

University Prospectus

Master of Science in Medical Biotechnology

Academic Year 2024/2025

EDUCATIONAL OBJECTIVES

The Master of Science in Medical Biotechnology (hereinafter referred to as Master) is designed for students interested in acquiring a deep knowledge of the molecular, cellular and genetic aspects of prokaryotes and eukaryotes organisms, the structure and function of biological macromolecules, and the cellular processes in which they are involved.

The Master's program introduces learners to the fundamental principles of pathological processes in human and animal organisms and their cellular and molecular pathogenesis, as well as provides expertise on congenital or acquired diseases of biotechnological interest.

Graduates will also learn how to recognize the interactions between external microorganisms and human or animal organisms using ad hoc diagnostic tests, to use bioinformatics tools to query databases, contemporary deontological issues, and current bioethical legislations.

From the academic year 2019/2020, the Master in Medical Biotechnology is splitted into two *curricula* to adequately focus on peculiar biotechnological applications:

- in Curriculum 1 – “Medico” –, all didactic activities are conducted in Italian.
- in Curriculum 2 – “Advanced Technologies” –, all didactic activities are conducted in English.

The educational objectives of the two curricula are intended to improve students' preparation in various biotechnological fields. The “Medical” curriculum focuses on the biotechnological aspects of medical disciplines like neurology, oncology and immunology, whereas the “Advanced Technologies” curriculum mainly deals with advanced biotechnological applications to be used in academic and industrial research.

ADMISSION

Master's enrolment requires a first-level (three-year) degree from an Italian University, or an International Bachelor's degree guaranteeing sufficient knowledge in the following disciplines:

- mathematics, chemistry and physics
- biology (cell biology, biochemistry, molecular biology, genetics, microbiology)
- anatomy, histology and physiology
- pharmacology and toxicology
- English language, in particular medical lexicon

It is mandatory to have acquired a minimum of 55 CFU (university educational credits) in different SSD (Italian academic fields):

- 30 CFU in SSD BIO
- 5 CFU negli SSD MED;
- 10 CFU negli SSD CHIM;
- 5 CFU negli SSD FIS;
- 5 CFU negli SSD MAT;

The bachelor degree in Biotechnology for Health at “Federico II” University guarantees the admission to the Master. In all other cases, applications must be sent to the Student Secretary Office in via Tommaso De Amicis 95, 80131 Napoli, Italy.

MASTER STRUCTURE

The Master offers 10 mandatory exams providing 85 CFU (university educational credits): 7 exams are organized into bi-modular courses – including two teachings and a single final exam –, while the remaining 3 are mono-modular. Furthermore, there are 10 CFU dedicated to optional exams (only available during the second year) and 25 CFU for internship and final test.

From the academic year 2019/2020, the Master’s program is divided into two curricula, which start differing from the second year. In particular, the main difference between the “Medical” and “Advanced Technologies” curriculums consists in 2 mandatory bi-modular exams of the second year (20 CFU), in addition to all the CFU earned through optional exams, internship, and Thesis preparation (35 CFU). These activities allow students to develop specific competences about fundamental principles of pathological and biotechnological processes in medical or technological fields.

Courses are divided into two semesters. The first semester normally begins at the end of September and ends in January. The second starts at the end of February and ends the first week of June.

Courses’ attendance is strongly recommended for all Master’s activities.

The “Medical” curriculum provides all teachings in Italian, while “Advanced Technologies” curriculum is entirely in English. When students complete the enrolment process, they can select their preferred curriculum.

The detailed study plan for the two curricula, including optional courses, is described below.

Medical Curriculum

I YEAR I SEMESTER	CFU	MODULE	CFU/Module	SSD	Activity
Biochimica dei sistemi complessi e Bioinformatica <i>Biochemistry of complex systems and Bioinformatic</i>	10	Biochimica <i>Biochemistry</i>	5	BIO/10	2c
		Bioinformatica <i>Bioinformatic</i>	5	BIO/10	2c
Biologia dello sviluppo e controllo dell’espressione genica <i>Developmental Biology and regulation of gene expression</i>	10	Biologia <i>Biology</i>	5	BIO/13	2c
		Biologia Molecolare <i>Molecular Biology</i>	5	BIO/11	2c
Microbiologia Molecolare e Cellulare <i>Molecular and cellulare Microbiology</i>	5		5	MED/07	2c
I YEAR II SEMESTER					
Diagnostica Avanzata <i>Advanced diagnostic</i>	10	Diagnostica Molecolare <i>Molecular Diagnostic</i>	5	BIO/12	2d
		Metodologie di Medicina di Laboratorio <i>Methodology in Laboratory Medicine</i>	5	MED/46	2e
Farmacologia speciale e terapia genica e cellulare <i>Special pharmacology and gene and cellular therapy</i>	10	Farmacologia speciale e farmacogenomica <i>Special pharmacology and pharmacogenic</i>	5	BIO/14	2g
		Terapia genica e cellulare	5	BIO/12	4

		Gene and cellulare therapy			
Genetica e Patologia Molecolare	10	Genetica Medica Medical Genetic	5	MED/03	2d
Molecular Genetic and Pathology		Patologia Molecolare Molecular Pathology	5	MED/04	2c

II YEAR I SEMESTER	CFU	MODULE	CFU/Module	SSD	Activity
Basi Molecolari di patologie immunitarie e neurologiche Molecular basis of immunological and neurological pathologies	10	Neurologia Neurology	5	MED/26	2e
		Immunologia Clinica Clinical Immunology	5	MED/09	2e
Sintesi di Biomolecole Biomolecules Synthesis	5		5	CHIM/06	2a
II YEAR II SEMESTER					
Basi Molecolari di patologie oncologiche Molecular basis of neoplastic diseases	10	Oncologia medica Medical oncology	5	MED/06	2e
		Oncologia sperimentale Experimental Oncology	5	MED/04	4
Bioetica Bioethic	5		5	MFIL/03	2g
Attività a scelta autonoma dello studente Elective activities	10		5		3
			5		
Prova finale Final Test	15		15		5
Tirocinio Internship	10		10		6

Advanced Technologies Curriculum

I YEAR I SEMESTER	CFU	MODULE	CFU/Module	SSD	Activity
Biochimica dei sistemi complessi e Bioinformatica Biochemistry of complex systems and Bioinformatic	10	Biochimica Biochemistry	5	BIO/10	2c
		Bioinformatica Bioinformatic	5	BIO/10	2c
Biologia dello sviluppo e controllo dell'espressione genica Developmental Biology and regulation of gene expression	10	Biologia Biology	5	BIO/13	2c
		Biologia Molecolare Molecular Biology	5	BIO/11	2c
Microbiologia Molecolare e Cellulare Molecular and cellulare Microbiology	5		5	MED/07	2c

I YEAR II SEMESTER					
Diagnostica Avanzata <i>Advanced diagnostic</i>	10	Diagnostica Molecolare <i>Molecular Diagnostic</i>	5	BIO/12	2d
		Metodologie di Medicina di Laboratorio <i>Methodology in Laboratory Medicine</i>	5	MED/46	2e
Farmacologia speciale e terapia genica e cellulare <i>Special pharmacology and gene and cellular therapy</i>	10	Farmacologia speciale e farmacogenomica <i>Special pharmacology and pharmacogenomic</i>	5	BIO/14	2g
		Terapia genica e cellulare <i>Gene and cellulare therapy</i>	5	BIO/12	4
Genetica e Patologia Molecolare <i>Genetic and Pathology</i>	10	Genetica Medica <i>Medical Genetic</i>	5	MED/03	2d
		Patologia Molecolare <i>Molecular Pathology</i>	5	MED/04	2c

II YEAR I SEMESTER	CFU	MODULE	CFU/Module	SSD	Activity
Molecular aspects of innovative therapies	10	Advanced therapeutic technologies	5	MED/46	2e
		Development of molecular agents	5	BIO/10	4
Sintesi di Biomolecole <i>Biomolecules synthesis</i>	5		5	CHIM/06	2a
II YEAR II SEMESTER					
Enabling technologies in cell biology and regenerative medicine	10	Advanced cell biology	5	BIO/13	2c
		Molecular tools in regenerative medicine	5	BIO/11	2c
Bioetica <i>Bioethic</i>	5		5	MFIL/03	2g
Attività a scelta autonoma dello studente <i>Elective activities</i>	10		5		3
			5		
Prova finale <i>Final Test</i>	15		15		5
Tirocinio <i>Internship</i>	10		10		6

***Types of activities included in DM 270/04**

Educational activity			Disciplinary area
1	Art. 10 comma 1, b)	Class specific activities	2a: Basic disciplines applied to biotechnology 2b: Morfology, function and pathology of cells and complex organisms 2c: Common biotechnology disciplines 2d: Laboratory Medicine and Diagnostics 2e: Medical-surgical disciplines 2f: Veterinary and animal reproduction disciplines 2g: Pharmaceutical disciplines 2h: Humanities and public policy 2i: Scientific English and linguistic, IT and interpersonal skills, medical pedagogy, advanced technologies and communication skills
2	Art. 10 comma 5, a)	Optional activities	3
3	Art. 10 comma 5, b)	Activities in related or integrative areas	4
4	Art. 10 comma 5, c)	Activities for the final exam and foreign language	5
5	Art. 10 comma 5, d)	Activities not provided in previous letters	6

Optional courses list for the academic year 2023/2024

The Teaching Coordination Committee proposes a list of elective teachings that allows students to explore specific aspects of biotechnological disciplines, both in Italian and English, taking into account the differences between the two curricula. Students can complete their study plan by selecting one or more courses, in accordance with the 10 CFU dedicated to optional activities.

Optional Teachings List (in BLU are indicated those in English)

Applicazioni diagnostiche morfomolecolari in istopatologia	5	MED/08
Aspetti biotecnologici in trapiantologia e chirurgia vascolare	5	MED/18
Biologia molecolare clinica applicata allo sport	5	M-EDF/01
Biotechnologie Farmacologiche Pharmacological Biotechnologies	5	BIO/14
Biotechnologie in diagnostica forense	5	BIO/12
Clinical Immunology	5	MED/09
Control of protein homeostasis in health and disease	5	MED/07
Diagnostica avanzata degli additivi e dei residui	5	BIO/12
Genomica di precisione	5	MED/03
Genomica funzionale	5	BIO/10
Medicina interna	5	MED/09
Microbial Biotechnologies	5	MED/07
Neurology	5	MED/26
Pathogenesis of human cancer	5	MED/04

RNA biotechnology: new routes and challenges	5	BIO/10
Applicazioni diagnostiche morfomolecolari in citopatologia	5	MED/08
Biologia della Riproduzione-Laboratorio per la Procreazione Medicalmente Assistita	5	MED/40
Diagnostica per Immagini	5	MED/36
Endocrinologia Endocrinology	5	MED/13
Epidemiologia	5	MED/42
Medicina dell'invecchiamento e Biotecnologie	5	MED/09
Molecular oncology	5	MED/04
Genetic Engineering	5	BIO/18
Scientific writing and presentation skills	5	MED/04

EXAMS

All courses offered in the Master require a final exam to gain CFU. Professors eventually incorporate ongoing tests into the course schedule, set their evaluation criteria and promptly communicate this type of information to students at the start of the course.

Exams and ongoing tests could be:

- multiple choice answers, open answers or numerical exercises;
- project discussion;
- laboratory activities' report;
- scheduled oral tests;
- Tests in computer lab.

At the end of each semester, students receive a grade based on the results of the final exam and of the ongoing tests. Exam admission is always subject to the required preliminary courses established by the Teaching Coordination Committee.

Students are evaluated on a scale expressed in thirtieth. The minimum grade to pass exams is 18/30. The Exam Committee can decide to assign to students the maximum grade *cum laude*. In case of failed exams, students can try again in other days, according to the didactic calendar. The Teaching Coordination Committee normally sets the amount of time between a failed exam and the student's admission to a subsequent exam session.

The exam calendar is organized in:

- Ordinary sessions: January, February, June, July, September;
- Extraordinary sessions: May, November.

The Teaching Coordination Committee deliberates eventual changes in exam schedule.

FINAL TEST AND THESIS

To be admitted to the final exam, students must acquire all the CFU required by their study plan, except for final exam's CFU. It is mandatory to fulfil administrative obligations.

The final exam consists in the discussion of a dissertation, written in Italian or English, focused on a scientific problematic studied during experimental activities in laboratory. Students of the "Advanced Technologies" curriculum must write their dissertation in English.

Students must complete preparatory activities for the final test with a high grade of autonomy, under the supervision of a professor (mentor). Students can execute this kind of activities at other universities (in

Italy or abroad), or at public or private structures laboratories affiliated with Federico II University. When students propose an external place for laboratory and thesis activities, the Thesis and Internship Committee must approve the project and the selection. In detail, the internship consists in a work period in university's structures or in research centres, companies, or external institutions, under the guidance of an external supervisor (external supervisor) aided by a Master's professor as internal supervisor.

Thesis discussion is public. The final grade, according to the paragraph 5 of Art. 24 of the Didactic Regulations, is the result of the entire student career and the quality of his/her thesis, dissertation, and discussion.