

*Department of Physics and Chemistry
“E. Segrè”
University of Palermo*

G. Marsella





UNIVERSITÀ
DEGLI STUDI
DI PALERMO

Department of Physics and Chemistry «E. Segrè»

International Students

Residence Permit

Courses and PhD programmes

International Degree
Programmes

Scholarship for International
Students

Tuition Fees

Courses and PhD programmes



Bachelor
Courses



Master of
Science &
Master of Arts
Courses



International
Degree
Programmes



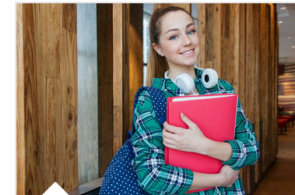
Five years
courses



PhD
programmes
(Dottorato di
Ricerca)



Summer &
Winter School



English
Subjects



Scholarship for
international
students



<https://www.unipa.it/mobilita/en/>



UNIVERSITÀ
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Physics and Chemistry

- The Department of Physics and Chemistry – Emilio Segrè (DiFC) offers a PhD program in Physical and Chemical Sciences, born in 2018 from the confluence of the two previous PhD programs, Physics and Materials Science and Nanotechnologies, the latter in agreement with University of Catania.
- The PhD program in Physical and Chemical Sciences is highly interdisciplinary and covers a wide variety of research areas, reflecting the heterogeneous scientific backgrounds of DiFC faculty members.



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DISCIPLINARY TRAINING

- The frontal training activities foreseen for our PhD students amount to 10 CFU (each CFU is equivalent to 10 frontal hours).
- These activities include participation in courses dedicated to doctoral students, cycles of lectures and seminars organized by the teaching staff, attendance of international schools.
- The various training activities are divided into 3 courses, the choice of dedicated courses is agreed upon by the teaching staff according to the needs of the individual students.
- The recognition of the CFU is achieved through the evaluation of the activities carried out by the students, for a total of 3 exams.

DISCIPLINARY TRAINING (1)

- [Information Theory and Physics 1: Classical Physics](#)
- [Information Theory and Physics 2: Quantum Physics](#)
- [Python Programming and Quantum Physics](#)
- [Fluctuations-induced Phenomena](#)
- [Time-resolved Photoluminescence](#)
- [Raman Spectroscopy](#)
- [Femtosecond Spectroscopy](#)
- [Atomic Force Microscopy](#)
- [Quantitative and Qualitative Analysis Methods in Physics Education Research](#)
- [Millisecond Pulsars: Theory and Observations](#)
- [Topology in Condensed Matter](#)

DISCIPLINARY TRAINING (2)

- [Quantum Optics in Photonic Lattices](#)
- [Introduction to Agent-based Models](#)
- [Long Range correlations in statistical physics](#)
- [Experimental Techniques in Astroparticle Physics](#)
- [Introduction to Data Acquisition](#)
- [Thermodynamic Techniques for the Characterization of Nanostructured Materials](#)
- [Organic/Inorganic Nanocomposites: Properties and Applications](#)
- [Project Management in the Scientific – Spatial Context](#)
- [Role of Noise in Out-Of-Equilibrium Statistical Physics](#)
- [Numerical Methods for Out-of-equilibrium Statistical Physics](#)
- [X-ray Synchrotron Radiation, a powerful tool in material science and technology for astrophysics](#)
- [Theories, techniques and instrumentations for the determination of bioanalites](#)

DISCIPLINARY TRAINING (3)

Moreover, doctoral students can attend the courses offered by the [Master Degree Program in Physics](#) and, thanks to a recent agreement, all disciplinary courses offered to PhD students from Scuola Internazionale Superiore di Studi Avanzati ([SISSA](#)).

LANGUAGE TRAINING

The seminar activities are carried out in English. The thesis is written in English. The CLA (Ateneo Language Center) organizes language training courses open to PhD students. The CLA also provides Italian courses for foreigners open to foreign students of the PhD program.

INFORMATICS

The research activity of the PhD program includes the use of advanced mathematical calculation programs (Matlab, Mathematica, dedicated codes). The training in the use of numerical and simulation codes is taken care of by the tutors. PhD students have the opportunity to participate in the matlab school coorganized annually by the Department of Physics and Chemistry.

RESEARCH MANAGEMENT, KNOWLEDGE OF RESEARCH SYSTEMS AND FINANCING SYSTEMS

The University organizes a series of training days dedicated to the management of research, knowledge of research systems and funding systems, directed to researchers and students of PhD courses.

Number of GRANTs

Ordinary grants	5
Grants from National Institute of Astrophysics (INAF)	2
Grant for foreigners students	1
Regional grants	1
Innovation and green grants	4

Total Grants	13
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International Links

Dottorato in collaborazione con Università e/o enti di ricerca esteri

UNIVERSITA' DI TURKU (Finland)

Department of Physics and Astronomy, (Turku Center for Quantum Physics and Tuorla Observatory)

*EBERHARD KARLS UNIVERSITY OF TUEBINGEN
(Germany)*

Department of Physics (Institute for Astronomy and Astrophysics and Institute for Theoretical Physics)

Research Institutes

INAF and INFN

International Collaborations

QUEEN'S UNIVERSITY BELFAST; UNIVERSITÉ TOULOUSE;
INSTITUT MAX VON LAUE - PAUL LANGEVIN (GRENOBLE); UNIVERSITE' JEAN MONNET
(ST-ETIENNE)



Research Areas

- The research areas of the Ph.D. program in Physical and Chemical Sciences can be described as following

ASTROPHYSICS

- physics of solar plasmas
- space weather
- stellar physics
- exoplanets
- evolution of supernova remnants and acceleration of cosmic rays
- accretion physics and outflows in compact objects (black hole and neutron stars)
- visible astrophysics
- high and very-high energy astrophysics (X and gamma rays)
- instrumentation for astrophysics



PHYSICS OF ELEMENTARY PARTICLES AND ASTROPARTICLES

- indirect study of cosmic rays (Extensive Air Showers: AUGER, CTA)
- direct study of cosmic rays (Detectors in space: DAMPE, HERD)
- particle detectors for the study of cosmic rays and elementary particles
- DAQ systems for particle physics experiments
- neutrino physics (KM3NET, DUNE)
- distributed sensor networks for different applications

QUANTUM MECHANICS

- quantum technologies
- quantum information theory
- coherent dynamics of mesoscopic systems
- dynamics of open quantum systems
- quantum optics
- fundamentals of quantum mechanics
- quantum electrodynamics
- quantum vacuum fluctuations and Casimir effect
- cosmological axions
- quantum field theory in curved space-times and in non-inertial frames
- quantum metrology and quantum phase transitions



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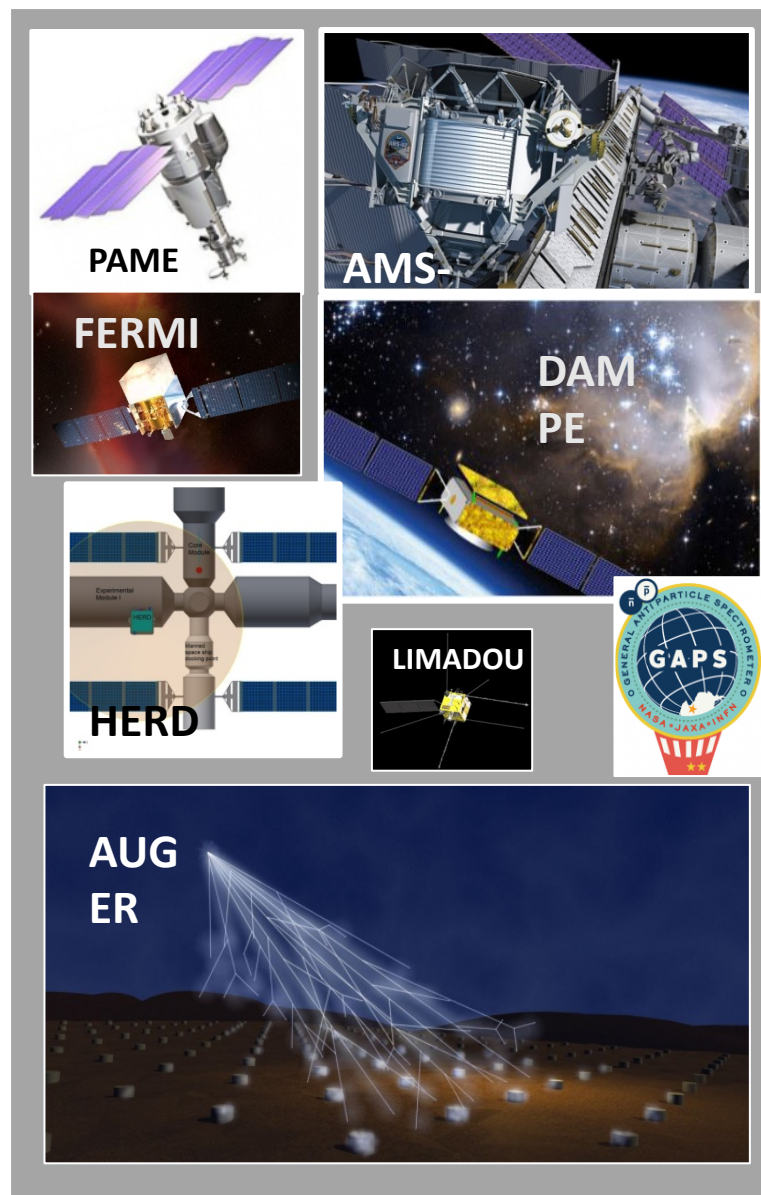


The Group of Elementary Particle Physics

- Cosmic Rays
Ground (Auger, CTA)
Underwater (KM3NET)
Space (DAMPE, HERD)
- Particle Physics
CERN (LHC Physics)
FRASCATI (Plasma acceleration)

Research activities with INFN Catania

Prof Giovanni Marsella
giovanni.marsella@unipa.it



- Backup-slides

PHYSICS OF COMPLEX SYSTEMS

- econophysics
- complex networks
- stochastic processes
- stochastic modeling for the dynamics of short and long Josephson junctions
- agent models
- analysis of physical, biological, biomedical and socio-technical systems with statistical physics methodologies
- data mining of physical, biological, biomedical and socio-technical systems with unconventional techniques based on complex networks

NANOMATERIALS FOR ELECTRONICS AND PHOTONICS

- fundamental properties of advanced materials: electronic, structural, morphological, spectroscopic
- nanomaterials and nanocomposites for applications in electronics, photonics and optoelectronics
- nanophysics and spectroscopy of nanosystems
- 0D, 1D, 2D, 3D nanomaterials
- thermal and radiation effects in condensed matter

DIDACTICS OF PHYSICS

- methodologies based on scientific inquiry
- simulation systems and learning environments

CHEMISTRY OF MATERIALS AND NANOTECHNOLOGIES

- hybrid organic-inorganic nanoarchitectures
- materials for fuel cells and electrolyzers
- thermoelectric materials
- photovoltaic materials and devices
- functional molecular surfaces
- biopolymers and bioplastics
- natural inorganic nanoparticles
- functional nanocomposites for cultural heritage
- conservation and restoration of cultural heritage
- sensors and biosensors
- transport and delivery of drugs

ENVIRONMENTAL ANALYTICAL CHEMISTRY

- speciation in natural fluids
- composite and bio-absorbent materials for water decontamination