



UNIVERSITÀ DEGLI STUDI DI PALERMO

Department: Physics and Chemistry – Emilio Segrè

A.Y. 2023/2024

DEGREE COURSE IN PHYSICS

Characteristics



Class of Master's Degree
(MSc) on Physics (LM-17)



2 YEARS



PALERMO



FREE ACCESS



2020



DOUBLE DEGREE

University of Turku, Turku (FINLAND)

Educational objectives

The 2nd cycle Degree Course in Physics aims at providing students the ability to promote and develop scientific and technological innovation, as well as to manage technologies in ambits related to physics in the industrial, environmental, healthcare, cultural heritage and public administration sectors.

The 2nd cycle Degree Course in Physics has a twofold educational objective: 1) consolidating and deepening basic competences in Physics which have already been acquired through the 1st cycle degree course, integrating them with advanced issues about fundamental aspects.

2) Providing specialist training through personalised paths, in accordance with the curriculum chosen by students.

The possible paths include a common part with basic insights related to quantum mechanics, radiation-matter interaction, experimental spectroscopy, structure of matter. Subsequently, a progressive diversification of the offer is envisaged, starting with options in three areas (Theoretical Physics, Physics of Matter, Astrophysics) and then branching out onto a range of more specialized issues (as illustrated in detail below).

At the end of this course, the graduates:

- have gained in-depth and flexible training, attentive to the most recent developments in physics research and related technologies;
- possess a solid cultural background in the various sectors of modern physics, from quantum to relativity, in its theoretical, experimental and applicative aspects, as well as a solid command of the scientific investigation method;
- have a broad scientific and operational preparation in the disciplines that characterize Physics;
- possess in-depth knowledge of measurement instruments and data analysis techniques, with applications ranging from physics of matter, to astrophysics, to nuclear/subnuclear physics;
- are able to operate with ample autonomy;
- are able to use the specific knowledge acquired (according to the chosen path) either for the use/design of sophisticated measurement instruments or for the modelling of complex systems in the various fields of science and also in fields other than science;
- are able to use the English language fluently, both in written and oral form, also with reference to disciplinary and technical lexicons.

Thanks to the acquired skills, graduates of this course will be able to carry out, with responsibilities, professional activities in all areas where mastery of the scientific method, specific technical-scientific skills and the ability to model complex phenomena are required. In particular, the activities that graduates will carry out include:

- the promotion and development of scientific and technological innovation,
- participation, including at the management level, in the activities of public and private research bodies,
- the management and design of technologies in professional areas with a high scientific, technological and cultural level, correlated with physics, in the sectors of industry, the environment, health, cultural heritage and public administration;
- the high-level dissemination of scientific culture, with particular reference to the theoretical, experimental and applicative

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aspects of the most recent developments in scientific research.

For these purposes, in relation to the specific objectives of the educational programmes, the Degree Course in Physics:

- includes activities providing in-depth knowledge of quantum mechanics, structure of matter, nuclear and subnuclear physics, astronomy and astrophysics, as well as of the processes involving the earth system, in their theoretical and experimental aspects, and of other aspects of modern physics;
- provides laboratory activities, dedicated to the operational knowledge of the most recent and sophisticated experimental methods, to the measurement and analysis and processing of data, and optionally to the knowledge of numerical and symbolic computation techniques, in areas including the physics of matter, astrophysics, nuclear/subnuclear physics, theoretical physics;
- provides external activities such as training internships in laboratories of research institutions, industrial companies, enterprises, public administration facilities, as well as study stays at other Italian and foreign universities, also within the framework of international agreements.

To achieve these objectives, the Degree Course is structured as follows:

- During the first year common skills are provided of a general nature and on three more specific areas, namely physics of matter, experimental and applied physics, and astrophysics. Through the University Language Centre (CLA) the necessary resources (courses, tests, bibliographic resources, ...) are made available to students to enable them to acquire further knowledge beyond the B2 level required upon entry. Other elective activities are also provided.

- The second year is dedicated to personalized paths, thanks to a wide range of elective courses in the areas of nuclear and particle physics, medical physics, astrophysics and physics of the interplanetary medium, physics of matter and biophysics, theoretical physics and complex systems, physics teaching methodology. The final period is dedicated to the degree thesis supplemented by internship experiences.

The Degree Course has an international scope: it is expected that at least one teaching of each possible path and many of the elective courses will be delivered in English, also to encourage the exchange of students within the framework of agreements with foreign universities.

Professional opportunities

Profile:

Physicist

Functions:

Graduates of class LM-17 - Physics will be able to carry out, with responsibilities, professional activities in all areas requiring command of the scientific method, specific technical-scientific skills and the ability to model complex phenomena. In particular, the activities that the graduates of the class will carry out include: the promotion and development of scientific and technological innovation, the participation, including at the management level, in the activities of public and private research bodies, as well as the management and design of technologies in occupational fields with a high scientific, technological and cultural value, correlated with physical disciplines, in the sectors of industry, environment, health, cultural heritage, and public administration; the high-level dissemination of scientific culture, with particular reference to the theoretical, experimental and applicative aspects of the most recent developments in scientific research.

Skills:

Graduates in Physics have the ability to work professionally in specific areas of application such as, according to the chosen curriculum, scientific and technological research or scientific support for industrial, medical, health and environmental activities, activities related to energy saving and cultural heritage, as well as the various activities aimed at the dissemination of scientific culture.

professional opportunities:

A high percentage of 2nd cycle graduates in Physics continue their training with a PhD in Physics, or in related fields, in Italy or abroad.

The main areas of employment for master's degrees in physics include:

- high-level scientific research, also with propositional and coordination tasks, at universities and public and private research agencies;
- the promotion and development of scientific and technological innovation, as well as the design and management of technologies in fields related to physical disciplines in the industrial sectors (namely microelectronics, optoelectronics, telecommunications, information technology, electronics, space, biomedical, optics) , the environment, health, cultural heritage and public administration;
- the transfer, to the economic and productive system, of knowledge and technological know-how developed in the field of basic research;
- the creation and use of complex reality models also in fields other than the scientific one (banks, financial companies, consulting firms);
- high-level teaching and dissemination of scientific culture with respect, in particular, to the various theoretical, experimental and applicative aspects of classical and modern physics.

Final examination features

It consists of the preparation of an original written dissertation, and of its discussion in front of an examining Board; the dissertation should be related to a specialist topic of the selected curriculum, and it should be prepared under the guidance of a supervising professor.

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Subjects 1 ° year	CFU	Sem.	Val.	SSD	TAF
15316 - ADVANCED QUANTUM MECHANICS <i>Rizzuto(PA)</i>	6	1	V	FIS/02	B
15308 - RADIATION-MATTER INTERACTION <i>Di Salvo(PO)</i>	6	2	V	FIS/05	B
19782 - SPECTROSCOPY WITH LABORATORY <i>Messina(PA)</i>	6	2	V	FIS/01	B
22671 - STATISTICAL PHYSICS <i>Mantegna(PO)</i>	6	2	V	FIS/03	B
13351 - ADVANCED SKILLS RELATED TO THE LABOUR MARKET	1	2	G		F
22646 - ENGLISH LANGUAGE SKILLS - EQUIVALENT TO LEVEL B2+	3	2	G		F
Optional subjects	6				B
Optional subjects II	6				B
Optional subjects III	6				B
Free subjects (suggested)	12				D
	58				

Subjects 2 ° year	CFU	Sem.	Val.	SSD	TAF
13121 - PRACTICE	8	2	G		F
05917 - FINAL EXAMINATION	30	2	G		E
Optional subjects IV	24				C
	62				

OPTIONAL SUBJECTS

Optional subjects	CFU	Sem.	Val.	SSD	TAF
22021 - STRUCTURE OF MATTER - ADVANCED COURSE <i>Ciccarello(PA)</i>	6	1	V	FIS/03	B
07382 - THEORY OF FIELDS <i>Passante(PA)</i>	6	2	V	FIS/03	B
Optional subjects II	CFU	Sem.	Val.	SSD	TAF
22022 - BIOPHYSICS <i>Cottone(PA)</i>	6	1	V	FIS/07	B
22018 - COMPUTATIONAL PHYSICS WITH LABORATORY <i>Cottone(PA)</i>	6	1	V	FIS/07	B
15315 - CONDENSED MATTER PHYSICS <i>Agnello(PO)</i>	6	2	V	FIS/01	B
Optional subjects III	CFU	Sem.	Val.	SSD	TAF
01500 - ASTROPHYSICS <i>Miceli(PA)</i>	6	1	V	FIS/05	B
22019 - THEORY OF GENERAL RELATIVITY <i>Carollo(PA)</i>	6	1	V	FIS/05	B
Optional subjects IV	CFU	Sem.	Val.	SSD	TAF
21961 - ASTROPHYSICS - LABORATORY	6	1	V	FIS/05	C
22663 - BIOPHOTONICS WITH LABORATORY	6	1	V		
- INTRODUCTION TO BIOPHOTONICS AND WET LAB <i>Sancataldo(RD)</i>	3	1	V	FIS/07	C

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OPTIONAL SUBJECTS

Optional subjects IV	CFU	Sem.	Val.	SSD	TAF
- LAB OF BIOPHOTONICS <i>Vetri(PO)</i>	3	1	V	FIS/07	C
21958 - COMPLEX NETWORKS <i>Micciche'(PO)</i>	6	1	V	FIS/07	C
22618 - GAUGE THEORIES <i>Lorenzo(PA)</i>	6	1	V	FIS/02	C
22020 - HIGH ENERGIES ASTROPHYSICS WITH LABORATORY <i>Iaria(PA)</i>	6	1	V	FIS/05	C
22659 - LAB OF PHYSICAL CHARACTERIZATION AND BIOSIGNAL PROCESSING <i>Persano Adorno(PA)</i>	6	1	V	FIS/07	C
22660 - LAB OF PHYSICS OF MATTER	6	1	V		
- LAB OF RAMAN SPECTROSCOPY AND PARAMAGNETIC RESONANCE <i>Agnello(PO)</i>	3	1	V	FIS/01	C
- LAB OF TIME-RESOLVED SPECTROSCOPY <i>Messina(PA)</i>	3	1	V	FIS/01	C
21944 - LABORATORY OF NUCLEAR AND SUBNUCLEAR PHYSICS <i>Marsella(PO)</i>	6	1	V	FIS/04	C
05044 - MATHEMATICAL METHODS AND MODELS FOR APPLICATIONS <i>Sciacca(PO)</i>	6	2	V	MAT/07	C
21962 - NANO-PARTICLES AND NANO-STRUCTURES <i>Buscarino(PA)</i>	6	1	V	FIS/01	C
15346 - PHYSICAL CHEMISTRY OF MATERIALS <i>Pignataro(PO)</i>	6	1	V	CHIM/02	C
21963 - PHYSICS OF COMPLEX SYSTEMS <i>Valenti(PO)</i>	6	1	V	FIS/02	C
02335 - PHYSICS TEACHING METHODOLOGY <i>Fazio(PO)</i>	6	1	V	FIS/08	C
22024 - QUANTUM OPTICS <i>Palma(PO)</i>	6	1	V	FIS/03	C
22748 - QUANTUM THERMODYNAMICS	6	1	V		
- NON-EQUILIBRIUM QUANTUM THERMODYNAMICS <i>Napoli(PA)</i>	3	1	V	FIS/03	C
- QUANTUM THERMODYNAMICS <i>Militello(PA)</i>	3	1	V	FIS/03	C
22658 - RADIATION DETECTORS WITH LAB <i>Abbene(PA)</i>	6	1	V	FIS/07	C
22425 - SPACE WEATHER	6	1	V		
- SUN-EARTH INTERACTION <i>Reale(PO)</i>	3	1	V	FIS/06	C
- SOLAR PHYSICS <i>Reale(PO)</i>	3	1	V	FIS/06	C
21956 - STELLAR EVOLUTION	6	1	V		
- POST MAIN SEQUENCE STARS AND SUPERNOVAE <i>Miceli(PA)</i>	3	1	V	FIS/05	C
- STAR FORMATION AND MAIN SEQUENCE <i>Argiroffi(RU)</i>	3	1	V	FIS/05	C

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OPTIONAL SUBJECTS

Free subjects (suggested)	CFU	Sem.	Val.	SSD	TAF
23367 - ADVANCED MATHEMATICS FOR PHYSICS <i>Bagarello(PO)</i>	6	2	V	MAT/07	D