



UNIVERSITÀ  
DEGLI STUDI DI MILANO-BICOCCA

## SYLLABUS DEL CORSO

### Cosmic Rays

2122-1-F5802Q013

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#### Aims

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

#### Contents

Cosmic rays (CR) are described in relation to observations, their composition and properties. Main topics are: origin and astrophysical sources of CR; acceleration processes; interaction with interstellar medium; propagation in the Milky Way; interaction with solar wind; propagation in the heliosphere; interaction with the Earth magnetic field and atmosphere; CR studies in relation to 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 research, Dark Matter, Cosmologic Anti-matter, CRs of extragalactic origin.

## **Prerequisites**

knowledge of the previous courses of physics

## **Teaching form**

front teaching

## **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 score up to 30, by interview consisting of a presentation and a discussion on one of the topics treated in the course, as a student choice.

## **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.

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