UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

SYLLABUS DEL CORSO

Raggi Cosmici

2021-1-F5801Q020

Aims

Introduce physics of Cosmic Rays and their relevance for Astrophysics, production sources, propagation environments and processes

Contents

Cosmic rays (CR) will be described in relation to the experimental data, their composition and properties. Main topics will be: origin and astrophysical sources of CR; acceleration processes; interaction with interstellar medium; propagation in the Milky Way; interaction with solar wind; propagation in the solar cavity; interaction with the Earth magnetic field; radiation belts and geomagnetic cut-off; interaction with Earth atmosphere; atmospheric showers; CR in fundamental physics and cosmology.

Detailed program

- Observational properties of Cosmic Rays: spectral intensity, energy density and composition. Main scientific results observing CR, current experimental activities from the ground and in space.
- Origin of CR: acceleration processes, galactic and extragalactic astrophysical sources.
- Interaction of CR with interstellar medium and propagation in the Milky Way: diffusive models and confinement processes, energy loss processes and electromagnetic radiation from CR, spallation processes and secondary component production.
- Interaction with solar wind and solar modulation: solar magnetic activity, solar particle emission,

heliosphere.

- Interaction with the Earth magnetic field and atmosphere: radiation belts and geomagnetic cut-off, extensive air showers and observations of highest energy CR.

- Relevance of Cosmic Rays for fundamental physics and cosmology: new physics reserch, Dark Matter, Cosmic Anti-matter, extragalactic CR.

Prerequisites

knowledge of the previous courses of physics

Teaching form

front teaching

During Covid-19 emergency period lectures will be mostly asynchronous from remote with some streaming synchronous events.

Textbook and teaching resource

1. Slides and notes of the lectures, provided by the lecturer.

2. Reference textbooks: a) High Energy Astrophysics, M.S. Longair, Cambridge University press, third edition, ISBN 978-0-521-75618-1; b) Space Physics – An introduction, C.T. Russel, J.G. Luhmann, R.J. Strangeway, Cambridge University press, ISBN 978-1-107-09882-4.

Semester

Second semester

Assessment method

Final assessment with the usual score up to 30, by interview consisting of a discussion of a presentation on one of the topics treated, as a student choice.

During Covid-19 emergency interview will take place via telematic connection. WebEx platform will be used through e-learning page of the class with the public link for virtual attendees.

Office hours

Tentatively every working Monday during the course, from 12:30 pm to 1:30 pm. Otherwise on request. This calendar is depending on the final lectures timetable.

During Covid-19 emergency question time for students will take place via telematic connection.