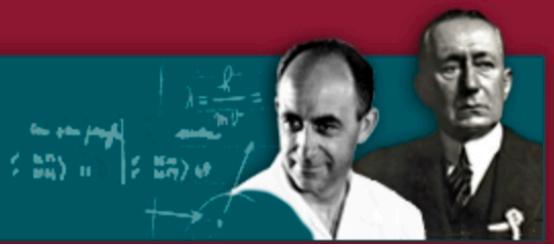

MASTER IN PHYSICS

Curriculum in BioSystems

General information on the different curricula can be found at
https://corsidilaurea.uniroma1.it/it/corso/2019/30055/programmazione

IMPORTANT:

The curriculum in BioSystems has been revised and has a NEW structure

New students enrolling in 2019-2020 should consider the curriculum_2019-2020

Students who enrolled in 2018-2019 (or before) should refer to the old curriculum

Curriculum in BioSystems

The curriculum provides a **comprehensive knowledge of the principles and applications of physical modelling in biology.** Besides a core background in physics (RQM and Condensed Matter) the student will develop a deep understanding of the physical mechanisms driving biological systems at all levels and scales, and of the techniques to analyze them.

➡ the origin of intra and inter molecular forces, of the self-assembly processes, the physics of polymers and of colloidal solutions.

➡ the basic principles of response theory and the main techniques in spectroscopy and microscopy to investigate biological systems at the microscopic scale.

➡ the theory of low Reynolds number hydrodynamics and how to study - through various experimental techniques - dynamical processes in cells and living systems.

➡ theoretical concepts in stochastic processes and the statistical physics of interacting systems and how to use them to describe signal amplification, regulation and collective phenomena in multi-scale biological processes, from neural networks to animal groups.

➡ computational methods to analyze data and make sense of them

Corso di laurea in Fisica (LM-17) - Curriculum Biosistemi

N.	Insegnamenti	CFU	anno	sem.	SSD	eng	ambito
1	Condensed Matter Physics	6	1	1	FIS/03	Y	caratt.
2	Soft and Biological Matter	6	1	1	FIS/03	Y	caratt.
3	Physics Laboratory I (propedeutico a Physics Laboratory II)	6	1	1	FIS/01	Y	caratt.
4	Physics Laboratory II	9	1	2	FIS/01	Y	caratt.
5	Theoretical Biophysics	6	1	2	FIS/02	Y	caratt.
6	Biophysics	6	1	2	FIS/03		caratt.
7	English language	4	1	2		Y	AAF
8	Gruppo A	6	1 / 2	1 / 2			aff.-int.
9	Gruppo A	6	1 / 2	1 / 2			aff.-int.
10	Corso a scelta	6	1	2			
11	Relativistic Quantum Mechanics	6	2	1	FIS/02	Y	caratt.
12	Gruppo A	6	1 / 2	1 / 2			aff.-int.
13	Corso a scelta	6	2	1			
14	Internship	3	2	1		Y	AAF
15	Thesis Project	38	2	2		Y	AAF

Gruppo A (aff.-int.)

1	Biochimica	6	1	1	BIO/10	N	
2	Computational Biophysics	6	1	1	INF/01	Y	
3	Atomistic Simulations	6	1	1	INF/01	Y	
4	Statistical Mechanics and Critical Phenomena	6	1	1	FIS/02	Y	
5	Nonlinear and Quantum Optics	6	1	1	FIS/03	Y	
6	Molecular biology	6	1	2	BIO/11	Y	
7	Mathematical Physics	6	1	2	MAT/07	Y	
8	Computational Statistical Mechanics	6	1	2	FIS/02	Y	
9	Nonlinear Waves and Solitons	6	1	2	FIS/02	Y	
10	Neural Networks	6	1	2	FIS/02	Y	
11	Meccanica statistica del non equilibrio	6	1	2	FIS/02	N	
12	Photonics	6	1	2	FIS/03	Y	
13	Many-Body Physics	6	1	2	FIS/03	Y	
14	Physics of liquids	6	1	2	FIS/03	Y	
15	Statistical Mechanics of Disordered Systems	6	2	1	FIS/02	Y	
16	Medical Applications of Physics	6	2	1	FIS/01	Y	
17	Physics of Complex Systems	6	2	1	FIS/03	Y	
18	Spectroscopy Methods and Nanophotonics	6	2	1	FIS/03	Y	
19	Surface physics and nanostructures	6	2	1	FIS/03	Y	

CFU = number of credits
Anno = year (first or second year)
Sem. = semester in which the course is taught
Eng = in English (Y) or in Italian (N)

SSD:
FIS: Physics course
CHIM: Chemistry course
BIO: Biology course
INF: Computer science course
MAT: Mathematics course

7 Mandatory Courses

4 common to all curricula
3 specific to the Biosystem CV

3 Courses from Group A

2 Elective Courses

Constraints:
2 courses must be NON-FIS
(BIO, INF, MAT etc)

Mandatory Courses:

Corso di laurea in Fisica (LM-17) - Curriculum Biosistemi							
N.	Insegnamenti	CFU	anno	sem.	SSD	eng	ambito
1	Condensed Matter Physics	6	1	1	FIS/03	Y	caratt.
2	Soft and Biological Matter	6	1	1	FIS/03	Y	caratt.
3	Physics Laboratory I (propedeutico a Physics Laboratory II)	6	1	1	FIS/01	Y	caratt.
4	Physics Laboratory II	9	1	2	FIS/01	Y	caratt.
5	Theoretical Biophysics	6	1	2	FIS/02	Y	caratt.
6	Biophysics	6	1	2	FIS/03		caratt.
7	English language	4	1	2		Y	AAF
8	Gruppo A	6	1 / 2	1 / 2			aff.-int.
9	Gruppo A	6	1 / 2	1 / 2			aff.-int.
10	Corso a scelta	6	1	2			
11	Relativistic Quantum Mechanics	6	2	1	FIS/02	Y	caratt.
12	Gruppo A	6	1 / 2	1 / 2			aff.-int.
13	Corso a scelta	6	2	1			
14	Internship	3	2	1		Y	AAF
15	Thesis Project	38	2	2		Y	AAF

Condensed Matter Physics
Lab I
Lab II
RQM

Soft and Biological Matter
Theoretical Biophysics
Biophysics

Note:
RQM is scheduled for the 2 year in the standard plan
Students who want to take RQM in the first year MUST present an `individual' plan where RQM is inserted in the first year

the general rule is that second year courses MUST be scheduled at the second year (RQM is a special situation)

Mandatory Courses specific to the Biosystem curriculum

- Soft and Biological Matter (Prof. Sciortino, year 1- sem 1)

  intramolecular forces, the role of water, polymers (structure and self-assembly), micelles, membranes, gels, colloidal suspensions, structure of DNA and proteins

- Biophysics (Prof. Di Leonardo, year 1 – sem 2)

  What's inside: genetic parts and circuits (gene expression – single molecule exp techniques – genetic editing)
  What's outside: single cell movements (flagella, cytoskeleton, cell substrate - exp technique to probe movement)
  Multicellular dynamics (growth and division, branching, tissue dynamics, quorum sensing – exp techniques)

- Theoretical Biophysics (Prof. Giardina, year 1 – sem 2)

  The role of noise: signal detection, signal amplification and statistical reliance
  (background in stochastic processes, bio cases: from chemoreception to chemotaxis; fotoreception)
  The role of interactions and collective phenomena
  (background in critical phenomena, bio cases: proteins, neural networks, animal groups and living active matter)

LABORATORY COURSES

LAB I (propaedeutic to LAB II)

LAB II

Different Courses:

A) Particle and Astroparticle (Prof. Cavoto)
B) Condensed Matter (Prof. Mariani)
C) BioSystems (Prof. Bordi)

linear response theory/scattering/spectroscopy/microscopy/imaging/NMR

Assignment/internship in one of the various labs working in biophysical research at the Department (presentation of available projects during the course LAB II)

Group A Courses

Gruppo A (aff.-int.)

1	Biochimica	6	1	1	BIO/10	N	
2	Computational Biophysics	6	1	1	INF/01	Y	
3	Atomistic Simulations	6	1	1	INF/01	Y	
4	Statistical Mechanics and Critical Phenomena	6	1	1	FIS/02	Y	
5	Nonlinear and Quantum Optics	6	1	1	FIS/03	Y	
6	Molecular biology	6	1	2	BIO/11	Y	
7	Mathematical Physics	6	1	2	MAT/07	Y	
8	Computational Statistical Mechanics	6	1	2	FIS/02	Y	
9	Nonlinear Waves and Solitons	6	1	2	FIS/02	Y	
10	Neural Networks	6	1	2	FIS/02	Y	
11	Meccanica statistica del non equilibrio	6	1	2	FIS/02	N	
12	Photonics	6	1	2	FIS/03	Y	
13	Many-Body Physics	6	1	2	FIS/03	Y	
14	Physics of liquids	6	1	2	FIS/03	Y	
15	Statistical Mechanics of Disordered Systems	6	2	1	FIS/02	Y	
16	Medical Applications of Physics	6	2	1	FIS/01	Y	
17	Physics of Complex Systems	6	2	1	FIS/03	Y	
18	Spectroscopy Methods and Nanophotonics	6	2	1	FIS/03	Y	
19	Surface physics and nanostructures	6	2	1	FIS/03	Y	

no anxiety: you can change your plan at year II.....

Structure of a reasonably balanced plan

First year:
9-11 courses (+ English)

Second year:
1-3 courses + internship and Thesis Project

Thesis Project: 38 cfu – Typically students ask the Thesis in the first semester of the second year, and start working on it when almost all exams are passed.

Internship: how does it work?

After 2 months of working on the thesis, the thesis advisor gives the student a signed form to certify the work done.
The student registers on Infostud for the `Internship' exam
The day of the exam the students bring the signed form to the responsible of the Internship, who registers the exam.

Internship Responsible for the BioSystem Curriculum: **Prof. BORDI**

MORE INFORMATION:

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