UNIVERSITÀ DEGLI STUDI DI NAPOLI FEDERICO II

SCUOLA POLITECNICA E DELLE SCIENZE DI BASE

DIPARTIMENTO DI FISICA "ETTORE PANCINI"

STUDENT GUIDE

MASTER'S DEGREE COURSE IN PHYSICS

Classe delle Lauree Magistrali Fisica, Classe N. LM-17 R

ACADEMIC YEAR 2025/2026

Naples, July 2025

Website of the Master's Degree Course in Physics
www.fisica.unina.it/corso-di-laurea-magistrale-in-fisica

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ACADEMIC DEGREE

The MSc Degree Program in Physics has a duration of two years and belongs to Class LM-17R "Physics" (FISICA) of the Italian system of Master's Degrees.
Students who successfully complete all examinations of the Degree Program (CdS) and pass the final graduation exam are awarded the academic title of **Master's Graduate in Physics** (*Dottore Magistrale in Fisica*).

TRAINING OBJECTIVES

(ART. 2 OF DIDACTIC REGULATIONS)

The MSc Degree Program in Physics aims at providing an advanced cultural education in physics, ensuring:

a) an in-depth cultural foundation in the fields of macro and microphysics;
b) a thorough knowledge of modern measurement instruments and data analysis techniques;
c) a solid understanding of mathematical and computational tools;
d) a high proficiency in the scientific method of investigation;
e) an advanced scientific and practical training in the field of physical sciences, with substantial knowledge and skills in at least one of the following disciplinary areas: Astrophysics, Physics Education and History of Physics, Electronics, Applied Physics, Biomedical Physics, Condensed Matter Physics, Nuclear Physics, Subnuclear and Astroparticle Physics, Theoretical Physics, and Geophysics.

The MSc Degree in Physics prepares students for professional activities to be carried out with autonomy and independence. The Degree offers a high level of qualification, combining research and development tasks in industrial and service sectors with a strong scientific and technological foundation (e.g., in electronics, mechanics, chemistry and materials science, energy, telecommunications, medicine, environment, cultural heritage, computer science, data analysis, etc.). The Degree opens to professional fields requiring the ability to analyze and model complex phenomena using scientific methods (e.g., in economics, finance, security, etc.). Also, it allows accessing to third-level educational paths, such as PhD programs and specialization schools in Medical Physics.
The structure of the MSc program is closely connected to the lines of physics research developed at the University, ensuring the achievement of a broad scientific education along with specific expertise in the proposed curricular pathways. To this end, the educational pathway includes a common training on the fundamental aspects of the discipline across all curricula. It focuses on a bulk of core courses mandatory to train highly qualified experts in the disciplinary areas listed in point e). Moreover, activities related to "Further Language Skills" within the "Additional Educational Activities (Art. 10, Paragraph 5, Letter d)" are planned to enhance communication skills in foreign languages. Each curriculum further complements the disciplinary training of the educational pathway with an additional number of credits from core courses, providing adequate preparation in at least one of the disciplinary areas mentioned in point e). The curriculum is selected by the student during the first year, and each curriculum includes a wide and varied range of core activities, covering at least three of the four disciplinary fields of the degree class LM-17 (Experimental and Applied; Theoretical and Fundamental Physics; Microscopic Physics of Matter and Fundamental Interactions; Astrophysical, Geophysical, Climatic, and Space).

PROCEDURES FOR ACCESS TO THE DEGREE PROGRAM (CDS)

(ART. 5 OF DIDACTIC REGULATIONS)

The verification of personal preparation is mandatory in all cases, and only students who meet the curricular requirements may undergo the assessment. Current regulations (Ministerial Decree of 22 October 2004, no. 270, RDA) require the verification of the adequacy of a student's personal preparation for admission to a MSc Degree Program. To successfully pursue the MSc Degree in Physics, students must have adequate knowledge of Physics, Mathematics, Chemistry, and scientific English. Therefore, admission to the MSc Degree Program in Physics is subject to a preliminary evaluation of the student's academic curriculum by a the CCD subcommittee of student affairs, consisting of the academic advisors of the degree curricula and the MSc Coordinator.

Students are exempt from the verification of personal preparation if they meet one of the following conditions:

1) A BSc Degree in Physics (L-30 Physical Sciences and Technologies) awarded by University of Naples Federico II or another state university in Italy;
2) A first-level degree in a scientific discipline other than Physics awarded by a state university in Italy, with an academic curriculum meeting the following requirements:
   a) At least 60 ECTS credits obtained in the following disciplines:
      i) At least 30 ECTS credits in SSD FIS/01, FIS/02, FIS/03, FIS/04, FIS/05, FIS/06, FIS/07;
      ii) At least 12 ECTS credits in SSD MAT/03, MAT/05;
      iii) At least 6 ECTS credits in SSD INF/01, MAT/08, ING-INF/05;
      iv) At least an additional 12 ECTS credits in SSD FIS or in one of the following SSDs: MAT/07 - Mathematical Physics; CHIM/02 - Physical Chemistry; GEO/10 - Solid Earth Geophysics; GEO/11 - Applied Geophysics; GEO/12 - Oceanography and Atmospheric Physics; ING-IND/06 - Fluid Dynamics; ING-IND/10 - Industrial Technical Physics; ING-IND/12 - Mechanical and Thermal Measurements; ING-IND/13 - Applied Mechanics; ING-IND/18 - Nuclear Reactor Physics; ING-IND/20 - Nuclear Measurements and Instrumentation; ING-IND/22 - Materials Science and Technology; ING-IND/31 - Electrical Engineering; ING-INF/01 - Electronics; ING-INF/02 - Electromagnetic Fields; ING-INF/06 - Electronic and Computer Bioengineering; ING-INF/07 - Electrical and Electronic Measurements; SECS-S/01 - Statistics.
   b) A grade point average of at least 27/30 (weighted based on ECTS credits) for exams related exclusively to the disciplines listed above.

Applications from students who do not meet the above criteria are reviewed by the "student practices" subcommittee. The subcommittee assesses whether the candidate possesses the necessary knowledge and skills in foundational mathematics and chemistry, related mathematical and computational disciplines, classical physics, quantum mechanics, laboratory activities, and English language proficiency, based on the student's prior academic documentation and, if necessary, through an interview, written test, and/or practical laboratory assessment. The subcommittee then issues a judgment of suitability that allows enrollment in the MSc Degree Program in Physics. If the candidate is deemed unsuitable, the subcommittee will specify the knowledge and skills that need to be acquired to reach the required level of preparation before enrollment.

CALENDAR OF TEACHING ACTIVITIES - A.Y. 2025/2026

The academic year is divided into two teaching periods (semesters), separated by intervals dedicated to independent study and examinations. Examinations are also scheduled for the month of September.

	Inizio	**Termine**
1° Teaching period	15th September 2025	19th December 2025
2° Teaching period	2nd March 2026	12th June 2026

Breaks in Teaching Activities and Holidays for Civil and Religious Observances: 19/09/2025, 01/11/2025, 12/11/2025 - 14/11/2025, 08/12/25, period 23/12/2025 - 06/01/2026, 16/02/2026 - 17/02/2026, period 02/04/2026 - 07/04/2026, 25/04/2026, 01/05/2026, 02/06/2025,
period 05/08/2026 - 22/08/2026.

Graduation Sessions are held in: February, March, June, July, September, October, and November/December. The full calendar of graduation dates can be consulted on the Degree Program's official webpage. (www.fisica.unina.it/corso-di-laurea-magistrale-in-fisica).

Examination Sessions:

At least five regular examination sessions and at least two make-up sessions (as defined in the University Academic Regulations) shall be scheduled as follows.

Mandatory Regular Sessions: One session in January 2026, one session in February 2026, one session in June 2026, one session in July 2026, and one session in September 2026.
Mandatory Make-up Sessions: One session during the period March 2, 2026 – March 21, 2026, and one session during the period October 19, 2026 – November 14, 2026.
For exact exam dates, please consult the webpages of the professors responsible for the course.
Opening of examination sessions for the academic year 2025/2026: December 15, 2025.

ERASMUS PROGRAM

Students may apply to attend courses, preferably non-core ones, at various European universities.
If the number of applications exceeds the maximum available places, a ranking will be drawn up based on credits earned (ECTS), exams passed, and the grade of the Bachelor's degree.

For information on courses offered by the partner universities, interested students may contact the International Relations Office at Via Mezzocannone No. 16, or the ERASMUS coordinator of the department:

- **Prof. Wolfgang Mueck**, Erasmus+ Coordinator, tel. 081-676916, e-mail wolfgang.mueck@unina.it, uff. 2N'02;

Before departing for the host institution abroad, students must obtain authorization from the Academic Board Coordinator of the Degree Program (CCD), specifying the chosen institution and the courses they intend to attend. The recognition of exams taken at other universities will be approved by the CCD.
Students may also carry out their thesis work at partner universities.

ACADEMIC ORGANIZATION

For the academic year 2025/2026, a new curriculum and a new regulation will come into effect, applicable only to students enrolling in the academic year 2025/2026 and thereafter. The academic organization of the two-year program, the standard structure of the curriculum, the educational objectives of the courses, any prerequisite requirements, as well as the methods for assessing the achievement of each type of activity, are outlined in the Academic Regulations of the Master's Degree Program in Physics (A.Y. 2025/26 and thereafter), available on the Degree Program's website (www.fisica.unina.it/corso-di-laurea-magistrale-in-fisica).
For students enrolling in years beyond the first in the academic year 2025/2026, the standard curriculum structure, educational objectives of the courses, any prerequisites, and the methods for verifying academic progress are contained in the Academic Regulations of the Master's Degree Program in Physics corresponding to the student's year of enrollment, which can also be consulted on the Degree Program's website (www.fisica.unina.it/corso-di-laurea-magistrale-in-fisica).
Note: Students enrolling in years beyond the first are advised to refer to the regulations and student guides from previous years, also available on the website (Italian).
The Master's Degree Program in Physics offers the following nine Curricula:

- Curriculum "Astrophysics" (AS) – Academic Advisor: Prof. Giovanni Covone (giovanni.covone@unina.it)
- Curriculum "Physics Education and History of Physics" (DI) – Academic Advisor: Prof. Italo Testa (italo.testa@unina.it)
- Curriculum "Electronics" (EL) – Academic Advisor: Prof. Alberto Aloisio (alberto.aloisio@unina.it)
- Curriculum "Biomedical Physics" (FB) – Academic Advisor: Prof. Paolo Russo (paolo.russo@unina.it)
- Curriculum "Physics of Matter" (FM) – Academic Advisor: Prof. Corrado de Lisio (corrado.delisio@unina.it)

- Curriculum "Nuclear Physics" (FN) – Academic Advisor: Prof. Antonino Di Leva (antonino.dileva@unina.it)
- Curriculum "Subnuclear and Astroparticle Physics" (FS) – Academic Advisor: Prof. Fabio Ambrosino (fabio.ambrosino@unina.it)
- Curriculum "Theoretical Physics" (FT) – Academic Advisor: Prof. Giampiero Esposito (giampiero.esposito@unina.it)
- Curriculum "Geophysics" (GE) – Academic Advisor: Dott. Guido Russo (guido.russo2@unina.it)

For any information regarding the Curricula, students may contact the Academic Advisors.

Students enrolling in the first year must simultaneously choose a curriculum.
The choice of curriculum may be changed by submitting a written request to the Coordinator, provided that the student has not passed any exams or has passed only the fundamental exams common to all curricula. Students enrolling in years beyond the first may request a change of curriculum at the time of enrollment.

Students may also modify their chosen curriculum or submit an individual study plan to the Student Office of the Academic Area of Science of the Polytechnic School and Basic Sciences, within the deadlines and according to the procedures established by the office, requesting approval from the Academic Board (CCD) of the Master's Degree Program in Physics.

Students intending to apply changes to their chosen curriculum are advised to contact the relevant Academic Advisor for prior assessment and verification of the suitability of such changes.

Students who replace a core, related, or integrative course within their curriculum with a course not included in the standard curriculum plan will exit the originally chosen curriculum, and their study plan will be classified as an Individual Study Plan.

TEACHING PLAN

The following table lists report the courses offered in the Master's Degree Program in Physics for the academic year 2025/2026 for first-year students (newly enrolled – code D59), according to the Academic Regulations of the Master's Degree Program in Physics (A.Y. 2025/26 and thereafter), and for second-year students (enrolled in A.Y. 2024/2025 – code D41), according to the Academic Regulations of the Master's Degree Program in Physics (A.Y. 2024/25 and thereafter). Any course equivalencies are indicated in the table.
Students enrolled in previous years (enrollment code N94) who wish to attend any of the courses are advised to contact the course instructor and/or the Degree Program Coordinator to arrange for any necessary adjustments due to changes in the number of credits (ECTS).

To take the exams for certain courses, it may be necessary to have previously passed exams for other courses. *These prerequisite requirements are specified in the course descriptions included in Annex 2 of the applicable Academic Regulations of the Master's Degree Program in Physics. The current and previous Academic Regulations can be found on the Degree Program's webpage, where all courses offered (including those not active in the current academic year) and their summary descriptions are listed. Further information about the courses is available on the Degree Program's webpage under the section "Instructors, Courses, and Contents." (www.fisica.unina.it/docenti-insegnamenti-e-programmi) and on the website of the professor responsible for the course for the current academic year.*

TEACHING PLAN OF MASTER'S DEGREE COURSE IN PHYSICS
Courses Offered in the Academic Year 2025/2026

Courses of the First Year

[*DIDACTIC REGULATIONS OF THE DEGREE PROGRAM PHYSICS (FISICA) (A.Y. 2025/26 and successive years*) – Enrollment Code D59/xxxx]

(in alphabetical order for Italian titles of the courses)

Insegnamento	CFU	Ore	SSD	Nuovo SSD (*)	Anno	Semestre	Docente	Qualifica
Signal Processing and Analysis (Analisi ed Elaborazione dei Segnali)	6	52	FIS/07	PHYS-06/A	I	2	Zollo Aldo	PO
Astrophysics (Astrofisica)	9	72	FIS/05	PHYS-05/A	I	1	Longo Giuseppe	PO
Radiation Biophysics (Biofisica delle radiazioni)	6	48	FIS/07	PHYS-02/A	I	2	Pugliese Mariagabriella	PA
Complements of Mathematical Methods of Physics (Complementi di Metodi matematici)	6	48	FIS/02	PHYS-05/A	I	2	Aniello Paolo	RU
Cosmology (Cosmologia)	6	48	FIS/05	PHYS-06/B	I	2	Capozziello Salvatore	PO
Physics Education (Didattica della Fisica)	9	72	FIS/08	PHYS-06/A	I	1	Testa Italo	PA
Radiation Dosimetry (Dosimetria delle radiazioni)	6	48	FIS/07	PHYS-03/A	I	2	*BORROWED FROM da Radiation Dosimetry (Dosimetria delle radiazioni) (D41)*	-
Classical Electrodynamics (Elettrodinamica Classica)	9	72	FIS/03	PHYS-01/A	I	1	Perroni Carmine Antonio	PA
Digital Electronics (Elettronica Digitale)	6	48	FIS/01	PHYS-01/A	I	2	*Da assegnare*	-
Astroparticle Physics (Fisica Astroparticellare)	6	48	FIS/01 FIS/04	PHYS-05/B	I	2	Fiorillo Giuliana	PO
Earth and Atmospheric Physics (Fisica della Terra e dell'Atmosfera)	6	48	FIS/06	PHYS-05/A	I	2	Festa Gaetano	PO
Physics of Galaxies (Fisica delle Galassie)	6	48	FIS/05	PHYS-01/A	I	2	Napolitano Nicola	PO
Particle Physics	9	72	FIS/01	PHYS-03/A	I	2	De Nardo Guglielmo	PO

(Fisica delle Particelle Elementari)								
Solid State Physics I (Fisica dello Stato Solido 1)	6	48	FIS/03	PHYS-03/A	I	2	Ninno Domenico	PO
Medical Physics (Fisica Medica)	6	48	FIS/07	PHYS-06/A	I	2	Mettivier Giovanni	PA
Nuclear Physics (Fisica Nucleare)	9	72	FIS/04	PHYS-01/A	I	2	Vardaci Emanuele	PA
Quantum Physics (Fisica Quantistica)	6	48	FIS/02	PHYS-02/A	I	2	Arzano Michele	PA
Electronics Fundamentals (Fondamenti di Elettronica)	6	48	FIS/01	PHYS-01/A	I	2	*Da assegnare*	-
Physics Laboratory (Laboratorio di Fisica) (A-DEL)	9	84	FIS/01	PHYS-01/A	I	1	Della Pietra Massimo	PA
Physics Laboratory (Laboratorio di Fisica) (DEM-NOB)	9	84	FIS/01	PHYS-01/A	I	1	Di Capua Roberto	PA
Physics Laboratory (Laboratorio di Fisica) (NOC-Z)	9	84	FIS/01	PHYS-01/A	I	1	Rusciano Giulia	PA
Particle Physics Laboratory (Laboratorio di Fisica delle Particelle)	9	96	FIS/01	PHYS-01/A	I	2	Guarino Fausto	PO
Laboratory of Nuclear Physics (Laboratorio di Fisica Nucleare)	9	72	FIS/01	PHYS-01/A	I	2	Best Andreas	PA
Continuum Mechanics (Meccanica del Continuo)	6	48	FIS/03	PHYS-03/A	I	1	Russo Guido	RU
Quantum Mechanics (Meccanica Quantistica)	9	72	FIS/02	PHYS-02/A	I	1	Vitale Patrizia	PO
Statistical Mechanics I (Meccanica Statistica I)	6	48	FIS/02	PHYS-02/A	I	2	Mueck Wolfgang	PA
Statistical Mechanics II (Meccanica Statistica II)	6	48	FIS/02	PHYS-02/A	I	1	De Candia Antonio	PA
Inversion Methods (Metodi inversi)	6	48	FIS/06	PHYS-02/A	I	1	Emolo Antonio	PA
Numerical Methods of Physics (Metodi numerici della fisica)	6	48	FIS/01	PHYS-05/B	I	2	De Candia Antonio	PA
Didactical Design for Physics (Preparazione di Esperienze Didattiche)	6	48	FIS/08	PHYS-02/A	I	2	*Borrowed from LM – Mathematics (LM-Matematica)*	-

General Relativity and Gravitation (Relatività Generale e Gravitazione)	6	48	FIS/02	PHYS-06/B	I	2	Esposito Giampiero	PO
History of Modern Physics (Storia della Fisica Moderna)	6	48	FIS/08	PHYS-06/B	I	2	Capozziello Salvatore	PO
Quantum Field Theory I (Teoria Quantistica dei Campi 1)	6	48	FIS/02	PHYS-02/A	I	2	Santorelli Pietro	PO

(*) *Il nuovo SSD ex DM 639/2024 è riportato a solo scopo conoscitivo ed in base alle tabelle di corrispondenza, in quanto i nuovi SSD non risultano ancora inseriti nella tabella delle attività formative della classe di laurea ex DM 1649/2023.*

Courses of the Second Year

[*DIDACTIC REGULATIONS OF THE DEGREE PROGRAM PHYSICS (FISICA) (A.Y. 2025/26 and successive years*) – Enrollment Code D41/xxxx]

Insegnamento	CFU	Ore	SSD	Nuovo SSD (*)	Anno	Semestre	Docente	Qualifica
Data Analysis in Subnuclear Physics (Analisi Dati in Fisica Subnucleare)	6	48	FIS/01	PHYS-01/A	II	1	Rossi Elvira	PA
High-Energy Astrophysics (Astrofisica delle Alte Energie)	6	48	FIS/05	PHYS-05/A	II	1	Paolillo Maurizio	PO
Multimessenger Astrophysics (Astrofisica multimessagera)	6	48	FIS/05	PHYS-05/A	II	2	De Laurentis Mariafelicia	PA
Nuclear Astrophysics (Astrofisica Nucleare)	6	48	FIS/01	PHYS-01/A	II	1	Imbriani Gianluca	PO
Astroinformatics (Astroinformatica)	6	48	FIS/05	PHYS-05/A	II	2	*Borrowed from LM DATA SCIENCE*	-
Complements of Cosmology (Complementi di Cosmologia)	6	48	FIS/05	PHYS-05/A	II	1	Piedipalumbo Ester	PA
Didactics of Modern Physics (Didattica della Fisica Moderna)	6	48	FIS/08	PHYS-06/B	II	1	Scotti di Uccio Umberto	PA
STEM Education (Didattica delle discipline STEM)	6	48	FIS/08	PHYS-06/B	II	2	*to be assigned*	-
Radiation Dosimetry (Dosimetria delle Radiazioni)	6	52	FIS/07	PHYS-06/A	II	2	Russo Paolo	PO
Digital Electronics (Elettronica Digitale)	6	48	FIS/01	PHYS-01/A	II	2	*Borrowed from Digital Electronics (Elettronica Digitale) (D59)*	-
Stellar Evolution (Evoluzione Stellare)	6	48	FIS/05	PHYS-05/A	II	2	*to be assigned*	-
Quantum Phases of Matter (Fasi quantistiche della Materia)	6	48	FIS/03	PHYS-03/A	II	1	Lucignano Procolo	PA
Theoretical Astroparticle Physics (Fisica Astroparticellare Teorica)	6	48	FIS/02	PHYS-02/A	II	1	Iocco Fabio	PA
Physics of Exotic Nuclei (Fisica dei Nuclei Esotici)	6	48	FIS/04	PHYS-01/A	II	2	Rapagnani David	RTD-A

Plasma Physics (Fisica dei Plasmi)	6	48	FIS/03	PHYS-03/A	II	2	Fedele Renato	PO
Flavor Physics (Fisica del Flavor)	6	48	FIS/01	PHYS-01/A	II	1	Ambrosino Fabio	PO
Physics of the Dark Universe (Fisica dell'Universo Oscuro)	6	48	FIS/01 FIS/04	PHYS-01/A	II	1	Fiorillo Giuliana	PO
Soft Matter Physics (Fisica della Materia Soffice)	6	48	FIS/03	PHYS-03/A	II	1	Lettieri Stefano	PA
Physics of Cosmic Radiation (Fisica della Radiazione Cosmica)	6	48	FIS/01 FIS/04	PHYS-01/A	II	1	Valore Laura	PA
Physics of Stellar Atmospheres (Fisica delle atmosfere stellari)	6	48	FIS/05	PHYS-05/A	II	2	*to be assigned*	-
Nuclear Physics for Environment and Cultural Heritage (Fisica Nucleare per i Beni Culturali ed Ambientali)	6	48	FIS/01 FIS/04	PHYS-01/A	II	2	Dell'Aquila Daniele	RTD-B
Experimental Standard Model Physics (Fisica Sperimentale del Modello Standard)	6	48	FIS/01	PHYS-01/A	II	1	Iorio Alberto Orso	PA
Experimental Gravitational Physics (Fisica Sperimentale della Gravitazione)	6	48	FIS/01	PHYS-01/A	II	1	Calloni Enrico	PO
Theoretical Physics of Fundamental Interactions (Fisica Teorica delle Interazioni Fondamentali)	6	48	FIS/02	PHYS-02/A	II	1	Sannino Francesco	PO
Electronics Fundamentals (Fondamenti di Elettronica)	6	48	FIS/01	PHYS-01/A	II	2	*to be assigned*	-
Fundamentals of nanomagnetism and applications (Fondamenti di Nanomagnetismo ed Applicazioni)	6	48	FIS/03	PHYS-03/A	II	1	Ausanio Giovanni Iannotti Vincenzo	PO PO
Photonics (Fotonica)	6	48	FIS/03	PHYS-03/A	II	1	D'Ambrosio Vincenzo	PA
Applied Geophysics	6	48	GEO/11	GEOS-04/B	II	2	Fedi Maurizio	PO
Introduction to Quantum Gravity (Introduzione alla Gravità quantistica)	6	48	FIS/02	PHYS-02/A	II	1	Amelino Camelia Giovanni	PO

Laboratory of Medical Physics (Laboratorio di Fisica Medica)	6	64	FIS/07	PHYS-06/A	II	1	Mettivier Giovanni	PA
Laboratory of Modern Optics (Laboratorio di Ottica Moderna)	6	56	FIS/03	PHYS-03/A	II	1	Gesuele Felice	PA
Digital Systems Laboratory (Laboratorio di Sistemi Digitali)	9	72	FIS/01	PHYS-01/A	II	1	Mastroianni Stefano	-
Many-Body Quantum Theory (Meccanica Quantistica dei Molti Corpi)	6	48	FIS/03	PHYS-03/A	II	1	De Filippis Giulio	PA
Statistical Mechanics I (Meccanica Statistica I)	6	48	FIS/02	PHYS-02/A	II	2	*Borrowed from* Statistical Mechanics I *(Meccanica Statistica I) (D59)*	-
Machine Learning Methods for Physics (Metodi di apprendimento automatico per la Fisica)	6	48	INF/01	INFO-01/A	II	1	Vitiello Autilia	RTD-B
Research Methods in Physics Education (Metodi per la ricerca in Didattica della Fisica)	6	48	FIS/08	PHYS-06/B	II	2	Testa Italo	PA
Experimental Methods for Nanotechnologies and Condensed Matter Physics (Metodi Sperimentali per le Nanotecnologie e la Materia Condensata)	6	56	FIS/03	PHYS-03/A	II	2	Pepe Giovanni Piero	PO
Digital Image Processing (Metodologie per l'Analisi delle Immagini)	6	52	FIS/07	PHYS-06/A	II	2	Russo Paolo	PO
Nuclear Measurements (Misure Nucleari)	6	48	FIS/04	PHYS-01/A	II	2	Di Leva Antonino	PA
Materials Computational Modelling (Modellazione Computazionale dei Materiali)	6	48	FIS/03	PHYS-03/A	II	2	Zen Andrea	PA
Quantum Optics and Information (Ottica ed Informazione Quantistica)	6	48	FIS/03	PHYS-03/A	II	1	Piccirillo Bruno	PA

Modern Optics (Ottica Moderna)	6	48	FIS/03	PHYS-03/A	II	2	De Lisio Corrado	PO
Planetology (Planetologia)	6	48	FIS/05	PHYS-05/A	II	1	Covone Giovanni	PA
Environmental Radioactivity (Radioattività Ambientale)	6	52	FIS/07	PHYS-06/A	II	2	Ambrosino Fabrizio	RTD-A
Nuclear Reactions (Reazioni Nucleari)	6	48	FIS/04	PHYS-01/A	II	1	Di Nitto Antonio	PA
Sensors, detectors and related electronics (Sensori, Rivelatori ed Elettronica Associata)	6	48	FIS/01	PHYS-01/A	II	2	Di Capua Francesco	PA
Seismology (Sismologia)	9	72	FIS/06	PHYS-05/B	II	1	Zollo Aldo	PO
Quantum Open Systems (Sistemi Aperti Quantistici)	6	48	FIS/03	PHYS-03/A	II	2	Fazio Rosario	PO
Complex Systems (Sistemi Complessi)	6	48	FIS/02	PHYS-02/A	II	1	Nicodemi Mario	PO
Optical Spectroscopy (Spettroscopia Ottica)	6	48	FIS/03	PHYS-03/A	II	1	Amoruso Salvatore	PO
History of Astronomy (Storia dell'Astronomia)	6	48	FIS/05	PHYS-05/A	II	1	Gargano Mauro	-
Techniques for particle acceleration (Tecniche di Accelerazione e Trasporto di Fasci di Particelle)	6	48	FIS/01	PHYS-01/A	II	1	Fedele Renato	PO
Experimental techniques in Particle Physics (Tecniche Sperimentali in Fisica delle Particelle Elementari)	6	48	FIS/01	PHYS-01/A	II	1	Saracino Giulio	PA
Superconducting Quantum Technologies (Tecnologie Quantistiche Superconduttive)	6	48	FIS/03	PHYS-03/A	II	2	Tafuri Francesco	PO
Classical Field Theory (Teoria Classica dei Campi)	6	48	FIS/02	PHYS-02/A	II	1	Esposito Giampiero	PO
Group Theory and Applications (Teoria dei Gruppi e Applicazioni)	6	48	FIS/02	PHYS-02/A	II	2	Ricciardi Giulia	PA

String Theory (Teoria delle Stringhe)	6	48	FIS/02	PHYS-02/A	II	1	Taronna Massimo	PO
Theory of Quantum Information (Teoria dell'informazione quantistica)	6	48	FIS/02	PHYS-02/A	II	1	Hamma Alioscia	PA
Quantum Field Theory I (Teoria Quantistica dei Campi I)	6	48	FIS/02	PHYS-02/A	II	2	*Borrowed from Quantum Field Theory I (Teoria Quantistica dei Campi I) (D59)*	-
Quantum Field Theory II (Teoria Quantistica dei Campi II)	6	48	FIS/02	PHYS-02/A	II	1	Miele Gennaro	PO
Computational Thermodynamics (Termodinamica Computazionale)	6	48	FIS/03	PHYS-03/A	II	2	Alfè Dario	PO

(*) *Il nuovo SSD ex DM 639/2024 è riportato a solo scopo conoscitivo ed in base alle tabelle di corrispondenza, in quanto i nuovi SSD non risultano ancora inseriti nella tabella delle attività formative della classe di laurea ex DM 1649/2023.*

Course Syllabi

The syllabi for individual courses are available on the webpages of the professors responsible for the courses and on the Degree Program's website. (http://www.fisica.unina.it/docenti-insegnamenti-e-programmi).

Course Start Dates and Lectures

The start date of each course can be determined from the lecture timetable (or from the attached "Master's Course Start Notices" table), which will be announced and published on the Degree Program's website at least one week before the beginning of each semester. The class timetable also includes the classrooms and/or laboratories where each course will be held.

The class will typically take place in the lecture room of the Department of Physics "Ettore Pancini", within Complesso Universitario di Monte S. Angelo, Via Cintia, 80126 Naples. Practical laboratory activities will be held in the facilities of the Didactic and Scientific Laboratories of the Department of Physics "Ettore Pancini". Further information will be available from Teaching Secretariat of the Department of Physics "Ettore Pancini" (Rooms 0N01, 0M06) and on the web page with class schedule on the website of the CdS.

Elective Courses

In the frame of the *Didactic Regulations of the Degree Program in Physics (FISICA)* (A.Y. 2025/26 and subsequent years) – enrollment code D59/xxxx and *Didactic Regulations of the Degree Program in Physics (FISICA)* (A.Y. 2025/26 and subsequent years) - enrollment code D41/xxxx - the student has 12 ECTS credits available for freely chosen elective courses.

In the frame of the *Didactic Regulations of the Degree Program in Physics (FISICA) (A.A. 2021/22 and successive years*) – enrollment code N94/xxxx - The student may freely select any course offered by another Degree Program within the college of Science of the Polytechnique and Basic Sciences School. The number of courses is not relevant; only the minimum credit requirement matters. If a student selects elective courses whose total ECTS credits exceed the minimum requirement, the excess credits from the last successfully completed elective course will be deducted by the Student Office. If credits have been lost in this manner, the student may submit a request to the Program Coordinator to have them recognized as ECTS credits under "Other Educational Activities."

It is permitted to select elective courses also from the Colleges of Engineering or Architecture within the Polytechnic and Basic Sciences School, or from other Schools of the University of Naples Federico II.

In such cases, students must notify the Coordinator by submitting a written request on plain paper. This is to ensure, in advance, that the selected courses are deemed consistent with the educational objectives of the Master's Degree Program in Physics. If the courses are considered not aligned, the corresponding ECTS credits will not be recognized by the Student Office.

However, students enrolled in the Master's Degree Program in Physics are strongly advised to select their freely chosen elective courses from within the offerings of their own curriculum, or from those of one of the other curricula of the Master's Degree Program in Physics.

Methods of Completion and Credit Allocation for "Other Activities"

The program curriculum includes 2 ECTS credits dedicated to "Other Activities" in accordance with Article 10, paragraph 5, letter (d) of Ministerial Decree 270/04. The following methods for completing and obtaining these credits are defined:

(a) Acquisition of knowledge and methodologies related to thesis work - Credits are awarded by the Degree Program Academic Board (CCD) Coordinator upon submission of a certificate issued by the thesis supervisor or another faculty member, confirming that the activity has been carried out for a period equivalent to 2 ECTS credits.

(b) Knowledge of a foreign language other than English - Credits are awarded by the CCD Coordinator upon receipt of a certificate from the faculty member designated to conduct the language interview.

(c) Participation in schools or internships within the scientific field of the student's Curriculum - Credits are granted upon request and submission of supporting documentation to the CCD Coordinator.

(d) Computer-related activities - Activities must be based on projects proposed by faculty and approved by the CCD. Credits already earned and recognized during the Bachelor's program cannot be recognized again in the Master's program. Credits are granted by the CCD Coordinator upon submission of a certificate from the faculty member supervising the activity.

(e) Recognition of professional activities - Credits are granted upon request and submission of supporting documentation to the CCD Coordinator. The activities must be consistent with the field of physics.

(f) Physics outreach and dissemination activities - Credits are granted by the CCD Coordinator upon submission of a certificate issued by the event or initiative supervisor. The certificate must clearly state the student's full name, the type of activity, and the time dedicated to it.

Students may also propose additional activities not listed above for credit recognition. These proposals must be submitted to the CCD for approval.

In all cases — whether choosing from the options (a)–(f) or proposing alternative activities approved by the CCD — students must complete a specific request form and submit it to the Educational Office of the Department of Physics "Ettore Pancini", indicating the selected activity type(s).

Students approaching graduation who intend to complete their academic requirements by the end of the academic year (March 31) without re-enrolling must remember that this deadline applies not only to exams and coursework but also to the acquisition of credits under "*Other Activities*".

Final Examination (Graduation)

The procedures for the assignment and completion of the thesis, the rules for admission to the final examination, as well as the procedures and evaluation criteria for the graduation exam, are detailed in the "Thesis and Master's Degree Examination" section of the Degree Program's website (in Italian): www.fisica.unina.it/tesi-ed-esame-di-laurea-magistrale-in-fisica

Students are required to follow all the specifications provided in this document and must strictly adhere to the deadlines and procedures indicated for academic and administrative tasks. Failure to comply will result in exclusion from the selected graduation session. Students will not be permitted to graduate in subsequent sessions until all obligations are fulfilled.

The full calendar of graduation sessions for the entire academic year is defined in March and is available in the "Teaching" section of the Degree Program's website under "Graduation Exam Schedule": www.fisica.unina.it/tesi-ed-esame-di-laurea-magistrale-in-fisica

Certification

It should be noted that, where applicable, the name of the selected curriculum—chosen from among the nine established in the official regulations—will appear on the degree certificate issued by the Student Office of the College of Science of the University of Naples Federico II.

Curricula (Study Plans) Structure

Note: Following the changes to the Degree Program's Curriculum and Academic Regulations starting from the academic year 2025/2026, students enrolling in years beyond the first are advised to refer to the regulations and student guides from previous years, available on the Degree Program's webpage under the section "Regulations and Guides from Previous Years."

The following tables show the structure of the curricula according to the Academic Regulations for the academic year 2025/2026 (first year – students with enrollment code D59).

KEY

Type of Educational Activity (TAF):

B = Characterising
C = Related or Supplementary
D = At the student's choice
E = Final exammination and language knowledge
F = Further training activities

CURRICULUM ASTROPHYSICS

The "Astrophysics" curriculum, in addition to the general objectives of the MSc Degree Program in Physics, aims specifically at providing graduates with an in-depth knowledge in at least one disciplinary area of astrophysics, such as cosmology and extragalactic astronomy e.g., or the experimental techniques of modern astrophysics. Furthermore, it aims at developing the ability to apply this knowledge in professional contexts related to astrophysical research or in the development of advanced software and hardware technologies, even in the industrial sector.

I Anno

Title Course	**SSD**	**Module**	**CREDITS**	**Hours**	**Type Activities *(lecture, workshop, etc.)***	**TAF**	**Disciplinary Area**	**Mandatory /optional**
Astrophysics	FIS/05	single	9	72	Frontal lesson	B	Astrophysics, geophysics, climate, and space	Mandatory
Cosmology	FIS/05	single	6	48	Frontal lesson	B	Astrophysics, geophysics, climate, and space	Mandatory
Classical Electrodynamics	FIS/03	single	9	72	Frontal lesson	B	Microphysics of Matter and of fundamental interactions	Mandatory
Physics of Galaxies	FIS/05	single	6	48	Frontal lesson	B	Astrophysics, geophysics, climate, and space	Mandatory
Quantum Physics	FIS/02	single	6	48	Frontal lesson	B	Theoretical and fundamental Physics	Mandatory
Physics Laboratory	FIS/01	single	9	84	Frontal lesson and laboratory workshop	B	Experimental and applied	Mandatory
Further training activities (art. 10 comma 5 lett d) –	-		4	-	-	F	Further language skills	Mandatory
Further training activities (art.	-		2	-	-		-	Mandatory

10 comma 5 lett d)								
II Anno								
Title Course	**SSD**	**Module**	**CREDITS**	**Hours**	**Type Activities *(Frontal lesson, workshop, etc.)***	**TAF**	**Ambito disciplinare**	**Mandatory /optional**
High-Energy Astrophysics	FIS/05	single	6	48	Frontal lesson	B	Astrophysics, geophysics, climate, and space	Mandatory
Astroinformatics	FIS/05	single	12	48	Frontal lesson	C	-	Mandatory (two of your choices)
Multimessenger Astrophysics	FIS/05							
Complements of Cosmology	FIS/05							
Stellar Evolution	FIS/05							
Philosophy of Scientific Knowledge	M-FIL/01							
Physics of Stellar Atmospheres	FIS/05							
Laboratory of Astrophysics	FIS/05							
Planetology	FIS/05							
History of Astronomy	FIS/05							
At the student's choice	-	single	12	96	Frontal lesson	D	-	Mandatory
Final examination	-	single	39	-	-	E	-	Mandatory

List of propaedeuticities
The Astrophysics course is a prerequisite for: High-Energy Astrophysics, Multimessenger Astrophysics, Cosmology, Cosmology Complements, Stellar Evolution, Physics of Galaxies, Astrophysics Laboratory, and Planetology.
The course in Cosmology is a prerequisite for: Cosmology Complements.

Course Modalities: All courses are taken in person.

CURRICULUM PHYSICS EDUCATION AND HISTORY OF PHYSICS

The "Physics Education and History of Physics" curriculum aims at training professionals with expertise in research methodologies in physics education and history of Physics, as well as in educational technologies for Physics. The graduate student will be capable of designing, delivering, and validating educational pathways based on the theoretical and experimental foundations of research in Physics education and history of Physics. They will also be proficient in evaluation methodologies and skilled in designing and using investigative tools, including the latest statistical analysis techniques (e.g., educational data mining). The acquired skills will enable the graduate student to manage software and hardware environments relevant to education. The developed competencies will be useful in various fields, including teaching (both in schools and universities), research (educational, historical, socio-scientific, complex systems, etc.), design of innovative tools for dissemination and education (software, hardware), and scientific communication.

I Anno

Title Course	**SSD**	**Module**	**CREDITS**	**Hours**	**Type Activities *(Frontal lesson, workshop, etc.)***	**TAF**	**Ambito disciplinare**	**Mandatory /optional**
Physics Education	FIS/08	single	9	72	Frontal lesson and laboratory	B	Theoretical and fundamental Physics	Mandatory
Classical Electrodynamics	FIS/03	single	9	72	Frontal lesson	B	Microphysics of Matter and of fundamental interactions	Mandatory
Quantum Physics	FIS/02	single	6	48	Frontal lesson	B	Theoretical and fundamental Physics	Mandatory
Physics Laboratory	FIS/01	single	9	84	Frontal lesson and laboratory workshop	B	Experimental and applied	Mandatory
Didactical Design for Physics Design of Educational Activities (*borrowed from MSc in Mathematics*)	FIS/08	single	6	48	Laboratory workshop	B	Theoretical and fundamental Physics	Mandatory (one of your choices)
History of Classical Physics History of Modern Physics	FIS/08	single	6	48	Frontal lesson	C	Theoretical and fundamental Physics	Mandatory (one of your choices)
Further training activities (art. 10 comma 5 lett d)	-		4	-	-	F	Further language skills	Mandatory
Further training activities (art. 10 comma 5 lett d)	-		2	-	-		-	Mandatory

II Anno								
Title Course	**SSD**	**Module**	**CREDITS**	**Hours**	**Type Activities *(Frontal lesson, workshop, etc.)***	**TAF**	**Disciplinary Area**	**Mandatory /optional**
Didactics of Modern Physics	FIS/08	single	6	48	Frontal lesson	B	Theoretical and fundamental Physics	Mandatory
Research Methods in Physics Education	FIS/08	single	6	48	Frontal lesson	C	-	Mandatory (one of your choices)
Educational Technologies for Physics Teaching								
Didactics of Mathematics (*borrowed from MSc in Mathematics*)	MAT/04	single	6	48	Frontal lesson	C	-	Mandatory (one of your choices)
STEM Education	FIS/08							
Philosophy of Scientific Knowledge	M-FIL/01							
Physics and Philosophy	FIS/08							
History of Astronomy	FIS/05							
At the student's choice	-	single	12	96	Frontal lesson	D	-	Mandatory
Final examination	-	single	39	-	-	E	-	Mandatory

List of propaedeuticities
The course in Physics Education is a prerequisite for: Didactics of Modern Physics.

Course Modalities: All courses are taken in person.

CURRICULUM ELECTRONICS

The "Electronics" curriculum of the Master's Degree Program in Physics aims to train professionals capable of contributing to the scientific and technological development of experimental apparatus for physical measurements in research and industry through the design of electronic instruments for data acquisition, processing, and control.
Graduates in Physics with a specialization in the Electronics Curriculum will be able to design, simulate, and implement original architectures of electronic systems for physical applications, employing the most innovative design and analysis techniques. They will have the opportunity to study, use, and apply the latest technologies in analog and digital electronic devices, with a particular focus on reconfigurable and programmable components, such as Field Programmable Gate Arrays (FPGA) and microprocessors. The Curriculum also includes educational pathways that allow for an in-depth study of digital signal processing, sensors and data acquisition, integrated digital electronics, and analog electronics. The proposed Curriculum includes laboratory activities focused not only on experimental methodologies, measurement, and data processing but also, in particular, on the design and implementation of electronic measurement and data acquisition systems, including those based on FPGA and microprocessors.

I Anno

Title Course	**SSD**	**Module**	**CREDITS**	**Hours**	**Type Activities *(Frontal lesson, workshop, etc.)***	**TAF**	**Disciplinary Area**	**Mandatory /optional**
Classical Electrodynamics	FIS/03	single	9	72	Frontal lesson	B	Microphysics of Matter and of fundamental interactions	Mandatory
Digital Electronics	FIS/01	single	6	48	Frontal lesson	B	Experimental and applied	Mandatory
Solid State Physics I	FIS/03	single	6	48	Frontal lesson	C	Microphysics of Matter and of fundamental interactions	Mandatory
Electronics Fundamentals	FIS/01	single	6	48	Frontal lesson	B	Experimental and applied	Mandatory
Physics Laboratory	FIS/01	single	9	84	Frontal lesson and laboratory workshop	B	Experimental and applied	Mandatory
Quantum Mechanics	FIS/02	single	9	72	Frontal lesson	B	Theoretical and fundamental Physics	Mandatory
Further training activities (art. 10 comma 5)	-		4	-	-	F	Further language skills	Mandatory
Further training activities (art. 10 comma 5)	-		2		-			

II Anno

Title Course	**SSD**	**Module**	**CREDITS**	**Hours**	**Type Activities *(Frontal lesson, workshop, etc.)***	**TAF**	**Disciplinary Area**	**Mandatory /optional**
Integrated Systems Architecture (*borrowed from MSc in Electonic Engineering*)	ING-INF/01	single	9	72	Frontal lesson	C	-	Mandatory (one of your choices)
Digital Systems Laboratory	FIS/01	single	9	72	Frontal lesson and laboratory workshop	B	Experimental and applied	Mandatory
At the student's choice	-	single	12	96	Frontal lesson	D	-	Mandatory
Final examination	-	single	39	-	-	E	-	Mandatory

List of propaedeuticities
None.

Course Modalities: All courses are taken in person.

CURRICULUM BIOMEDICAL PHYSICS

Graduates of the MSc Degree Program in Physics, with a specialization in "Biomedical Physics", will:

- Acquire knowledge of the physical methodologies (theoretical and experimental) necessary for describing and understanding the living matter in the biological and medical context;
- Gain in-depth knowledge of the development and use of instruments required for the control and detection of physical phenomena in the fields of prevention, diagnosis, and treatment;
- Be able to apply the specific knowledge acquired in modeling, radiation biophysics, physical techniques related to biomedical diagnostics, biomedical image analysis, and the measurement of ionizing radiation in medical physics and environmental contexts.

In terms of postgraduate education, graduates will be eligible to pursue PhD programs and the Specialization School of Medical Physics. For the latter, some of the credits earned may be recognized, subject to approval by the School's Academic Board.

To achieve these objectives, the curriculum in Biomedical Physics:

- Includes activities aimed at acquiring specialized knowledge and skills in imaging, biophysics, and medical physics;
- Provides laboratory activities focused on learning experimental methodologies, data measurements and processing, and, in particular, the use of modern biomedical instrumentation.

I Anno

Title Course	**SSD**	**Module**	**CREDITS**	**Ore**	**Type Activities *(Frontal lesson, workshop, etc.)***	**TAF**	**Disciplinary Area**	**Mandatory /optional**
Radiation Dosimetry	FIS/07	single	6	52	Frontal lesson and laboratory workshop	C	-	Mandatory
Radiation Biophysics	FIS/07	single	6	52	Frontal lesson and laboratory workshop	B	Experimental and applied	Mandatory
Classical Electrodynamics	FIS/03	single	9	72	Frontal lesson	B	Microphysics of Matter and of fundamental interactions	Mandatory
Medical Physics	FIS/07	single	6	48	Frontal lesson	B	Experimental and applied	Mandatory
Physics Laboratory	FIS/01	single	9	84	Frontal lesson and laboratory workshop	B	Experimental and applied	Mandatory
Quantum Mechanics	FIS/02	single	9	72	Frontal lesson	B	Theoretical and fundamental Physics	Mandatory
Further training activities (art. 10 comma 5)	-		4	-	-	F	Further language skills	Mandatory
Further training activities (art. 10 comma 5)	-		2		-			

II Anno

Title Course	**SSD**	**Module**	**CREDITS**	**Hours**	**Type Activities *(Frontal lesson, workshop, etc.)***	**TAF**	**Disciplinary Area**	**Mandatory /optional**
Laboratory of Medical Physics	FIS/07	single	6	64	Frontal lesson and Workshop	B	Experimental and applied	Mandatory
Physical Basis of Magnetic Resonance	FIS/07	single	6	52	Frontal lesson	C	-	Mandatory (One of your choices)
Radiotherapy Physics								
Digital Image Processing								
Environmental Radioactivity								
Further training activities (art. 10 comma 5, lettera d)	-	single	6	150	Learning and orientation traineeship	F	-	Mandatory
At the student's choice	-	single	12	96	Frontal lesson	D	-	Mandatory
Final examination	-	single	39	-	-	E	-	Mandatory

List of propaedeuticities
None.

Course Modalities: All courses are taken in person.

CURRICULUM PHYSICS OF MATTER

The "Physics of Matter" curriculum, in addition to the general objectives of the MSc Degree Program in Physics, specifically aims at providing graduates with an in-depth knowledge of at least one disciplinary area of physics of matter. This may include, for example, solid-state physics, including semiconductors and nanostructured systems, superconductors and other strongly correlated materials, soft condensed matter physics, including polymers, liquid crystals, and biological systems, atomic and molecular physics, as well as modern optics and photonics. Graduates will also acquire the ability to apply this specific knowledge in professional contexts related to the development and application of advanced technologies. Examples include industrial sectors such as semiconductors, information and communication technology, optoelectronics, new materials, and advanced diagnostic techniques, with a high level of autonomy and the ability to tackle and solve complex, non-standard problems.

I Anno

Title Course	**SSD**	**Module**	**CREDITS**	**Hours**	**Type Activities *(Frontal lesson, workshop, etc.)***	**TAF**	**Disciplinary Area**	**Mandatory /optional**
Classical Electrodynamics	FIS/03	single	9	72	Frontal lesson	B	Microphysics of Matter and of fundamental interactions	Mandatory
Solid State Physics I	FIS/03	single	6	48	Frontal lesson	B	Microphysics of Matter and of fundamental interactions	Mandatory
Physics Laboratory	FIS/01	single	9	84	Frontal lesson and laboratory workshop	B	Experimental and applied	Mandatory
Quantum Mechanics	FIS/02	single	9	72	Frontal lesson	B	Theoretical and fundamental Physics	Mandatory
Statistical Mechanics I	FIS/02	single	6	48	Frontal lesson	B	Theoretical and fundamental Physics	Mandatory
At the student's choice	-	single	6	48	-	D	-	Mandatory
Further training activities (art. 10 comma 5)	-	-	4	-	-	F	Further language skills	Mandatory
Further training activities (art. 10 comma 5)	-	-	2	-	-			Mandatory

II Anno

Title Course	SSD	Module	CREDITS	Hours	Type Activities *(Frontal lesson, workshop, etc.)*	TAF	Disciplinary Area	Mandatory /optional
Laboratory of Modern Optics	FIS/03	single	6	56	Frontal lesson and laboratory workshop	B	Microphysics of Matter and of fundamental interactions	Mandatory (one of your choices)
Many-Body Quantum Theory	FIS/03			48	Frontal lesson			
Experimental Methods for Nanotechnologies and Condensed Matter Physics	FIS/03			56	Frontal lesson and laboratory workshop			
Biophotonics	FIS/03	single	18	48	Frontal lesson	C	-	Mandatory (tre of your choices)
Quantum Phases of Matter	FIS/03	single		48	Frontal lesson			
Plasma Physics	FIS/03	single		48	Frontal lesson			
Soft Matter Physics	FIS/03	single		48	Frontal lesson			
Solid State Physics II	FIS/03	single		48	Frontal lesson			
Fundamentals of nanomagnetism and applications	FIS/03	single		48	Frontal lesson			
Photonics	FIS/03	single		48	Frontal lesson and laboratory workshop			
Materials Computational Modelling	FIS/03	single		48	Frontal lesson			
Quantum Optics and Information	FIS/03	single		48	Frontal lesson			
Modern Optics	FIS/03	single		48	Frontal lesson			
Quantum Open Systems	FIS/03	single		48	Frontal lesson			
Optical Spectroscopy	FIS/03	single		48	Frontal lesson			
Superconducting Quantum Technologies	FIS/03	single		48	Frontal lesson			
Computational Thermodynamics	FIS/03	single		48	Frontal lesson			
At the student's choice	-	single	6	48	Frontal lesson	D	-	Mandatory
Final examination	-	single	39	-	-	E	-	Mandatory

List of propaedeuticities
The course in Solid State Physics I is a prerequisite for: Solid State Physics II; Materials Computational Modelling.
The course in Quantum Mechanics is a prerequisite for: Quantum Open Systems.

Course Modalities: All courses are taken in person.

CURRICULUM NUCLEAR PHYSICS

The "Nuclear Physics" curriculum of the MSc Degree Program in Physics has the following educational objectives:

- To provide an in-depth knowledge of the latest developments in Nuclear Physics in its various aspects (theoretical, experimental, and applied) and related interdisciplinary topics. This level of knowledge will enable graduates to engage in both fundamental and applied research activities, as well as in the productive sectors;
- To acquire advanced skills in computer science, with a particular focus on computational and data analysis aspects, which are also common to other fields of scientific research, facilitating their integration into activities beyond the nuclear field;
- To gain advanced knowledge of experimental methodologies, including the development and use of advanced instrumentation and measurement apparatus, enabling graduates to make innovative and managerial contributions to both fundamental and applied research, as well as to productive and public utility activities, such as the production and study of new materials, environmental risk prevention and control, analysis in the field of cultural heritage, and radiation protection.

I Anno

Title Course	**SSD**	**Module**	**CREDITS**	**Hours**	**Type Activities *(Frontal lesson, workshop, etc.)***	**TAF**	**Disciplinary Area**	**Mandatory /optional**
Classical Electrodynamics	FIS/03	single	9	72	Frontal lesson	B	Microphysics of Matter and of fundamental interactions	Mandatory
Nuclear Physics	FIS/04	single	9	72	Frontal lesson	B	Microphysics of Matter and of fundamental interactions	Mandatory
Physics Laboratory	FIS/01	single	9	84	Frontal lesson and laboratory workshop	B	Experimental and applied	Mandatory
Laboratory of Nuclear Physics	FIS/01	single	9	72	Frontal lesson and laboratory workshop	B	Experimental and applied	Mandatory
Quantum Mechanics	FIS/02	single	9	72	Frontal lesson	B	Theoretical and fundamental Physics	Mandatory
Further training activities (art. 10 comma 5)	-	-	4	-	-	F	Further language skills	Mandatory
Further training activities (art. 10 comma 5)	-	-	2	-	-	F	-	-

II Anno

Title Course	**SSD**	**Module**	**CREDITS**	**Hours**	**Type Activities *(Frontal lesson, workshop, etc.)***	**TAF**	**Disciplinary Area**	**Mandatory /optional**
Nuclear Reactions	FIS/04	single	6	48	Frontal lesson	B	Microphysics of Matter and of fundamental interactions	Mandatory
Nuclear Astrophysics	FIS/01,FIS/04	single	12	48	Frontal lesson	C	-	Mandatory (two of your choices)
Physics of Exotic Nuclei	FIS/04	single		48				
Nuclear Physics for Environment and Cultural Heritage	FIS/01,FIS/04	single		48				
Computational Intelligence (*borrowed from MSc in Data Science*)	INF/01	single		48				
Statistical Mechanics I	FIS/02	single		48				
Machine Learning Methods for Physics	INF/01	single		48				
Nuclear Measurements	FIS/01, FIS/04	single		48				
Theory of Nuclear Structure	FIS/04	single		48				
At the student's choice	-	single	12	96	Frontal lesson	D	-	Mandatory
Final examination	-	single	39	-	-	E	-	Mandatory

List of propaedeuticities
The course in Nuclear Physics is a prerequisite for: Physics of Exotic Nuclei; Nuclear Structure Theory.
The course in Nuclear Reactions is a prerequisite for: Physics of Exotic Nuclei.

Course Modalities: All courses are taken in person.

CURRICULUM SUBNUCLEAR AND ASTROPARTICLE PHYSICS

The "Subnuclear and Astroparticle Physics" curriculum of the MSc Degree Program in Physics has the following educational objectives:

- To provide an in-depth understanding of the latest experimental topics in subnuclear and astroparticle physics and related interdisciplinary issues. This knowledge will enable graduates to effectively engage in both fundamental and applied research activities;
- To acquire advanced knowledge of experimental methodologies, including the design, development, and use of sophisticated instrumentation and measurement systems, allowing graduates to contribute significantly to both fundamental and applied research as well as to productive or public utility activities;
- To develop advanced skills in computer science, with a focus on data analysis, the control and monitoring of complex instrumentation systems, and the management of advanced computing systems and networks, facilitating productive engagement in a wide range of activities beyond specifically research-oriented tasks;
- To acquire a work methodology based on solid foundational knowledge, flexibility, initiative, and collaboration in the workplace, enabling graduates to constructively integrate into a broad spectrum of activities related to both fundamental and applied research as well as to productive sectors.

I Anno

Title Course	**SSD**	**Module**	**CREDITS**	**Hours**	**Type Activities *(Frontal lesson, workshop, etc.)***	**TAF**	**Disciplinary Area**	**Mandatory /optional**
Classical Electrodynamics	FIS/03	single	9	72	Frontal lesson	B	Microphysics of Matter and of fundamental interactions	Mandatory
Astroparticle Physics	FIS/01, FIS/04	single	6	48	Frontal lesson	B	Experimental and applied	Mandatory
Particle Physics	FIS/01	single	9	72	Frontal lesson	B	Experimental and applied	Mandatory
Physics Laboratory	FIS/01	single	9	84	Frontal lesson and laboratory workshop	B	Experimental and applied	Mandatory
Particle Physics Laboratory	FIS/01	single	9	96	Frontal lesson and laboratory workshop	B	Experimental and applied	Mandatory
Quantum Mechanics	FIS/02	single	9	72	Frontal lesson	B	Theoretical and fundamental Physics	Mandatory
Further training activities (art. 10 comma 5)	-		4	-	-	F	Further language skills	Mandatory
Further training activities (art. 10 comma 5)	-		2	-	-	F	-	-

II Anno

Title Course	**SSD**	**Module**	**CREDITS**	**Hours**	**Type Activities *(Frontal lesson, workshop, etc.)***	**TAF**	**Disciplinary Area**	**Mandatory /optional**
Data Analysis in Subnuclear Physics	FIS/01	single	12	48	Frontal lesson	C	-	Mandatory (two of your choices)
Nuclear Astrophysics	FIS/01	single		48				
Digital Electronics	FIS/01	single		48				
Flavor Physics	FIS/01	single		48				
Physics of the Dark Universe	FIS/01, FIS/04	single		48				
Physics of Cosmic Radiation	FIS/01, FIS/04	single		48				
Experimental Standard Model Physics	FIS/01	single		48				
Experimental Gravitational Physics	FIS/01	single		48				
Theoretical Physics of Fundamental Interactions	FIS/02	single		48				
Electronics Fundamentals	FIS/01	single		48				
Computational Intelligence (*borrowed from MSc in Data Science*)	INF/01	single		48				
Statistical Mechanics I	FIS/02	single		48				
Machine Learning Methods for Physics	INF/01	single		48				
Perturbative QCD	FIS/02	single		48				
Sensors, detectors and related electronics	FIS/01	single		48				
Techniques for particle acceleration	FIS/01, FIS/03	single		48				
Experimental techniques in Particle Physics	FIS/01	single		48				
Quantum Field Theory I	FIS/02	single		48				
At the student's choice	-	single	12	96	Frontal lesson	D	-	Mandatory

Final examination	-	single	39	-	-	E	-	Mandatory

List of propaedeuticities
The course in Classical Electrodynamics is a prerequisite for: Quantum Field Theory I.
The course in Quantum Mechanics is a prerequisite for: Perturbative QCD; Quantum Field Theory I.
The course in Quantum Field Theory I is a prerequisite for: Theoretical Physics of Fundamental Interactions; Perturbative QCD.

Course Modalities: All courses are taken in person.

CURRICULUM THEORETICAL PHYSICS

The "Theoretical Physics" curriculum of the MSc Degree Program in Physics aims at developing individuals with an in-depth understanding of the key topics in modern theoretical physics and proficiency in contemporary techniques for solving related problems. Graduates of the MSc Degree Program in Physics, specializing in "Theoretical Physics," will acquire specific skills to use their knowledge for interpreting and predicting the behavior of complex systems. Graduates will be prepared to join research groups in public or private institutions or to apply their modeling skills in other professional environments.

I Anno

Title Course	**SSD**	**Module**	**CREDITS**	**Hours**	**Type Activities *(Frontal lesson, workshop, etc.)***	**TAF**	**Disciplinary Area**	**Mandatory /optional**
Complements of Mathematical Methods of Physics	FIS/02	single	6	48	Frontal lesson	B	Theoretical and fundamental Physics	Mandatory
Classical Electrodynamics	FIS/03	single	9	72	Frontal lesson	B	Microphysics of Matter and of fundamental interactions	Mandatory
Physics Laboratory	FIS/01	single	9	84	Frontal lesson and laboratory workshop	B	Experimental and applied	Mandatory
Quantum Mechanics	FIS/02	single	9	72	Frontal lesson	B	Theoretical and fundamental Physics	Mandatory
Quantum Field Theory I	FIS/02	single	6	48	Frontal lesson	B	Theoretical and fundamental Physics	Mandatory
Numerical Methods of Physics Models of Biological Systems General Relativity and Gravitation	FIS/02	single	6	48	Frontal lesson	C		Mandatory (one of your choices)
Statistical Mechanics I Statistical Mechanics II	FIS/02	single	6	48	Frontal lesson	B	Theoretical and fundamental Physics	Mandatory (one of your choices)
Further training activities (art. 10 comma 5)	-		4	-	-	F	Further language skills	Mandatory
Further training activities (art. 10 comma 5)	-		2	-	-	F	-	-

II Anno

Title Course	SSD	Module	CREDITS	Hours	Type Activities *(Frontal lesson, workshop, etc.)*	TAF	Disciplinary Area	Mandatory /optional
Phenomenology of Elementary Particles	FIS/02	single	12	48	Frontal lesson	C	-	Mandatory (two of your choices)
Theoretical Astroparticle Physics	FIS/02	single		48				
Theoretical Physics of Fundamental Interactions	FIS/02	single		48				
Introduction to Quantum Gravity	FIS/02	single		48				
Models of Biological Systems	FIS/02	single		48				
Perturbative QCD	FIS/02	single		48				
Complex Systems	FIS/02	single		48		C		
Classical Field Theory	FIS/02	single		48				
Group Theory and Applications	FIS/02	single		48				
String Theory	FIS/02	single		48				
Theory of Quantum Information	FIS/02	single		48				
Quantum Field Theory II	FIS/02	single		48				
Quantum Theory of Measurement	FIS/02	single		48				
At the student's choice	-	single	12	96	Frontal lesson	D	-	Mandatory
Final examination	-	single	39	-	-	E	-	Mandatory

List of propaedeuticities

The course in Classical Electrodynamics is a prerequisite for: Classical Field Theory, Quantum Field Theory I.

The course in Quantum Mechanics is a prerequisite for: Perturbative QCD; Group Theory and Applications; Quantum Information Theory; Quantum Field Theory I; Quantum Theory of Measurement.

The course in Quantum Field Theory I is a prerequisite for: Phenomenology of Elementary Particles; Theoretical Astroparticle Physics; Theoretical Physics of Fundamental Interactions; Introduction to Quantum Gravity; Perturbative QCD; Quantum Field Theory II; String Theory.

The course in General Relativity and Gravitation is a prerequisite for: Theoretical Astroparticle Physics; Introduction to Quantum Gravity; String Theory.

Course Modalities: All courses are taken in person.

CURRICULUM GEOPHYSICS

In addition to the general objectives of the MSc Degree Program in Physics, the "Geophysics" curriculum aims at achieving the following educational objectives:

- To provide a solid cultural background in both theoretical and applied geophysics, along with an in-depth understanding of modern instrumentation and techniques for acquiring, processing, and interpreting geophysical data;
- To ensure comprehensive mastery of methods for monitoring, classifying, and modeling complex dynamic phenomena at planetary, continental, regional, and local scales;
- To develop advanced scientific and operational expertise for improving and developing methods for geophysical exploration of the subsurface and studying the physical parameters of rocks.

Graduates of the MSc Degree Program in Physics, specializing in Geophysics, will be prepared to engage in activities such as promoting and developing scientific and technological innovations in Earth Science field, as well as managing and designing technologies and methodologies for analysis in related sectors, including industry, cultural heritage, civil engineering, environment, and land management. Graduates may find employment in observatories and research institutions focused on fundamental and applied research, natural and environmental risk prevention and control, and other areas of significant utility, such as the exploration and exploitation of natural resources, land management, non-invasive analysis in cultural heritage, design of instrumentation for geophysical exploration of the subsurface and monitoring of natural phenomena, and applied computing in Earth Science.

I Anno

Title Course	**SSD**	**Module**	**CREDITS**	**Hours**	**Type Activities *(Frontal lesson, workshop, etc.)***	**TAF**	**Disciplinary Area**	**Mandatory /optional**
Signal Processing and Analysis	FIS/01, FIS/06, FIS/07	single	6	52	Frontal lesson and laboratory workshop	C	Astrophysics, geophysics, climate, and space	Mandatory
Classical Electrodynamics	FIS/03	single	9	72	Frontal lesson	B	Microphysics of Matter and of fundamental interactions	Mandatory
Earth and Atmospheric Physics	FIS/06	single	6	48	Frontal lesson	B	Astrophysics, geophysics, climate, and space	Mandatory
Quantum Physics	FIS/02	single	6	48	Frontal lesson	B	Theoretical and fundamental Physics	Mandatory
Physics Laboratory	FIS/01	single	9	84	Frontal lesson and laboratory workshop	B	Experimental and applied	Mandatory
Continuum Mechanics	FIS/06	single	6	48	Frontal lesson	B	Astrophysics, geophysics, climate, and space	Mandatory
Inversion Methods	FIS/06	single	6	48	Frontal lesson	B	Astrophysics, geophysics, climate, and space	Mandatory

Further training activities (art. 10 comma 5)	-		4	-	-	F	Further language skills	Mandatory
Further training activities (art. 10 comma 5)	-		2	-	-	F	-	-
II Anno								
Title Course	**SSD**	**Module**	**CREDITS**	**Hours**	**Type Activities *(Frontal lesson, workshop, etc.)***	**TAF**	**Disciplinary Area**	**Mandatory /of your choices**
Seismology	FIS/06	single	9	72	Frontal lesson and laboratory workshop	B	Astrophysics, geophysics, climate, and space	Mandatory
Complements of Mathematical Methods	FIS/02	single	6	48	Frontal lesson	C		Mandatory (one of your choices)
Applied Geophysics	GEO/11	single						
Introduction to Volcano and Non Standard Seismology	FIS/06	single						
Statistical Mechanics I	FIS/02	single						
Mathematical Methods for Geophysics	FIS/02	single						
Big Data Seismology	FIS/06	single						
Computational Thermodynamics	FIS/03	single						
At the student's choice	-	single	12	96	Frontal lesson	D	-	Mandatory
Final examination	-	single	39	-	-	E	-	Mandatory

List of propaedeuticities
None.

Course Modalities: All courses are taken in person.