Course unit English denomination	Physics at Future Colliders
Teacher in charge (if defined)	Dr. Patrizia Azzi
Teaching Hours	24
Number of ECTS credits allocated	3
Course period	Spring Term
Course delivery method	x In presence ☐ Remotely ☐ Blended
Language of instruction	English
Mandatory attendance	☒ Yes (50% minimum of presence) ☐ No

Course unit contents

Basic introduction to collider physics, focusing on near term and future projects: HL-LHC, e+e- machines (linear and circular), high-energy hadron machines (including heavy ion running), electron-hadron, muon collider. and newer options coming on the market. The course will discuss the different physics challenges and ultimate performance. Some details about detectors would be given. Goal of the course: understanding the advantages and limitations of the different machine choices for various physics benchmarks.

Learning goals

The course will familiarize students with the relevant physics measurement that could be performed at different collider machines, considering different colliding particles (protons,electrons, muons, ions, etc) and different energy ranges, as those of current projects on the table.
They will acquire the knowledge toolkit (physics observables, phenomenology, measurement methods, systematics evaluation…) to be able to have a critical approach to: learn the characteristics of the various proposals and understand their differences, understand which physics can be done best at which machine, how, i.e. where the performance comes from, participate constructively to the choices for the future.

Teaching methods	Frontal lessons in dual mode with transparencies (material published on the course Moodle and available throughout the course). Possibility of questions & answers with the teacher through the Slack platform.
Course on transversal, interdisciplinary,	☐ Yes ☒ No

transdisciplinary skills	
Available for PhD students from other courses	☒ Yes ☐ No
Prerequisites (not mandatory)	Content is for everyone with some knowledge of the Standard Model, for insta theorists and other experimentalists(from non-collider physics, neutrino, astroparticle, etc…). The course can also be of interest for curious students in other fields with a basic knowledge of Standard Model. This is not an accelerator physics course, nor a detector course (there are other courses available for that).
Examination methods (in applicable)	Oral Presentation (with slides) of about 20 min+ 40min discussion • Choosing a specific Physics measurement/topic and discuss how it can be exploited across the different machines • (the challenge is that this approach is orthogonal to the way things are presented in the course)
Suggested readings	Material given by the teacher
Additional information	