

PIANO DI STUDIO DEL CORSO DI LAUREA MAGISTRALE IN PHYSICS (CLASSE LM-17)
A.A. 2025-2026
Percorso formativo previsto per studenti impegnati a tempo pieno iscritti all'a.a 2025-2026
CURRICULUM THEORETICAL PHYSICS AND COMPLEX SYSTEMS
ANNO I – SEMESTRE I

Learning activities	SSD	ECTS				TAF	MV
		TOT	LEZ	LAB	ESE		
1. Mathematical Methods of Physics	FIS/02	6	3		3	B	O
2. Solid State Physics	FIS/03	6	4		2	B	O
3. Statistical Mechanics	FIS/02	6	5		1	B	S/O
4. Quantum Field Theory	FIS/02	6	4		2	B	O
5. Computational Physics	FIS/01	6	4	2		B	O

ANNO I – SEMESTRE II

Learning activities	SSD	ECTS				TAF	MV
		TOT	LEZ	LAB	ESE		
6. One learning activity to be chosen between:							
6a. Probabilistic Methods of Physics	MAT/07	6	5		1	C	O
6b. Kinetic Theory of Transport Phenomena	CHIM/03	6	5		1	C	O
7. Critical and Non Equilibrium Phenomena	FIS/02	6	5		1	B	S/O
8. Quantum Information	FIS/02	6	4		2	B	O
9. One learning activity to be chosen between:							
9a. Modeling of Complex Systems	FIS/07	6	5		1	C	O
9b. Interacting Quantum Fields	FIS/02	6	5		1	C	O

ANNO II – SEMESTRE I

Learning activities	SSD	ECTS				TAF	MV
		TOT	LEZ	LAB	ESE		
10. One learning activity to be chosen between:							
10a. Standard Model	FIS/02	6	5		1	C	O
10b. Pattern Recognition	FIS/07	6	5		1	C	O
11. One learning activity to be chosen between:							
11a. Machine Learning for Physics	FIS/07	6	5		1	C	O
11b. General Relativity	FIS/02	6	5		1	C	S/O

ANNO II – SEMESTRE II

Learning activities	SSD	ECTS				TAF	MV
		TOT	LEZ	LAB	ESE		
Final Examination		32				E	

ATTIVITA' FORMATIVE OBBLIGATORIE

Learning activities	SSD	ECTS				TAF	MV
		TOT	LEZ	LAB	ESE		
12. Elective courses		12				D	
Internship		10				F	

CURRICULUM PARTICLE ASTROPARTICLE PHYSICS AND ADVANCED TECHNOLOGIES
ANNO I – SEMESTRE I

Learning activities	SSD	ECTS				TAF	MV
		TOT	LEZ	LAB	ESE		
1. Mathematical Methods of Physics	FIS/02	6	3		3	B	0
2. Laboratory of Digital Devices	FIS/01	6	3	3		B	S/0
3. Quantum Field Theory	FIS/02	6	4		2	B	0
4. Particle detector Physics	FIS/01	6	5	1		B	0
5. Statistical Data Analysis	FIS/01	6	5	1		B	0

ANNO I – SEMESTRE II

Learning activities	SSD	ECTS				TAF	MV
		TOT	LEZ	LAB	ESE		
6. Elementary Particle Physics	FIS/04	6	5		1	B	0
7. One learning activity to be chosen between:							
7a. Interacting Quantum Fields	FIS/02	6	5		1	C	0
7b. Quantum Technologies	FIS/02	6	5		1	C	0
8. Fundamental Interactions	FIS/04	6	5		1	B	0
9. One learning activity to be chosen among:							
9a. High Energy Astrophysics	FIS/04	6	5		1	C	0
9b. Collider Particle Physics	FIS/04	6	5		1	C	0
9c. Computing Technologies	FIS/01	6	5		1	C	0

ANNO II – SEMESTRE I

Learning activities	SSD	ECTS				TAF	MV
		TOT	LEZ	LAB	ESE		
10. Particle and Radiation Detector Laboratory	FIS/01	6	3	3		B	0
11. One learning activity to be chosen among:							
11a. Scientific Data Analysis Laboratory	FIS/01	6	2	4		C	0
11b. Laboratory of Data Acquisition Technologies	FIS/01	6	3	3		C	S/0
11c. Health Physics	FIS/07	6	4	1	1	C	0

ANNO II – SEMESTRE II

Learning activities	SSD	ECTS				TAF	MV
		TOT	LEZ	LAB	ESE		
Final Examination		32				E	

ATTIVITA' FORMATIVE OBBLIGATORIE

Learning activities	SSD	ECTS				TAF	MV
		TOT	LEZ	LAB	ESE		
12. Elective courses		12				D	
Internship		10				F	

CURRICULUM CONDENSED MATTER PHYSICS AND PHOTONICS
ANNO I – SEMESTRE I

Learning activities	SSD	ECTS				TAF	MV
		TOT	LEZ	LAB	ESE		
1. e 2. Two learning activities to be chosen among:							
1a. Mathematical Methods of Physics	FIS/02	6	3		3	C	O
1b. Computational Physics	FIS/01	6	4	2		C	O
1c. Laboratory of Digital Devices	FIS/01	6	3	3		C	S/O
3. Statistical Mechanics	FIS/02	6	5		1	B	S/O
4. Quantum Field Theory	FIS/02	6	4		2	B	O
5. Solid State Physics	FIS/03	6	4		2	B	O

ANNO I – SEMESTRE II

Learning activities	SSD	ECTS				TAF	MV
		TOT	LEZ	LAB	ESE		
6. One learning activity to be chosen among:							
6a. Critical and Non equilibrium Phenomena	FIS/02	6	5		1	C	S/O
6b. Quantum Technologies	FIS/02	6	5		1	C	O
6.c Spectroscopy and Computer Modeling of Molecular Systems	CHIM/03	6	5		1	C	O
7. Laboratory of Photonics	FIS/03	6	4	2		B	S/O
8. Condensed Matter Physics	FIS/03	6	5	1		B	O
9. Optoelectronics and Nanotechnologies	FIS/03	6	4	1	1	B	O

ANNO II – SEMESTRE I

Learning activities	SSD	ECTS				TAF	MV
		TOT	LEZ	LAB	ESE		
10. Laboratory of Quantum Optics	FIS/03	6	4	2		B	O
11. Examination to be chosen from							
11a. Physics of Sensors and Laboratory of Spectroscopy	FIS/03	6	4	2		B	S/O
11b. Laboratory of Data Acquisition Technologies	FIS/01	6	3	3		B	S/O

ANNO II – SEMESTRE II

Learning activities	SSD	ECTS				TAF	MV
		TOT	LEZ	LAB	ESE		
Final Examination		32				E	

ATTIVITA' FORMATIVE OBBLIGATORIE

Learning activities	SSD	ECTS				TAF	MV
		TOT	LEZ	LAB	ESE		
12. Elective courses		12				D	
Internship		10				F	

Legenda:

SSD= settore scientifico disciplinare;

CFU (crediti formativi universitari): **TOT**= cfu totali per insegnamento o altra attività formativa; **LEZ** = cfu orario per lezione in aula; **LAB**= cfu orario per esercitazioni di laboratorio, d'aula etc;

TAF (tipologia attività formativa): **A**= attività formativa di base; **B**= attività formativa caratterizzante; **C - R**= attività formativa affine o integrativa; **D**= attività formativa a scelta dello studente; **E**= Lingua/prova finale; **F**= altro (ulteriori conoscenze linguistiche, abilità informatiche, Tirocini formativi e di orientamento, altre conoscenze utili per l'inserimento nel mondo del Lavoro); **G**= a scelta autonoma della sede (ambiti di sede); **S**: stage e tirocini; **T**: caratterizzanti transitate ad affini.

MV (modalità di verifica): **O**= orale; **S** = scritto; **I**= idoneità; **F**= solo frequenza.

ATTIVITA' FORMATIVE A SCELTA PROPOSTE PER L'A.A 2025-2026
ANNO I – SEMESTRE II

Learning activities	SSD	ECTS				TAF	MV
		TOT	LEZ	LAB	ESE		
Advanced Programming in C++	FIS/01	3	2	1		D	0
Applied physics to cultural heritage	FIS/07	3	2		1	D	0
Cryptography	MAT/02	3	1	2		D	0
Drone remote sensing and environmental monitoring	SECS-P/13	3	2	1		D	0
Dynamical systems. Stability and Chaos	FIS/02	3	3			D	0
Energy Technologies	SECS-P/13	3	1	2		D	0
Fundamentals of nuclear energy production by fission reactors	FIS/04	3	3			D	0
Heavy Ion Physics	FIS/04	3	2		1	D	0
Molecular Dynamics	FIS/07	3	2		1	D	0
Non equilibrium phenomena	FIS/02	3	2		1	D	0
Physics Behind Sensing Technologies	FIS/03	3	2	1		D	0
Physics of Surfaces, Interfaces and Nanostructures – structural properties	FIS/03	3	2	1		D	0
Technologies for Space Applications	FIS/01	3	2	1		D	0

ANNO II – SEMESTRE I

Learning activities	SSD	ECTS				TAF	MV
		TOT	LEZ	LAB	ESE		
Advanced quantum field theory	FIS/02	3	2	1		D	0
Beyond the Standard Model Neutrino Physics	FIS/02	3	2		1	D	0
Cosmic Ray Physics	FIS/01	3	2		1	D	0
Cosmology	FIS/02	3	2		1	D	0
Deep Learning and Generative Models	FIS/07	3	2	1		D	0
Earth Observation and GIS Data Analysis	FIS/06	3	2		1	D	0
Electronic bio-sensors	CHIM/01	3	2	1		D	0
Health Technologies	FIS/07	3	2	1		D	0
Higgs Physics	FIS/01	3	2	1		D	0
Laboratory of Plasma Physics	FIS/03	3	2		1	D	0
Machine learning techniques for particle physics	FIS/01	3	2	1		D	0
Multimessenger Astrophysics	FIS/05	3	2		1	D	0
Neutrino Physics	FIS/04	3	2		1	D	0
Nuclear Fusion Technologies	FIS/04	3	2	1		D	0
Physics of space electric propulsion	FIS/03	3	3			D	0
Physics of Surfaces, Interfaces and Nanostructures – optical properties	FIS/03	3	2	1		D	0
Random matrix theory	MAT/07	3	2		1	D	0
Rare Events Physics	FIS/04	3	2	1		D	0
Satellite Radar Remote Sensing	FIS/06	3	2		1	D	0
Theoretical astroparticle physics	FIS/02	3	2		1	D	0

Percorso formativo previsto per studenti impegnati a tempo parziale iscritti all'a.a 2025-2026
CURRICULUM THEORETICAL PHYSICS AND COMPLEX SYSTEMS
ANNO I – SEMESTRE I

Learning activities	SSD	ECTS				TAF	MV
		TOT	LEZ	LAB	ESE		
1. Mathematical Methods of Physics	FIS/02	6	3		3	B	O
2. Solid State Physics	FIS/03	6	4		2	B	O
3. Statistical Mechanics	FIS/02	6	5		1	B	S/O

ANNO I – SEMESTRE II

Learning activities	SSD	ECTS				TAF	MV
		TOT	LEZ	LAB	ESE		
4. One learning activity to be chosen between:							
4a. Probabilistic Methods of Physics	MAT/07	6	5		1	C	O
4b. Kinetic Theory of Transport Phenomena	CHIM/03	6	5		1	C	O
5. Critical and Non Equilibrium Phenomena	FIS/02	6	5		1	B	S/O

ANNO II – SEMESTRE I

Learning activities	SSD	ECTS				TAF	MV
		TOT	LEZ	LAB	ESE		
6. Quantum Field Theory	FIS/02	6	4		2	B	O
7. Computational Physics	FIS/01	6	4	2		B	O

ANNO II – SEMESTRE II

Learning activities	SSD	ECTS				TAF	MV
		TOT	LEZ	LAB	ESE		
8. Quantum Information	FIS/02	6	4		2	B	O
9. Examination to be chosen from							
9a. Modeling of Complex Systems	FIS/07	6	5		1	C	O
9b. Interacting Quantum Fields	FIS/02	6	5		1	C	O

ANNO III – SEMESTRE I

Learning activities	SSD	ECTS				TAF	MV
		TOT	LEZ	LAB	ESE		
10. One learning activity to be chosen between:							
10a. Standard Model	FIS/02	6	5		1	C	O
10b. Pattern Recognition	FIS/07	6	5		1	C	O

ANNO III – SEMESTRE II

Learning activities	SSD	ECTS				TAF	MV
		TOT	LEZ	LAB	ESE		
11. Elective courses (***)		12				D	

ANNO IV – SEMESTRE I

Learning activities	SSD	ECTS				TAF	MV
		TOT	LEZ	LAB	ESE		
12. One learning activity to be chosen between:							
12a. Machine Learning for Physics	FIS/07	6	5		1	C	O
12b. General Relativity	FIS/02	6	5		1	C	S/O

ANNO IV – SEMESTRE II

Learning activities	SSD	ECTS				TAF	MV
		TOT	LEZ	LAB	ESE		
Final Examination		32				E	

ATTIVITA' FORMATIVE OBBLIGATORIE

Learning activities	SSD	ECTS				TAF	MV
		TOT	LEZ	LAB	ESE		
Internship		10				F	

CURRICULUM PARTICLE ASTROPARTICLE PHYSICS AND ADVANCED TECHNOLOGIES
ANNO I – SEMESTRE I

Learning activities	SSD	ECTS				TAF	MV
		TOT	LEZ	LAB	ESE		
1. Mathematical Methods of Physics	FIS/02	6	3		3	B	O
2. Quantum Field Theory	FIS/02	6	4		2	B	O

ANNO I – SEMESTRE II

Learning activities	SSD	ECTS				TAF	MV
		TOT	LEZ	LAB	ESE		
3. Elementary Particle Physics	FIS/04	6	5		1	B	O
4. One learning activity to be chosen between:							
4a. Interacting Quantum Fields	FIS/02	6	5		1	C	O
4b. Quantum Technologies	FIS/02	6	5		1	C	O

ANNO II – SEMESTRE I

Learning activities	SSD	ECTS				TAF	MV
		TOT	LEZ	LAB	ESE		
5. Laboratory of Digital Devices	FIS/01	6	3	3		B	S/O
6. Particle detector Physics	FIS/01	6	5	1		B	O
7. Statistical Data Analysis	FIS/01	6	5	1		B	O

ANNO II – SEMESTRE II

Learning activities	SSD	ECTS				TAF	MV
		TOT	LEZ	LAB	ESE		
8. Fundamental Interactions	FIS/04	6	5		1	B	O
9. One learning activity to be chosen among:							
9a. High Energy Astrophysics	FIS/04	6	5		1	C	O
9b. Collider Particle Physics	FIS/04	6	5		1	C	O
9c. Computing Technologies	FIS/01	6	5		1	C	O

ANNO III – SEMESTRE I

Learning activities	SSD	ECTS				TAF	MV
		TOT	LEZ	LAB	ESE		
10. Particle and Radiation Detector Laboratory	FIS/01	6	3	3		B	O

ANNO III – SEMESTRE II

Learning activities	SSD	ECTS				TAF	MV
		TOT	LEZ	LAB	ESE		
11. Elective courses (***)		12				D	

ANNO IV – SEMESTRE I

Learning activities	SSD	ECTS				TAF	MV
		TOT	LEZ	LAB	ESE		
12. One learning activity to be chosen among:							
12a. Scientific Data Analysis Laboratory	FIS/01	6	2	4		C	O
12b. Laboratory of Data Acquisition Technologies	FIS/01	6	3	3		C	S/O
12c. Health Physics	FIS/07	6	4	1	1	C	O

ANNO IV – SEMESTRE II

Learning activities	SSD	ECTS				TAF	MV
		TOT	LEZ	LAB	ESE		
Final Examination		32				E	

ATTIVITA' FORMATIVE OBBLIGATORIE

Learning activities	SSD	ECTS				TAF	MV
		TOT	LEZ	LAB	ESE		
Internship		10				F	

CURRICULUM CONDENSED MATTER PHYSICS AND PHOTONICS
ANNO I – SEMESTRE I

Learning activities	SSD	ECTS				TAF	MV
		TOT	LEZ	LAB	ESE		
1. e 2. Two learning activities to be chosen among:							
1a. Mathematical Methods of Physics	FIS/02	6	3		3	C	O
1b. Computational Physics	FIS/01	6	4	2		C	O
1c. Laboratory of Digital Devices	FIS/01	6	3	3		C	S/O
3. Solid State Physics	FIS/03	6	4		2	B	O

ANNO I – SEMESTRE II

Learning activities	SSD	ECTS				TAF	MV
		TOT	LEZ	LAB	ESE		
4. Laboratory of Photonics	FIS/03	6	4	2		B	S/O
5. Condensed Matter Physics	FIS/03	6	5	1		B	O

ANNO II – SEMESTRE I

Learning activities	SSD	ECTS				TAF	MV
		TOT	LEZ	LAB	ESE		
6. Statistical Mechanics	FIS/02	6	5		1	B	S/O
7. Quantum Field Theory	FIS/02	6	4		2	B	O

ANNO II – SEMESTRE II

Learning activities	SSD	ECTS				TAF	MV
		TOT	LEZ	LAB	ESE		
8. One learning activity to be chosen among:							
8a. Critical and Non equilibrium Phenomena	FIS/02	6	5		1	C	S/O
8b. Quantum Technologies	FIS/02	6	5		1	C	O
8c. Spectroscopy and Computer Modeling of Molecular Systems	CHIM/03	6	5		1	C	O
9. Optoelectronics and Nanotechnologies	FIS/03	6	4	1	1	B	O

ANNO III – SEMESTRE I

Learning activities	SSD	ECTS				TAF	MV
		TOT	LEZ	LAB	ESE		
10. Laboratory of Quantum Optics	FIS/03	6	4	2		B	O

ANNO III – SEMESTRE II

Learning activities	SSD	ECTS				TAF	MV
		TOT	LEZ	LAB	ESE		
11. Elective courses (***)		12				D	

ANNO IV – SEMESTRE I

Learning activities	SSD	ECTS				TAF	MV
		TOT	LEZ	LAB	ESE		
12. One learning activity to be chosen between:							
12a. Physics of Sensors and Laboratory of Spectroscopy	FIS/03	6	4	2		B	S/O
12b. Laboratory of Data Acquisition Technologies	FIS/01	6	3	3		B	S/O

ANNO IV – SEMESTRE II

Learning activities	SSD	ECTS				TAF	MV
		TOT	LEZ	LAB	ESE		
Final Examination		32				E	

ATTIVITA' FORMATIVE OBBLIGATORIE

Learning activities	SSD	ECTS				TAF	MV
		TOT	LEZ	LAB	ESE		
Internship		10				F	

(***) Le attività a scelta dello studente non sono vincolate al II semestre del III anno.

Legenda:

SSD= settore scientifico disciplinare; CFU (crediti formativi universitari); TOT= cfu totali per insegnamento o altra attività formativa; LEZ = cfu orario per lezione in aula; LAB= cfu orario per esercitazioni di laboratorio, d'aula etc; TAF (tipologia attività formativa): A= attività formativa di base; B= attività formativa caratterizzante; C - R= attività formativa affine o integrativa; D= attività formativa a scelta dello studente; E= Lingua/prova finale; F= altro (ulteriori conoscenze linguistiche, abilità informatiche, Tirocini formativi e di orientamento, altre conoscenze utili per l'inserimento nel mondo del Lavoro); G= a scelta autonoma della sede (ambiti di sede); S: stage e tirocini; T: caratterizzanti transitate ad affini. MV (modalità di verifica): O= orale; S = scritto; I= idoneità; F= solo frequenza.