UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

COURSE SYLLABUS

Plasma Physics Laboratory

2324-1-F1701Q131

Aims

Acquisition of experimental skills and techniques in plasma physics

Contents

The course consists of a series of experiments on laboratory plasmas and magnetized plasmas. The experiments will be preceded by introductory lectures on the physics and diagnostics of plasmas and related technologies.

Detailed program

The course includes a series of introductory lectures on plasma physics and diagnostics and related technologies (12 hours).

Laboratory activity (108 hours) involves conducting experiments on the following topics:

- Setting up a vacuum chamber; characterization of vacuum using mass spectroscopy and search for leaks.
- Study of low-frequency wave propagation in plasma.
- Measurement of plasma density by microwave absorption spectroscopy at plasma frequency.
- Production of plasmas at atmospheric pressure for biomedical applications.
- Characterization of a magnetized plasma through the use of Langmuir probes and optical spectroscopy.
- Study of turbulence in a magnetized plasma using different techniques (electrostatic probe array, fast imaging) and advanced data analysis techniques.

Prerequisites

None. Notions required for the full understanding of the topics covered by the experimental activity will be provided during the introductory lectures.

Teaching form

Introductory lectures (12 hours) and laboratory experiments (108 hours). Introductory lectures will be given in Italian. Assistance during the laboratory experiments will be provided in Italian, or in English on request.

The detailed schedule of activities will be published on the e-learning page in October 2023.

The laboratory activities will be held partly in room 2028a on the second floor of the U2 building - Department of Physics, and partly at the PlasmaPrometeo centre, located in the U9 building.

Textbook and teaching resource

The slides of the introductory lectures will be provided. Handouts prepared by the lecturers will also be provided on some topics.

The following texts are recommended for further study of the physics, technologies and diagnostic methods relating to laboratory plasmas:
F.F. Chen, *Introduction to Plasma Physics and Controlled Fusion,* 3?? Edition, Springer International Publishing, 2016.
Y.P. Raizer, *Gas Discharge Physics*, Springer-Verlag, 1991.
M.A. Lieberman and A.J. Lichtenberg, *Principles of Plasma Discharges and Materials Processing*, Wiley, 1994.
I.H. Hutchinson, *Principles of Plasma Diagnostics*, Cambridge University Press, 1990.

Semester

First year, first semester

Assessment method

There are no in-progress tests, only a final exam.
To be admitted to the examination, a report must be drawn up on all the experiments carried out in the laboratory. The report, written in English, must contain a brief description of the apparatus used, the results obtained and a brief discussion of them.
The examination, which will be held orally, will focus mainly on the discussion of the report itself, with possible mentions of the concepts explained during the introductory lectures.
During the examination, the quality of the report, the care taken in performing the measurements and related data analysis, and the understanding of the physics concepts on which the experiments are based will be evaluated.
The exam will be held in Italian, or in English on request.

Office hours

Students are received by appointment.
The contact details of the lecturers are as follows:
prof. Emilio Martines, U2 building, third floor, room 3026, email: emilio.martines@unimib.it
prof. Ruggero Barni, U2 building, third floor, room 3029, email: ruggero.barni@unimib.it

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