

# TP

The Master's degree in Physics aims at forming students with specific advanced skills in different areas of modern physics, based on a solid interdisciplinary scientific background.

Graduates in Physics are appreciated for their open-minded, multi-disciplinary approach and their ability to apply scientific method to the analysis and resolution of complex problems, in various fields of physics as well as in other science-related sectors.

Graduates will be able to continue their education in Professional Masters' Programmes and/or Doctoral Schools worldwide, and career opportunities in Italian and foreign public agencies or private companies in the field of:

- Research and development
- Applications and technological innovation
- Scientific outreach and teaching

More specifically, at the end of the course, students in the Theoretical Physics curriculum will:

- have in-depth and up-to-date understanding of all the theoretical and fundamental aspects of contemporary physics;
- use advanced mathematical and numerical tools to describe and model physical systems;
- apply scientific methods and techniques to the resolution of problems.

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**MASTER'S DEGREE IN PHYSICS**  
Curriculum: THEORETICAL PHYSICS

**SECOND CYCLE DEGREE PROGRAMME/MASTER**  
UNIVERSITY OF BOLOGNA

Web-page:  
<https://corsi.unibo.it/2cycle/Physics>

**PROGRAMME DIRECTOR:**  
Prof. Nico Lanconelli  
e-mail: [nico.lanconelli@unibo.it](mailto:nico.lanconelli@unibo.it)

**CONTACTS FOR THE CURRICULUM IN**  
**THEORETICAL PHYSICS:**  
Prof. Elisa Ercolessi  
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**TUITION FEE:** about € 3,000.00 / year

# TP



ALMA MATER STUDIORUM  
UNIVERSITÀ DI BOLOGNA  
SCHOOL OF SCIENCE

**SCHOOL OF SCIENCE**

**PHYSICS**  
**CURRICULUM**  
**IN THEO**  
**RETICAL**  
**PHYSICS**

**SECOND CYCLE**  
**DEGREE**  
**PROGRAMME/**  
**MASTER**

**BOLOGNA**



## COURSE STRUCTURE

I year	ECTS
<b>Compulsory Classes</b>	<b>30</b>
Quantum Field Theory 1	6
Quantum Field Theory 2	6
Health Physics	6
Relativistic Quantum Mechanics & Path Integrals	6
Statistical Mechanics	6
General Relativity 1	6
<b>Elective Classes in Theoretical Physics</b>	<b>12</b>
General Relativity 2	6
Statistical Field Theory	6
Theory of the Standard Model	6
Group Theory for Physics	6
Quantum States of Matter and Radiation	6
Theoretical and Numerical Aspects of Nuclear Physics	6
<b>Elective Classes in other related fields of Physics</b>	<b>12</b>
II year	ECTS
<b>Elective Classes in Advanced Theoretical Physics</b>	<b>6</b>
Advanced Mathematical Methods for Physics	6
Advanced Quantum Field Theory	6
Quantum Cosmology	6
Quantum Many Body Theory	6
Supersymmetry in Particles, Strings and Fields	6
<b>Elective Classes from any course of Master in Physics</b>	<b>12</b>
<b>Transversal Skills for Physics-related Professions</b>	<b>6</b>
<b>Advanced Professional and Research Skills in Physics</b>	<b>6</b>
<b>Final Dissertation</b> (inclusive of stage and/or periods abroad)	<b>36</b>

## Learning Outcomes

During the first year of the programme, students acquire a solid background in all areas of theoretical physics, with emphasis on quantum field theoretical techniques applied to particles and strings, general relativity and cosmology, quantum mechanics and statistical physics.

During the second year of the programme, students develop cross-cutting skills in project writing, innovation, scientific communication and outreach.

At the end of the course, students shall produce and orally defend an original research project, developed within a research group of the Department, possibly in collaboration with other public science agencies or private companies in Italy or abroad.

## Career Opportunities

2nd cycle degree graduates can apply for Professional Masters' Programmes as well as PhD Programmes in Italian and foreign universities. Career opportunities for graduates also lie in Research and Development Units within public science agencies and private companies.

## Entry Requirements

Admission to the 2nd cycle degree programme in Physics is open to candidates with:

- a First Cycle Degree obtained in Italy or equivalent qualification obtained abroad, in one of the following classes:
  - degree programme in class L-30 (pursuant to DM 270/2004) Physics Sciences and Technology;
  - degree programme in class XXV Physics Sciences and Technology (pursuant to DM 509/99);
  - 4-year degree programme in Physics and in Astronomy from the previous degree programme system
- knowledge of English to level B2.

To profitably attend the Programme, students must possess fundamental skills in mathematics and a good understanding of the phenomenology and models of classical and modern physics, including the fundamentals of micro-physics applied to particle physics and condensed matter. They should also have laboratory experience including the use of basic instruments and data acquisition and processing, using computer-assisted techniques.

Admission is subject to the assessment of the candidate's personal knowledge based on the student's curriculum and/or an interview, according to the rules set by the Degree Programme Board and published on the web-page.