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DI TORINO

Master Program in MOLECULAR BIOTECHNOLOGY

Emanuela TOLOSANO

Program overview

Department: ***Molecular Biotechnology and Health Sciences***

Coordinator: ***Prof. Paola Defilippi***

Degree level: ***Postgraduate***

Duration: ***2 years***

Credits: ***120 ECTS***

Access: ***No restriction on the number of places. However, candidates are subjected to a preliminary verification of the specific curricular and personal requirements.***

Admission requirements

Web page: *https://www.molecularbiotechnology.unito.it/do/home.pl*

We welcome applications from candidates who have a Bachelor Degree (three-year first level degree) or other equivalent qualifications obtained from Italian or foreign Universities.

Depending on the Bachelor Degree, the scientific background will be verified by a written test. To be admitted at the verification test, candidates must have an appropriate number of credits in the following subjects:

Mathematics, Statistics, Physics, General and Inorganic Chemistry, Organic Chemistry, Biochemistry, Cell Biology, Molecular Biology and Genetics.

Location

MOLECULAR BIOTECNOLOGY CENTER (MBC) GUIDO TARONE

MBC 1 Via Nizza 52

MBC 2 Piazza Nizza 44

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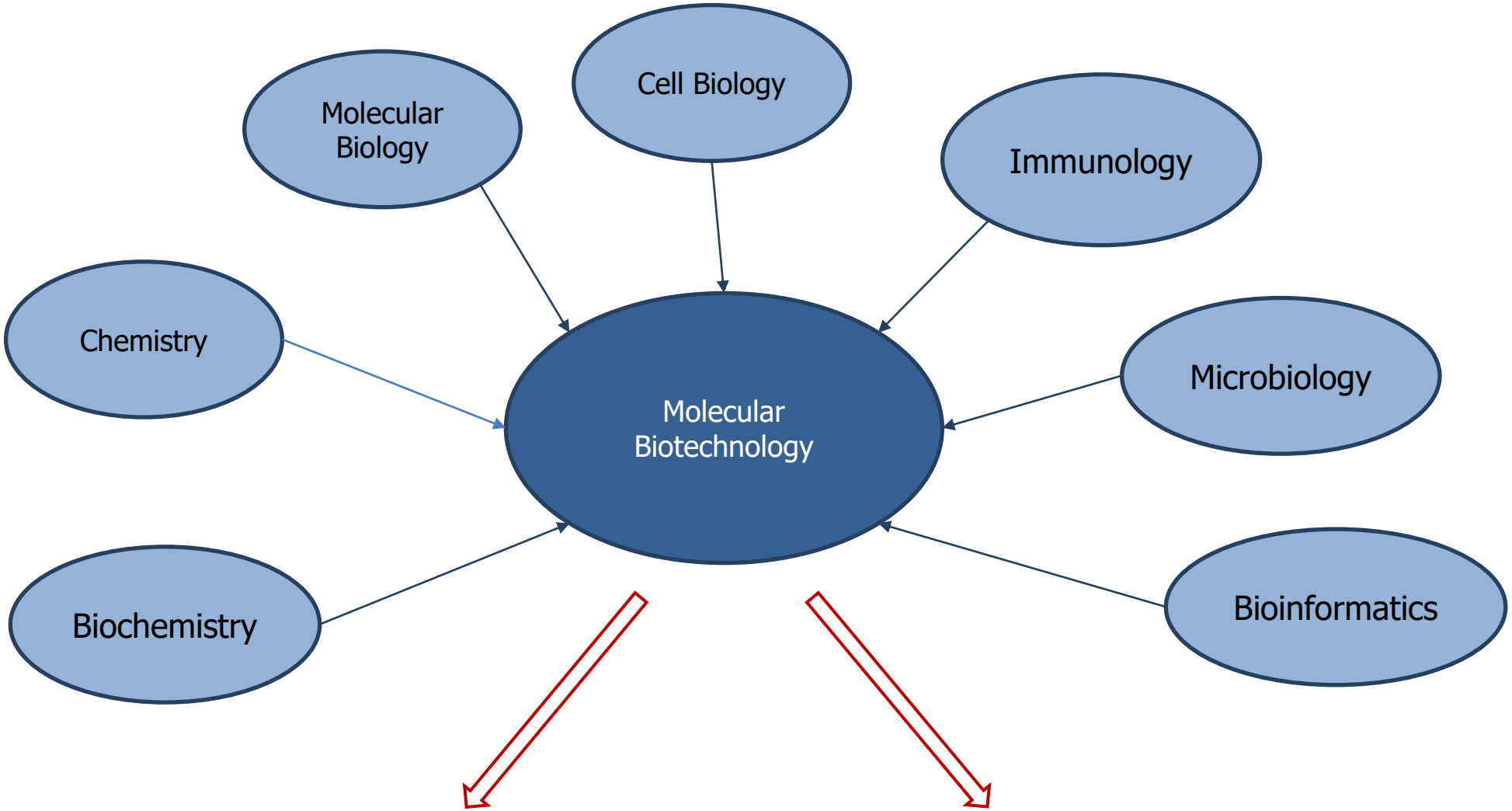
Master program's aim

Nowadays, Molecular Biotechnology plays a crucial role in the development of health sciences *in terms of* ***medical treatments***, ***therapies***, *and* ***diagnostic tools***, *with an increasing demand for interdisciplinary approaches.*

Our Master in Molecular Biotechnology intersects with various scientific disciplines, such as ***cellular and molecular biology, immunology, chemistry, physics, molecular imaging and bioinformatics***. *This* ***interdisciplinary approach*** *enhances the problem-solving skills and prepares the students to collaborate with experts from different fields.*



understanding biological processes

- **Creating new diagnostics tools**
- **Identifying new therapeutic targets**
- **Developing innovative therapeutic**

- ***Understanding molecular processes at the cellular level*** *to create targeted treatments for various diseases, including cancer, genetic disorders, neurodegeneration and infectious diseases.*

- ***Cell therapy****, which involves the use of living cells to treat various medical conditions and diseases.*

- ***"Omics"****, including genomics, transcriptomics, epigenomics, proteomics and metabolomics, as essential tools to gain a comprehensive understanding of complex biological processes.*

- ***Genetic engineering*** *enables the manipulation of genes and genomes for various applications, such as the production of genetically modified organisms (GMOs), and gene therapy*

Study plan

*The courses in the program are structured into two curricula: the **Translational Biotechnology Program** and the **Biomedical Imaging and Drug Discovery**.*

*The **Translational Biotechnology Program** focuses on the latest advances in genetic engineering, "in the biomedicine field with specific reference to technological aspects including "omics", and gene and cell therapy.*

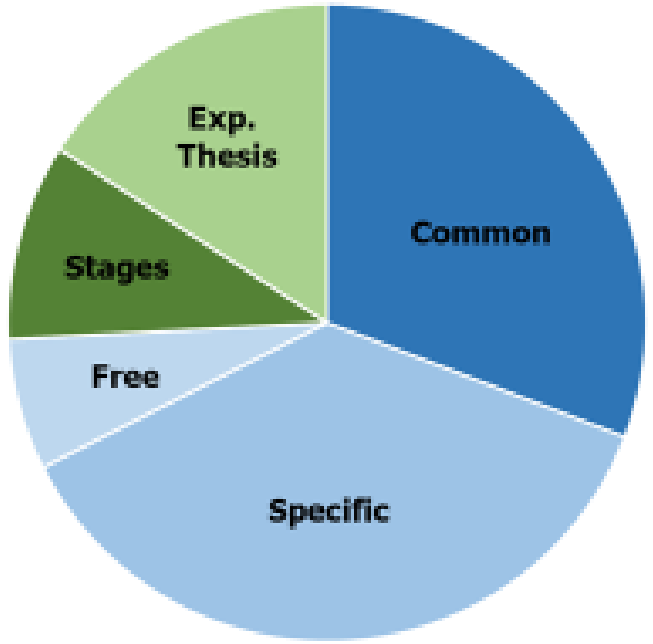
Study plan

*The **Biomedical Imaging and Drug Discovery** addresses topics in the field of drug discovery and medical diagnostics with a focus on the latest advances in molecular imaging technology.*

Study plan

ECTS distribution

The study plan (120 credits) includes some courses common to both programs in the first year, some optional courses to be chosen by the students (8 credits) and stages in laboratory (12 credits) and 19 (5 + 14) credits for experimental thesis



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CURRICULUM TRANSLATIONAL BIOTECHNOLOGY A.A. 2023/2024			
FIRST YEAR			
First Semester			
BIO0136	Physiology		5 ECTS
BIO0167	Functional Genomics		8 ECTS
		Molecular Dynamics of Cellular Processes	5
		The Genetic Basis of Cancer	3
BIO0143	Genomics and Epigenomics		10 ECTS
		Computational Genomics and Epigenomics	5
		Genomics and Epigenomics of Gene Regulation	5
BIO0115	Interactions and Gene Networks		5 ECTS
Second Semester			
BIO0175	Biology of Regeneration and Development		10 ECTS
		Innovative experimental models in developmental biology and pathology	5
		Stem Cell Biology	5
BIO0114	Molecular Immunology		5 ECTS
BIO0171	In vitro diagnostics: molecular profiling of proliferative processes		5 ECTS
BIO0159	Stage I		6 ECTS
BIO0158	Thesis I		5 ECTS

SECOND YEAR			
First Semester			
BIO0168	Chemistry for Health Sciences		13 ECTS
		Supramolecular and Bioinorganic Chemistry	3
		Nanomaterials	5
		Mass Spectrometry	5
BIO0169	Therapeutic Biotechnology		8 ECTS
		The molecular basis of neurological therapies	3
		Therapeutic biotechnology applied to regenerative medicine	5
BIO0170	Pharmacology and Drug Therapies		8 ECTS
		Pharmacological Biotechnology	3
		Drug Discovery: basic principles	5
Second Semester			
BIO0164	Biotech Companies Management		4 ECTS
BIO0165	Stage II		6 ECTS
BIO0166	Thesis II		14 ECTS

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CURRICULUM BIOMEDICAL IMAGING AND DRUG DISCOVERY AA 2023/2024			
FIRST YEAR			
First semester			
BIO0108	Physiology and Biochemistry		10 ECTS
		Physiology	5
		Biochemistry	5
BIO0154	Computational genomics and Gene Networks		10 ECTS
		Computational genomics and epigenomics	5
		Interactions and Gene Networks	5
BIO0214	Principles of drug discovery		5 ECTS
BIO0153	Supramolecular chemistry and Spectroscopic methods		8 ECTS
		Supramolecular and Bioinorganic Chemistry	3
		Spectroscopy of biomolecules	5
Second semester			
BIO0242	Biomedical imaging		11 ECTS
		PET/SPECT/CT	5
		MRI/OI/US/PAI	6
BIO0157	Data analysis		6 ECTS
BIO0159	Stage I		6 ECTS
BIO0158	Thesis I		5 ECTS

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SECOND YEAR			
First semester			
BIO0160	Advanced materials and methods for health sciences		10 ECTS
		Mass Spectrometry	5
		Nanomaterials	5
BIO0161	Advanced Drug Discovery		5 ECTS
BIO0163	Immuno-based assays for translational medicine		7 ECTS
		Immuno-based assays for translational medicine I	5
		Immuno-based assays for translational medicine II	2
Second semester			
BIO0162	In vitro diagnostics: proteomics, interactomics and metabolomics		5 ECTS
BIO0164	Biotech Companies Management		4 ECTS
BIO0165	Stage II		6 ECTS
BIO0166	Thesis II		14 ECTS

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FREELY CHOSEN COURSES (for both curricula) A.Y. 2023/2024			
First Semester			
BIO0185	Cancer Metabolism		4 ECTS
BIO0218	Metals in Medicine and biological systems		4 ECTS
BIO0178	Image Analysis for Biotechnologists		4 ECTS
BIO0192	Molecular Pharmacolgy		2 ECTS
BIO0213	Imaging of brain disease and therapy		4 ECTS
Second Semester			
BIO00221	Methods in computational biology		6 ECTS
		Methods in computational biology I	2
		Methods in computational biology II	2
		Methods in computational biology III	2
BIO0186	Molecular Medicinal Chemistry		6 ECTS
BIO0187	Genetic Models of Human Pathology		6 ECTS
BIO0188	In vivo Imaging of Cancer Therapy		4 ECTS
BIO0189	Enabling technologies in drug synthesis and processing		4 ECTS
BIO0219	Pathologic basis of disease		4 ECTS
BIO0120	Scientific Communication		4 ECTS
		Scientific Communication 1	1
		Scientific Communication 2	2
		Scientific Communication 3	1
BIO0191	The Hallmarks of Ageing: molecular basis of ageing-associated syndromes		4 ECTS
BIO0217	Advanced Mass Spectrometry		4 ECTS
BIO0220	Computational Drug Discovery		4 ECTS
BIO0249	Biotechnology in and towards environmental sustainability		4 ECTS
		Biology for sustainability	2
		Environmental sustainability	1
		Biology for sustainable agrifood system	1

Study plan 2024-25:

Approved modifications

Translational Biotechnology Program

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Molecular, Computational and Translational Biotechnology Program

BIO0253 – PROGRAMMING APPROACHES FOR BIOINFORMATICS
BIO0254A - ADVANCED DATA ANALYSIS FOR BIOLOGICAL PROCESSES
BIO0221A - METHODS IN COMPUTATIONAL BIOLOGY I
BIO0221B - METHODS IN COMPUTATIONAL BIOLOGY II
BIO0221C - METHODS IN COMPUTATIONAL BIOLOGY III

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The main focus of this program is on practical experience, which the students gain during several internships. Students spend most of their formative curriculum attending the experimental work in a research laboratory that may lead to scientific publications. Lectures and seminars offered by the University of Torino are part of the formative track.

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The program aims to produce researchers whose profound knowledge of the most advanced biotechnological applications enables them to independently address the most important basic and applied biomedical issues. As such, the graduates have all the theoretical knowledge and practical skills to access at international doctoral programs or to be considered for positions in pharma- and biotech- companies.

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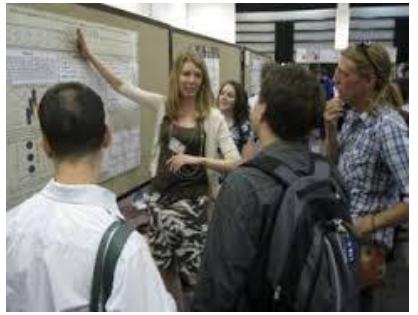
Thinking

Set and perform an experiment

SCIENTIST

Discuss data



Present data

Experimental thesis

Academia:

- Molecular Biotechnology Center – MBC
- Candiolo Cancer Institute – IRCCS
- Neuroscience Institute Cavalieri Ottolenghi – NICO
- CeRMS– Centro di Ricerca in Medicina Sperimentale

Industry:

- Bioindustry Park Silvano Fumero, Colleretto Giacosa (TO) (Bracco, Merck-Serono)
- DiaSorin
- Chiesi Farmaceutici

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Career opportunities

The program aims to produce researchers whose profound knowledge of the most advanced biotechnological applications enables them to independently address the most important basic and applied biomedical issues.

Career opportunities

Industry: *The pharmaceutical and biotech industries have a growing demand for professionals skilled in molecular biotechnology. You can work in diverse roles also within research institutions or regulatory agencies.*

Academia: *to pursue further academic research through a Ph.D. program.*

To make meaningful contributions to society *by advancing scientific knowledge and addressing real-world challenges in healthcare, agriculture, environment, and beyond.*

International mobility opportunities

- ***Erasmus program***
- ***International Academic Exchange: University of Minnesota (USA)***
- ***COIL (Collaborative Online International Learning):***
  Universidad San Paulo, Madrid (Espagne)
  University of Paris Saclay (France)

Contacts and useful links

Coordinator: *paola.defilippi@unito.it*

Web page: *www.unito.it,*
https://www.molecularbiotechnology.unito.it/do/home.pl

Other useful links:
https://en.unito.it/studying-unito/programs/degree-programs/degree-programs-english
https://en.unito.it/studying-unito/international-degree-seeking-students

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Thank you for your attention