



UNIVERSITA' DEGLI STUDI DI MILANO
PROGRAMME DESCRIPTION - ACADEMIC YEAR 2025/26
MASTER DEGREE
BIOINFORMATICS FOR COMPUTATIONAL GENOMICS (Classe LM-8 R)
Enrolled in the 2025/2026 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
Years of course currently available:	1st
Access procedures:	Cap on student, student selection based on entrance test
Course code:	FBR

PERSONS/ROLES

Head of Study Programme

Prof. Giulio Pavesi

Tutors - Faculty

Students can contact, according to their needs, tutors from both University of Milan and Politecnico di Milano:

Academic guidance tutor: Giulio Pavesi (Unimi), Marco Masseroli (Polimi)

Erasmus and international mobility tutor: Matteo Chiara (Unimi)

Study plan tutor: Roberto Mantovani (Unimi)

Internship tutor: Roberto Mantovani (Unimi)

Seminar and workshop tutor: Giulio Pavesi (Unimi), Marco Masseroli (Polimi)

Dissertation tutor: Roberto Mantovani (Unimi), Marco Masseroli (Polimi)

University and programme transfer tutor: Matteo Chiara (Unimi)

Master's degree admission tutor: Giulio Pavesi (Unimi), Marco Masseroli (Polimi)

Credit recognition tutor: Giulio Pavesi (Unimi), Marco Masseroli (Polimi)

Degree Course website

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

Email: bcgenomics@unimi.it

Academic Services Office

via Celoria, 26 - 20133 Milan - ground floor, C Building By appointment. <https://informastudenti.unimi.it/>

Student Desks

via Celoria, 18 - 20133 Milan Phone 0250325032 <https://www.unimi.it/en/node/360> <https://www.unimi.it/en/node/359>

CHARACTERISTICS OF DEGREE PROGRAMME

General and specific learning objectives

The Master Degree in 'Bioinformatics for Computational Genomics' (BCG) aims to form graduates with an adequate knowledge about the molecular basis of biological systems; the structure and function of biological molecules and how they participate in cellular processes; the technologies and platforms for the analysis of genomes; the tools for bioinformatic and genomic analysis; and the statistical and computational methodologies for the analysis of biomolecular data.

The BCG degree therefore includes activities providing in depth knowledge on:

1. the organization of information in the genome and the molecular and cellular processes at the basis of gene expression and its regulation
2. the experimental methods used for studying genes and their function in different model species, both prokaryotic and eukaryotic
3. the technologies employed in modern genomic research

4. methods and protocols of bioinformatic analysis in functional genomics studies
5. algorithmic, mathematical and statistical approaches underlying bioinformatic and genomic analysis tools
6. data base technologies for the storage and organization of the data
7. modelling and analysis techniques employed in systems biology for the study of interactions in complex biological systems.

The program includes, as a fundamental step in the formation of the students, an internship in research laboratories either at the University of Milan or in other Italian or foreign research institutes. The research experience of the internship and its results will be described in a final written dissertation, to be discussed in front of a thesis committee.

Expected learning outcomes

Knowledge and understanding

Graduates in BCG will acquire an in depth knowledge allowing them to apply a multidisciplinary and computational approach to solving complex problems in the fields of biology and biotechnology. The degree aims at providing integrated knowledge on different fields of chemistry and biology, which represent the foundations for a Master degree in the class of Biotechnology. The BCG Master degree aims in particular at providing solid inter-disciplinary knowledge for the development and application of computational tools for bioinformatic and genomic analysis.

Applying knowledge and understanding

A fundamental objective of the Master degree in BCG is to provide students with the ability of applying the knowledge acquired. This aim will be achieved both with class contents and with the final internship in a research laboratory. Suitable teaching time will thus be devoted to problem solving and to activities that will augment the analytical and methodological skills of the students. The skills acquired in classes on fundamental topics will be applied to the design and development of bioinformatic tools for genomic, transcriptomic, epigenomic, and systems biology studies.

Autonomy / judgment (Making judgments)

The acquisition of autonomous skills for making judgements will be made possible by the teaching methods employed in classes and the respective topics. The latter ones will often refer to relevant problems and research lines in different areas, and will include problem solving activities that will take place during classes or the development of projects to be discussed at exams. The usage of teaching material alternative to textbooks (research articles, on line tutorials and videos) will be encouraged, in order to make students acquire notions with a proactive and autonomous approach.

Communication skills

Communication skills can be defined as the acquisition of tools and knowledge for scientific communication using the English language; skills in computing for the elaboration, presentation, and discussion of experimental data; being able to work autonomously, and being able to communicate the results of one's activities to others in seminars, journal clubs, etc. The acquisition of these skills will be included in classes and in the experimental laboratory activities leading to the final dissertation (reading and discussion of scientific literature; reading and discussion of analysis protocols; elaboration and discussion of experimental data).

Learning skills

Learning skills can be defined as the development of suitable skills for the acquisition of novel knowledge, also through retrieval and study of scientific articles in English or access to databases and retrieval of information. These skills will be acquired during the experimental laboratory activities leading to the final dissertation, or the reading and discussion of scientific literature during classes or exams. These activities will allow students to learn through a 'hands on' approach and through the constant interaction both with their peers and the instructors.

Professional profile and employment opportunities

The BCG Master degree aims to train highly skilled professionals able to merge in depth knowledge on the molecular foundations of life sciences with up-to-date knowledge of the current techniques and technologies for bioinformatic and genomic analysis. Particular emphasis will be put on the quantitative and computational aspects of the latter ones, which will be focused on the analysis, modelling, and comprehension of biological systems. The ultimate goal is to train in a multi-disciplinary context professionals ready to cope with the challenges deriving from modern biomolecular sciences in the post-genomic era, and able to conjugate and integrate knowledge on biology, genetics, computer science, information engineering, and statistics in different fields of basic or applied research. The BCG program aims to train the following professional figures: biologist and related figures, biotechnologist.

Graduates in BCG will thus be able to:

1. take part in the design and execution of large scale genomic analyses
2. identify and extract the biological meaning from the results obtained
3. design autonomously tools and protocols for the bioinformatic analysis of different types of experimental data
4. play a pivotal role in research groups focused on basic or applied genomic research
5. coordinate and supervise research projects and groups focused on bioinformatics and genomics.

Initial knowledge required

Italian Students:

Students can apply to the BCG Master degree course, provided that they satisfy one of the following two requirements:

1. they have completed a bachelor degree program (Laurea Triennale) in one of the following classes:

- Biotechnology (class L2);
- Biology (class L13);
- Agriculture and Food Sciences (class L26);
- Pharmacological Sciences (class L29);

and during their studies they have acquired at least 30 CFU in biological areas (SSD BIO/01-19) with at least 18 CFU in Genetics (BIO/18), Molecular Biology (BIO/11) and Biochemistry (BIO/10)

OR

2. they have completed a bachelor degree program (Laurea Triennale) in one of the following classes:

- Information Engineering (class L8);
- Physics (class L30);
- Computer Sciences (class L31);
- Mathematics (class L35);
- Statistics (class L41).

and during their studies they have acquired at least 30 CFU in the areas of computer science, information engineering, biomedical engineering, mathematics and/or statistics (SSD INF/01, ING-INF/05, ING-INF/06, MAT/01-09, and/or SECS-S/01), with at least 6 CFU in mathematics (MAT/01-09) and at least 12 CFU in one or more of the following areas: computer science (INF/01), information engineering (ING-INF/05), biomedical engineering (ING-INF/06), statistics (SECS-S/01).

The same criteria are applied to candidates in possession of foreign university degrees, deemed to be suitable by the Teachers Council, in which it is possible to clearly identify disciplines and number of credits acquired for each discipline (1 CFU = 1 ECTS - European Credit Transfer and Accumulation System). If this is not possible, the documents certifying the career of the candidates will be examined in detail by the Teachers Council in order to assess if their background complies with the previous requirements.

Foreign Students

Students in possession of a Bachelor degree in an area of those described at the previous point (Admission for Italian Students), where courses taken in the required disciplines can be clearly identified together with the amount of hours/credits of the courses. If this is not possible, the documents certifying the career of the students will be examined by the Teachers Council in order to assess if their background complies with the previous requirements.

Language Requirements

Students must be proficient in English, with a B2 level of competence. In exceptional cases, students without a valid language certificate may be accepted on condition that their level of English proficiency, assessed during the interview, is evidently good. The adequate personal preparation of the candidates, their ability to communicate in English and their motivation are decisive elements for the admission and they are going to be verified and tested during the admission interview.

Knowledge of Italian is not required for attendance, nor for graduation. Foreign students are however encouraged to acquire basic knowledge of the Italian language before the final dissertation, by attending one or more than one 60-hour Italian courses organized by the University Language Centre/Slam

BACKGROUND KNOWLEDGE

The prerequisite to access the BCG Master degree program is an adequate knowledge of the fundamentals of either (1) genetics, molecular biology and biochemistry or (2) computer science, information engineering and mathematics.

This will be verified through 1) evaluation of the bachelor study program and 2) direct assessment of candidate scientific background knowledge.

Evaluation of the bachelor study program

EU students satisfying the above criteria will be admitted to an interview for the assessment of their scientific background knowledge. Non EU students resident abroad will be evaluated only according to their previous bachelor study program.

Interview for direct assessment of candidate scientific background knowledge
The candidate's background knowledge will be verified by an interview with the Commission for Admittance to the Master, composed by teaching members appointed by the Teaching Board. The interview will evaluate the expertise of the candidates in topics related to their bachelor degree.

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.

Non EU students resident abroad will be awarded up to 100 points for their resume only (type of bachelor degree attended, exam grades, further courses attended, additional degrees, etc.).

The minimum score required for admission is 60/100.

For the Academic Year 2025-2026, interviews for Italian and EU students will take place online on July 2nd 2025. Foreign non EU students who reside in Italy must attend the evaluation interview as well. At the beginning of the interview, students must show a valid ID card or passport for identification. It is advisable to check for any possible updates concerning dates and times of the examination on the website: <https://bcg.cdl.unimi.it>

Admission results for both EU and non-EU students will be published together at the end of the admission procedure.

Compulsory attendance

Course attendance is highly recommended. Exceptions for students planning not to attend all or most of the classes of a course ("studenti non frequentanti") must be motivated and authorized by the lecturer.

Internship criteria

The students will carry out an internship consisting of an experimental project leading to writing a dissertation in English, whose discussion will constitute the final exam. The internship involves the attendance of a research laboratory either at University of Milan or in other research laboratory, upon previous authorization of the Coordinator of the Master degree. The internship and the preparation of the dissertation account for a minimum of 21 CFU, that can be extended by employing CFU for freely chosen activities, and thus it represents a fundamental moment of the Master degree program. The dissertation will describe the original research or project carried out by the student under the supervision of a lecturer within the BCG Master degree, and its subject must be consistent with the goals and the disciplines taught in the Master degree.

Degree programme final exams

The final exam consists of the oral presentation and discussion of the research project main results 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.

Campus

Lecture rooms and laboratories are located:

- in the "Città Studi" campus of the University of Milan, mostly in the University buildings of via Celoria, 26 and via Golgi;
- in the "Leonardo" Campus of the Politecnico di Milano, Piazza Leonardo da Vinci 32.

Notes

Students with a Bachelor degree (Laurea Triennale) in Information Engineering or Biomedical Engineering who obtained the BCG Master degree will also have the opportunity of enrolling in the Master degree programs in 'Computer Science and Engineering' or 'Biomedical Engineering?', respectively, at the Politecnico di Milano, with the automatic transfer in their career of part of the CFUs acquired in the BCG program; thus, they will have a very significant reduction of the number of exams to be taken to obtain the second degree. Students interested in this opportunity can contact Prof. Marco Masseroli (marco.masseroli@polimi.it) for further information.

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 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 BCG degree program supports the international mobility of the University program: a lecturer (for the academic year 2025/2026, Prof. Matteo Chiara) acts as a tutor for students interested in the Erasmus+ program, in order to guide students in their choice of the most suitable program for their formation.

In the framework of the Erasmus+ program, the BCG Master course has in place agreements with Universities in Denmark, Germany, Spain, Switzerland, Norway, and The Netherlands, all offering courses in English.

Calls for participation can be found at the following link: <https://www.unimi.it/en/international/study-abroad/studying-abroad-erasmus>

The time spent abroad can be used to attend courses and pass the relative exams, thus collecting credits towards the Master degree, as well as to carry out the experimental project for the dissertation. The student admitted to the mobility program must submit a study plan detailing the training activities that he/she plans to carry out, with the corresponding credits. The number of credits should correspond as much as possible to the number of credits that the student should acquire in a similar time at the home University. The proposed activities must be consistent with the goals and the contents of the Master degree. The study plan must be approved by the BCG Student Mobility Committee, which can request changes or integrations. At the end of the mobility program, according to the guidelines provided by the University of Milan, the courses attended (with a passed exam) by the student are registered in his/her career, preferably with its original name and with an indication of the ECTS (European Credit Transfer and Accumulation System) and their conversion in CFU (usually 1 ECTS = 1 CFU). The students willing to carry out their dissertation work as part of a mobility program abroad must have an internal supervisor (chosen among the BCG lecturers) and the study plan must be approved by the BCG Teaching 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 organises 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;

Student Desk booking through InformaStudenti

1st COURSE YEAR Core/compulsory courses/activities common		
Learning activity	Ects	Sector
Bioinformatics and Computational Biology	6	ING-INF/05
Biostatistics	6	(5) SECS-S/01, (1) MAT/06
Genomics and Transcriptomics	12	BIO/11
Machine Learning	6	(5) ING-INF/05, (1) INF/01
Organic Chemistry	6	CHIM/06
Scientific Programming	6	ING-INF/05
	Total compulsory credits	42
Elective courses		
Students with a degree/background in computer science, engineering, mathematics or physics will attend the courses of the "Knowledge Alignment Plan 1".		
Students with a degree/background in life sciences (biology or biotechnology or equivalent) will attend the courses of the "Knowledge Alignment Plan 2".		
Biostatistics (<i>Knowledge Alignment Plan 2</i>)	6	(5) SECS-S/01, (1) MAT/06
Genetics, Cellular and Molecular Biology (<i>Knowledge Alignment Plan 1</i>)	12	(5) BIO/11, (1) BIO/06, (5) BIO/18, (1) BIO/13
Organic Chemistry (<i>Knowledge Alignment Plan 1</i>)	6	BIO/10
Programming and Data Bases (<i>Knowledge Alignment Plan 2</i>)	12	(10) ING-INF/05, (2) INF/01
2nd COURSE YEAR (available as of academic year 2026/27) Core/compulsory courses/activities common		
Learning activity	Ects	Sector
Advanced Genomics and Epigenomics	12	(3) BIO/11, (6) BIO/19, (3) BIO/18
Structural Chemistry	6	(4) ING-IND/34, (2) CHIM/06
Systems Biology and Network Analysis	6	ING-INF/06
	Total compulsory credits	24
Further elective courses		
Open choice courses: 12 CFU		
The student can employ part of all of the 12 CFU of freely chosen activities in attending one ore more of the following courses:		
Genomic Big Data Management and Computing	6	(1) BIO/11, (5) ING-INF/05
Interdisciplinary Project	6	(1) BIO/11, (5) ING-INF/05
Neurogenomics and Brain Disease Modelling	6	BIO/11
End of course requirements		
Final internship and dissertation	21	ND
Language skills and other activities (attendance to seminars, etc)	3	ND
	Total compulsory credits	24

COURSE PROGRESSION REQUIREMENTS

There are no propaedeutic courses in the BCG degree that can limit progression from the first to the second year.