

PHD PROGRAMME IN PHYSICS, ASTROPHYSICS, AND APPLIED PHYSICS
UNIVERSITÀ DEGLI STUDI DI MILANO
PhD Cycle 41 (2025-2026)

All lectures will be given in English.

Course title	Advanced topics in particle physics
Teacher in charge of the course	D'Auria Saverio
List of the teachers of the course	D'Auria Saverio; University of Milan; saverio.dauria@unimi.it Serafini Luca; INFN Milan section; luca.serafini@mi.infn.it Turra Ruggero; INFN Milan section; ruggero.turra@mi.infn.it
Training objectives	Provide a framework of advanced notions used in experimental particle physics: accelerators, detectors and statistical methods.
Prerequisites	General knowledge of the Standard Model of particle physics, classical electrodynamics, basics of statistics.
Detailed course program	Introduction to particle accelerators: physics and technology challenges. • History of the evolution of particle accelerators: ideas, technologies and applications. • Transverse and longitudinal beam dynamics basics and issues. • Accelerators for physics, human health and industry. • Colliders for extreme microscopy while pushing the energy frontier. • Particle Detectors. • Position sensitive silicon and gaseous detectors. • Calorimetry for particle physics. • Reconstruction of physical quantities like momentum, energy, particle identification in particle physics measurements. • Selected physics measurements at present and future accelerators. • Statistical analysis with exercises. • Hypothesis testing, Likelihood method. • Estimation of confidence levels.
Examination modalities	The examination consists in the production of a short essay on an experimental technique, exercises on statistical methods and an interview on the basics of accelerator physics
Preliminary schedule	September 1-13, 2026 Course enrolment deadline: December 27, 2025.