UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

COURSE SYLLABUS

Astrophysics Laboratory

2021-3-E3001Q058

Aims

1) Introduce instrumentation and techniques for Astrophysics observations;

2) Allow students to get the first experience in sources observation and signal calibration.

Contents

Astronomical sources, techniques and instrumentation used in astrophysics are described for several spectral bands, with particular attention to the microwave band, which will be used during the laboratory activity.

In addition Cosmic Rays an related observational techniques are described.

Students are guided to perform some measurement including: detector characterisation; calibration of observed signals; observation of sky sources.

Detailed program

In the first part astronomical sources and observables are described, among them: Sun, Moon, Galaxy, Cosmic microwave background, Cosmic rays. Techniques and instrumentation used in astrophysics are also described for

the several spectral bands, with particular attention to the microwave band used during the laboratory activity. The following items are presented: antennas, telescopes, optics; detectors; photometric and spectroscopic techniques; noise reduction techniques and data analysis.

Students will work in groups of 3-4 people. Each group will carry on observations of sky sources like: Sun, Moon, Galaxy, Cosmic microwave background, Cosmic rays. Groups are then involved in measurements including: detector characterisation; calibration of observed signals. Each group will analyse data and subtract spurious signals like rf interferences or atmospheric emission. Finally groups will describe their activity and discuss results in a short report.

Prerequisites

Students are requested to know contents of courses of Physics and Laboratories followed in the previous years.

Teaching form

1) Introductory front teaching: 20-24 hours;

During Covid-19 emergency lectures will be done with asynchronous video registration.

2) Laboratory experimental training: 72-76 hours.

During Covid-19 emergency laboratory activity will be done with partial presence of students and eventual syncrhronous video connection.

Textbook and teaching resource

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

2) Software codes and packages for driving instruments and data analysis.

3) Reference textbook: An introduction to radio astronomy / Bernard F. Burke, F. Graham-Smith. - 4. ed. Cambridge University 2019.

Semester

Full year (both semesters).

Assessment method

1) Final assessment with the usual score up to 30;

2) evaluation by written report on the activities carried on in laboratory, incuding experimental measurements and data analysis,

3) final interview on the same topics of the report.

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

Every working Wednesday during the class period, from 12:30 pm to 1:30 pm. Otherwise on request.

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