As an alternative, they can modify their course programme by choosing a different elective.

Compulsory attendance

Attendance at lectures and practical courses is compulsory. The attendance threshold for exam admission is 75%. Below this threshold, admission to the exam is at the discretion of the teacher, who may require additional activities before admission to the exam.

Internship criteria

The experimental thesis accounts for 33 CFU and represents a major part of the Master's degree program. Thesis internship: the student will carry out an original experimental project in a research laboratory during an internship of, at least 9 months (33 cfu). The experimental thesis project can be carried out in a laboratory at the University of Milan or in another research laboratory, upon previous authorization of the coordinator of the master's degree. At the end of the internship, the student will write a dissertation in English that will be approved by an internal tutor (relatore interno). The 120 CFU required for the achievement of the master's degree are acquired in compliance with these regulatory rules.

Degree programme final exam

The final exam consists of the oral presentation of the main results of the thesis project and discussion with a committee. It contributes maximum 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.

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 organisations.

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

institutions.

The University of Milan is a member of the 4EU+ European University Alliance that brings together eight public multidisciplinary universities: University of Milan, Charles University of Prague, Heidelberg University, Paris-Panthéon-Assas University, Sorbonne University of Paris, University of Copenhagen, University of Geneva, and University of Warsaw. The 4EU+ Alliance offers integrated educational pathways and programmes to promote the international mobility of students (physical, blended and virtual).

Study and internships abroad

The QB degree programme supports the University's international mobility initiatives. QB lecturers (for the academic year 2026/2027, Veronica Gregis and Marco Buscaglia) act as tutors for students interested in the Erasmus+ programme, guiding them in selecting the most suitable mobility opportunity for their academic development. Every January, the Erasmus+ programme is presented to QB students during a local event organized by the Erasmus+ Coordinator for the Industrial Biotechnology area (Prof. Veronica Gregis).

As part of the Erasmus+ framework, the QB Master's programme has established agreements with several partner universities offering courses taught in English. The list of currently available destinations is regularly updated and can be consulted at the following link:

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

Time spent abroad may be used to attend courses and take the corresponding examinations, thereby earning credits towards the Master's degree, as well as to carry out the experimental work for the dissertation. Students admitted to the mobility programme must submit a study plan outlining the training activities they intend to undertake, together with the corresponding number of credits.

The number of credits should, as far as possible, correspond to the number of credits the student would normally acquire at the home university during the same period. The proposed activities must be consistent with the objectives and contents of the Master's programme. The study plan must be approved by the QB Student Mobility Committee, which may request changes or additions.

At the end of the mobility period, and in accordance with the guidelines of the University of Milan, all courses completed abroad (with passed examinations) will be recorded in the student's transcript, preferably preserving their original titles, together with the ECTS (European Credit Transfer and Accumulation System) value and the corresponding CFU conversion (typically, 1 ECTS = 1 CFU).

Students wishing to conduct their dissertation work abroad must have an internal supervisor (chosen from among the QB faculty), and their study plan must be approved by the QB Board.

How to participate in Erasmus mobility programs

The students of the University of Milan can participate in mobility programs, through a public selection procedure.

Ad hoc commissions will evaluate:

- Academic career
- the candidate's proposed study program 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+ program 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 program 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;
 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/study/enrolment>

Deadlines to apply

Candidates holding, or due to complete, a bachelor's degree by 31 December 2026 may submit an admission application following the terms indicated below:

Applications for the Master's degree course can be submitted starting from January 22nd, 2026.

For extra-EU candidates, who need to request a visa, the deadline to apply is April 30th, 2026.

For all others, Italians and EU-candidates, the deadline to apply is October 30th, 2026.

Excellence Scholarships for international students

All candidates with a foreign qualification (EU and extra-EU) who will apply for admission to the Master's degree within April 30th, 2026 are eligible for these scholarships.

Link: <https://www.unimi.it/en/study/financial-support/international-scholarships>

Eligibility assessment

The adequate personal preparation of the candidates and the possession of the admission requirements will be evaluated by an Admission Committee composed of the coordinator and at least one lecturer of the Master's degree. Applicants satisfying the criteria will be invited to an Entry Interview for the assessment of scientific background knowledge and English language skills (see below). At the end of the interview, successful applicants will receive notice of their eligibility and will be allowed to enroll in the Master's degree program.

Entry Interview

For the Academic year 2026-27 the interview will be held online on a video conference platform and the candidate will receive an email with the date and instructions for connecting.

At the beginning of the interview, students must show a valid ID card or passport for identification.

The interview will evaluate the expertise of the candidate in topics related to their bachelor degree and the English language skills.

The committee will evaluate each applicant on a 100-point scale:

1) Up to 50/100 points will be awarded for the applicant resume (type of bachelor degree attended, exam grades, further courses attended, additional degrees, etc.)

2) Up to 50/100 points will be awarded for the interview.

The minimum score required for admission is 60/100.

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
<i>year</i>	Principles of spectroscopy and applications to quantitative biology		10	(1) CHEM-02/A, (4) CHEM-05/A, (1) CHEM-03/A, (4) CHEM-01/A
<i>1 semester</i>	Cell biophysics		6	BIOS-06/A
<i>1 semester</i>	Imaging in living cells		5	(4) BIOS-02/A, (1) PHYS-06/A
<i>1 semester</i>	Mathematical modeling for Biology		6	(1) MATH-04/A, (1) MATH-05/A, (3) MATH-03/A, (1) MATH-03/B
<i>1 semester</i>	Programming in Python		6	INFO-01/A
<i>2 semester</i>	Advanced Molecular biology		9	(6) BIOS-08/A, (3) BIOS-14/A
<i>2 semester</i>	Integrated structural biology		6	BIOS-07/A
<i>2 semester</i>	Measurement of nanoscale interactions in biological systems and data analysis		6	(1) PHYS-03/A, (1)

				PHYS-04/A, (4) FIS/03
2 semester	Molecular biophysics		6	PHYS-06/A
Total number of compulsory credits/ects			60	
2nd COURSE YEAR (available as of academic year 2027/28) Core/compulsory courses/activities				
Scheduling	Learning activity	Module/teaching unit	Ects	Sector
1 semester	Artificial Intelligence in Quantitative Biology		6	(2) PHYS-06/A, (4) INFO-01/A
Total number of compulsory credits/ects			6	
Elective courses				
The student must choose one of the following courses:				
1 semester	Introduction to Logic		6	PHIL-02/A
1 semester	Non linear dynamics in quantitative biology		6	(4) BIOS-08/A, (1) BIOS-15/A, (1) BIOS-14/A
1 semester	Structural bioinformatics		6	PHYS-06/A
1 semester	Synthetic Biology		6	(3) BIOS-02/A, (3) BIOS-08/A
2 semester	Cell population dynamics		6	(1) BIOS-04/A, (5) BIOS-10/A
Open choice courses: 12 ECTS				
Further elective courses				
Student must acquire 3 ECTS chosen among: Italian language course (only for foreign students), attending seminars, workshop, short internship (75h) in a research lab, others activity related to job placement				
	Additional Language Skills: Italian (3 ECTS)		3	NN
	Other training activities		3	NN
End of course requirements				
	Thesis project and final dissertation		33	NN
Total number of compulsory credits/ects			33	