

Information on opportunities available to Master students in physics offered by the High Energy Physics Laboratory

The High Energy Physics Laboratory (LPHE, <https://www.epfl.ch/labs/lphe/en>) offers teaching in particle physics and related topics. These courses, exercises, and laboratory sessions are intended for students interested in experimental or theoretical aspects of these fields. LPHE also offers specialisation projects and Master projects in experimental particle physics, linked to its research activities. LPHE participates in experiments at CERN and elsewhere, within large international collaborations.

LPHE currently comprises 44 researchers, including 7 teachers. It has offices and laboratories in the Bâtiment des Sciences Physiques (BSP), also known as the “Cubotron”, where it benefits from mechanical and electronics workshops. Some members of the LPHE are based at CERN.

Courses under the responsibility of LPHE (except service courses)

Academic year 2026–2027			
Code	Title	Hours/week	Semester
PHYS-342	Physique nucléaire	2 C + 1 E	Bachelor 5
PHYS-311	Particles and fundamental interactions	2 C + 2 E	Bachelor 6
PHYS-415	Particle physics I	2 C + 2 E	Master 1
PHYS-416	Particle physics II	2 C + 2 E	Master 2
PHYS-440	Particle detection	2 C + 2 E	Master 1
PHYS-471	Particle physics : the flavour frontier	2 C + 2 E	Master 2
PHYS-400	Selected topics in nuclear and particle physics	2 C + 2 E	Master 2
PHYS-439	Introduction to astroparticle physics	2 C + 2 E	Master 2

All courses are optional, except PHYS-311. One may also mention the courses “Introduction to particle accelerators” (Master semester 1) and “Quantum field theory” (Master semesters 1 and 2) given under the responsibility of the Particle Accelerator Physics Laboratory (LPAP) and the Theoretical Particle Physics Laboratory (LPTP). For a complete description of Master courses, see <https://www.epfl.ch/schools/sb/sph/en/master/>.

Master laboratory work (Physics projects I and II)

Autumn semester : design, construction and implementation of a radiation measurement experiment, in groups of 3 students (see <https://www.epfl.ch/labs/lphe/en/tpiv/>) :

- study of β decays using a spectrometer and “measurement” of the neutrino mass ;
- measurement of the lifetime and magnetic moment of cosmic muons ;
- development of a cosmic ray detector.

Spring semester : individual project linked to the research performed at LPHE (see further below) ; familiarisation with modern particle physics techniques (detectors, software, ...) that will be used during the specialisation semester and/or the Master project.

Specialisation semester and Master project

The specialisation semester allows the student to broaden their knowledge and experience in particle physics, mainly through practical projects.

For the Master project, the student is integrated into a research team of LPHE. The topic is closely related to ongoing laboratory activities and concerns one aspect of experimental particle physics (data analysis, simulations, or detector development and testing, ...).

The main research effort of the LPHE focuses on the **LHCb** experiment at the Large Hadron Collider (LHC) at CERN (<https://lhcb-outreach.web.cern.ch>), designed to study the violation of the CP symmetry and rare decays of hadrons containing a b or c quark, but also active in other areas, such as the search for heavy neutral leptons. LPHE is also involved in the **NA62** experiment at CERN (<https://home.cern/fr/science/na62>) for precision measurements of K^+ meson decays with an intense K^+ beam, as well as in the smaller **SND@LHC** experiment (<http://snd-lhc.web.cern.ch>) whose goal is to measure neutrino (and possibly dark matter) production in the direction of the LHC beams.

LPHE is also active in astroparticle physics : with the **DAMPE** experiment (<https://dpnc.unige.ch/dampe>) and the future space instrument **HERD** (<https://herd.ihep.ac.cn>), it studies the origin, acceleration, and propagation of cosmic rays in the Universe, with a particular focus on gamma rays and dark matter searches.

Finally, a significant effort in detector development and experiment design for the future **FCC-ee** collider at CERN (<https://fccis.web.cern.ch>) began in 2025, as well as activity for the future **SHiP** experiment at CERN (<https://ship.web.cern.ch>).

The ultimate goal of all these projects is the direct or indirect search for new physics, i.e., phenomena not explained within the Standard Model of particle physics. The LHC experiments are currently completing their third data-taking period (Run 3 of the LHC, 2022–2026), will be upgraded in the coming years to operate until 2041, and will extend the limits of our knowledge.

In 2026–2028, LPHE research activities will focus on the following objectives :

- analyze recorded data with a view to publishing scientific results ;
- develop technologies for upgrading the LHCb detector and for future experiments (HERD, SHiP, FCC-ee) ;
- optimize the design of a future detector at FCC-ee.

Registration and information requests

To apply for Physics Projects I and II, fill out the form provided by the Physics Section (<https://sb-projects.epfl.ch/>) which will be available from July 28 to August 17, 2026.

For any questions, or to express your interest (in advance) for any project at LPHE, feel free to contact one of the LPHE professors :

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