



**UNIVERSITA' DEGLI STUDI DI MILANO**  
**PROGRAMME DESCRIPTION - ACADEMIC YEAR 2021/22**  
**MASTER DEGREE**  
**Pharmaceutical Biotechnology (Classe LM-9)**  
**enrolled from 2014/15 academic year**

### HEADING

<b>Degree classification - Denomination and code:</b>	LM-9 Pharmaceutical, veterinary and medical biotechnologies
<b>Degree title:</b>	Dottore Magistrale
<b>Curricula currently available:</b>	Biotechnology in drug research and development / Development and production of biotechnological drugs / PHARMACOGENOMICS AND PRECISION THERAPEUTICS
<b>Length of course:</b>	2 years
<b>Credits required for admission:</b>	180
<b>Total number of credits required to complete programme:</b>	120
<b>Years of course currently available:</b>	1st , 2nd
<b>Access procedures:</b>	Open, subject to entry requirements
<b>Course code:</b>	E51

### PERSONS/ROLES

#### Head of Interdepartmental Study Programme

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#### Tutors - Faculty

Tutor per l'orientamento

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Tutor per stage e tirocini

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Tutor per la mobilità internazionale e l'Erasmus

prof.ssa Anna Cariboni anna.cariboni@unimi.it

Tutor per studenti disabili DSA

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#### Degree Course website

<https://www.unimi.it/corsi/corsi-di-laurea/biotecnologie-del-farmaco>

Via Celoria 18, Milano Phone 02 503 25032 <https://www.unimi.it/it/node/360> <https://www.unimi.it/it/node/359>

Via Balzaretti 9, Milano Phone 02 503 18231 Email: [antonella.masi@unimi.it](mailto:antonella.masi@unimi.it)

### CHARACTERISTICS OF DEGREE PROGRAMME

#### General and specific learning objectives

The aim of the master course in Pharmaceutical Biotechnology is to provide knowledge in scientific methodologies for the design, production and characterization of biotechnological drugs. The master course is organized in three programs, two held in Italian and one in English. The first two programs share a common first year, dedicated to the acquisition of basic knowledge, followed by specific pathways oriented (1) to the use of the biotechnologies in identifying new targets and designing new drugs ("Biotecnologie nella ricerca e sviluppo del farmaco") and (2) to the development, production, formulation, and evaluation of biotechnological drugs ("Biotecnologie nella ricerca e sviluppo del farmaco"). The third program, "Pharmacogenomics and Precision Therapeutics", held in English, is more focused to the recent innovative biotechnological drugs, such as cell and gene therapies.

#### Expected learning outcomes

The Master Course in Pharmaceutical Biotechnology provides deep knowledge in the field of biotechnologies applied to the development of new drugs. The graduates will acquire specific expertise in the areas of: biochemistry, biology, physiology,

pathology, cell and molecular biotechnologies, pharmacology, legislation, and pharmaceutical chemistry. The ambition of the Master Course is to provide the students with a multidisciplinary background sufficient to approach the various phases of drug development, from research, production and formulation, to pre-clinical and clinical development and approval.

The graduates will acquire:

- ability to apply the knowledge to the identification of new targets and development of novel drugs;
- ability to face innovative drugs, such as gene and cell therapies;
- ability to apply current methodologies to generate novel protocols, with a problem-solving approach, being able to integrate knowledge obtained during the first level degree with those acquired during the master course.

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

The Master's Degree in Pharmaceutical Biotechnology is awarded to students with advanced skills in the development of scientific methodologies, able to coordinate national and international research projects and with specialized knowledge in the field of applied biotechnology, development and application of drugs, diagnostics, vaccines and nutraceuticals produced through biotechnological processes. The specific roles and professionalism of the graduate in the Master's Degree in Pharmaceutical Biotechnology, according to the nomenclature and classification drawn up by ISTAT, are included within Group of the Intellectual, Scientific and Highly specialized professions and are:

- Chemist representatives and disseminators;
- Biologists and related professions;
- Biotechnologists;
- Pharmacologists.

Graduates will be able to find employment in the following professional fields:

- Teaching activity in the scientific disciplinary field in secondary level education institutions;
- Teaching and research activities in public and private universities;
- Scientific research and technological development activities in public companies (National Health Institute, CNR, AIFA, National Environmental Agency, Research Institutions, etc), in both national and international public and private companies aimed at preclinical activities in the biomedical field;
- Scientific research and development activities in the biotechnological, pharmaceutical, diagnostic and cosmetic industry, in the food and food processing industry;
- Scientific research and technological development activities;
- Clinical monitoring and pharmaceutical technical scientific information activities;
- Management activities in quality assurance and environmental safety assessment and assurance;

Graduates will also be able to be involved in activities connected to the development, management and regulation of biotechnological companies in the public and private sectors, with managerial and consultancy functions in the following fields:

- therapeutic, with particular regard to the development and testing of products with innovative therapeutic potential to be applied to human and animal pathology;
- production and planning, in connection to patents in the health field;
- formulation, with reference to the preparation of vectors, cells and advanced pharmaceutical forms for the administration of new therapeutic products;
- diagnostic, through the management of molecular analysis technologies and cellular biotechnologies applied to the medical, pharmacological, toxicological, cosmetological and environmental fields;
- experimentation in the biomedical field, with reference to the use of in vivo and in vitro models for the understanding of the action mechanism of new drug.

The course allows to obtain the qualification to the profession of biologist.

### **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 and other Extra-EU 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**

To increase internationalization, students will be informed on the Erasmus and Erasmus Mundus programs activated within the master course. Lectures of foreign teachers and stages in foreign laboratories will be also proposed. Some of the classes will be given in English to give the students the opportunity to improve the English knowledge, with specific focus on scientific terminology.

More info is available at the link:

<https://www.unimi.it/it/internazionale/studiare-allestero>

<https://www.unimi.it/it/internazionale/studiare-allestero/partire-con-erasmus/come-partecipare/erasmus-aree/erasmus-scienze-del-farmaco>

Procedure for the recognition of study periods abroad: each student must propose a Learning Agreement regarding training activities that lead to the recognition of a number of credits adequate to the period spent abroad. Specifically, 20 CFU for a three-month period; 30 CFU for a six-month period; 45 CFU for a nine-month period.

Evaluation of the period spent abroad: the period of study abroad will be recognized as valid after obtaining at least 70% of the credits specified in the learning agreement, while the activity of the thesis or internship will be valid only after acquisition of all credits.

Incentives: for students who have accomplished satisfactorily the training program, additional points are added to the final degree mark. Up to a maximum of 3 points can be added depending on the duration of the study period, the amount of credits attained, and the overall results obtained by the student.

### 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 generally begins around February each year with the publication of a call for applications specifying the destinations, with the respective programme duration (from 2/3 to 12 months), requirements and online application deadline.

Every year, before the deadline for the call, the University organizes informative meetings to illustrate opportunities and rules for participation to students.

Erasmus+ scholarship

The European Union grants the winners of the Erasmus+ programme selection a scholarship to contribute to their mobility costs, which is 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.

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

For assistance, please contact:

International Mobility Office

Via Santa Sofia 9 (second floor)

Tel. 02 503 13501-12589-13495-13502

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

Student Desk booking through InformaStudenti

## ACTIVE CURRICULA LIST

Biotechnology in drug research and development Course years currently available: 1st , 2nd

Development and production of biotechnological drugs Course years currently available: 1st , 2nd

PHARMACOGENOMICS AND PRECISION THERAPEUTICS Course years currently available: 1st , 2nd

### Procedure for choosing a curriculum

The choice among the three offered curricula must be done at admission. It is possible to change the curriculum only between the two held in Italian, and only before the end of the first semester.

## CURRICULUM: [E51-C] Biotechnology in drug research and development

### Qualifying Training Objectives

The disciplines and educational activities of the curriculum deal with peculiar aspects of biotechnological research in the biomedical field, with reference to the identification of new therapeutic targets and the design of new biotechnological drugs and innovative therapies, also with the help of computational methodologies.

## 1st COURSE YEAR Core/compulsory courses/activities Curriculum-specific features Biotechnology in drug research and development

Learning activity	Ects	Sector
Biology of development and differentiation	6	BIO/13
Biotechnology in Pharmacology	8	BIO/14
Metabolic and Functional Biochemistry	6	BIO/10

Molecular basis of hormone and drug action	8	MED/13, BIO/14
MOLECULAR VIROLOGY	6	BIO/19, MED/07
Pathophysiology	6	MED/04
Physiology of Integrated systems	6	BIO/09
Purification and formulation of biotechnological drug products	8	CHIM/09, CHIM/08
Structural Bioinformatics and Molecular Modeling	10	BIO/10, CHIM/06, CHIM/08
Total compulsory credits		64

### ***2nd COURSE YEAR Core/compulsory courses/activities Curriculum-specific features Biotechnology in drug research and development***

Learning activity	Ects	Sector
Advanced course in Biotechnology and Pharmacology	7	BIO/14
Innovative biotechnological drugs	9	(3) CHIM/06, (6) BIO/14, (6) CHIM/08
Total compulsory credits		16

### ***Further elective courses Curriculum-specific features Biotechnology in drug research and development***

Experimental laboratory of Biotechnology	9	ND
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### ***End of course requirements Curriculum-specific features Biotechnology in drug research and development***

FINAL EXAM	21	ND
Lab training	10	ND
Total compulsory credits		31

### ***CURRICULUM: [E51-D] Development and production of biotechnological drugs***

#### **Qualifying Training Objectives**

The curriculum is aimed at the acquisition of skills necessary for the production, analysis and formulation of biotechnological drugs, diagnostics and vaccines, more closely related to the phases from the development and clinical testing of biotechnological drugs to their industrial production, up to their release on the market.

### ***1st COURSE YEAR Core/compulsory courses/activities Curriculum-specific features Development and production of biotechnological drugs***

Learning activity	Ects	Sector
Biology of development and differentiation	6	BIO/13
Biotechnology in Pharmacology	8	BIO/14
Clinical Pharmacology and Applied Biochemistry	9	MED/03, BIO/10, BIO/14
Metabolic and Functional Biochemistry	6	BIO/10
MOLECULAR VIROLOGY	6	BIO/19, MED/07
Pathophysiology	6	MED/04
Physiology of Integrated systems	6	BIO/09
Preparation and development of drugs with biotechnological methods	9	CHIM/11, CHIM/08
Purification and formulation of biotechnological drug products	8	CHIM/09, CHIM/08
Total compulsory credits		64

### ***2nd COURSE YEAR Core/compulsory courses/activities Curriculum-specific features Development and production of biotechnological drugs***

Learning activity	Ects	Sector
Manufacturing of biotechnological drug products	7	CHIM/09
Quality control and analysis for biopharmaceuticals	9	(6) BIO/14, (3) CHIM/06, (6) CHIM/08
Total compulsory credits		16

### ***Further elective courses Curriculum-specific features Development and production of biotechnological drugs***

Experimental laboratory of Biotechnology	9	ND
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### ***End of course requirements Curriculum-specific features Development and production of biotechnological drugs***

FINAL EXAM	21	ND
Lab training	10	ND
Total compulsory credits		31

### ***CURRICULUM: [E51-E] PHARMACOGENOMICS AND PRECISION THERAPEUTICS***

#### **Qualifying Training Objectives**

The curriculum, delivered in English and aimed at foreign and Italian students, is designed to train graduates who are able to face the future challenges in the field of biotechnological drugs.

<b>1st COURSE YEAR Core/compulsory courses/activities Curriculum-specific features PHARMACOGENOMICS AND PRECISION THERAPEUTICS</b>		
<b>Learning activity</b>	<b>Ects</b>	<b>Sector</b>
Bioinformatics and molecular modeling	8	BIO/10, CHIM/06, CHIM/08
Communicable and non-communicable diseases	8	MED/04, BIO/19
Integrated systems physiology	6	BIO/09
Molecular biochemistry and functional biology	10	BIO/10, BIO/13
Omics: from bench to bedside	6	BIO/10, MED/04
Pharmacogenomics, clinical pharmacology, and orphan drugs	7	BIO/14
Protein engineering, drug delivery and regulatory aspects	11	CHIM/09, CHIM/08
Total compulsory credits		56
<b>2nd COURSE YEAR Core/compulsory courses/activities Curriculum-specific features PHARMACOGENOMICS AND PRECISION THERAPEUTICS</b>		
<b>Learning activity</b>	<b>Ects</b>	<b>Sector</b>
Biomarkers: from identification to exploitation	10	(4) MED/13, (6) BIO/14, (6) CHIM/08
Cell therapy and gene silencing	7	BIO/19, BIO/14, BIO/13
Nanotechnology based medicinal products	7	CHIM/06, BIO/14, CHIM/09
Total compulsory credits		24
<b>Further elective courses Curriculum-specific features PHARMACOGENOMICS AND PRECISION THERAPEUTICS</b>		
Experimental Laboratory of Biotechnology	9	ND
<b>End of course requirements Curriculum-specific features PHARMACOGENOMICS AND PRECISION THERAPEUTICS</b>		
Final Exam	21	ND
Lab Training	10	ND
Total compulsory credits		31