PhD course in Physics, Astrophysics, and Applied Physics - Università degli Studi di Milano
PhD cicle 40 (2024-2025)

All lectures will be given in English.

Course title	Advanced topics in astrophysics and plasma physics - Plasma physics for astrophysics
Teacher in charge of the course	Romé Massimiliano
List of the teachers of the course *[surname/name; affiliation; e-mail]*	Romé Massimiliano, University of Milan, massimiliano.rome@unimi.it
Training objectives	Training on phenomenological aspects and theoretical models of plasma physics, which allow one to address specific problems in astrophysics and more generally in the field of laboratory plasmas.
Prerequisites *[please insert details and also **state whether the course has advanced contents** suitable for students with prior knowledge of the topics or is also suitable for students without prior knowledge]*	The course is suitable for students without prior knowledge of plasma physics. Depending on the students' prior knowledge, advanced plasma physics contents applied in astrophysical contexts will possibly be presented.
Detailed course program	Motion of charged particles in the Earth's dipolar magnetic field: trapped particles, permitted and prohibited trajectories for particles arriving from infinity (cosmic rays), cut-off rigidity and asymptotic directions. Brief notes on the kinetic and fluid description of a plasma. Magnetohydrodynamics (MHD) equations: waves, equilibria, instabilities in the presence of gravity. The solar wind. The solar magnetic field: magnetoconvection and sunspots, bipolar magnetic regions, magnetic buoyancy. Brief notes on the MHD dynamo theory. Brief notes on the magnetic reconnection.
Examination modalities	Short presentation in seminar form and questions about a topic presented during the course or more generally on a plasma astrophysics topic of interest to the student.
Preliminary schedule *[please indicate the weeks when the lectures will be given]*	March 2025