

UNIVERSITA' DEGLI STUDI DI BARI

MASTER'S PROGRAMME "PHYSICS"

Study plan 2022-2023

CURRICULUM THEORETICAL PHYSICS AND COMPLEX SYSTEMS

First year

Semester I

Course title	Details		ECTS				Type of exam
	SSD/ Scientific sector	Type (*)	Tot	Les.	Ex.s	Lab	
1. Mathematical Methods for Physics	FIS/02	b	6	3	3		Exam with score
2. Condensed Matter Physics	FIS/03	b	6	4	1	1	Exam with score
3. Statistical Mechanics	FIS/02	b	6	5	1		Exam with score
4. Quantum Field Theory	FIS/02	b	6	3	3		Exam with score
5. Computational Physics	FIS/01	b	6	4		2	Exam with score

Semester II

Course title	Details		ECTS				Type of exam
	SSD/ Scientific sector	Type (*)	Tot	Les.	Ex.s	Lab	
6. One exam to be chosen between 6.a and 6.b							Exam with score
6.a Probabilistic Methods of Physics	MAT/07	c	6	5	1		
6.b Kinetic Theory of Transport Phenomena	CHIM/03	c	6	5	1		
7. Critical and Non equilibrium Phenomena	FIS/02	b	6	5	1		Exam with score

8. Quantum Information	FIS/02	b	6	5	1		Exam with score
9. One exam between 9.a e 9.b							Exam with score
9.a Modeling of Complex Systems	FIS/07	c	6	5	1		
9.b Interacting Quantum Fields	FIS/02	c	6	5	1		

Second year

Semester I

Course title	Details		ECTS				Type of exam
	SSD/ Scientific sector	Type (*)	Tot	Les.	Ex.s	Lab	
10. One exam to be chosen between 10.a and 10.b							Exam with score
10.a Standard Model	FIS/02	c	6	5	1		
10.b Pattern Recognition	FIS/07	c	6	5	1		
11. One exam to be chosen between 11.a and 11.b							Exam with score
11.a Machine Learning for Physics	FIS/07	c	6	5	1		
11.b General Relativity	FIS/02	c	6	5	1		
12. Free Exams (**)		d	12				Exams with score
Trainersheep		f	10				Attendance

Semester II

Course title	Details		ECTS				Type of exam
	SSD/ Scientific sector	Type (*)	Tot	Les.	Ex.s	Lab	
Final Examination		e	32				Viva thesis defence

CURRICULUM PARTICLE ASTROPARTICLE PHYSICS AND ADVANCED TECHNOLOGIES

First year

Semester I

Course title	Details		ECTS				Type of exam
	SSD/ Scientific sector	Type (*)	Tot	Les.	Ex.s	Lab	
1. Mathematical Methods of Physics	FIS/02	b	6	3	3		Exam with score
2. Laboratory of Digital Devices	FIS/01	b	6	3		3	Exam with score
3. Quantum Field Theory	FIS/02	b	6	3	3		Exam with score
4. Particle Detector Physics	FIS/01	b	6	5		1	Exam with score
5. Statistical Data Analysis	FIS/01	b	6	5	1		Exam with score

Semester II

Course title	Details		ECTS				Type of exam
	SSD/ Scientific sector	Type (*)	Tot	Les.	Ex.s	Lab	
6. Elementary Particle Physics	FIS/04	b	6	5	1		Exam with score
7. One exam to be chosen between 7.a and 7.b							Exam with score
7.a Interacting Quantum Fields	FIS/02	b	6	4	2		
7.b Quantum Technologies	FIS/02	b	6	5	1		
8. Fundamental Interactions	FIS/04	b	6	5	1		Exam with score
9. One exam to be chosen among 9.a , 9.b and 9.c							Exam with score
9.a High Energy Astrophysics	FIS/05	c	6	5	1		
9.b Collider Particle Physics	FIS/04	c	6	5	1		
9.c Computing Technologies	FIS/01	c	6	5	1		

Second year

Semester II

Course title	Details		ECTS				Type of exam
	SSD/ Scientific sector	Type (*)	Tot	Les.	Ex.s	Lab	
10. Particle and Radiation Detector Laboratory	FIS/01	b	6	3		3	Exam with score
11. One exam to be chosen between 11.a, 11.b and 11.c							Exam with score
11.a Scientific Data Analysis Laboratory	FIS/01	c	6	2		4	
11.b Laboratory of Data Acquisition Technologies	FIS/01	c	6	3		3	
11.c Health Physics	FIS/07	c	6	4	1	1	
12. Free Exams (**)		d	12				Exams with score
Traineeship		f	10				Attendance

II semestre

Course title	Details		ECTS				Type of exam
	SSD/ Scientific sector	Type (*)	Tot	Les.	Ex.s	Lab	
Final Examination		e	32				Viva thesis defence

CURRICULUM CONDENSED MATTER PHYSICS AND PHOTONICS

First year

Semester I

Course title	Details		ECTS				Type of exam
	SSD/ Scientific sector	Type (*)	Tot	Les.	Ex.s	Lab	
1. Two exams to be chosen among 1.2a, 1.2b and 1.2c							Exams with score
1.2.a Mathematical Methods of Physics	FIS/02	c	6	5	1		
1.2.b Computational Physics	FIS/01	c	6	4		2	
1.2.b Laboratory of Digital Devices	FIS/01	b	6	3		3	
3. Statistical Mechanics	FIS/02	c	6	5	1		Exam with score
4. Quantum Field Theory	FIS/02	b	6	5	1		Exam with score
5. Condensed Matter Physics	FIS/03	b	6	4	1	1	Exam with score

Semester II

Course title	Details		ECTS				Type of exam
	SSD/ Scientific sector	Type (*)	Tot	Les.	Ex.s	Lab	
6 One exam to be chosen among 6.a, 6.b and 6.c							Exam with score
6.a Critical and Non equilibrium Phenomena	FIS/02	c	6	5	1		
6.b Quantum Technologies	FIS/02	c	6	5	1		
6.c Spectroscopy and Computer Modeling of Molecular Systems	CHIM/03	c	6	5	1		
7. Laboratory of Photonics	FIS/03	b	6	4		2	Exam with score
8. Solid State Physics	FIS/03	b	6	4	2		Exam with score
9. Optoelectronics and Nanotechnologies	FIS/03	b	6	4	1	1	Exam with score

Second year

Semestre I

Course title	Details		ECTS				Type of exam
	SSD/ Scientific sector	Type (*)	Tot	Les.	Ex.s	Lab	
10. Laboratory of Quantum Optics	FIS/03	b	6	4		2	Exam with score
11. One exam to be chosen between 11.a and 11.b							Exam with score
11.a Physics of Sensors and Laboratory of Spectroscopy	FIS/03	c	6	4		2	
11.b Laboratory of Data Acquisition Technologies	FIS/01	c	6	3		3	
12. Free exams (**)		d	12				
Traineeship		f	10				Attendance

Semester II

Course title	Details		ECTS				Type of exam
	SSD/ Scientific sector	Type (*)	Tot	Les.	Ex.s	Lab	
Final Examination		e	32				Viva thesis defence

(*) Notes

- a) basic;
- b) characterization;
- c) complementary;
- d) elective;
- e) final thesis;
- f) not included above.

(**) Elective courses

Course title Year II- Semester I	Details		ECTS			
	SSD/ Scientific sector	Type (*)	Tot	Les.	Ex.s	Lab
Cosmology	FIS/02	d	3	2	1	
Deep Learning and generative Models	FIS/07	d	3	2	1	
Physical Applications of group Theory	FIS/02	d	3	2	1	
Advanced quantum field theory	FIS/02	d	3	2	1	
Laboratory of Plasma Physics	FIS/03	d	3	2		1
Didactics of Physics	FIS/08	d	3	2	1	
Relativistic Kinematics of Particle Interactions	FIS/04	d	3	2	1	
Neutrino Physics	FIS/04	d	3	2	1	
Cosmic Ray Physics	FIS/01	d	3	2	1	
Multimessenger Astrophysics	FIS/05	d	3	2	1	
Theoretical astroparticle physics	FIS/02	d	3	2	1	
Earth Observation and GIS Data Analysis	FIS/06	d	3	2	1	
Rare Events Physics	FIS/04	d	3	2		1
Health Technologies	FIS/07	d	3	2		1
Large fluctuations in probability and statistical mechanics	FIS/02	d	3	3		
Ultrafast Laser Physics and Applications	FIS/03	d	3	2		1
Random matrix theory	MAT/07	d	3	2	1	
Physics of space electric propulsion	FIS/03	d	3	3		
Nuclear Fusion Technologies	FIS/04	d	3	2		1
Higgs physics	FIS/04	d	3	2		1

Course title Year II- Semester II	Details		ECTS			
	SSD/ Scientific sector	Type (*)	Tot	Les.	Ex.s	Lab
Heavy Ion Physics	FIS/04	d	3	2	1	
Advanced Programming in C++	FIS/01	d	3	2		1
Technologies for Space Applications	FIS/01	d	3	2		1
Molecular Dynamics	FIS/07	d	3	2	1	
Applied physics to cultural heritage	FIS/07	d	3	2	1	
AI programming in physics	FIS/01	d	3	2		1
Non equilibrium phenomena	FIS/02	d	3	2	1	

