University Prospectus

Master of Science in Medical Biotechnology

Academic Year 2025/2026

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 spitted 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.

From the academic year 2025/2026, the Master in Medical Biotechnology has activated also the "Bioinformatics" curriculum.

The educational objectives of the three 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; the "Advanced Technologies" curriculum mainly deals with advanced biotechnological applications to be used in academic and industrial research; the "Bioinformatics" curriculum provides computer science skills to analyze and interpret complex data and biological images. These skills, integrated with advanced teachings in molecular biology, genomics, transcriptomics, epigenomics, and metagenomics will provide the ability to analyze and use multi-omics data to implement personalized medicine approaches

The three curricula are taught in Italian (medical and bioinformatics) and English (advanced technologies), respectively.

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.
Students will be automatically admitted if they have a certified B2 level. In the absence of certification, knowledge of the English language at B2 level will be assessed by a special commission appointed by the Course of Study Coordination Commission.

B2 level is verified in the following ways:

- presentation of a language certification, level B2 or higher, issued by an international certifying body recognized by the Ministry of University and Scientific Research according to the provisions of DM 06.05.2020 and subsequent amendments;
- presentation of a certification obtained during a degree program at the University of Naples Federico II through the Centro Linguistico d'Ateneo (CLA), including certifications validated during the three-year career;
- passing the Placement test, provided by the CLA, within 12 months from the date of matriculation.

In case of failure of the Placement Test, the student will have to take enhancement course
organized by the CLA with compulsory attendance, with final examination and issuance of relevant certification or attestation. In the absence of English language certification or attestation, the student will not be allowed to take the final exam for the Master's degree.

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; from the academic year 2025/26, "Bioinformatics" curriculum will be available. In particular, the main difference between the "Medical", "Bioinformatics" and "Advanced Technologies" curriculums consists in 2 mandatory 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" and "Bioinformatics" curricula provide 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.

Curriculum Medico

I ANNO I SEMESTRE	CFU	MODULO	CFU/Modulo	SSD	TAF
Biochimica dei sistemi complessi e Bioinformatica	10	Biochimica	5	BIO/10	B
		Bioinformatica	5	BIO/10	B
	10	Biologia	5	BIO/13	B

Biologia dello sviluppo e controllo dell'espressione genica		Biologia Molecolare	5	BIO/11	B
Microbiologia Molecolare e Cellulare	5		5	MED/07	B
I ANNO II SEMESTRE					
Diagnostica Avanzata	10	Diagnostica Molecolare	5	BIO/12	B
		Metodologie di Medicina di Laboratorio	5	MED/46	B
Farmacologia speciale e terapia genica e cellulare	10	Farmacologia speciale e farmacogenomica	5	BIO/14	B
		Terapia genica e cellulare	5	BIO/12	B
Genetica e Patologia Molecolare	10	Genetica Medica	5	MED/03	B
		Patologia Molecolare	5	MED/04	B
Attività a scelta autonoma dello studente	5		5		D

II ANNO I SEMESTRE	**CFU**	**MODULO**	**CFU/Modulo**	**SSD**	**TAF**
Basi Molecolari di patologie immunitarie e neurologiche	10	Neurologia	5	MED/26	C
		Immunologia Clinica	5	MED/09	C
Sintesi di Biomolecole	5		5	CHIM/06	B
II ANNO II SEMESTRE					
Basi Molecolari di patologie oncologiche	10	Oncologia medica	5	MED/06	B
		Oncologia sperimentale	5	MED/04	C
Bioetica	5		5	MFIL/03	B
Attività a scelta autonoma dello studente	5		5		D
Prova finale	15		15		E
Tirocinio	10		10		F

Curriculum Advanced Technologies

I YEAR I SEMESTER	**CFU**	**MODULO**	**CFU/Modulo**	**SSD**	**TAF**
Biochemistry of complex systems and bioinformatics	10	Biochemistry	5	BIO/10	B
		Bioinformatics	5	BIO/10	B
Developmental Biology and gene expression control	10	Biology	5	BIO/13	B
		Molecular Biology	5	BIO/11	B
Molecular and Cellular Microbiology	5		5	MED/07	B
I YEAR II SEMESTER					
Advanced diagnostic	10	Molecular Diagnostic	5	BIO/12	B
		Laboratory medicine methodologies	5	MED/46	B
Special Pharmacology and Gene and Cell Therapy	10	Special Pharmacology and Pharmacogenomics	5	BIO/14	B
		Gene and cell therapy	5	BIO/12	B
Genetics and molecular pathology	10	Medical Genetics	5	MED/03	B
		Molecular pathology	5	MED/04	B
Elective course			5		D

II YEAR I SEMESTER	CFU	MODULO	CFU/Modulo	SSD	TAF
Molecular aspects of innovative therapies	10	Advanced therapeutic technologies	5	MED/46	B
		Development of molecular agents	5	BIO/10	C
Synthesis of biomolecules	5		5	CHIM/06	B
II YEAR II SEMESTER					
Enabling technologies in cell biology and regenerative medicine	10	Advanced cell biology	5	BIO/13	C
		Molecular tools in regenerative medicine	5	BIO/11	C
Bioethics	5		5	MFIL/03	B
Elective course	5		5		D
Final Test	15		15		E
Training	10		10		F

Curriculum Bioinformatico

I ANNO I SEMESTRE	CFU	MODULO	CFU/Modulo	SSD	TAF
Biochimica dei sistemi complessi e Bioinformatica	10	Biochimica	5	BIO/10	B
		Bioinformatica	5	BIO/10	B
Biologia dello sviluppo e controllo dell'espressione genica	10	Biologia	5	BIO/13	B
		Biologia Molecolare	5	BIO/11	B
Microbiologia Molecolare e Cellulare	5		5	MED/07	B
I ANNO II SEMESTRE					
Diagnostica Avanzata	10	Diagnostica Molecolare	5	BIO/12	B
		Metodologie di Medicina di Laboratorio	5	MED/46	B
Farmacologia speciale e terapia genica e cellulare	10	Farmacologia speciale e farmacogenomica	5	BIO/14	B
		Terapia genica e cellulare	5	BIO/12	B
Genetica e Patologia Molecolare	10	Genetica Medica	5	MED/03	B
		Patologia Molecolare	5	MED/04	B
Attività a scelta autonoma dello studente	5		5		D

II ANNO I SEMESTRE	CFU	MODULO	CFU/Modulo	SSD	TAF
Programmazione Bioinformatica e Gestione Dati	10	Fondamenti di Programmazione per la Bioinformatica	5	INGINF/ 05	B
		Gestione e Analisi di Dati Biologici	2+3	BIO/18 FIS/07	C
Sintesi di Biomolecole	5		5	CHIM/06	B
II ANNO II SEMESTRE					
Genomica Avanzata e Analisi Multi-Omiche	10	Tecnologie di Sequenziamento e Analisi Genomica	3+2	MED/03 BIO/12	C
		Trascrittomica, Epigenomica	3+2	BIO/11	C

		e Medicina di Precisione		MED/04	
Bioetica	5		5	MFIL/03	B
Attività a scelta autonoma dello studente	5		5		D
Prova finale	15		15		E
Tirocinio	10		10		F

***Legenda delle tipologie delle attività formative (TAF) ai sensi del DM 270/04**

B = Characterizing
C = Similar or integrative
D = Elective
E = Final test and language test
F = Others

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
Applicazioni diagnostiche morfomolecolari in citopatologia	5	MED/08
Biologia molecolare clinica applicata allo sport	5	M-EDF/01
Biologia della Riproduzione-Laboratorio per la Procreazione Medicalmente Assistita	5	MED/40
Biotecnologie Farmacologiche	5	BIO/14
Biotecnologie 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
Diagnostica per Immagini	5	MED/36
Endocrinologia	5	MED/13
Epidemiologia	5	MED/42
Functional Genomics	5	BIO/10
Genomica di precisione	5	MED/03
Genetic Engineering	5	BIO/18
Microbial Biotechnologies	5	MED/07
Medicina dell'invecchiamento e Biotecnologie	5	MED/09
Molecular annotation of human diseases and machine learning	5	MED/04
Molecular oncology	5	MED/04
Pathogenesis of human cancer	5	MED/04
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.

Master thesis cannot last less than 12 months and students can start their thesis work from the first year.

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.