



# UNIVERSITÀ DEGLI STUDI DI PALERMO

**Department: Biological, Chemical and Pharmaceutical Sciences and Technologies**

**A.Y. 2023/2024**

## **DEGREE COURSE IN BIOMOLECULAR INDUSTRIAL BIOTECHNOLOGIES**

### **Characteristics**



Class of Master's Degree  
(MSc) on Industrial  
biotechnologies (LM-8)



2 YEARS



PALERMO



FREE ACCESS



2296

### **Educational objectives**

The specific objective of the course is to train highly qualified experts with biological knowledge and skills at the molecular level, with a strong multidisciplinary connotation, applicable to the various areas of industrial biotechnology.

The training activities provide for the acquisition of knowledge and skills in two main disciplinary areas: -

1. biotechnological-molecular disciplines, providing: i) advanced knowledge at the molecular and cellular level of biological systems and their biotechnological applications; ii) genomic, proteomic and bioinformatics knowledge for the computational analysis of biological data and the design of new biomolecules; iii) knowledge on the organization and expression regulation of prokaryotic, eukaryotic, and viral genomes.

2. bio-chemical, bio-physical and engineering subjects, providing knowledge i) on chemistry and biotechnological disciplines related to the processes for the production, transformation and characterization of bio-goods; ii) basic knowledge relating to industrial biotechnological plants and to the regulations and safety criteria associated with them in order to transfer the acquired biological and chemical knowledge to a production scale; iii) knowledge of the structure-function relationships of biological macromolecules useful for biotechnological purposes.

The educational path is organized in such a way that most of the disciplines are taught in the first year, organized to allow the sequential study of the disciplinary contents through careful coordination of the relative programmes; in the second year, the frontal activity is limited to the first semester and the learning continues with an extensive experimental activity carried out in university research laboratories and/or other laboratories or public or private facilities, both national and international. A good command of the English language will be acquired, level B2, necessary for effectively access the labour market. The preparatory experimental activity for the final exam enables students to contextualize, in a working reality, the knowledge, methodologies and skills acquired during the course. The original results of the research carried out will be the object of the Degree Thesis, where graduates will have to demonstrate the acquisition of full organizational and planning autonomy. They can also continue their training path through II level Masters, Research Doctorates and Graduate Schools.

### **Professional opportunities**

Profile:

Biomolecular Industrial Biotechnologist

Functions:

Graduates in "Biomolecular industrial biotechnologies" possess in-depth knowledge of organic chemistry, physical chemistry, applied physics, cell biology, biochemistry, molecular biology, functional genomics, microbiology, biological systems, and biochemical plants, enabling them to:

- 1) carry out basic and applied research in the field of genetic, tissue, cellular, protein and metabolic engineering, using recombinant DNA techniques for the production and development of molecules of biotechnological interest and/or the manipulation of stem cells;
- 2) operate in research and development laboratories, for the validation and optimization of biotechnological production processes, and for the supervision of the correct performance of production and analytical procedures and of quality control in industrial production chains;
- 3) select the technologies and instruments suitable for the structural and functional analysis of biological macromolecules;
- 4) use the main biological databases to extrapolate information necessary for the development of processes, and carry out bioinformatic analyses for the study of protein and nucleotide sequences; apply bioinformatics methodologies for accessing, organizing and analysing data present in genomics, proteomics and metabolomics databases;

Legenda: Per. = periodo o semestre, Val. = Valutazione (V=voto, G=giudizio), TAF= Tipologia Attività Formativa (A=base, B=caratterizzante, C=Affine, S=stages, D=a scelta, F=altre)

- 5) performing genotyping, isolating and selecting microorganisms for their use in small and large scale bioreactors;  
 6) carry out planning and coordinating activities for the promotion and development of scientific and technological innovation in areas related to biotechnological disciplines; coordinate research projects in the field of molecular and industrial biotechnology.

#### Skills:

Graduates in "Biomolecular Industrial Biotechnology" are able to use biological systems and genetic and tissue engineering techniques for applications in various production sectors, such as the biomedical, chemical-pharmaceutical and industrial sectors at large. They can also use genetic manipulation techniques, traditional analytical tools and modern technologies (for example genomics, proteomics and bioimaging), enabling them to work in biomedical laboratories of molecular diagnostics and in research and development laboratories dedicated to the production of engineered proteins and drugs and their delivery. They can use, manage and supervise culture systems of gametes, embryos and cells (including stem cells) for the development of transgenic organisms, useful for the study of human pathologies, including carcinogenesis, for testing new drugs and for the study and induction of regeneration processes.

#### Professional opportunities:

The employment opportunities for those who obtain the 2nd cycle degree in "Biomolecular industrial biotechnologies" may be found in:

- National and international universities and research centres, with the possibility of continuing one's education in graduate schools, second-level masters and PhD courses.
- Companies in the biotechnological, biomedical, agri-food, pharmaceutical and environmental sectors.
- Diagnostic or applied research centres.
- Analysis laboratories.
- Regional agencies for environmental prevention.
- Freelance activity (upon enrolment in the Register of Biologists and/or the National Association of Italian Biotechnologists - ANBI).
- Agencies, organizations or companies for scientific dissemination and specialized press.
- Companies and bodies for quality certification.

#### Final examination features

It consists of the presentation of an original dissertation prepared by the candidate under the guidance of a supervising professor; the dissertation should report the results of the research activity carried out during the internship at a university laboratory, or at an external laboratory with which the University has signed a specific agreement. The content of the dissertation will be presented to an examining Board. For the presentation, candidates should also use audio-visuals. During and/or at the end of the presentation, the members of the Board may ask questions to the candidate in order to better assess the level of acquired competence. The final mark will be determined by the Board on the basis of the final examination, also taking into account the marks obtained in individual examinations. The appointment of the examining Board and the final mark are regulated by specific Regulations.

Subjects 1 ° year	CFU	Sem.	Val.	SSD	TAF
15562 - ADVANCED MOLECULAR BIOLOGY <i>Cavalleri(PA)</i>	9	1	V	BIO/11	B
01676 - CELLULAR BIOTECHNOLOGIES <i>Cancemi(PA)</i>	7	1	V	BIO/06	B
23336 - CHEMICAL-PHYSICAL MODELS AND METHODS FOR BIOLOGICAL SYSTEMS <i>Lombardo(RU)</i>	6	1	V	CHIM/02	C
17543 - MICROBIAL BIOTECHNOLOGIES <i>Gallo(PA)</i>	6	1	V	BIO/19	B
13351 - ADVANCED SKILLS RELATED TO THE LABOUR MARKET	3	1	G		F
20691 - ENGLISH LANGUAGE SKILLS - EQUIVALENT TO LEVEL B2	3	1	G		F
23340 - BIO-REACTORS AND BIOTECHNOLOGICAL PLANTS - INTEGRATED COURSE	9	2	V		
- BIO-REACTORS <i>Lima(RD)</i>	3	2		ING-IND/25	C
- PRINCIPLES OF BIOCHEMICAL EQUIPMENT <i>Scargiali(PO)</i>	6	2		ING-IND/25	B
01551 - APPLIED BIOCHEMISTRY - INTEGRATED COURSE	9	2	V		
- APPLIED BIOCHEMISTRY <i>Gherzi(PA)</i>	6	2		BIO/10	B

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Subjects 1 ° year	CFU	Sem.	Val.	SSD	TAF
- CANCER BIOCHEMISTRY <i>Campora(RD)</i>	3	2		BIO/10	C
23335 - SPECTROSCOPY AND BIOIMAGING <i>Vetri(PO)</i>	6	2	V	FIS/01	B

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Subjects 2 ° year	CFU	Sem.	Val.	SSD	TAF
23338 - DRUG DELIVERY STRATEGIES AND SYSTEMS IN ORGANIC CHEMISTRY <i>D'Anna(PO)</i>	6	1	V	CHIM/06	B
23333 - FUNCTIONAL AND COMPUTATIONAL GENOMICS - INTEGRATED COURSE	9	1	V		
- COMPUTATIONAL GENOMICS <i>Romano(PQ)</i>	3	1		BIO/13	C
- FUNCTIONAL GENOMICS <i>Feo(PO)</i>	6	1		BIO/18	B
05917 - FINAL EXAMINATION	38	2	G		E
Free subjects	9				D
Free subjects (suggested)	9				D

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## OPTIONAL SUBJECTS

Free subjects (suggested)	CFU	Sem.	Val.	SSD	TAF
21199 - BIOTECHNOLOGIES FOR THE ENVIRONMENT <i>Mannina(PO)</i>	6	1	V	ICAR/03	D

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